National Energy and Climate Plan of the Czech Republic

November 2019

Executive Summary

The National Energy and Climate Plan of the Czech Republic was prepared on the basis of a Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action and it contains the main targets and policies in all five dimensions of the Energy Union for the period 2021–2030 with a view to 2050. The main part of the National Plan is the setting of the Czech Republic's contribution to the European climate and energy targets concerning the reduction of greenhouse gas emissions, the increase in the share of renewable energy sources and increase of energy efficiency. This is a revised version of the Draft National Plan, which was acknowledged by the Czech Government on 28 January 2019 and submitted to the European Commission on 30 January 2019. The National Plan is based on two main strategic documents, namely the State Energy Policy of the Czech Republic, which was approved in 2015, and the Climate Protection Policy of the Czech Republic, which was approved in 2017. The structure and the elements of the National Plan comply with the above Regulation.

In relation to reducing greenhouse gas emissions the European target is set at 43 % compared to 2005 in the sectors covered by the EU ETS, and at 30 % in sectors outside the EU ETS. The main target of the Czech Republic is to reduce the total greenhouse gas emissions by 30 % by 2030 compared to 2005, corresponding to a reduction of emissions of 44 million tonnes CO_2 eq. The National Plan also includes long-term indicative targets by 2050 based on the agreed Climate Protection Policy. According to the emission projections, a 34 % reduction in greenhouse gas emissions (compared to 2005) will be achieved through the implementation of the policies and measures contained in the National Plan. Emission projections have been updated for the purpose of preparing the National Plan and are consistent with these energy projections. These projections are prepared on a two-year basis.

Decarbonisation also includes renewable energy sources. An EU-wide target by 2030 of 32 %, expressed as a share of renewable sources in gross final energy consumption, was agreed. The recast of the Renewable Energy Directive (2018/2001) furthermore includes requirements for sub-targets in heating and cooling and in transport. The Czech Republic proposes a 22 % contribution to the European target by 2030, an increase of 9 percentage points compared to the Czech national target of 13 % for 2020. The average year-on-year growth of RES share in heating and cooling is proposed at 1 %. In transport, the target is set as binding on all Member States at 14 %. The main policies for fulfilling the proposed contribution include those enshrined in the draft amendment to Act No 165/2012, on supported energy sources, which sets out a new support scheme for renewable or supported energy sources after 2020. However, this proposal has not yet passed through the entire legislative process. Other policies beyond the scope of the proposed amendment to the law will also be important to meet the proposed RES contribution.

In energy efficiency, there are three targets for the period 2021–2030: (i) an indicative target for the size of primary energy sources, final consumption and energy intensity; (ii) a binding energy savings target for public sector buildings; (iii) a binding year-on-year rate of final consumption savings. These objectives correspond to Articles 3, 5 and 7 of the of Directive 2012/27/EU on energy efficiency, as amended. The aim of the Czech Republic is to reach primary energy sources at the level of 1 735 PJ in 2030, final consumption at the level of 990 PJ and energy intensity of GDP at the level of 0.157 MJ/CZK. The Czech Republic has chosen a target expressed in the energy intensity of GDP as its primary objective. On the basis of an assumed energy performance of central institution buildings in 2020, the Czech Republic set the commitment to achieve energy savings in buildings with low energy performance of these institutions of 124 TJ, in accordance with the rules of the Energy Efficiency Directive. Furthermore, in accordance with Article 7, a commitment of cumulated energy savings of 462 PJ was set on the basis of the available

EUROSTAT data and the consumption forecast in 2018 and 2019. The commitment in Articles 5 and 7 is preliminary and will be recalculated on the basis of current data available in 2020. In order to meet its energy efficiency targets and commitments, the Czech Republic will continue to use economic measures, including public support, legislative measures and measures in the field of education and counselling. Measures for the implementation of Article 7 are clearly listed in Annex 4.

In the field of energy security, the National Plan is based mainly on the targets and policies contained in the approved State Energy Policy of the Czech Republic. As regards the dimension energy security, there are no EU-level targets, although there are a number of requirements arising from European legislation, for example from the Regulation concerning measures to safeguard the security of gas supply. The main objectives can be described as increasing the diversification of the energy mix, maintaining self-sufficiency in electricity supply, ensuring sufficient development of energy infrastructure and no significant increase in import dependency. However, import dependence is very likely to gradually increase due to a decrease in the use of domestic brown and black coal and the related increase in imported energy commodities.

With regard to the internal energy market dimension, the achievement of the electricity interconnection of 15 % by 2030 is crucial. The Czech Republic aims to maintain the import/export capacity of the transmission system, among other things, for 2030 in proportion to the maximum load of at least 30/35 %, which corresponds to the 15 % target in terms of installation performance. The Czech Republic's interconnection is already almost 30 %, so the Czech Republic does not consider it necessary to introduce further specific policies in this area. Energy market integration and infrastructure development are already significantly harmonised at EU level. Further harmonisation is clearly provided by European legislation, which also includes most of the information and planning obligations, such as the obligation to prepare ten-year network development plans for transmission systems. The National Plan describes the current state and the expected development of market integration and energy infrastructure.

The fifth dimension of the Energy Union is that of research, innovation and competitiveness. In this regard, the Czech Republic has not set any specific quantifiable targets in public research, development and innovation specifically related to the Energy Union. However, research, development and innovation in sustainable energy are one of the priority areas of key strategic documents such as the National R&D Strategy for Smart Specialisation and the National Priorities for Oriented Research, Experimental Development and Innovation. In the development of priorities in this area, the Czech Republic also seeks to take into account the priorities at EU level, especially the priorities of the European Strategic Energy Technology Plan. It is not possible to precisely determine the exact level of public funding of research, development and innovation for low-carbon technologies. However, the National Plan shows the estimate of public finances allocated to the energy sector.

Total investments related to the fulfilment of the National Energy and Climate Plan of the Czech Republic are estimated between CZK 1 to 5 billion. These investments have been quantified in detail with a view to meeting the RES and energy efficiency targets. Total costs associated with the development of renewable energy sources amount to almost CZK 900 billion. In this respect, it is worth pointing out that this is a cost at the level of state aid, the total investment will be higher than that. Achieving the annual savings target (under Article 7 of Directive 2012/27/EU on energy efficiency) is associated with a total investment of CZK 634.5 billion and an allocation of CZK 157.8 billion of public expenditure. Additional investments / public funds will have to be further spent to comply with Article 3 of the Energy Efficiency Directive. Other dimensions will also be linked to additional investments, such as infrastructure development. Detailed information is provided in Chapter 5.3.

Contents

Introduction

The National Energy and Climate Plan of the Czech Republic (hereinafter the ‘National Plan’) was prepared on the basis of the Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action[1], the draft of which was presented in the legislative package entitled ‘Clean Energy for All Europeans’, which was published by the European Commission on 30 November 2016. This is a revised version of the Draft National Plan, which was acknowledged by the Czech Government on 28 January 2019 and submitted to the European Commission on 30 January 2019.

As regards the negotiation of the Regulation on the Governance of the Energy Union and Climate Action itself, on 29 June 2018 the text of the proposal by the EU Council, i.e. the Member States, adopted as part of ‘trialogues’, was approved. Furthermore, the draft Regulation was approved on 13 November 2018 by the plenary of the European Parliament. On 3 December 2018, the draft was formally approved by the Council for Transport, Telecommunications and Energy. The Regulation was published in the Official Journal of the European Union on 21 December 2018 and entered into force on 24 December 2018.

The obligation to prepare the National Energy and Climate Plan follows from Article 3 of the above Regulation. This document is a final version of the National Energy and Climate Plan of the Czech Republic in accordance with Article 3 of the Regulation. The structure of the National Plan is specifically prescribed by the annexes (namely Annex I) to this Regulation.[2]

The declared targets (purpose) of the National Energy and Climate Plan as well as the entire Energy Union governance system are: (i) to prepare and implement policies and measures designed to meet the targets of the Energy Union and the long-term Union greenhouse gas emissions commitments, in particular the Union’s 2030 targets for energy and climate; (ii) stimulate cooperation between Member States; (iii) greater regulatory and investor certainty based on covering all five basic dimensions of the Energy Union supported by planning documents and a robust and comprehensive analytical framework; (iv) effective opportunities for public participation; (v) a structured, transparent and iterative process between the Commission and the Member States; (vi) enhanced cooperation between energy and climate policy makers[3].

The submission of the draft National Plan was followed by an ‘iterative process’ between the Czech Republic and the European Commission, which consisted mainly of consulting the received recommendations, which the Commission published on 18 June 2019. The Regulation on the Governance of the Energy Union and Climate Action requires each Member State to take due account of any recommendations in its final national energy and climate plan to be submitted to the Commission by 31 December 2019, or to provide adequate justification for not taking them into account. The National Plan contains information on taking into account the recommendations of the European Commission by the Czech Republic.

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[1] The full title of the Regulation is as follows: REGULATION (EU) 2018/1999 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

[2] The Annex to the Regulation prescribes level 1, 2, 3 (and, exceptionally, level 4) headings, but also subsections with Roman numerals. Save for exceptions, the level 4 headings are not based on the requirements of Annex I and have been added to improve the structure of the text.

[3] The above targets were formulated on the basis of information from the European Commission.

Section A: National Plan

1 Overview and process for establishing the plan

1.1 Executive summary

i. Political, economic, environmental and social context of the plan

1.1.1.1 Political context

The Czech Republic is a stable democratic State, a member of the UN, OECD, EU and NATO and other international organisations. The Czech Republic has a directly elected President and a bicameral Parliament, which consists of the Senate and the Chamber of Deputies.

As part of self-government, the Czech Republic is divided into 14 self-governing regions, 76 districts and more than 6 200 self-governing municipalities[4]. Municipalities and regions are managed by elected assemblies. Regions are headed by governors, statutory cities by statutory mayors and cities and municipalities by mayors (starosta). Prague has a special status, being simultaneously a region, statutory city and the capital.

1.1.1.2 Economic context[5]

Currently, the Czech Republic is undergoing a phase of economic growth, particularly due to the growth of domestic demand, but also due to net exports and increased private investment. Household consumption has been boosted by labour market developments, rising disposable income and a high level of consumer confidence. From a sectoral point of view, industry contributed most to the growth of real gross value added, which corresponds to its higher volatility during the economic cycle and the structure of the Czech economy. However, other economic sectors also saw an increase in gross value added.

In the next few years, real GDP is expected to grow at just under 2.5 %. Economic growth should be driven almost exclusively by domestic demand, including both consumption (particularly private) and investment by companies and the government. This growth structure can be considered healthy. Shortage of labour is becoming a constraint to faster economic growth due to the tense situation on the labour market.

Economic growth in the Czech Republic should be faster than in the euro area, which should lead to a continued increase in the relative economic level of the Czech Republic. The expected medium-term trend towards increased wage dynamics and exchange rate appreciation after the Czech National Bank (CNB) abandoned the exchange rate floor should be reflected in an increase in the comparative GDP price level. In terms of the price competitiveness of the Czech economy, however, the anticipated increase should not be problematic.

Inflation is estimated to remain within the tolerance band of around 2 % of the CNB's inflation target for the period 2018–2021. An increase in unit labour costs and growth in domestic demand in the context of a positive output gap should have inflationary pressure, while exchange rate appreciation will have the opposite effect on consumer prices. Higher inflation will result in slower growth of real wages and

[4] In the case of districts, the division is territorial, not self-governing.

[5] This information is based on documents from the Ministry of Finance prepared in May 2018. The figures below are then based on documents from the Ministry of Finance prepared in July 2018, which leads to partial inconsistency. The text and numeric values in this chapter will be aligned to match the July economic forecast.

thus household consumption. In the labour market, the economic boom is reflected in the dynamic development of all important indicators, which confirms that the economy is at full employment.

In some professions and regions, the gap between job demand and supply is already significant. Shortage of labour may hinder production growth, forcing some businesses to reject new orders. On the other hand, it contributes to better use of labour, higher wages and hence household consumption. It can also motivate businesses to invest in machines and equipment that increase labour productivity.

In the short term, the labour shortage can be partly mitigated by the involvement of 'discouraged persons' (those economically inactive but willing to work), or by facilitating the employment of foreigners from non-EU countries. In the medium and long term, it will be important for economic growth to ensure that the education system better prepares graduates, allowing them to acquire the competencies and skills required to perform certain professions in the context of the digitisation and automation of the economy, including those that are yet to be created. On the demand side of the labour market, it will be necessary to modernise production and other procedures, thus reducing the labour intensity.

In terms of the external macroeconomic balance, the current account balance has been positive since 2014. Surplus balance of goods and services exceeds the deficit of primary income, which is most affected by the outflow of foreign direct investment in the form of dividends and reinvested profits. The current account balance should continue to show a slight surplus in the following years.

Although the expected economic developments are associated with positive expectations, they also involve risks. The economic prospects of our major business partners are further improving. Many 'soft indicators' in the euro area as a whole and in its major economies are close to historical or multi-year highs. Economic developments in the euro area could be even more favourable than expected, which could considerably benefit the highly export-oriented economy of the Czech Republic.

In this respect, the risks involve the tendency to increase protectionism – although the Czech Republic trades mostly with other EU states, although indirect exposure to some non-EU countries may be significant. Another risk is the form of the future relationship between the United Kingdom and the EU in relation to the free movement of goods and services.

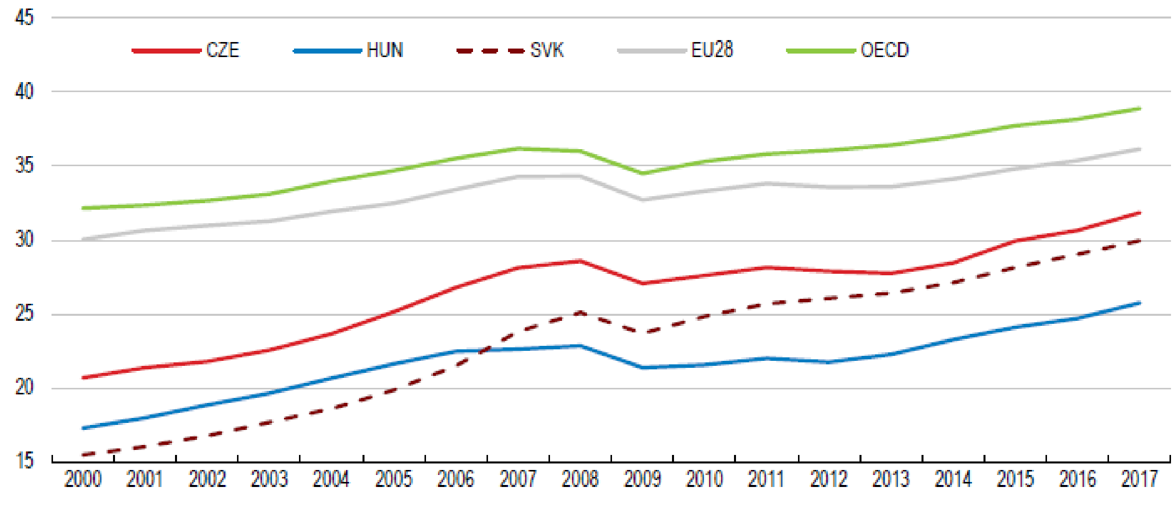
In the longer term, significant risks include the loss of the EU budget revenues from the United Kingdom, as well as the new allocation linked to the higher relative economic development of the Czech regions and the possible redirection of funds in the EU budget to other priorities.

Table 1: *Economic context*

		2012	2013	2014	2015	2016	2017	2018 *Prediction*	2019 *Prediction*	2020 *Outlook*	2021 *Outlook*
Gross domestic product	*CZK billion, current prices*	**4 060**	**4 098**	**4 314**	**4 596**	**4 773**	**5 055**	**5 320**	**5 596**	**5 840**	**6 094**
Gross domestic product	*Growth (%), constant prices*	**-0.8**	**-0.5**	**2.7**	**5.3**	**2.6**	**4.4**	**3.6**	**3.3**	**2.6**	**2.4**
Households consumption	*Growth (%), constant prices*	**-1.2**	**0.5**	**1.8**	**3.7**	**3.6**	**4.0**	**4.3**	**4.1**	**2.9**	**2.6**
Government consumption	*Growth (%), constant prices*	**-2.0**	**2.5**	**1.1**	**1.9**	**2.0**	**1.5**	**1.9**	**2.0**	**1.8**	**1.8**
Gross fixed capital formation	*Growth (%), constant prices*	**-3.1**	**-2.5**	**3.9**	**10.2**	**-2.3**	**5.4**	**5.7**	**4.4**	**3.0**	**2.8**
Foreign trade contribution to GDP growth	*percentage points, constant prices*	**1.3**	**0.1**	**-0.5**	**-0.2**	**1.2**	**1.0**	**-0.2**	**-0.1**	**0.1**	**0.2**
Inventory change contribution to GDP growth	*percentage points, constant prices*	**-0.2**	**-0.7**	**1.1**	**0.8**	**0.0**	**-0.1**	**0.0**	**0.0**	**0.0**	**0.0**
GDP deflator	*Growth (%)*	**1.5**	**1.4**	**2.5**	**1.2**	**1.2**	**1.4**	**1.5**	**1.8**	**1.7**	**1.9**
Average inflation rate	*%*	**3.3**	**1.4**	**0.4**	**0.3**	**0.7**	**2.5**	**2.1**	**1.9**	**1.8**	**1.8**
Employment *(LFS)*	*Growth (%)*	**0.4**	**1.0**	**0.8**	**1.4**	**1.9**	**1.6**	**0.7**	**0.2**	**0.2**	**0.1**
Unemployment rate *(LFS)*	*Average (%)*	**7.0**	**7.0**	**6.1**	**5.1**	**4.0**	**2.9**	**2.4**	**2.3**	**2.3**	**2.3**
Wages and salaries volume *(home concept*	*Growth (%), current prices*	**2.6**	**0.5**	**3.6**	**4.8**	**5.8**	**8.3**	**7.7**	**6.5**	**5.5**	**5.4**
Current account balance to GDP ratio	*%*	**-1.6**	**-0.5**	**0.2**	**0.2**	**1.6**	**1.1**	**0.4**	**0.2**	**0.3**	**0.5**
Assumptions:											
CZK/EUR exchange rate		**25.1**	**26.0**	**27.5**	**27.3**	**27.0**	**26.3**	**25.1**	**24.7**	**24.3**	**23.9**
Long-term interest rates (10 years)	*% p.a.*	**2.7**	**2.2**	**1.4**	**0.6**	**0.4**	**1.0**	**1.9**	**2.2**	**2.6**	**2.9**
Brent Crude	*USD/barrel*	**112**	**109**	**99**	**52**	**44**	**54**	**65**	**61**	**59**	**57**
Eurozone GDP (EA19)	*Growth (%), constant prices*	**-0.9**	**-0.2**	**1.3**	**2.1**	**1.8**	**2.3**	**2.3**	**1.8**	**1.8**	**1.7**

Source: Ministry of Finance of the Czech Republic

Chart 1: *Comparison of the developments in GDP per capita (2010 prices, in USD thousand, PPP)*



Source: OECD Economic Survey of the Czech Republic (July 2018)

1.1.1.3 Environmental context

Over the past 20 years, the environment has significantly improved in terms of emissions of airborne dust and sulphur and nitrogen oxides in large and medium-sized combustion sources. However, it is still not satisfactory, particularly in terms of air pollution by substances posing health risks, and in affected areas it poses serious risks to human health and ecosystems and causes premature deaths and other economic damage. The situation is unsatisfactory in almost every municipality of the Czech Republic due to emissions from domestic coal burners and in all cities due to emissions from diesel and petrol engines. As a result, a significant majority of the population of the Czech Republic is affected.

The main risks to maintaining or further improving the environment are changes in the landscape related to the development of settlements (expansion of developed area, changes in the functional use of the area) and the developing road infrastructure, increased traffic intensity, intensive farming practices and finally consumption behaviour of households and individuals (heating, consumption of natural resources, etc.). The developments in environmental pressures will depend heavily on the performance of the economy in the next 10 years, with the specific load per unit of economic output to continue to gradually decline. An important aspect for improving the consumption behaviour of households is to promote increased consumer awareness of sustainable consumption and production and the impact of high consumption of people regardless of the limited supply of resources.

The development of anthropogenic loads and the state of the environmental elements can be influenced by the changing climate and the associated change in temperature and rainfall regime. It can be assumed that this mechanism will affect the total emissions from electricity and heat generation, distribution pattern of pollutants and air quality, the quality and quantity of surface water and groundwater, biodiversity and state of forest land, soil quality, the spread of harmful organisms in agriculture and the related consumption of agrochemicals. Overall, we are likely to see an increase in extreme nature of climate, consisting of more frequent occurrences of hazardous hydrological and weather phenomena such as floods, droughts, strong winds, temperature fluctuations, etc.

Model simulations expect a continuing gradual increase in average annual temperature by 0.3°C per decade. The total annual precipitation will not change significantly, but we will see increased fluctuations in total precipitation both on year-on-year basis and during the year, as well as the rainfall distribution in our territory to become more uneven. Changes in landscape use may lead to higher risk of water and wind erosion and reduced retention of the landscape, making it more vulnerable to floods due to the expected more frequent torrential rainfall. Similarly, more frequent droughts are expected, due to both lack of precipitation ('meteorological drought') and increased evaporation due to high temperatures ('agricultural drought').

GHG emissions declined by 34.7 % between 1990 and 2016. However, in comparison with the EU, the Czech Republic has higher specific GHG emissions per capita (12.4 tonnes of CO_2 eq. per capita compared to 8.7 tonnes of CO_2 eq. per capita in the EU). On the other hand, the Czech Republic has a below-average share of transport in total European GHG emissions, currently at around 14 %, although it can be expected to increase. The emission intensity of GDP is higher in the Czech Republic compared to the EU average, due to the higher share of industry in the GDP and the higher emission intensity of transport.

The above-the-threshold concentrations of PM10, which affect a large share of the population, continue to be a significant problem (the emission limit for the 24-hour average concentration of PM10 was exceeded on 8.3 % of the territory in 2017, with the above-the-threshold concentrations affecting 23.1 % of the Czech population). As a result of PM10 air pollution, there may be an increase in the incidence of allergic diseases in children, as well as in an increase in respiratory and cardiovascular diseases or even premature deaths, especially in elderly and chronically ill people. Non-compliance with the target emission limits for benzo(a)pyrene and ground-level ozone also continues to be a problem. An important role in air quality is also played by poor dispersion conditions.

By 2020, particulate matter emissions of PM2.5, SO_2, NOx, volatile organic compounds (VOC) and NH3 will decrease. The obligation of the Czech Republic to reduce the emissions of these pollutants is laid down in Directive (EU) 2016/2284 of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants. It lays down the national commitments for 2020 and for 2030. In accordance with Annex 2 to the Directive, the Czech Republic is obliged to reduce emissions of selected pollutants compared to the reference year 2005 as follows: for PM 2.5 by 17 % for 2020 and by 60 % for 2030; for SO_2 by 45 % for 2020 and 66 % for 2030; for NOx by 35 % for 2020 and 64 % for 2030; for VOCs by 18 % for 2020 and 50 % for 2030; for NH3 by 7 % for 2020 and 22 % for 2030. Water quality in watercourses is gradually improving, mainly due to a decrease in the amount of discharged pollution from point sources. An important factor affecting water quality is the share of the population connected to water supply and sewerage systems which lead to a waste water treatment plant; their number has increased almost twice since 1990, with a particular increase in waste water treatment plants with tertiary treatment (removal of P and N). The requirements of Council Directive 91/271/EEC concerning urban waste-water treatment, which lays down an obligation to ensure that municipalities with more than 2 000 inhabitants are connected to waste water treatment plants, are not met only for a minor share of these municipalities. In 2018, 85.5 % of the Czech population was connected to the public sewer system. By contrast, the Czech Republic is unsuccessful in limiting the extent of surface pollution, which mainly results from agricultural activity (the use of mineral fertilisers), which subsequently leads to the eutrophication of watercourses and reservoirs. An equally important aspect in assessing the state of water is its environmental value. In this respect, it is necessary to increase migration permeability and improve morphological conditions in watercourses, where appropriate and effective. Water quality problems do not only concern municipal water or pollution from agricultural sources, but also, for example, medicines that get through the sewerage into watercourses, where they negatively affect aquatic organisms and enter the food chains.

Due to changes in landscape use and climate change, the resilience of ecosystems is diminishing, which results in the unfavourable state of a number of wild species of plants and wild animals (including the species of plants and animals of Community importance) and the reduced ability to eliminate or absorb external influences, including the spread of non-native species and harmful organisms. The decline in ecosystem resilience is mainly due to the persisting consequences of intensified agriculture in the second half of the 20th century, accompanied by the unification of land affected by such agriculture, the persisting significant share of forests which are unbalanced in terms of species, age and spatial structure, persisting degradation of forest soils polluted by emissions, regulation and fragmentation of watercourses and the increasing fragmentation of the landscape (due to transport and construction). These reasons result in the decline of rare species and the reduction of the abundance and vitality of populations of common species, migration routes are disrupted and plants and animals are exposed to increased stress, while undesirable (non-native and invasive) species spread.

1.1.1.4 Social context

Inequality and poverty have been low in the last decade compared to other OECD countries. There are large regional disparities in poverty; there is a high level of poverty in the Northwest and the Moravian-Silesian regions, while at the same time the level of poverty is generally relatively low, reflecting the high wage margins due to differences in qualifications and productivity across sectors. The largest economic inequality is in Prague, while low-income population in Prague is doing relatively ‘better’ compared to people from ‘peripheral’ regions. In the northwest, the higher level of poverty is due to the low wage/income of most workers.

ii. Overarching strategy covering all five dimensions of the Energy Union

The Strategic Framework Czech Republic 2030 can be considered as the overarching strategy covering all five dimensions of the Energy Union. This document defines the top-level targets for the development of the Czech Republic. The strategic framework links two fundamental concepts: sustainable development and quality of life. The Czech Republic 2030 constitutes a long-term framework for strategic planning in the State administration and allows the long-term objectives of the State administration to be communicated transparently to professionals and the general public. The Strategic Framework Czech Republic 2030 builds on the Strategic Framework for Sustainable Development of 2010. The Report on Quality of Life and its Sustainability is prepared every three years. Specific measures are then further elaborated in the implementation plan.[6]

In this respect, it is necessary to point out that the Strategic Framework Czech Republic 2030 is the top-level strategic document, which can be described as an overarching document covering all five dimensions of the Energy Union. At the same time, however, it should be noted that the document has a significantly wider scope and deals in general with sustainable development and quality of life, where the definition of an energy union can only be seen as one of the parts of this overall definition. Table 2 then shows other significant top-level strategic documents, both overarching and sectoral (including the aforementioned Strategic Framework Czech Republic 2030). However, the list is not exhaustive, it only shows the most important documents. The key strategies in energy and climate protection are further outlined in subchapters 1.2.1.1 and 1.2.1.2.

Table 2: *Top-level strategic documents*

Strategic document	Brief description
Strategic Framework Czech Republic 2030	Top-level document, which defines top-level targets for the development of the Czech Republic. The document supersedes the Strategic Framework for Sustainable Development of 2010.
Regional Development Strategy of the Czech Republic 2014–2020 (RDS)	The basic strategic document in regional development. The RDS is a tool for implementing regional policy and coordinating the impact of other public policies on regional development. The RDS interconnects sectoral aspects (themes and priorities) with territorial aspects. It is a medium-term document, which contains a long-term view of the Czech Republic’s regional development (long-term vision) as well as short-term implementation steps.
Transport Policy of the Czech Republic for 2014–2020 with the Prospect of 2050	Transport is one of the very important sectors of the national economy, which affects virtually all areas of public and private life and the business environment. This sector is necessary for increasing the competitiveness of the Czech Republic. The document identifies the key issues of the sector and proposes measures to address them.

6 For more information and relevant materials, see www.cr2030.cz.

International Competitiveness Strategy of the Czech Republic 2012–2020	The strategy defines measures that should put the Czech Republic among the 20 most competitive economies in the world. The tools to achieve this include maintaining a long-term balanced public budget, improve and improved quality and better efficiency of public administration, modernised transport, energy and ICT infrastructure, creating a financially sustainable public healthcare model, optimised education system and the entire national innovation system as the main pillars of the development of knowledge society and economy, increased flexibility of the labour market and creating favourable conditions for the development of business and commercial activities.
The National Research, Development and Innovation Policy of the Czech Republic 2016–2020 and its update for 2019–2020	The National Research, Development and Innovation Policy of the Czech Republic 2016–2020 is the key strategic document at national level, which sets out guidelines for research, development and innovation and forms the basis for other related strategic documents of the Czech Republic. The document puts more emphasis on supporting applied research for the needs of the economy and the State administration, and identifies the key areas and research topics on which applied research should focus. The National Policy also proposes changes in the management and funding of science to produce more top-level scientific results and to engage companies more in R&D. The document has superseded the National Research, Development and Innovation Policy of the Czech Republic 2009–2015. In 2018, the Report on the Evaluation of Fulfilment of Measures of the National Research, Development and Innovation Policy of the Czech Republic 2016–2020 was prepared and it was approved by the Czech Government in February 2019. This report includes an update of the National Research, Development and Innovation Policy of the Czech Republic 2016–2020 for the period 2019–2020, prepared in the context of the proposed modifications to the measures described in that report.
National priorities for research, experimental development and innovation	By its Resolution No 552 of 19 July 2012, the Government approved the National Priorities of Oriented Research, Experimental Development and Innovation. National priorities for oriented research, experimental development and innovation are valid for the period up to 2030 with gradual fulfilment. Within the defined 6

	priority areas, there are 24 sub-areas with a total of 170 specific targets. The document contains a description of each of the priority areas and sub-areas, indicating links between the areas and defining several system measures. The document also contains a statement on the expected allocation of research, development and innovation expenditures from the State budget to individual areas and defines the period during which the progress towards and the update of the priorities will be evaluated.
National Research and Innovation Strategy for Smart Specialisation of the Czech Republic (RIS3 Strategy)	The purpose of the National RIS3 Strategy is to effectively focus European, national, regional and private funding on priority innovation specialisations in order to fully exploit the Czech Republic's knowledge potential.
National Initiative Industry 4.0	The document aims to mobilise key sectors and industry representatives to develop detailed action plans in areas of political, economic and social life. Reducing energy and raw material intensity of production, increasing productivity in production, optimising logistics routes, technology solutions for decentralised energy production and distribution systems and smart city infrastructure are the major benefits of Industry 4.0.
Raw material policy in the field of minerals and their sources	Raw material policy was updated in 2017. The document responds to the transformation of the raw material industry, especially as regards the range of raw materials required by modern industry. There has been a major shift towards modern high-tech raw materials which are used in electronics and other modern industries. The document reflects the principles of the EU Raw Materials Initiative, which was created in relation to the increase in the importance of raw materials security of EU Member States.
State Energy Policy of the Czech Republic (SEP)	Top-level strategic document for the energy sector. It was approved in May 2015. The current SEP has an outlook until 2040.
State Environmental Policy of the Czech Republic 2012–2020	The State Environmental Policy of the Czech Republic 2012–2020 is an overarching strategic document, which defines the implementation of effective environmental protection in the Czech Republic. The main objective is to ensure a healthy and quality environment for people living in the Czech Republic, to contribute to the efficient use of all resources and to minimise the negative impacts of human activity on the environment, including cross-border impacts,

	thus contributing to better quality of life in Europe and in the world.
Innovation Strategy of the Czech Republic 2019–2030	Innovation Strategy of the Czech Republic 2019–2030 was approved by Government Resolution No 104 of 4 February 2019. It is a strategic framework plan that predetermines government policy in the area of research, development and innovation and it is intended to help the Czech Republic become one of Europe's most innovative countries within twelve years. The innovation strategy consists of nine interconnected pillars, which contain the starting points, the basic strategic objectives and the instruments leading to their fulfilment. These pillars represent the following areas: Research and development funding and evaluation, Innovation and research centres, National start-up and spin-off environment, Polytechnic education, Digitisation, Mobility and construction environment, Intellectual property protection, Smart investment and Smart marketing.
Territorial Development Policy of the Czech Republic	During the preparation of the National Plan of the Czech Republic, the Territorial Development Policy of the Czech Republic is effective as amended by Updates Nos 1, 2 and 3. (Update No 3 was approved by Government Resolution No 630 of 2 September 2019) Strategic document with nationwide scope and a spatial planning tool binding for making and issuing spatial planning documentation of regions and municipalities and for decision-making in the territory. Its main purpose is to coordinate regional spatial planning activities of regions (or municipalities) and departmental policies, strategies and documents with territorial projection. This document sets out, among other things, the national priorities of spatial planning and defines in particular the development plans (areas and corridors) of transport and technical infrastructure of international and national importance, or of those exceeding the territory of one region.

Source: Prepared by MIT using publicly available information

iii. Overview table with key objectives, policies and measures of the plan

Table 3 provides an overview table on reducing GHG emissions. Table 4 sets out targets for renewable energy sources. Table 5 then sets out energy efficiency targets. The main targets of the other dimensions of the Energy Union (i.e. energy security, internal energy market and research, innovation and competitiveness) and policies and measures in all dimensions of the Energy Union are clearly described in the various parts of this document, so it is not easy to create an overview table with a 'reasonable scope' with this information.

Table 3: *Overview table of GHG reduction targets (compared to 2005)*

	2020	2030
Absolute terms	32 Mt CO_2eq.	44 Mt CO_2eq.
Relative terms	20 %	30 %

Source: Prepared by MIT for the purposes of the National Plan

Table 4: *Overview table of RES targets (share of RES in gross final consumption)*

	2020	2030
RES share	13.0 %	22.0 %

Source: Prepared by MIT for the purposes of the National Plan

Table 5: *Overview table of energy efficiency targets*

	2020	2030
Article 3 (non-binding target)	Final energy consumption: 1 060 PJ Primary energy consumption: 1 855 PJ	Final energy consumption: 990 PJ[7] Primary energy consumption: 1 735 PJ Energy intensity of GDP: 0.157 MJ/CZK
Article 5 (binding target)	148.6 TJ	124.0 TJ
Article 7 (binding target)	Annual energy savings: 51.1 PJ Cumulated savings: 204.39 PJ	Annual energy savings: 84 PJ Cumulated savings: 462 PJ

Source: Prepared by MIT for the purposes of the National Plan

1.2 Overview of current policy situation

i. The national and Union energy system and the policy context of the national plan

The political context of the national plan is described in Chapter 1.1.1.1. The description of the European energy system and the policy context at EU level goes beyond the scope of this document and is dealt with in other documents specifically focused on this area.

[7] This is the final consumption in the EUROSTAT methodology, not the 'final consumption 2020–2030'.

ii. Current energy and climate policies and measures relating to the five dimensions of the Energy Union

1.2.1.1 State Energy Policy of the Czech Republic and other strategic documents in the field of energy

The key strategic document, which contains policies and measures in the field of energy and, therefore, across all five dimensions of the Energy Union, is the State Energy Policy (SEP). Furthermore, territorial energy policies, which must be in line with the State Energy Policy, are also being prepared. These strategic documents are laid down in Act No 406/2000, on energy management, as amended (hereinafter 'Act No 406/2000'). The State Energy Policy is adopted for a period of 25 years and is binding for the performance of State administration in the field of energy management. It is prepared by the Ministry of Industry and Trade, which evaluates it at least once every 5 years and informs the Government of the evaluation. In addition, it submits to the Government, by 31 December of each year, an evaluation of the progress towards the targets and measures laid down in the SEP. The current State Energy Policy of the Czech Republic was approved by the Government on 16 May 2015 and has an outlook until 2040.

The long-term vision of the Czech Republic's energy sector is a reliable, affordable and sustainable energy supplies for households and the economy. This vision is summarised into three top-level objectives of the Czech Republic's energy sector: security – competitiveness – sustainability.

The SEP contains the following strategic energy priorities: (i) a balanced energy mix / transformation of the energy industry; (ii) energy savings and energy efficiency improvements; (iii) infrastructure development; (iv) research in the field of energy and industry, human resources; (v) energy security.

Furthermore, it contains the strategy for the development of major energy sectors and related areas, namely: electricity sector; gas sector; oil processing; heating sector; transport; energy efficiency; research, development, innovation and education; power engineering; external energy policy.

Table 6: *Strategic objectives of the State Energy Policy*

Safety	Competitiveness	Sustainability
Maintain or increase contingency reserves	Maintain transmission capacity for export and import at a level of at least 30 % of the electricity system load	Reduce energy intensity of gross value added to EU-28 average
Reduce and sustain the diversification of primary energy sources below 0.25	Optimise discounted energy costs	Permanently reduce the total environmental burden in all components
Reduce and sustain the diversification of gross electricity generation below 0.35	Keep the energy prices at no more than 120 % of the OECD level	Optimise the use of land for energy while maintaining full food security
Reduce and sustain the diversification of imports below 0.30	Achieve and maintain the levels of final electricity and gas prices below EU-28 level	Permanently reduce the share of fossil fuels in primary energy consumption
Sustain import dependence at or below EU-28 level	Achieve and maintain the share of energy expenditure in total	Reduce the electricity intensity of GVA and keep it below EU-28 level

	household spending as low as possible below 10 %	
Ensure that the N-1 criterion is met in the operation of the electricity system	Optimise the share of the energy sector in gross value added	Achieve full use of the economically efficient potential of RES in the Czech Republic
Ensure permanent self-sufficiency in electricity supply at a minimum level of 90 %	Reduce the share of energy imports in gross value added below 2010 levels	Keep electricity consumption per capita permanently below the EU28 average
Ensure performance appropriateness within -5 % to +15 % of the maximum electricity system load	Maintain positive total economic value added of the energy sector	Achieve 60 % of heat supply from heat supply systems from cogeneration and 20 % from RES
	Stabilise the effect of energy imports on the balance of payments	

Source: State Energy Policy of the Czech Republic (2015)

The State Energy Policy of the Czech Republic provides the intended energy mix using relative corridors for primary energy sources and gross electricity generation.

Table 7: *Share of individual fuels in total primary energy sources (excluding electricity)*

	2016 level	2040 target level
Coal and other solid non-renewable fuels	40 %	11–17 %
Oil and petroleum products	20 %	14–17 %
Gaseous fuels	16 %	18–25 %
Nuclear energy	15 %	25–33 %
Renewable and secondary energy sources	10 %	17–22 %

Source: State Energy Policy of the Czech Republic (2015)

Table 8: *Share of individual fuels in gross electricity generation*

	2016 level	2040 target level
Coal and other solid non-renewable fuels	50 %	11–21 %
Nuclear energy	29 %	46–58 %
Natural gas	8 %	5–15 %
Renewable and secondary energy sources	13 %	18–25 %

Source: State Energy Policy of the Czech Republic (2015)

Table 9: *Basic strategic documents in the field of energy*[8]

Strategic document	Brief description
State Energy Policy of the Czech Republic (SEP)	Top-level strategic document for the energy sector. It was approved in May 2015. The current SEP has an outlook until 2040.
National Action Plan for Smart Grids (NAP SG)	It was approved by the Czech Government on 4 March 2015. It focuses mainly on the strategy of network infrastructure development to ensure reliable and safe operation with the required development of distributed production. The Update of the NAP SG for 2019–2030 was approved by the Government of the Czech Republic on 16 September 2019.
National Action Plan for Clean Mobility (NAP CM)	It is based on Directive 2014/94/EC of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure. The document is aimed at creating a strategic framework for developing clean mobility and providing for the necessary infrastructure. The document was approved by the Government of the Czech Republic on 20 November 2015. This document was being updated in 2019.
National Action Plan for the Development of Nuclear Energy in the Czech Republic (NAP NE)	Approved by the Czech government in June 2015. The document is aimed at meeting the objectives of the SEP in the area of further development of nuclear energy.
National Renewable Energy Action Plan of the Czech Republic (NAP RES)	The last NAP RES was approved by the government on 25 January 2016. This document specifies measures and tools concerning RES. For the period after 2021, the NAP RES will be superseded by the National Plan.
National Energy Efficiency Action Plan of the Czech Republic (NAP EE)	The National Energy Efficiency Action Plan describes the planned energy efficiency improvement measures and expected or achieved energy savings, including those in the supply, transmission and distribution of energy as well as energy end-use. For the period after 2021, the NAP EE will be superseded by the National Plan.

[8] In addition to strategic document, it is also worth mentioning the voluntary commitments of cities and regions (e.g. under the Covenant of Mayors) in achieving energy and climate goals. It can be expected that local authorities will take greater responsibility for achieving climate targets also by implementing smart strategies and smart projects at the level of municipalities and cities.

National Emission Reduction Programme of the Czech Republic	It is the basic strategic document on the air quality improvement and reduction of emissions from air pollution sources. The document was approved on 2 December 2015 by a resolution of the Government of the Czech Republic. This document is currently being updated.
Action Plan for Biomass in the Czech Republic 2012–2020	The aim of this document is primarily to define the measures and principles which will lead to the effective and efficient utilisation of the biomass energy potential and thus help to fulfil the obligations of the Czech Republic for the generation of energy from renewable sources by 2020. The document was approved by the government on 12 September 2012.
Raw material policy in the field of minerals and their sources	On 14 June 2017, by Resolution No 441 of 14 June 2017, the Government of the Czech Republic discussed and approved the document entitled 'Raw Materials Policy of the Czech Republic in the Field of Minerals and their Sources'. This has completed the process of updating the Czech State raw materials policy, which has been running continuously since 2012, with the actual approval process lasting almost a year and a half.

Source: Prepared by MIT using publicly available information

1.2.1.2 Climate Policy and other strategic documents in the field of climate protection

The Climate Policy in the Czech Republic represents a strategy until 2030 as well as a low-emission economy development plan until 2050. It focuses on measures to reduce greenhouse gas emissions and is thus complementary to the approved Strategy on Adaptation to Climate Change in the Czech Republic, which focuses on the issue of adaptation to climate change. The Climate Policy follows on from the State Energy Policy of the Czech Republic and takes up and develops a number of its measures in the field of energy. In doing so, it is based on the so-called optimised SEP scenario. However, it also contains a whole range of new policies and measures focused on sectors outside EU ETS.

The Climate Policy in the Czech Republic sets the main targets in reducing greenhouse gas emissions and sets long-term indicative targets (see Table 10).

Table 10: *Summary of targets of the Climate Policy in Czech Republic*

Target horizon	Target description
Main target by 2020	By 2020, reduce emissions of the Czech Republic by at least **32 Mt CO_2 eq.** compared to 2005 (corresponding to a reduction of **20 % compared to 2005**).

Main target by 2030	By 2030, reduce emissions of the Czech Republic by at least **44 Mt CO_2 eq.** compared to 2005 (corresponding to a reduction of **30 % compared to 2005**).
Indicative target by 2040	Approach the indicative level of **70 Mt CO_2 eq.** of emissions in 2040.
Indicative target by 2050	Approach the indicative level **of 39 Mt CO_2 eq.** of emissions in 2050 (corresponding to a reduction of **80 % compared to 1990**).

Source: Climate Policy in Czech Republic

Table 11 contains a list of other important strategic documents in the field of climate protection and reduction of pollutants.

Table 11: *Basic strategic documents in the field of climate protection and reduction of pollutant emissions*

Strategic document	Brief description
Climate Policy in the Czech Republic (CP)	The Climate Policy in the Czech Republic represents a climate strategy until 2030 as well as a low-emission economy development plan until 2050.
Strategic Framework Czech Republic 2030	Top-level document, which defines top-level targets for the development of the Czech Republic. The document supersedes the Strategic Framework for Sustainable Development of 2010.
State Environmental Policy of the Czech Republic 2012–2020	It defines a plan to implement effective environmental protection in the Czech Republic by 2020.
Strategy on Adaptation to Climate Change in the Czech Republic	Approved in October 2015; it builds on the National Action Plan for Adaptation to Climate Change.
National Action Plan for Adaptation to Climate Change	It builds on the 2015 strategy; it contains specific implementation measures, including the responsibilities of individual ministries and the deadlines for the proposed tasks.
National Emission Reduction Programme of the Czech Republic	It is the basic strategic document on the air quality improvement and reduction of emissions from air pollution sources. The document was approved on 2 December 2015 by a resolution of the Government of the Czech Republic. An update of this document was prepared in 2019. The update passed the interdepartmental comment procedure in the first half of 2019 and the material will be submitted to the Czech

	Government for approval after the eventual completion of the SEA process.

Source: Prepared by MIT using publicly available information

iii. Key issues of cross-border relevance

Among the key issues of cross-border relevance are, in general, (i) major strategic documents that are subject to international strategic impact assessment (SEA); (ii) major infrastructure projects, in particular cross-border interconnection in the field of electricity transmission, transmission of gas and oil and petroleum products, as well as the construction of major production sources or sources located close to the border with the neighbouring state (these projects are predominantly subject to the international EIA); (iii) transnational cooperation in the field of science and research; (iv) other activities that may have an impact on another Member State.

iv. Administrative structure of implementing national energy and climate policies

As regards the administrative structure of implementing national energy and climate policies, an important role is played by the Ministry of Industry and Trade, which is the central State administration body in the field of energy, and the Ministry of the Environment, which is the central State administration body in the field of climate policy. These ministries are responsible for the preparation of legislation in the above areas as well as of non-legislative strategic materials. Legislative and non-legislative measures are specified within the 'legislative' or 'non-legislative' plan of the Czech Government. Measures and policies pass through a standard legislative process, with gradual involvement of the Government of the Czech Republic, the Chamber of Deputies, the Senate and the President of the Czech Republic. Non-legislative documents are approved by the Government of the Czech Republic, which adopts the relevant resolutions, specifying concrete tasks following from that resolution. The preparation of top-level strategic documents, their content and their binding nature are in most cases laid down in legislation. The obligation to prepare, the mandatory elements and the binding nature of the State Energy Policy is, for example, laid down in Act No 406/2000, on energy management.

1.3 Consultations and involvement of national and Union entities and their outcome

i. Involvement of national parliament

During the preparation or finalisation of the Draft National Plan, a number of seminars were held in the Chamber of Deputies and the Parliament of the Czech Republic, which were specifically or partially focused on the process of preparing the National Plan (for example on 13 December 2018, a seminar was held with an emphasis on the issue of financing objectives; on 4 April 2018, there was a seminar focused on RES, etc.). The issue of preparing the National Plan was also repeatedly discussed at the level of relevant committees (in particular the Committee on Power Engineering and the Committee on Environment of the Chamber of Deputies). The Senate of the Czech Republic also requested the elaboration of a framework position on the recommendations of the European Commission of 18 June 2019 regarding the Draft National Energy and Climate Plan of the Czech Republic. This framework position was discussed by the Committee on European Affairs of the Senate of the Czech Republic on 24 October 2019 and it was approved at the plenary session of the Senate of the Czech Republic on 30 October 2019. In its adopted resolution (Resolution 124 of the 15th meeting held on 24 October 2019), the Senate appreciates the systematic and comprehensive approach of the European Commission to achieving the goals of the Energy Union and laying the foundations for a successful transition to clean energy in the EU; the Senate respects the government's decision to submit a compromise target for the 22 % share of renewable energy in the final version of the Czech National Plan, but recommends that the Czech Government continuously negotiate with stakeholders and look for ways to more significantly increase the share of renewable energy sources (RES) within the energy mix of the Czech Republic in the 2023–2024 Plan Update and to reduce primary energy consumption, taking into account geographical and climatic conditions, economic possibilities of the Czech Republic and expected future development of individual technologies (this is not an exhaustive list of information from the resolution). On 13 November 2019, the National Plan of the Czech Republic or the European Commission's recommendations regarding the Draft National Plan were discussed by the Committee on Environment of the Chamber of Deputies of the Parliament of the Czech Republic and a resolution was adopted regarding this matter. On 11 December 2019, the Commission's recommendations of 18 June 2019 regarding the Draft Integrated National Plan of the Czech Republic were discussed within the Committee on European Affairs of the Chamber of Deputies of the Parliament of the Czech Republic. Representatives of the Chamber of Deputies of the Parliament of the Czech Republic also participated in the meetings of the working group for the preparation of the National Plan. At the same time, the National Plan was being discussed throughout the preparation process, in particular with relevant Members of Parliament and Senators, for whom the energy and climate sectors are a key area of responsibility.

ii. Involvement of local and regional authorities

Local and regional authorities (self-governing units/regions, cities and municipalities, etc.) had the opportunity to comment on the draft and final versions of the National Plan of the Czech Republic within the standard comment procedures through the respective groups and associations. At the same time, the relevant authorities were invited to relevant working groups and had the opportunity to participate directly in the preparation of the document.

The regions of the Czech Republic also elaborate the 'territorial energy concepts' (the obligation for the regions to elaborate them is laid down by law), which must be in accordance with the state energy concept and at the same time serve as a basis for its updating. This process should ensure coherence of objectives and priorities at the state and regional level. However, the requirements of Regulation (EU) 2018/1999 to a large extent do not correspond to the time course of elaboration of strategic documents in the Czech Republic, so the National Plan could not fully reflect the energy planning on the regional level due to incomplete cycle of preparation of territorial energy concepts.

iii. Consultations of stakeholders, including the social partners, and engagement of civil society and the general public

The National Energy and Climate Plan was prepared with the participation of a wide range of relevant professional bodies. From the departments, the following entities were directly involved in the preparations beyond the Ministry of Industry and Trade and the Ministry of the Environment: Ministry for Regional Development; Ministry of Finance; Ministry of Agriculture and Ministry of Transport; Energy Regulatory Office; Czech Hydrometeorological Office; the electricity and gas market operator, OTE, a.s.; the transmission system operator, ČEPS, a.s.; the transport system operator, NET4GAS; Confederation of Industry and Transport; Czech Chamber of Commerce; Chamber of Renewable Energy Sources, Czech Gas Association; Union of Towns and Municipalities; Czech Association of Petroleum Industry and Trade; representatives of the Chamber of Deputies and the Senate of the Czech Republic[9].

[9] This is not an exhaustive list, but a list of the main entities involved in the preparation.

An external (interdepartmental) comment procedure and public consultation took place as part of the preparation of the Draft National Energy and Climate Plan of the Czech Republic. During December 2018, specifically on Friday 21 December 2018, a formal external consultation process regarding the Draft National Plan of the Czech Republic was launched with ministries and other bodies with the status of a commenting body. Also, on Friday 21 December 2018, the Draft National Plan of the Czech Republic was published on the website of the Ministry of Industry and Trade[10] for public consultation. The most important comments include (without limitation): the ambition level, especially in the area of RES and the electricity sector; a comment on determining the contribution to the European RES target; a suggestion to implement a wider portfolio of policy measures regarding the compliance with Article 7 of the Energy Efficiency Directive – the requirement for detailed discussion; the requirement to process additional analyses; the requirement to fill in some missing parts such as impact analyses; impacts on final customers and minimisation of State aid; insufficient public/private resources to meet the contributions in the plan; insufficient time to discuss and revise the document; inadequacy of measures and policies to achieve targets and their lack of specificity in some cases; statistical irregularities and inconsistencies; excessive scope of some parts and also the excessive briefness of some other areas; contradicting the development of some underlying trends and quantities; a requirement to emphasise the role of nuclear power to meet decarbonisation targets.

On 11 November 2019, external (interdepartmental) comment procedure and public consultation[11] were launched with a deadline for comments set to 22 November 2019 and 25 November 2019 respectively. Hundreds of comments were received during the comment procedure and public consultation. All comments received, both in the external comment procedure and in the public consultation, including their settlement, are available on request[12].

iv. Consultations of other Member States

In accordance with Article 12 of Regulation (EU) 2018/1999, the National Plan of the Czech Republic was regionally consulted as follows. On 20 November 2018, a regional consultation of the Visegrad Group countries (Czech Republic, Slovakia, Hungary, Poland) and Austria took place under the Slovak Presidency of the Visegrad Group. This meeting was attended by representatives of the public administration, namely those responsible for the energy sector and climate protection. Practical aspects regarding the preparation of the National Plan and its draft were discussed, as well as individual issues corresponding to the individual dimensions of the Energy Union, namely: (i) renewable energy sources; (ii) climate protection; (iii) energy efficiency; (iv) the internal energy market; and (v) energy security. The main aspects of the preparation, the positions on the main targets and the most important policies to meet these targets were discussed. The experts also discussed further steps and specific elements of the National Plan where there is space for further regional cooperation.

On 8 and 9 April, a regional consultation of the Draft German National Plan took place in Berlin with the participation of a number of Member States, including the Czech Republic. Germany provided information on all dimensions of the Energy Union and Germany’s approach to objectives, measures and policies in each dimension. The joint meeting of the ‘electricity neighbours’ platform also provided

[10] The reference to the Draft National Plan of the Czech Republic for the purposes of public consultation: https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/navrh-vnitrostatniho-planu-v-oblasti-energetiky-a-klimatu-ceske-republiky--242761/

[11] The reference to the National Plan of the Czech Republic for the purposes of public consultation: https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/verejna-konzultace-k-vnitrostatnimu-planu-ceske-republiky-v-oblasti-energetiky-a-klimatu--250509/

[12] Comments and their settlements are available only in Czech.

information on the planned end of coal use in Germany. Member States, including the Czech Republic, had the opportunity to discuss specific parts introduced by Germany.

On 28 June 2019, a regional consultation was held in Vienna at the invitation of Austria, attended by representatives of Austria, Slovakia, Germany and the Czech Republic. The meeting had a form of an information exchange and subsequent discussion on all five dimensions of the Energy Union. Relative consensus has been reached on the fact that the common challenges for the participating countries are, in particular, decarbonisation of transport and energy security. Furthermore, areas of possible future cooperation, or a deepening of existing regional cooperation, were identified.

The Czech Republic also discussed parts of the National Plan of the Czech Republic or its draft on relevant bilateral and multilateral platforms, such as bilateral negotiations with representatives of France on 18 July 2019 in Prague and meeting of the Polish and Czech governments on 28 August 2019 in Warsaw or during the V4 high-level panel discussion on energy efficiency on 28 November in Prague. We can also mention the V4 joint meeting on production adequacy, which took place on 4 July 2019 with the participation of representatives of the International Energy Agency (IEA) and the Nuclear Energy Agency (NEA).

On 23 August 2019, the Czech Republic published the Draft National Plan for regional consultation[13]. All neighbouring countries (Slovakia, Germany, Poland) as well as Hungary (due to the Visegrad Group cooperation) were informed about the launch of the consultation via a letter. The other Member States were notified about the regional consultation electronically via national contacts. By 15 October 2019, the Czech Republic received no comments from any of the Member States; several Member States sent statements on the non-application of comments as well as some clarifying questions.

Under the V4 Presidency, the Czech Republic plans to organise a follow-up regional consultation in the first half of 2020, focusing on the implementation of the National Plans (by this time, the plans must already be submitted as required by Regulation (EU) 2018/1999) and on the consultation of the subsequent actions, mainly the elaboration of annual and biannual progress reports as required by Regulation (EU) 2018/1999.

Consultations with other Member States were also carried out within the frameworks initiated by the European Commission or at the level of the European Council. This includes, among other things, the meetings of the Technical Working Group (meetings took place in 2019 on the following dates: 29 January, 15 May, 2 and 3 July, 17 September). Within this working group, the Czech Republic presented, among other things, an approach to the construction of RES trajectories and national objectives and policies in the area of research, innovation and competitiveness. Negotiations regarding the National Energy and Climate Plan also took place at the level of the Energy Working Groups and the Telecommunications and Energy Council, which took place on 25 June 2019 and 24 September 2019. Last but not least, there were discussions initiated by the European Commission focusing on specific topics, such as the Technical Workshop on RES and Energy Efficiency, which took place on 11 September 2019 and the joint meeting of representatives of the Technical Working Group and representatives of the European Strategic Energy Technology Plan, which took place on 16 September 2019.

Last but not least, it is necessary to mention that the policies and measures listed in the National Plan are based on the vast majority of the approved strategic documents, especially the State Energy Policy and the Climate Protection Policy. These documents are subject to strategic environmental assessment (SEA). Interstate consultations were also held as part of this process, in which other Member States had

[13] The public consultation information was published at the following link.

the opportunity to comment. Therefore, the regional consultation was also carried out in the form of interstate consultations on key strategic documents.

v. Iterative process with the Commission

In accordance with Article 9(2) of Regulation (EU) 2018/1999, the Commission will examine the draft integrated national energy and climate plans and may issue recommendations to each Member State no later than six months before the deadline for submitting the integrated national energy and climate plans. On 18 June 2019, the European Commission published a Communication (COM (2019)285) assessing the joint achievement of the Energy Union objectives and of the climate action measures; recommendations for all Member States, including the Czech Republic, were published at the same time.

The Czech Republic appreciates the efforts of the European Commission to clarify the requirements of Regulation (EU) 2018/1999 and the recommendations made through presentations and discussions in the framework of TWG, EWP and TTE meetings. The Czech Republic also utilised the bilateral consultations with Commission representatives.

In accordance to Article 34 of Regulation (EU) 2018/1999, a Member State is required to take due account of relevant recommendations in a spirit of solidarity between the Member States and the Union and among the Member States themselves. The Czech Republic received a total of ten specific recommendations. Below is how the Czech Republic took these recommendations into account when finalising the National Plan.

Recommendations of the European Commission on the Draft National Plan of the Czech Republic and their considerations by the Czech Republic:

1) Increase the 2030 ambition level for the share of renewable energy to at least 23 % as the Czech Republic's contribution to the Union's 2030 renewable energy target as set out in the formula in Annex II to Regulation (EU) 2018/1999. Indicate in the final plan an indicative trajectory which, in accordance with that share, will reach all the reference points referred to in Article 4(a)(2) of Regulation (EU) 2018/1999, taking into account the need to step up efforts to achieve this goal together. Present detailed and quantified policies and measures in line with the obligations set out in Directive (EU) 2018/2001 of the European Parliament and of the Council in order to achieve this contribution in a timely and cost-effective manner. Increase the ambition level in the heating and cooling sector to achieve the indicative target referred to in Article 23 of Directive (EU) 2018/2001 and present measures to achieve the transport sector target set out in the Czech Republic plan in accordance with Article 25 of Directive (EU) 2018/2001. Introduce measures to reduce administrative burdens related to the framework for the self-consumption of electricity from renewable sources and the renewable community in accordance with Articles 21 and 22 of Directive (EU) 2018/2001.

   Taking account of the recommendations: The Czech Republic's contribution to the EU renewable energy target for 2030 (as a share of gross final energy consumption) was increased to 22 %. For detailed information on the contribution of each renewable source and individual sectors, see 2.1.2. The indicative trajectory which, in accordance with the stated share, reaches all reference points referred to in Article 4(a)(2) of Regulation (EU) 2018/1999, is provided in 2.1.2. For detailed information on policies and measures, see 3.1.2 and 3.1.2.2. The ambition level in the heating and cooling sector was increased from an average annual growth rate of 0.8 % to 1.0 % (excluding waste heat). Achieving the indicative target referred to in Article 23 of Directive (EU) 2018/2001 is not possible for objective reasons, more detailed justification is given in 2.1.2. Detailed information regarding measures to achieve the transport sector goal can be found in Chapter3.1.3.6. Information regarding the introduction of measures to reduce administrative burdens related to the framework for the self-consumption of electricity from renewable sources and the renewable community in accordance with Articles 21 and 22 of Directive (EU) 2018/2001 is provided in Chapter 3.1.2, specifically in point (v). For the area of self-consumption of electricity from renewable sources and the community for renewable energy sources, the Czech Republic will transpose Directive (EU) 2018/2001 into national legislation on 30 June 2021 and it is not possible to anticipate future legislation at this point. The Czech Republic will provide detailed information in the framework of the biannual integrated reports on energy from renewable sources.

2) Increase the ambition level to reduce primary energy consumption, taking into account the need to step up efforts to achieve the Union's energy efficiency target for 2030 and support it with policies and measures to achieve further energy savings by 2030. Better identify the policies and measures envisaged to be adopted during the 2021–2030 period, for example on the basis of an assessment of their expected impacts.

   Taking account of the recommendations: As regards the indicative contribution to the EU 2030 energy efficiency target, the Czech Republic did not increase its ambitions in the area of primary energy sources and final consumption compared to the Draft National Plan. The Czech Republic set its targets on the basis of realistic possibilities, taking into account national circumstances affecting primary and final energy consumption in accordance with Article 6 of Regulation (EU) 2018/1999. Any increase in ambition would imply an increase in overall investment in this area, beyond the already relatively large-scale investment in meeting the target set out by Article 7 of Directive 2012/27/EU on energy efficiency, as amended, which would need to be offset by national and Union resources in order to maintain competitiveness. The determination of the Czech Republic's contributions is based on the realistic possibility of fulfilling the commitments by 2030. Furthermore, the target value of primary energy sources has also been partially increased compared to the Draft National Plan of the Czech Republic, due to an increase in the share of renewable energy sources. Detailed information on energy efficiency policies and measures has been added to Chapter 3.2. Furthermore, Annex 4 has been added, which contains detailed cards of policy measures focused on complying with Article 7 of Directive 2012/27/EU on energy efficiency, as amended.

3) Provide forecasts on the future mix of energy sources, including renewable gas, and planned measures concerning the energy system resilience, demand side measures and measures concerning cyber security and critical infrastructure. Provide more detailed policies and measures aimed at greater diversification of gas supplies from third countries. Further specify measures to support energy security objectives for diversification and reduction of energy dependency, including measures to ensure flexibility and long-term supply of nuclear materials and fuel, in particular with a view to developing nuclear power generation capacity.

   Taking account of the recommendations: The expected future composition of energy sources and their consumption is clearly presented in Annex 1, which provides a simplified energy balance in 2016, 2020, 2025 and 2030. More information on the future energy mix has been added to 4.4.1.1. Detail information on estimating the development of gas from renewable sources is provided in 4.2.2. Information regarding existing or planned cyber security measures has been added to 3.3.1.6. Critical infrastructure measures are listed in 3.3.1.1. Detailed information on diversifying gas supplies from third countries is provided in 4.4.1.3. Measures to support energy security objectives for diversification and reduction of energy dependency, including flexibility measures, are described in Chapter 3.3. Measures to ensure the security of long-term supplies of nuclear materials and fuel have been added to 3.3.1.5, detailed information regarding the current situation and expected developments with regard to long-term supplies of nuclear materials and fuels were also added to 4.4.1.6.

4) Define perspective objectives and tasks for market integration, in particular well-defined new and planned measures. Outline the potential of renewable gas. Provide in the final plan an overall assessment of existing and future measures related to the development of competition.

   Taking account of the recommendations: Objectives regarding for market integration are listed in 2.4.3. Detail information on estimating the development of gas from renewable sources is provided in 4.2.2. The impact assessment of individual existing and future measures with regard to the development of competition is administratively demanding also in view of the above policies and measures. Regulatory impact assessment is carried out for legislative measures on a compulsory basis, which also assesses the impact on competition. These assessments may be shared by the Czech Republic for selected policies, but they cannot be included in gross in this document, given, for example, its scope. State aid is also subject to an assessment directly by the European Commission according to the applicable state aid rules, so the Czech Republic assumes that the key schemes have been or will be assessed directly by the European Commission (this concerns for example the proposed scheme for support of renewable energy sources for 2021–2030 under the amendment to Act No 165/2012, on supported energy sources, see in detail the section 3.1.2.2).

5) Further clarify the national and funding objectives for research, innovation and competitiveness, which are specifically relating to the Energy Union and are to be achieved from now on by 2030, so that they are immediately measurable and appropriate to support the achievement of objectives in other dimensions of an integrated national energy and climate plan. Support these objectives with specific and adequate policies and measures, including those to be developed in cooperation with other Member States, such as the European Strategic Energy Technology Plan.

   Taking account of the recommendations: Objectives are described in Chapter 2.5. As stated in this section, the Czech Republic does not have an aggregate goal that would be easily quantifiable, specifically for the energy and climate sectors. In the time horizon since the draft submission, it was not possible to design and approve such an objective at national level. Policies and measures are described in Chapter 3.5, no additional policies in this area have been approved since the submission of the draft. The Czech Republic will report on further developments in the relevant progress report prepared in accordance with Regulation (EU) 2018/1999.

6) Continue the already excellent regional cooperation within the Visegrad Group consisting of the Czech Republic, Hungary, Poland and Slovakia, as well as the bilateral dialogues with other Member States. Such cooperation could include topics such as further integration of the internal energy market, measures related to assessing the adequacy of the system in view of the planned continuation of the capacity market, fair transformation, reducing carbon emissions and further introduction of renewable energy, including the resulting impacts on the energy system and cross-border trade in electricity.

   Taking account of the recommendations: The Czech Republic plans to continue the regional cooperation at the Visegrad Group level as well as at bilateral level with other (relevant) Member States. For more information on the regional consultation of the National Plan, see Chapter 1.3, in particular part (iv).

7) Extend the analysis of investment needs and resources, including relevant funding at national, regional and Union level, currently available for specific policies, to a general overview of investment needs to achieve the energy and climate objectives. Also consider cost-effective transfers to other Member States under Regulation (EU) 2018/842 of the European Parliament and of the Council as a source of funding.

Taking account of the recommendations: Information regarding investment needs to achieve the objectives and sources of funding has been added to Chapters 5 and 5.3.4. For information regarding the possible use of static transfers / transfers in RES, please see Chapter 3.1.2, specifically point (ii).

8) Indicate all subsidies in the energy sector, including in particular fossil fuel subsidies, and the measures or plans taken to phase them out.

Taking account of the recommendations: The list of energy subsidies with emphasis on fossil fuel subsidies, including measures and plans for their phasing out, were added to chapters 3.1.3 part (iv) and 4.6 part (iv)

9) Add to the analysis the information regarding interactions with air quality and air emissions policy, report and quantify the impacts of air pollution in different scenarios, provide background information and consider synergies and compensatory effects.

Taking account of the recommendations: Interactions with air quality and air emissions policy, including quantification of the effects of air pollution, have been added to Chapter 4.2.1, specifically to section (iii).

10) Better integrate aspects of fair transformation, in particular by providing more details on the skills, social and employment impacts of the planned objectives, policies and measures. The final integrated national energy and climate plan should in particular analyse the impact of the energy transformation on the population affected by the phasing out of coal use or adaptations in other energy-intensive sectors and it should be linked to the Czech strategic ReStart framework to support the fair transformation of Czech coal regions. Further develop methods to address energy poverty issues, among other things by specifying the assessment required by Regulation (EU) 2018/1999.

Taking account of the recommendations: Information on energy sector transformation has been added to Chapter 5.2, with particular emphasis on the population affected by the gradual phasing out of coal use. The impacts of the energy sector transformation on the population affected by the phasing out of coal use, or the overall impacts of the phaseout, should be analysed in more detail by the ‘Coal Commission’, established on 30 July 2019. However, the partial outputs of the Commission must be prepared by 30 September 2020 at the latest according to the approved statute. Hence, it is not possible to provide all the recommended information, which will however be supplemented through the relevant progress reports in accordance with Regulation (EU) 2018/1999.

On 5 June 2019, the European Commission published a new proposal for country-specific recommendations including a justification in the context of the **European Semester for coordination of economic policies**. Regarding the energy recommendations, the Czech Republic was recommended to take the following steps for 2019–2020:

In the context of the investment economic policy, focus on transport and in particular its sustainability, digital infrastructure and the transition to a low-carbon economy and energy sector transformation, including increasing energy efficiency, taking into account regional disparities. Reduce the administrative burden for investments and promote more competition based on quality criteria in public procurement. Remove obstacles to the development of a fully functioning innovative ecosystem.

Taking account of the recommendations: The Czech Republic is reducing the energy intensity of the economy in the long-term. It was decreased by almost 18 % in the period 2010–2018. Significant public funds from subsidy programmes are invested each year to improve energy efficiency across sectors of the economy. In the framework of 9 programmes to support energy savings, approximately CZK 81 billion is allocated in 2014–2020. In the next programming period 2021–2027 it is planned to maintain approximately the same allocation rate in subsidy programmes. The availability of public funds under national investment policy does not appear to be a barrier to energy efficiency.

The barrier to increasing the intensity of increasing the energy efficiency of the economy is the low motivation to implement energy-saving measures, which stems from a low awareness of the wider benefits of energy-saving measures. In order to remove this barrier, the MIT commissioned a communication strategy design to raise awareness of energy savings across sectors. The strategy aims to design the most appropriate tools and communication channels to raise awareness of the potential for reducing final energy consumption in households, business and public sectors, as well as in transport. Awareness-raising should contribute to unlocking the potential for energy savings and, consequently, to increasing the drawdown of funding from subsidy programmes, thus improving the effectiveness of the state investment policy.

1.4 Regional cooperation in preparing the plan

i. Elements subject to joint or coordinated planning with other Member States

The National Plan does not contain any parts prepared at regional level. Unfortunately, joint planning was not possible, not even in partial sections or topics, due to the time horizon of the preparation and the fact that this was the first time a National Plan has been prepared. Nevertheless, it is obvious that coordinated planning already takes place in a number of aspects, for example in the area of infrastructure, transmission system operation, etc. However, the Czech Republic would like to initiate a joint preparation of selected sections or topics with neighbouring or other Member States when preparing this document for the next period or for its update. In this respect, there is a possibility of joint preparation in the field of energy security or the internal energy market, but also in other sections or topics.

ii. Explanation of how regional cooperation is considered in the plan

The Czech Republic prefers ‘bottom-up’ approach to regional cooperation. The Czech Republic actively works with other Member States within different multilateral or bilateral platforms on the relevant issues – electricity, gas, research, development and innovation, etc.

The Czech Republic does not consider it effective to initiate a specific regional cooperation platform aimed at discussing the National Plan as a whole, also in view of the fact that the regional dimension is different for different issues. For example, in the electricity sector, a different cooperation platform is important for the Czech Republic than, for example, in the gas sector.

However, this year, the Czech Republic contacted selected Member States with which it has already set up bilateral or multilateral cooperation and discussed the National Plan with them. For more information, see1.3, specifically iv.

2 National objectives and targets

2.1 Dimension decarbonisation

2.1.1 GHG emissions and removals [14]

i. The elements set out in Article 4(1)(a)

The EU's climate and energy policy framework for 2030 sets the EU-wide target of achieving a GHG reduction of at least 40 % by 2030 compared to 1990. This target is further broken down to emission reduction in EU ETS and non-ETS sectors by 43 % and 30 %, respectively, compared to 2005.

Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 established binding national targets for individual Member States for non-ETS sectors. The targets for individual Member States range from 0 to 40 % compared to 2005. The regulation sets for the Czech Republic a binding emission reduction target of 14 % compared to 2005 and a binding linear trajectory of its achievement starting on the average of its greenhouse gas emissions for 2016, 2017 and 2018 and ending in 2030. The start of the linear trajectory of a Member State is either at five-twelfths of the distance from 2019 to 2020 or in 2020, whichever results in a lower allocation for that Member State. The Regulation also sets out flexibilities that a Member State may use.

Annual emission allocations for each year between 2021 and 2030 will be set out in implementing acts in accordance with the Regulation. For the purposes of these implementing acts, the Commission will carry out a comprehensive review of the most recent national inventory data for the years 2005 and 2016 to 2018 submitted by Member States pursuant to Article 7 of Regulation (EU) No 525/2013.

The progress towards the EU's 2030 climate and energy policy framework now also includes emissions and sinks related to land use, land-use change and forestry (LULUCF). Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU sets out Member States' commitments and accounting rules applicable to emissions and sinks from the LULUCF sector. For the periods from 2021 to 2025 and from 2026 to 2030, taking into account the flexibilities, each Member State shall ensure that its emissions from all of the land use categories do not exceed GHG sinks.

For managed forest land, a special accounting category is set on the basis of a forest reference level. By 31 December 2018, Member States should submit to the Commission their national forestry accounting plans, including these reference levels. The benchmark level for forests in this respect corresponds to 3 801.4 kt CO_2 eq. (this value will still be subject to further review by the European Commission in 2020). Based on a comparison of this reference level with the LULUCF emission projection mentioned in Chapter 4.2.1, it is clear that the Czech Republic is unlikely to be able to use flexibility in accordance with Article 7 of Regulation (EU) 2018/842 of the European Parliament and of the Council to achieve its target for non-ETS sectors by 2030. In relation to the LULUCF sector and carbon neutrality, it should

[14] It is necessary to ensure consistency with long-term strategies under Article 15.

be emphasized that in the coming years the role of forestry in the Czech Republic will change in terms of CO2 sinks due to extraordinary logging related to the elimination of bark beetle calamity. For these reasons, it is likely that the category of the managed forest land will temporarily show CO2 emissions. From the perspective of the Czech Republic, it is crucial to achieve such a CO2 emissions commitment in the LULUCF sector that takes into account the current situation in forestry caused by bark beetle calamity in the last two years (2017 and 2018), especially when finalising the benchmark levels for forests, the final version of which must be submitted to the European Commission by 31 December 2019.

Further information on the LULUCF sector in the Czech Republic, including information on existing and planned policies and measures, is provided in a report submitted by the Czech Republic to the European Commission in 2017 on the basis of Article 10 of Decision No 529/2013/EU of the European Parliament and of the Council. [15]

In reducing greenhouse gas emissions, priority will also be given to reducing health risk emissions to the air. This includes the urgent reduction and termination of local coal furnaces and stoves in households and increasing the energy efficiency of buildings. The aim is also to reduce, as much as possible, the emissions of PAH substances created by combustion of damp wood, the limits of which are very often exceeded in the Czech Republic.

Reduction of health hazardous substances emissions will also be prioritised in the transport sector, along with greenhouse gas emissions, by decommissioning technically outdated, desolate and low-efficiency diesel and gasoline engines, where external health and property damage significantly exceed external climate damage.

ii. Alternatively, other national objectives and targets consistent with the Paris Agreement and existing long-term strategies. If it is important in terms of contributing to the overall commitment of the Union to reduce greenhouse gas emissions, or, where relevant, other targets, including any sectoral and adaptation targets

In March 2017, the Government of the Czech Republic adopted the Climate Policy in the Czech Republic, which represents a long-term strategy for the transition to a low-carbon economy and the contribution of the Czech Republic to achieving the targets of the Paris Agreement. As a long-term strategy of low-emission development, in line with Article 4 of the Paris Agreement, it was sent to the Secretariat of the United Nations Framework Convention on Climate Change on 15 January 2018.

It is a climate protection strategy by 2030, with a long-term outlook for the transition to a sustainable low-emission economy by 2050. It defines the main national climate protection targets and measures to ensure that the greenhouse gas emission reduction targets are met in response to the obligations under international treaties (the UN Framework Convention on Climate Change and its Kyoto Protocol, the Paris Agreement and the obligations under EU legislation).

[15] The measures are available at: http://mzp.cz/cz/opatreni_v_ramci_lulucf

Table 12: *Main targets and long-term indicative targets of Climate Policy in the Czech Republic*

Target horizon	Target description
Main target by 2020	By 2020, reduce emissions of the Czech Republic by at least **32 Mt CO_2 eq.** compared to 2005 (corresponding to a reduction of **20 % compared to 2005**).
Main target by 2030	By 2030, reduce emissions of the Czech Republic by at least **44 Mt CO_2 eq.** compared to 2005 (corresponding to a reduction of **30 % compared to 2005**).
Indicative target by 2040	Approach the indicative level of **70 Mt CO_2 eq.** of emissions in 2040.
Indicative target by 2050	Approach the indicative level **of 39 Mt CO_2 eq.** of emissions in 2050 (corresponding to a reduction of **80 % compared to 1990**).

Source: Climate Policy in Czech Republic

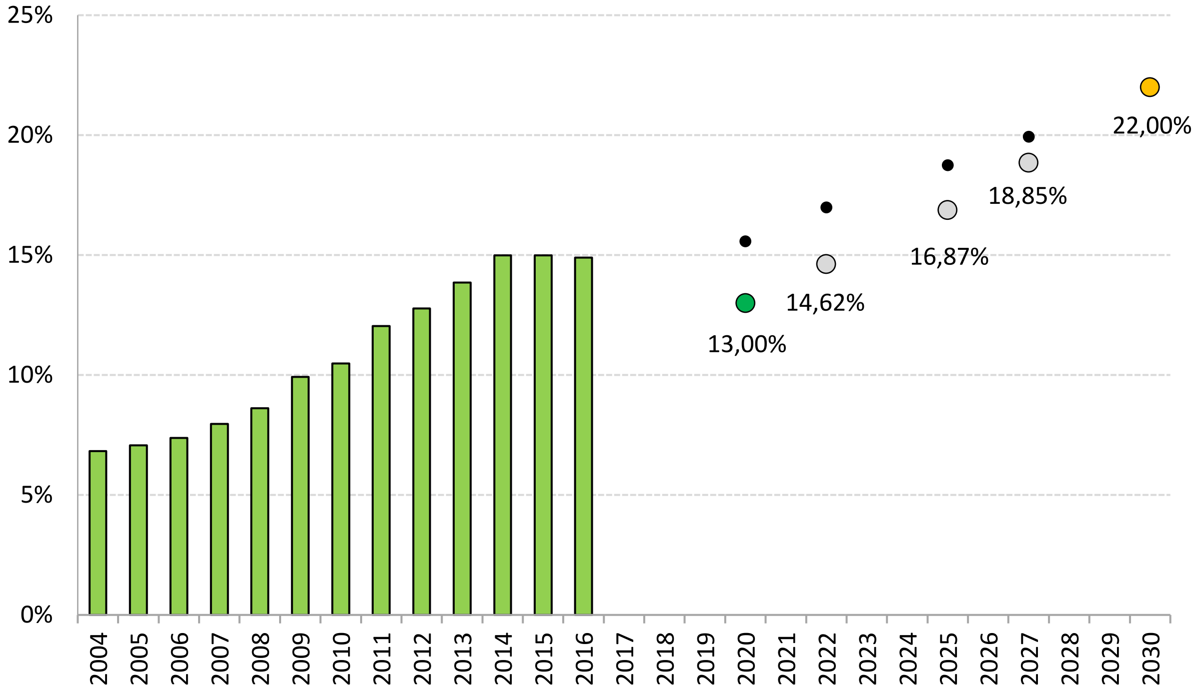
The Implementation of the Climate Protection Policy in the Czech Republic will be evaluated by the end of 2021 and the first update is scheduled by the end of 2023 following the review of commitments under the Paris Agreement.

2.1.2 Renewable energy (Framework target 2030)

i. Elements under Article 4(2)(a)

The Czech Republic plans to achieve the RES share in gross final consumption at 22 % by 2030, which is an increase of 9 percentage points compared to the national target of 13.0 % for 2020. This share of 22 % corresponds to the requirement to express a national contribution to the achievement of a binding EU target of 32.0 % by 2030 under Article 3 of the revised Directive 2009/28/EC on the promotion of the use of energy from renewable sources (Directive (EU) 2018/2001). By 2022, the Czech Republic commits to achieve a share of 14.62 % under Article 4(2) of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, and to achieve 16.87 % by 2025 and 18.85 % by 2027, or to identify and implement additional policies if these interim values are not achieved. Chart 2 depicts the Czech Republic's contribution to meeting the EU goal in 2030, including the historical developments, checkpoints, and expected development (black dots).

Chart 2: *Contribution of the Czech Republic to the fulfilment of the EU target in 2030 compared to historical development %*



Source: Prepared by MIT for the purposes of the National Plan

ii. Estimated trajectories for the sectoral share of renewable energy in final energy consumption from 2021 to 2030 in the electricity, heating and cooling, and transport sector[16]

Table 13: *Developments in gross final consumption from RES by sectors for the purposes of determining the overall target (in TJ)*[17]

Final RES consumption	2016	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	33 247.7	33 512.1	35 708.3	36 487.1	37 502.4	38 333.9	39 457.9	40 305.6	40 944.3	42 058.8	43 045.9	44 540.4
Transport	14 197.3	20 398.5	20 567.9	21 073.2	21 902.7	22 607.8	23 449.7	24 532.9	26 090.6	27 531.3	29 073.6	30 577.3
Heating and cooling	117 220.8	120 222.0	128 281.5	131 716.4	136 960.7	140 376.5	144 156.8	148 139.3	151 882.5	156 259.8	159 750.4	164 599.5
Total	164 665.9	174 132.6	184 557.7	189 276.7	196 365.8	201 318.2	207 064.5	212 977.9	218 917.4	225 849.9	231 869.9	239 717.2

Source: Prepared by MIT for the purposes of the National Plan

Table 14: *Development of RES share in gross final consumption by sector (%)*[18]

RES share in consumption	2016	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	13.6 %	13.4 %	13.8 %	14.1 %	14.5 %	14.8 %	15.2 %	15.5 %	15.7 %	16.1 %	16.4 %	16.9 %
Transport	6.4 %	8.8 %	7.8 %	8.1 %	8.6 %	9.0 %	9.5 %	10.2 %	11.2 %	12.1 %	13.1 %	14.0 %
Heating and cooling	19.9 %	20.7 %	22.3 %	23.1 %	24.2 %	25.0 %	25.9 %	26.8 %	27.7 %	28.7 %	29.6 %	30.7 %
Total	14.9 %	15.6 %	16.5 %	17.0 %	17.7 %	18.2 %	18.7 %	19.3 %	19.9 %	20.6 %	21.2 %	22.0 %

[16] The shares are calculated on the basis of the EUROSTAT methodology, which is currently used for expressing the RES targets. Unfortunately, the Directive (EU) 2018/2001 has introduced a number of relatively fundamental changes in the calculation of the RES share and in this methodology. At the time of the preparation of the National Plan, neither the revised EUROSTAT methodology nor the calculation file was available to be able to verify how the changes in the Directive would be reflected in the calculation; this is also very problematic with regard to the comparability of individual values between Member States. The Czech Republic therefore made all the changes so that the calculation complies as closely as possible with the requirements of Directive (EU) 2018/2001.

[17] The RES consumption for the calculation of the sectoral targets, which is shown below in the tables, and the RES consumption in the sector for the calculation of the overall target differ in accordance with the methodology.

[18] The methodology for determining RES share in gross final consumption is not entirely trivial. Other values are used to determine the sectoral shares and the total share in some cases; for example, values including and excluding multipliers were used for transport. There are also partial modifications to avoid double counting, for example with regard to the consumption of electricity in the transport sector. The overall denominator, i.e. ‘gross final consumption’, does not correspond to ‘final consumption’ within the energy balance, and there are some differences.

Source: Prepared by MIT for the purposes of the National Plan

iii. Estimated trajectories by renewable energy technology that the Member State projects to use to achieve the overall and sectoral trajectories for renewable energy from 2021 to 2030, including expected total gross final energy consumption per technology and sector in Mtoe and total planned installed capacity (divided by new capacity and repowering) per technology and sector in MW

Table 15: *Expected development of RES in the electricity production sector (in TJ)*

RES Consumption – electricity	2016	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Non-household biomass	7 443.9	7 899.7	8 026.5	8 085.4	8 525.0	8 532.0	8 607.8	8 607.0	8 635.3	8 639.7	8 637.2	8 988.4
Hydropower plants[19]	8 205.5	6 923.0	6 955.4	6 977.0	6 998.6	7 020.2	7 041.8	7 063.4	7 085.0	7 106.6	7 128.2	7 149.8
Biodegradable component of MSW	354.8	432.8	991.4	1 104.8	1 241.0	1 354.4	1 354.4	1 354.4	1 354.4	1 603.8	1 603.8	1 603.8
Biogas stations	9 320.5	9 469.5	9 415.9	9 403.3	9 132.8	8 971.1	9 019.8	8 626.2	7 968.4	7 353.0	6 680.6	6 013.5
Geothermal energy	0.0	152.1	152.1	152.1	152.1	152.1	152.1	278.1	309.6	341.1	372.6	404.1
Wind power plants	1 867.1	2 424.8	2 673.0	2 972.9	3 314.7	3 714.8	4 147.3	4 561.7	4 970.9	5 438.9	5 949.8	6 459.7
Photovoltaic power plants	7 673.2	8 050.8	8 319.0	8 630.4	9 019.2	9 504.3	10 092.9	10 812.9	11 662.5	12 654.3	13 784.7	15 077.1
Total	34 865.0	35 352.7	36 533.2	37 325.9	38 383.4	39 248.9	40 416.0	41 303.7	41 986.1	43 137.4	44 156.9	45 696.4

Source: Prepared by MIT for the purposes of the National Plan

Table 16: *Expected development of RES in the transport sector (in TJ)*[20]

RES consumption – transport	2016	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Biofuels not listed in Annex IX	12 580.0	18 557.9	19 354.8	19 456.5	19 572.7	19 707.4	19 825.5	19 902.5	20 011.3	20 137.5	20 280.4	20 390.9
Biofuels under Annex IX (Part A)	0.0	0.0	276.5	555.9	1 398.1	1 970.7	2 832.2	4 264.8	6 575.1	8 630.4	10 864.5	13 108.5
Biofuels under Annex IX (Part B)	0.0	0.0	500.0	1 000.0	1 500.0	2 000.0	2 500.0	3 000.0	3 500.0	4 000.0	4 500.0	4 952.1
RES electricity	4 167.8	4 818.4	1 390.3	1 448.9	1 557.5	1 653.6	1 767.5	1 877.7	1 996.8	2 104.1	2 204.0	2 330.4
Total	16 747.8	23 376.4	21 521.5	22 461.3	24 028.3	25 331.7	26 925.3	29 045.0	32 083.2	34 872.0	37 848.9	40 781.9

[19] In connection with the forthcoming Government Decree on the method and criteria for the determination of minimum residual flows, the volume of electricity production in hydropower plants can be reduced and also the security of water resources may decrease if the requirements for guaranteed minimum flow rates in watercourses increase.

[20] These values take account of multipliers, which are allowed by Directive (EU) 2018/2001. For the period 2021–2030, multipliers were revised in line with the Directive.

Source: Prepared by MIT for the purposes of the National Plan

Table 17: *Expected development of RES in the heating and cooling sector (in TJ)*

RES consumption – H&C	2016	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Household biomass	75 454.0	74 395.0	76 198.9	78 002.8	79 806.7	81 610.6	83 414.6	85 218.5	87 022.4	88 826.3	90 630.2	92 434.1
Non-household biomass	26 631.0	27 561.3	31 284.3	31 676.4	33 614.4	33 900.9	34 836.0	35 097.3	35 220.6	35 269.5	35 318.5	36 723.2
Biodegradable component of MSW	2 418.0	2 690.9	4 701.7	5 110.2	5 600.2	6 008.7	6 008.7	6 008.7	6 008.7	6 906.5	6 906.5	6 906.5
Biogas stations	7 489.0	7 595.0	7 510.9	7 736.7	8 146.1	8 461.6	8 902.9	9 571.5	10 627.5	11 494.1	12 371.2	13 250.1
Heat pumps	4 441.8	6 621.2	7 166.0	7 710.8	8 255.6	8 800.5	9 345.3	9 890.1	10 435.0	10 979.8	11 524.6	12 069.5
Geothermal energy	0.0	310.0	310.0	310.0	310.0	310.0	310.0	960.0	1 122.5	1 285.0	1 447.5	1 610.0
Solar thermal collectors	787.0	1 048.6	1 109.8	1 169.4	1 227.5	1 284.2	1 339.5	1 393.3	1 445.9	1 498.6	1 552.0	1 606.1
Total	117 220.8	120 222.0	128 281.5	131 716.4	136 960.7	140 376.5	144 156.8	148 139.3	151 882.5	156 259.8	159 750.4	164 599.5

Source: Prepared by MIT for the purposes of the National Plan

Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources also sets an indicative target of a 1.1 % year-on-year increase in the share of RES in the heating and cooling sector (if the Member State does not expect to include waste heat, which is the case of the Czech Republic) at the level of the average value in the period 2021–2030[21]. It is problematic for the Czech Republic to meet this indicative target, partly due to the relatively high current RES share in the heating and cooling sector (almost 20 % in 2016). The above trends correspond to the average annual growth rate of RES share in the heating and cooling sector of 1.0 %. Achieving higher growth in this sector in the period until 2030 can be described as problematic, also due to the potential for further development of individual RES sources, which has been carefully analysed within the preparation of the National Plan. Higher development of non-fuel / non-combustion sources than mentioned above can no longer be foreseen, also in view of measures and policies in this area. Further development of RES through fuel / combustion sources is already associated with possible negative impacts within other areas.

The values in the above tables are given in TJ, the values in ktoe are given in the analytical annexes to this document (specifically in Annex 2).

[21] I.e. it is the difference in the share in the heating and cooling sector in 2030 and in 2020 divided by the number of years of the reference period (10 years in this case).

Table 18 shows the expected installed capacity (electrical), which corresponds to the trajectory of the share of renewable energy sources in the above gross final consumption. However, the above capacities must be to some extent regarded as indicative. For example, in the case of biomass, co-combustion with other fuels occurs and the installed capacity is thus distributed indicatively. In the case of hydropower, the capacity of pumped-storage hydropower plants is not included. For the biodegradable part of municipal solid waste, the total installed capacity of the sources is given, where a non-renewable component of the waste is also incinerated. Below is indicative information on the division between newly installed capacity and capacity installed due to upgrading.

Table 18: *Expected installed capacity (electric)*

Installed generation capacity (MWe)	2016	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Biomass	376	414	414	414	431	431	435	435	436	436	436	454
Hydropower plants	1 090	1 106	1 109	1 111	1 113	1 115	1 117	1 119	1 121	1 123	1 125	1 127
Biodegradable component of MSW	55	55	102	112	123	133	133	133	133	154	154	154
Biogas stations	369	355	354	345	339	338	337	322	314	307	299	287
Geothermal energy	0	10	10	10	10	10	10	10	10	10	10	10
Wind power plants	282	370	410	455	505	565	625	685	745	820	895	970
Photovoltaic systems	2 068	2 082	2 153	2 236	2 340	2 470	2 628	2 822	3 051	3 319	3 625	3 975
Total	4 240	4 392	4 552	4 683	4 861	5 062	5 285	5 526	5 810	6 169	6 544	6 977

Source: Prepared by MIT for the purposes of the National Plan

Furthermore, Regulation (EU) 2018/1999 requires the installed capacity to be broken down by sector and by technology. The division into individual sectors is problematic and cannot be done without a significant interpretation distortion. Many sources produce in cogeneration and some proportional divisions may be relatively distorting. The requirement of division by technology is not fully understandable. Division according to the main fuels mentioned above determines the application of the technology to a large extent. The Czech Republic does not consider it appropriate to anticipate the application of individual technologies for sources where there is a large number of technological options, which should be determined by market influences.

The prediction of installed capacity divided into capacity from modernisation and new capacity is relatively problematic as it anticipates the decision-making of private entities responding to specific market conditions. However, the Czech Republic also carried out some analysis with regard to setting up the support scheme for the period 2021–2030, among other things taking into account the incentive measures to modernise the source (the ‘repowering’). Three sources were analysed in detail: (i) wind farms; (ii) photovoltaic power plants and biogas plants. Based on the information about the start of drawing the aid and the period of the granted aid, it is possible to obtain some information about the duration of operation of individual resources. However, it is not possible to predict whether and for how long the source will continue to be operated after the aid ends. Table 19 summarises the results of the analysis. The range is based on the assumption that 100 % of the sources will cease operation following the end of the aid and the assumption that 60 % of the sources will continue to operate the source ten years after the end of the aid (this applies to those sources except for biogas stations, where intervals were created differently). It is apparent that for wind farms, only about 32 % of the sources that were in operation in 2016 can be in operation in 2030. In the case of photovoltaic power plants, this value is 78 %. However, the table also shows the year 2035, where the dropout of sources that are currently in operation is already quite noticeable. Therefore, in order to achieve the installed capacity (see Table 18), it is necessary for these sources to be upgraded and to remain in operation, or to be compensated by new sources. Thus, the installed capacity of new sources can significantly exceed the installed capacity difference in 2030 and 2016, as this is sometimes perceived in a simplified way.

Table 19: *Installed capacity of existing sources without modernisation (repowering)*

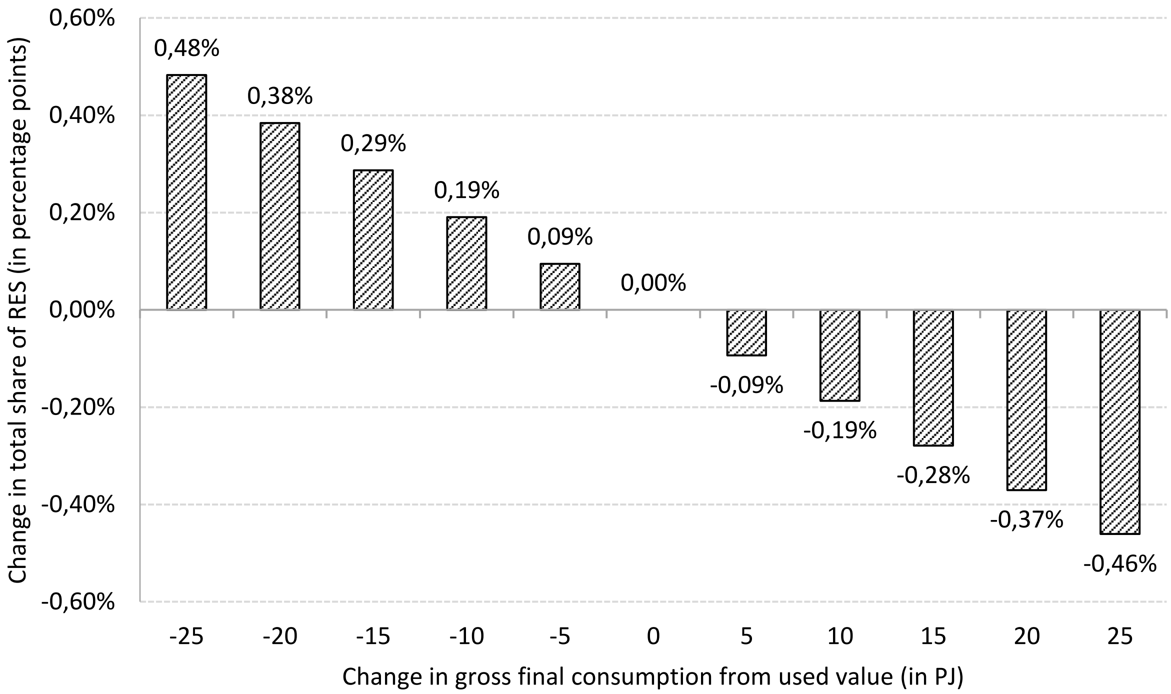
	Capacity in 2016 (MWe)	**Capacity in 2030 (MWe)**	**Capacity in 2035 (MWe)**
Wind power plants	282	91–206	0–160
Photovoltaic power plants	2 068	1 615–1 887	0–1 226
Biogas stations	368	287-356	N/A

Source: Ministry of Industry and Trade

The Czech Republic considers it very important to point out the inherent uncertainties of the outlook for the RES share in gross final consumption. It is a ratio indicator, the amount of which is therefore influenced not only by the development of the numerator but also by the development of the denominator. The developments in the final consumption / gross final consumption is affected by a number of significant uncertainties, from temperature conditions to economic growth (industrial production in the given year). Chart 3 presents the basic sensitivity analysis of the dependence of the total RES share on a change in gross final consumption. This also reflects the mutual interaction between RES and energy efficiency targets. For the context of these values, it is worth mentioning that in 2016 the contribution to the total share was 0.66 % for photovoltaic energy (with installed capacity of approximately 2 GW) 0.16 % for wind energy (with installed capacity of 0.28 GW). It can be seen from the above that if we consider a possible deviation of final energy consumption (i.e. the denominator for the calculation of the RES share) of about -2.5 % to +2.5 %, which, in absolute value, is equivalent to the deviation of -25 to +25 PJ; the resulting deviation of the RES share would be -0.5 pp and +0.5 pp (compared to the reference value). The change in final energy consumption (denominator) by 5 PJ is therefore associated with a change in the RES share of approximately 0.1 pp and this relationship is basically linear.

The Czech Republic prefers to express the target as an interval, which allows partial uncertainties to be covered. However, this approach was not considered appropriate by the European Commission, particularly due to the simplicity of assessing the contributions by individual Member States. Nevertheless, the Czech Republic considers it appropriate and important to mention this.

Chart 3: *Sensitivity analysis of the total RES share depending on a change in gross final consumption*



Source: Prepared by MIT for the purposes of the National Plan

iv. Estimated trajectories on bioenergy demand, disaggregated between heat, electricity and transport, and on biomass supply by feedstocks and origin (distinguishing between domestic production and imports). For forest biomass, an assessment of its source and impact on the LULUCF sink

Estimated trajectories for bioenergy demand, broken down by heat, electricity and transport sectors

The following tables show the estimated trajectory of bioenergy consumption and the sources to cover this consumption, broken down by domestic and imported sources and broken down by the electricity, heating and cooling sectors and the transport sector. Table 20 shows the expected consumption of bioenergy, which shows that this type of energy plays an essential role in further increasing the share of RES and achieving the EU contribution to the above RES target. Table 22 provides information on expected net imports of biomass. It follows from this table that the Czech Republic does not currently expect significant systematic imports of solid biomass and that consumption until 2030 will be covered mainly by domestic sources. The Czech Republic is currently a net exporter of solid biomass; the assumption that exports will partly decline, if this occurs, depends, among other things, on market factors. Liquid biofuels, especially biodiesel, form a certain exception to the assumption of covering consumption mainly by domestic sources, where this consumption will in the future be associated with higher imports from abroad, or a partial decrease in exports (but this largely depends on market factors).

It is absolutely crucial to stress that these figures can only be considered as indicative, as the outlooks and assumptions are subject to a number of uncertainties. In the Czech Republic, for example, it is now very difficult to predict the availability of forest woody biomass with regard to the further course of bark beetle calamity. Agricultural biomass production is already significantly affected by climate change and its availability will depend on a number of factors, such as the course of the growing season, the implementation of the future Common Agricultural Policy objectives and increasing environmental protection requirements, in particular the protection of water and soil resources. At the same time, the achievement of the targets for reducing greenhouse gas emissions and the use of RES should not risk the occurrence of direct competition between the availability of agricultural and forest biomass for the energy sector and the fulfilment of basic production functions in agriculture. The overall layout and mix of domestic and imported resources will also be significantly influenced in the future by the availability of these sources on the market and by the economic situation of individual actors. Therefore, the expected values below will have to be continuously verified and further refined. For more detailed information on the LULUCF sector, see Chapter 4.2.1.

Local furnaces in the Czech Republic currently produce 47 % of total emissions of volatile organic compounds, 41 % of total emissions of PM10 dust particles and 74 % of total emissions of PM2.5 dust particles. A significant part of these pollutants is produces due to the burning of wet wood in unsuitable furnaces. When using wood and similar fuels in households, it is necessary to ensure that this is done in suitable furnaces and that the burned wood, wood chips or wood-based fuels such as pellets, briquettes etc. are sufficiently dried. In order to fulfil the assumptions for increasing the use of wood (biomass) for heating in the household sector, intensive support will be provided in this sector to replace inappropriate furnaces.

Table 20: *Expected consumption of bioenergy broken down by sectors (in TJ)*

Bioenergy consumption	2016	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	17 119.2	17 802.0	18 433.7	18 593.5	18 898.8	18 857.5	18 982.0	18 587.6	17 958.1	17 596.5	16 921.6	16 605.7
Biomass	7 443.9	7 899.7	8 026.5	8 085.4	8 525.0	8 532.0	8 607.8	8 607.0	8 635.3	8 639.7	8 637.2	8 988.4
Biodegradable component of MSW	354.8	432.8	991.4	1 104.8	1 241.0	1 354.4	1 354.4	1 354.4	1 354.4	1 603.8	1 603.8	1 603.8
Biogas	9 320.5	9 469.5	9 415.9	9 403.3	9 132.8	8 971.1	9 019.8	8 626.2	7 968.4	7 353.0	6 680.6	6 013.5
Heating	111 992.0	112 242.2	119 695.8	122 526.1	127 167.5	129 981.8	133 162.1	135 895.9	138 879.2	142 496.4	145 226.4	149 313.9
Biomass (excl. households)	26 631.0	27 561.3	31 284.3	31 676.4	33 614.4	33 900.9	34 836.0	35 097.3	35 220.6	35 269.5	35 318.5	36 723.2
Biomass (households)	75 454.0	74 395.0	76 198.9	78 002.8	79 806.7	81 610.6	83 414.6	85 218.5	87 022.4	88 826.3	90 630.2	92 434.1
Biodegradable component of MSW	2 418.0	2 690.9	4 701.7	5 110.2	5 600.2	6 008.7	6 008.7	6 008.7	6 008.7	6 906.5	6 906.5	6 906.5
Biogas	7 489.0	7 595.0	7 510.9	7 736.7	8 146.1	8 461.6	8 902.9	9 571.5	10 627.5	11 494.1	12 371.2	13 250.1
Transport	12 580.0	18 557.9	19 743.0	20 234.5	21 021.8	21 692.8	22 491.6	23 534.9	25 048.8	26 452.7	27 962.6	29 421.2
Bioethanol	1 998.0	2 836.5	2 842.9	2 823.8	2 802.3	2 780.0	2 756.9	2 728.7	2 700.5	2 674.5	2 653.4	2 629.8
Biodiesel	10 582.0	15 721.4	16 761.9	17 132.7	17 520.4	17 927.4	18 318.6	18 673.8	19 060.7	19 463.0	19 877.0	20 237.2
Biogas	0.0	0.0	138.2	278.0	699.0	985.4	1 416.1	2 132.4	3 287.6	4 315.2	5 432.2	6 554.2
Total	141 691.2	148 602.2	157 872.5	161 354.1	167 088.1	170 532.1	174 635.7	178 018.3	181 886.1	186 545.6	190 110.6	195 340.8

Source: Prepared by MIT for the purposes of the National Plan

Table 21: *Estimated bioenergy consumption produced from domestic sources (in TJ)*

Est. consumption from dom. sources	2016	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Solid biomass	127 911.0	129 377.9	131 538.7	134 293.5	139 921.6	142 398.4	144 843.0	146 801.4	148 465.3	151 381.0	153 025.8	157 431.6
Biomass from forestry, including resid.	109 052.0	107 606.9	106 760.2	108 743.9	113 486.9	115 192.6	117 436.1	119 193.5	120 857.4	122 520.0	124 164.8	128 570.6
Cellulose extracts	15 278.0	18 138.9	18 340.0	18 541.1	18 742.1	18 943.2	19 144.3	19 345.4	19 345.4	19 345.4	19 345.4	19 345.4
Renewable component of MSW	3 581.0	3 632.1	6 438.5	7 008.5	7 692.5	8 262.5	8 262.5	8 262.5	8 262.5	9 515.6	9 515.6	9 515.6
Agricultural inputs – biofuels	8 511.6	11 092.9	11 569.5	11 350.9	11 146.8	10 961.2	10 759.0	10 426.3	10 125.4	9 841.9	9 575.1	9 275.9
Bioethanol	2 869.7	3 511.5	3 493.6	3 450.2	3 404.4	3 357.8	3 310.4	3 279.5	3 248.6	3 219.9	3 196.1	3 169.8
Biodiesel	5 641.9	7 581.4	8 075.9	7 900.7	7 742.4	7 603.4	7 448.6	7 146.8	6 876.7	6 622.0	6 379.0	6 106.2
Recycled oils[22]	0.0	0.0	250.0	500.0	750.0	1 000.0	1 250.0	1 500.0	1 750.0	2 000.0	2 250.0	2 476.0
Biogas from anaerobic fermentation	25 161.0	25 161.3	25 161.4	25 161.6	25 161.7	25 161.9	25 877.5	26 239.5	26 823.3	27 342.5	27 907.0	28 473.9
Biogas from agricultural inputs	22 855.9	22 856.2	22 718.1	22 578.5	22 216.4	21 954.3	22 275.5	21 981.4	21 507.2	21 085.3	20 626.6	20 166.0
Biogas from waste inputs	0.0	0.0	138.2	278.0	640.2	902.5	1 297.0	1 953.0	3 011.0	3 952.2	4 975.2	6 002.8
Landfill and sludge gas	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1
Total	161 583.6	165 632.1	168 519.5	171 306.0	176 980.2	179 521.4	182 729.5	184 967.2	187 163.9	190 565.5	192 757.9	197 657.5

Source: Prepared by MIT for the purposes of the National Plan

[22] Recycled oils are already consumed in certain quantities in the Czech Republic. However, these volumes are not separately monitored in the energy balance. Thus, the increment shows an increment beyond the amount already consumed, which, however, currently corresponds to relatively low volumes compared to total consumption (this also applies to the following two tables).

Table 22: *Net bioenergy import (in TJ)*

Net bioenergy import	**2016**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Solid biomass	-2 665.0	-1 000.0	-750.0	-500.0	-250.0	0.0	250.0	450.0	650.0	850.0	1 050.0	1 250.0
Biomass from forestry, including resid.	-2 665.0	-1 000.0	-750.0	-500.0	-250.0	0.0	250.0	450.0	650.0	850.0	1 050.0	1 250.0
Cellulose extracts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Renewable component of MSW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Agricultural inputs – biofuels	4 068.4	7 465.0	7 785.3	8 105.6	8 425.9	8 746.2	9 066.5	9 476.2	9 885.9	10 295.6	10 705.3	11 115.0
Bioethanol	-871.7	-675.0	-650.7	-626.4	-602.1	-577.8	-553.5	-550.8	-548.1	-545.4	-542.7	-540.0
Biodiesel	4 940.1	8 140.0	8 436.0	8 732.0	9 028.0	9 324.0	9 620.0	10 027.0	10 434.0	10 841.0	11 248.0	11 655.0
Recycled oils	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biogas from anaerobic fermentation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biogas from agricultural inputs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biogas from waste inputs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Landfill and sludge gas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1 403.4	7 605.1	8 503.2	8 731.7	8 977.0	9 241.6	9 490.5	9 703.3	9 947.8	10 207.8	10 479.4	10 697.2

Source: Prepared by MIT for the purposes of the National Plan

Table 23: *Total bioenergy resources (in TJ)*

Total bioenergy resources	**2016**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Solid biomass	125 246.0	128 377.9	130 788.7	133 793.5	139 671.6	142 398.4	145 093.0	147 251.4	149 115.3	152 231.0	154 075.8	158 681.6
Biomass from forestry, including resid.	106 387.0	106 606.9	106 010.2	108 243.9	113 236.9	115 192.6	117 686.1	119 643.5	121 507.4	123 370.0	125 214.8	129 820.6
Cellulose extracts	15 278.0	18 138.9	18 340.0	18 541.1	18 742.1	18 943.2	19 144.3	19 345.4	19 345.4	19 345.4	19 345.4	19 345.4
Renewable component of MSW	3 581.0	3 632.1	6 438.5	7 008.5	7 692.5	8 262.5	8 262.5	8 262.5	8 262.5	9 515.6	9 515.6	9 515.6
Agricultural inputs – biofuels	12 580.0	18 557.9	19 354.8	19 456.5	19 572.7	19 707.4	19 825.5	19 902.5	20 011.3	20 137.5	20 280.4	20 390.9
Bioethanol	1 998.0	2 836.5	2 842.9	2 823.8	2 802.3	2 780.0	2 756.9	2 728.7	2 700.5	2 674.5	2 653.4	2 629.8
Biodiesel	10 582.0	15 721.4	16 511.9	16 632.7	16 770.4	16 927.4	17 068.6	17 173.8	17 310.7	17 463.0	17 627.0	17 761.2
Recycled oils	0.0	0.0	250.0	500.0	750.0	1 000.0	1 250.0	1 500.0	1 750.0	2 000.0	2 250.0	2 476.0
Biogas from anaerobic fermentation	25 161.0	25 161.3	25 161.4	25 161.6	25 161.7	25 161.9	25 877.5	26 239.5	26 823.3	27 342.5	27 907.0	28 473.9
Biogas from agricultural inputs	22 855.9	22 856.2	22 718.1	22 578.5	22 216.4	21 954.3	22 275.5	21 981.4	21 507.2	21 085.3	20 626.6	20 166.0
Biogas from waste inputs	0.0	0.0	138.2	278.0	640.2	902.5	1 297.0	1 953.0	3 011.0	3 952.2	4 975.2	6 002.8
Landfill and sludge gas	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1	2 305.1
Total	162 987.0	172 097.1	175 554.8	178 911.6	185 156.1	188 267.6	192 046.0	194 893.4	197 699.8	201 711.1	204 513.2	210 022.5

Source: Prepared by MIT for the purposes of the National Plan

Supply of biomass according to initial raw materials and origin

Agriculture

The area of arable land used for the cultivation of agricultural crops, including straw production, decreased by almost 260 000 ha in the Czech Republic between 2000 and 2017. By contrast, the area of permanent grasslands used for livestock grazing and hay production increased by about 140 000 ha in the same period. However, the total area of farmed agricultural land in the Czech Republic declined by more than 120 000 ha in the period 2000–2017 due to the occupation of the agricultural land fund. That said, soil occupation has accelerated considerably in recent years, particularly for construction and other purposes (warehouses, shopping and entertainment centres, car parks, roads, civil engineering and industrial construction, mining of raw materials, especially sandy gravel, etc.). At present, about 15 ha of agricultural land is occupied daily, and given the continuing interest in infrastructure construction and construction plots, there is no indication that this trend of declining agricultural (and in particular arable) land has declined substantially.

Table 24: *State of farmed agricultural land in the Czech Republic, 2000–2017*

Year	Total utilised agricultural land	of which									
		arable land	of which unsown and fallow	hop-field	of which in production	vineyards	of which in production	gardens	orchards	permanent grassland	other permanent crops
Agrocenzus (agricultural census)											
2000	3 643 168	2 757 259	36 444	6 974	4 695	11 260	9 162	7914	22 547	837 215	-
2002	3 652 028	2 767 052	83 149	8 203	6 148	1 1 869	9 985	5 068	20 990	838 846	-
2003	3 668 380	2 746 993	176 990	8 019	5 962	12 844	10 794	4 663	20 826	875 035	-
2004	3 631 423	2 718 879	54 539	7 720	5 873	17 394	13 029	4 331	24 984	858 115	-
2005	3 605 493	2 702 568	45 286	7 468	5 659	17 892	14 341	2 877	21 948	852 740	-
2006	3 565 982	2 628 763	43 743	7 176	5 460	17 649	15 627	2 326	20 678	889 389	-
2007	3 596 716	2 618 109	30 323	6 962	5 408	17 327	16 999	1 813	20 368	932 138	-
2008	3 571 594	2 592 152	23 377	6 672	5 345	16 799	16 403	1 779	21 140	933 052	-
2009	3 545 840	2 573 790	28 513	6 661	5 305	16 708	16 136	1 769	21 738	925 173	-
2010	3 523 857	2 540 471	45 047	6 479	5 238	16 686	16 033	1 351	22 776	936 095	-
2011	3 504 032	2 515 980	28 283	6 288	4 786	16 693	15 883	998	22 339	941 733	-
2012	3 525 889	2 513 380	32 847	5 985	4 435	16 648	15 696	1 371	20 769	967 736	-
2013	3 521 000	2 500 796	23 784	5 823	4 339	16 787	15 699	1 196	22 687	973 711	-
2014	3 515 555	2 488 740	22 002	5 748	t tT2	16 946	15 810	666	22 949	980 506	-
2015	3 493 717	2 492 498	35 091	5 595	4 617	17 065	15 916	1 365	19 402	957 793	-
2016	3 488 788	2 494 021	30 167	5 603	4 783	17 088	15 896	748	20 802	948 566	1 958
2017	3 521 329	2 497 792	26 247	5 704	4 945	17 210	15 834	666	17 111	978 161	4 685

Source: Czech Statistical Office

The current problem is also soil degradation, in particular erosion (water and wind), soil compaction, loss of humus, reduced water absorption capacity, etc. The total damage related to soil degradation is estimated at CZK 4 to 10 billion annually (loss of topsoil, reduction of yields, clogging of watercourses, damage to private and municipal property, etc.). In the Czech Republic, over 50 % of agricultural land is potentially threatened by water erosion and about 25 % by wind erosion. On some plots, farming methods to prevent soil erosion may involve, for example, the cultivation of certain crops only with the use of soil protection technologies, no cultivation of selected erosive crops, the obligation to grow multi-annual fodder crops such as clover and alfalfa or even the conversion of the respective soil blocks or their parts to permanent grassland.

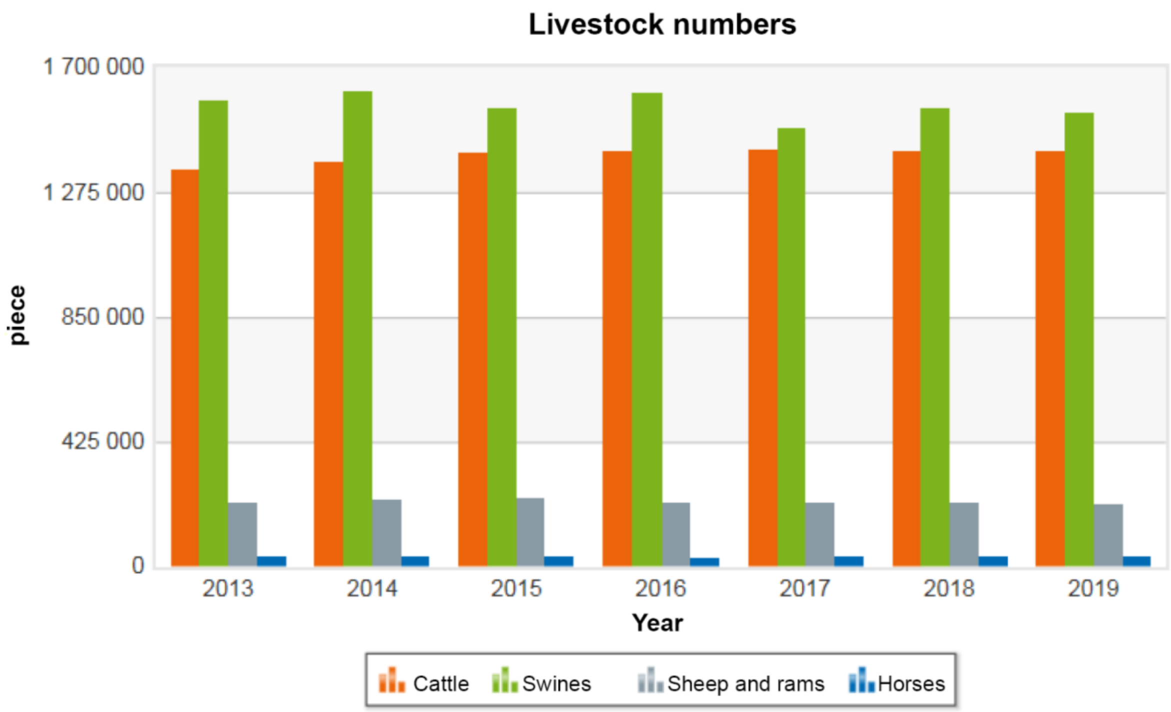
Another issue is also the impact of climate change, which has recently been manifested, for example, by more frequent periods of agricultural drought, which reduce the yields of some commodities, thereby increasing the necessary crop area to ensure sufficient harvest of food commodities, feeds and bedding. Part of the land (especially of permanent grassland) is cultivated under the agri-environment-climate measures or falls within NATURA 2000, protected landscape areas, national parks or other types of specially protected areas where, due to the protection of biodiversity or other specific requirements, intensive farming is impossible and lower production is to be expected.

Table 25: *Selected indicative indicators of strategic objectives according to the Strategy of the Ministry of Agriculture of the Czech Republic with a view to 2030*

Indicator	Unit	Current situation	Indicative value 2020	Indicative value 2025	Indicative value 2030	Performance and measures
Area of cereals	ha thousands	1 411	1 400	1 300	1 300	Reduction in areas in favour of areas for growing fruit, vegetables, hops, grapes and reallocation of livestock support.
Area of oil seed crops	ha thousands	464	430	400	400	Reduction in areas in favour of areas for growing fruit, vegetables, hops, grapes and reallocation of livestock support.
Area of perennial fodder crops	ha thousands	168	min. 180	min. 200	min. 250	Extensions of perennial fodder crop areas, at least in connection with the greening of direct payments.

Source: Strategy of the Ministry of Agriculture of the Czech Republic with a view to 2030

Chart 4: *Livestock in the Czech Republic, 2012–2019*



Source: Czech Statistical Office

The table above shows some stagnation in the current evolution of the number of selected livestock species. The Ministry of Agriculture, however, expects a revival in livestock production, in particular in the slaughter cattle sector and in the pig and poultry sectors, in line with its Strategy with a view to 2030. This development would be desirable in terms of the structural development of agriculture, positive impacts on the quality of soil, its water regime, biodiversity and ensuring cultural landscape. In terms of raw materials for energy production, this development would entail increased demands for the production of bulk plant feed and bedding, but also a partial increase in some livestock waste for subsequent use in the RES sector. Like farmyard manure, biogas plants also contribute to the return of organic matter to the soil through digestate applied to agricultural land. Therefore, it is desirable to develop the biogas plant sector, especially in regions with insufficient intensity of livestock production.

Forestry

The area of forest land in the Czech Republic is slowly growing, which is because the area of newly forested land which was previously not forested is larger than the area of land which is deforested for various reasons. In 2016, the area of forest land was almost 34 % of the area of the Czech Republic. The most important owner of forests in the Czech Republic is the State. Lesy ČR, a state-owned enterprise, manages an area of 1.25 million hectares, Vojenské lesy a statky manage about 123 thousand hectares, and other State-owned forests (national parks, regional forests, etc.) manage about 121 thousand hectares. Of the total area of forests, about 60 % are managed by the State, 19 % by natural persons, 17 % by municipalities, 3 % by legal persons, 2 % by the church and 1 % by cooperatives. The total timber stock was estimated at 696 million m^3 in 2016. The timber stock in the Czech Republic is given without bark.

Table 26: *Development of the total area of forest (ha)*

Year	2010	2012	2014	2015	2016	2018
Forest land area in ha	2 657 376	2 661 889	2 666 376	2 668 392	2 669 850	2 673 392

Source: Forest Management Institute (FMI)

Table 27: *Logging (in million m^3)*

	2000	2010	2015	2016	2017	2018
Coniferous	12.58	15.07	14.38	15.92	17.74	24.21
Deciduous	1.59	1.67	1.78	1.69	1.65	1.48
Total	14.44	16.74	16.16	17.61	19.39	25.69

Note: Data are given in m^3 of timber without bark.

Source: Ministry of Agriculture (MoA)

In 2018 a total of 25.69 million m^3 of raw timber was harvested in the Czech forests, which represents an increase of 6.3 million m^3 compared to the previous year. This volume was largely caused by the processing of extraordinary logging of 23.01 million m^3 timber. In 2018, the share of extraordinary logging was 90 % and the default conditions for planned forest management continued to deteriorate.

In terms of tree composition, the volume of coniferous logs increased by 6.47 million m^3 to 24.21 million m^3 in 2017. Consequently, the share of coniferous logging in total logging was approximately 94 %.

The proportions of deciduous and coniferous logging are influenced by the processing of extraordinary logging, especially the trees affected by bark beetle, and the demand on the raw timber market.

Conclusions

Today's area of agricultural land which is annually used on a consistent basis for the production of raw materials used in the energy sector, is around 350–400 thousand ha. Forestry produces about 2 million m^3 of wood chips, 1.5 million tonnes of cellulose extracts and almost 5 million tonnes of firewood which are further used every year for energy purposes. In this respect, agricultural and forestry management plays an important role in the production of biomass further used as RES, thus contributing significantly to increasing energy self-sufficiency and meeting national climate commitments.

The strategy of the Ministry of Agriculture of the Czech Republic with a view to 2030 permits an increase in the energy use of agricultural biomass by 2030 by 20 %, but only on condition of maintaining the strategic level of agricultural production for food use. The strategy thus confirms that the main role of agricultural land is to ensure sufficient food for human nutrition and livestock feed and bedding. This basic function can be affected by a number of negative factors, such as the loss of agricultural land, limits for erosive crops (e.g. maize, potatoes, beets, broad beans, soya, sunflower and sorghum) or the overall increase in instability of agricultural production caused by climate change (long-term drought, new pests, increased freezing of winter and spring crops, damage caused by torrential rain, hailstorms, etc.).

Therefore, additional area of land available for an increase in the production of energy biomass may in fact be very limited. Moreover, by 2030 both the area of agricultural land (especially arable land) and the stability of production will decrease, which means that the land used to produce energy biomass will rather stagnate or grow only slightly. Another uncertainty resulting from yield fluctuations is the developments in prices of not only the targeted biomass, but also of post-harvest residues (especially grain straw). Increasing demand for livestock feed and bedding may cause a rise in prices, which will also affect those interested in its use as energy. In general, therefore, it is necessary to anticipate an increase in the price of energy biomass above the inflation rate in 2020–2030.

In view of the above, it would not be responsible to continue to intensively increase the use of agricultural land for energy purposes; we should rather focus on its more efficient use in terms of the unit amount of energy from RES in final consumption per hectare. This could be fostered, for example, by the development of biomethane production or the partial replacement of targeted biomass in biogas plants using biodegradable waste (BW) or biodegradable municipal waste (BMW). This could free up a certain amount of agricultural land fund for more efficient energy use methods. Regarding forest soil and wood biomass production, a significant year-on-year volatility of its availability for energy and technical use is expected in the reference period until 2030, depending on the evolution of pest spread and on the capacities for the processing of increased extraordinary logging and the processing capacity of wood in the sawmill and paper industries. In areas of high intensity of extraordinary logging, a shortage of wood biomass for energy use and rising prices for bioenergy can be expected in the coming years.

The Czech Republic's adaptation strategy and the National Action Plan for Adaptation to Climate Change also address potential conflicts and synergies in biomass production and energy use in terms of biodiversity and ecosystem services. As part of the preparation of the National Action Plan, all proposed measures were also evaluated on the basis of the environmental and ecosystem services criterion.

Biodiversity is a prerequisite for the provision of ecosystem services and contributes significantly to the improved ability of ecosystems to adapt to the impacts of climate change. Species-rich, healthy and interconnected ecosystems can mitigate the effects of extreme weather events or natural disasters, including floods, droughts and landslides. For example, wetlands and floodplains retain flood water, trees stabilise slopes and reduce soil erosion, and coastal vegetation prevents shore erosion.

Both adaptation and mitigation measures, taking into account the long-term outlook of landscape (ecosystem) management with an emphasis on biodiversity protection and provision of key ecosystem services, incl. water retention in the landscape should include measures and cooperation in particular in the areas of land-use (spatial) planning, strategic planning, water planning, forest planning, land consolidation, landscape management and subsidy policy, including the setting of agricultural subsidies.

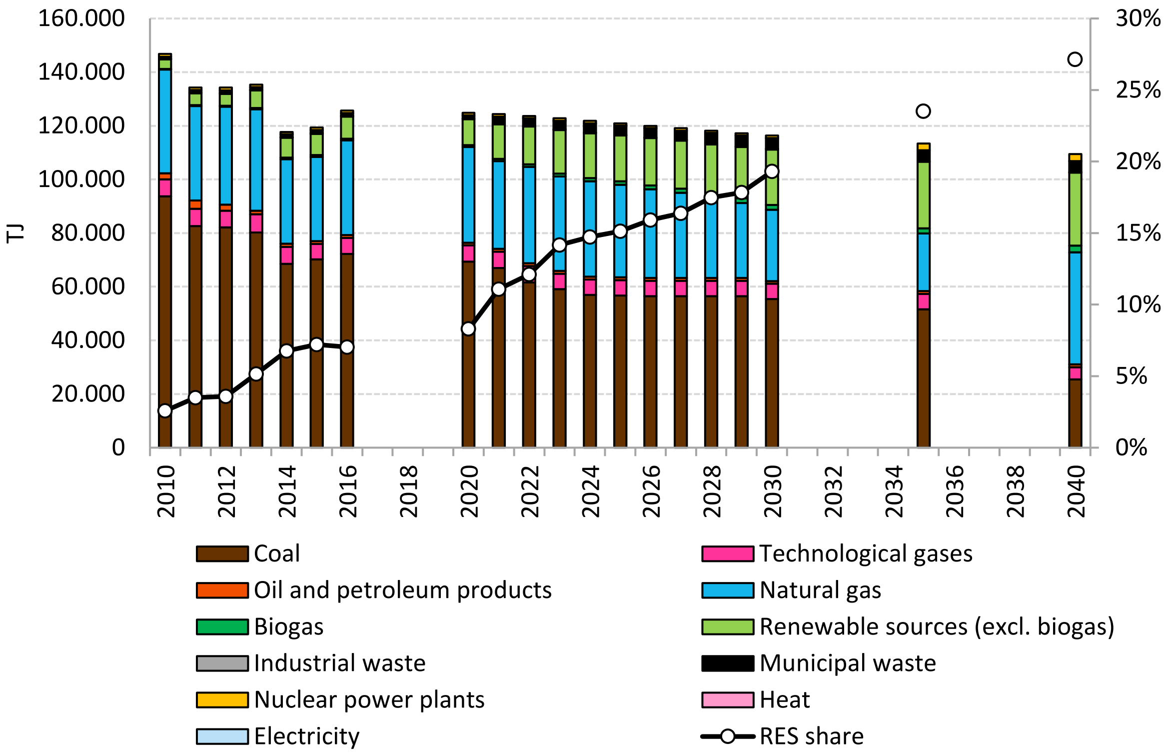
It is important to ensure that biodiversity and ecosystem considerations are integrated into mitigation measures and that adaptation and mitigation measures are mutually parallel. From the point of view of carbon accounting and carbon storage in ecosystems, priority should be given to protecting and restoring natural or near-natural ecosystems with high carbon-binding potential. For renewable biomass, priority should be given to indigenous species or species without adverse impact on natural (indigenous) ecosystems. Afforestation of agricultural land and especially non-agricultural land needs to be regulated in such a way that it does not lead to a loss of natural habitats, a reduction in biodiversity and the possibility of adapting to climate change. At the same time, in order to effectively protect ecosystems, it is necessary to know the value of ecosystem services and to use this information in decision-making processes.

v. Where applicable, other national trajectories and objectives, including those that are long term or sectoral (e.g. share of renewable energy in district heating, renewable energy use in buildings, renewable energy produced by cities, renewable energy communities and renewables self-consumers, energy recovered from the sludge acquired through the treatment of wastewater)

The State Energy Policy of the Czech Republic, approved in 2015, sets the target of covering at least 20 % of heat supply from heat supply systems to be covered by renewable energy sources by 2040. Statistically, expressing the amount of thermal energy supplied within the heat supply systems is relatively problematic, among other things because of the definition of the heat supply system, but it is generally possible to generalise this heat to the 'heat sold' category, or the category of gross heat production within the energy balance. Chart 5 shows the expected development of the heat sold and the share of renewable energy sources, 20 % share should be reached before 2040[23]. The chart explicitly expresses the contribution of biogas, or biomethane, which emphasises that the Czech Republic counts on a partial contribution of biogas within the heat sold. More information on the expected share of RES gas can be found in Chapter 4.2.2, specifically in part (ii).

[23] The share of RES in the heating and cooling sector according to EUROSTAT methodology is not equivalent to the share of RES in terms of heat sold and thus these shares do not match

Chart 5: *Development of heat sold and the share of RES*



Source: Prepared by MIT for the purposes of the National Plan

Particular emphasis will be given to the Renewable Energy Community ('community energy'), which is behind the economic, environmental and social benefits on a local and national scale. The participation of citizens and local authorities (e.g. municipalities) in community energy projects creates significant added value in terms of local acceptance of renewable energy sources and access to private capital. Its development is accompanied by local investment, greater choice for consumers and increased citizen participation in energy transformation. Above all, the participation of citizens and local authorities in community energy is linked to the desirable increase in renewable energy production and the emphasis on energy savings. Community energy can thus become an important element for meeting the Czech Republic's objectives in individual areas.

2.2 'Energy efficiency' dimension

i. The elements set out in of Article 4(b)

2.2.1.1 Compliance with obligation under Article 3 of Directive 2012/27/EU

Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, as amended by its 2018 revision (hereinafter 'Directive 2012/27/EU'), establishes a framework for measures to promote energy efficiency improvements across the EU in order to ensure the EU energy efficiency target by 2020 / 2030. Article 3 of Directive 2012/27/EU allows each Member State to set an indicative national energy efficiency target, based on either primary or final energy consumption, primary or final energy savings, or energy intensity. At the same time, however, Member States should respect the EU energy efficiency target by 2020 and 2030, which is set at 20 % and 32.5 %, respectively. Achieving this target should lead in 2020 to EU primary energy consumption of no more than 1 474 Mtoe or final energy consumption of more than 1 078 Mtoe.

For the year 2030, the revised EU Energy Efficiency Directive sets a target of at least 32.5 %; when converted to absolute values, the primary energy consumption should not exceed 1 273 Mtoe and final energy consumption should not exceed 956 Mtoe for the EU (excluding the United Kingdom, it is 1 128 Mtoe of primary energy consumption and 846 Mtoe of final energy consumption).

The Czech Republic considers the indicative national target defined in Article 3 of Directive 2012/27/EU as a non-binding framework target, which does not create a specific and legally enforceable obligation for both the Czech Republic and other entities. Achieving the 2020/2030 target for final and primary energy consumption is influenced by a number of factors and assumptions, which may evolve over time. For this reason, the contribution of the Czech Republic is supplemented to include a specification of 'boundary conditions'. A significant change in these input parameters may in the future trigger the need for the Czech Republic to reassess the indicative national targets.

Contribution of the Czech Republic to the non-binding EU target by 2030

For the period until 2030, the Czech Republic considers it most appropriate to set a national target for the energy performance of the economy which better reflects the influence of external factors on final energy consumption, such as the economic growth. **The 2030 national target of the Czech Republic corresponds to the reduction of the energy intensity of GDP creation to the level of 0.157 MJ/CZK and the creation of GVA to the level of 0.174 MJ/CZK.** With regard to the obligation arising from Article 3(1) of the Energy Efficiency Directive, the national target of the Czech Republic is also expressed in the final energy consumption, which should not exceed 990 PJ or 1 735 PJ in primary energy consumption[24].

The national target is determined as the maximum potential for reducing energy consumption in individual sectors of the economy, i.e. at the limit of final energy consumption that the Czech Republic can realistically achieve with regard to the assumption of the development of the 'boundary conditions'. This potential reflects the effect of both the approved and planned strategies, policies and measures to be implemented in the period up to 2030, under the following assumptions:

- GDP growth in line with the assumptions in Chapter 4.1;
- annual increase in residential area, taking into account the demographic developments in the Czech Republic in accordance with the assumptions in Chapter 4.1;
- growth in transport performance in the transport sector;
- a change in the structure of the economy (growth of the services sector and a decrease of heavy industry);
- increase/decrease of production in industry.

For a detailed description of the developments in and the setting of the final energy consumption target / primary energy consumption target, see Chapter 4.3.

Strategies and policies affecting the level of final energy consumption include, without limitation:

- Long-term strategy for the renovation of buildings pursuant to Article 2a of the Energy Performance of Buildings Directive;
- obligation under Article 5 of the Energy Efficiency Directive;
- obligation under Article 7 of the Energy Efficiency Directive;

[24] The value is in line with Eurostat methodology – Final Energy Consumption.

- legislative and regulatory measures resulting from the transposition and implementation of national and EU legislation;
- fiscal instruments
- strategies and policies in other areas including, inter alia, the transport sector and specified in the following strategic materials:
    - State Energy Policy of the Czech Republic
    - National Reform Programme of the Czech Republic (NRP)
    - State Environmental Policy
    - Climate Policy in Czech Republic
    - Strategic Framework for Sustainable Development of the Czech Republic
    - Transport Policy of the Czech Republic for 2014–2020 with the Prospect of 2050.

2.2.1.2 Cumulative energy savings target under Article 7 of Directive 2012/27/EU for the period 2021–2030

The revision of Directive 2012/27/EU of 11 December 2018 extends the obligation to achieve new energy savings for the period 2021–2030.

In line with the text of the revision of Directive 2012/27/EU and the rules for setting the commitment, the Czech Republic's target under Article 7 for 2021–2030 was set at 84 PJ of new energy savings, i.e. 462 PJ of cumulated energy savings by 2030[25]**.** The commitment respects the requirement to meet the minimum annual energy savings of 0.8 % of annual final energy consumption in accordance with Article 7(1)(b).

The target calculation baseline is the final energy consumption according to Eurostat data – Final Energy Consumption Europe 2020–2030. In the period 2021–2030, the Czech Republic does not exercise the option of deducting or counting additional savings under the 'exemption system' in accordance with Article 7(4).

The cumulated energy savings commitment is based on the assumption of a proportional reduction in energy consumption over the entire commitment period.

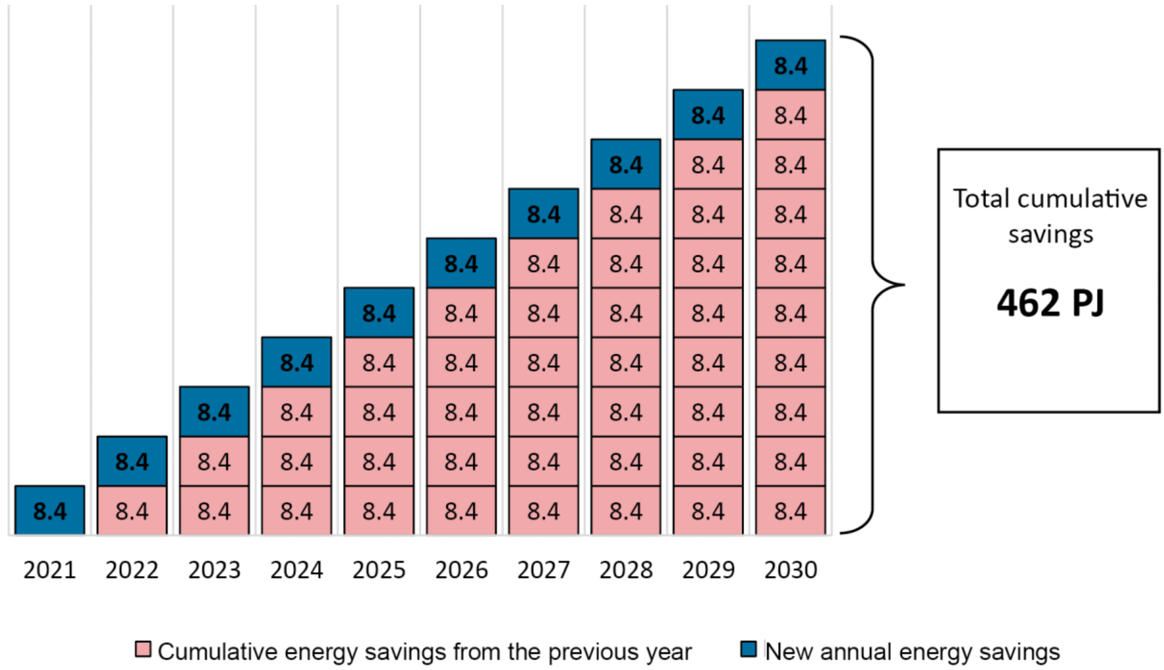
Table 28: *Calculation of savings in accordance with Article 7 (% and PJ)*

Commitment	Value
Averaged final consumption (2016–2018)	1 050 PJ
Relative amount of the commitment	0.8 %
Annual commitment	8.4 PJ
Total commitment	84 PJ
Cumulative commitment	462 PJ

[25] The commitment is determined on the basis of the predicted development of final energy consumption in 2018. The commitment will be revised in 2020 on the basis of a EUROSTAT data update – in accordance with the Directive, the reference value will be averaged over the most recent three-year period prior to 1 January 2019. This approach is chosen in view of the time inconsistence between the submission of the National Plan and the deadline for transposition and implementation of the approved revision of Directive 2012/27/EU.

Source: Prepared by MIT for the purposes of the National Plan

Chart 6: *Determining the cumulative commitment of the Czech Republic pursuant to Article 7 for 2021–2030 (PJ)*



Source: Prepared by MIT for the purposes of the National Plan

2.2.1.3 Exemplary role of public bodies' buildings under Article 5 of Directive 2012/27/EU

Article 5 of the Directive provides that each Member State shall ensure, as from 1 January 2014, the renovation of at least 3 % of the total floor area of buildings with a total useful floor area over 250 m^2, where the buildings are owned and occupied by central government and which simultaneously do not meet the minimum requirements for the energy performance of buildings of Class C – Efficient. These minimum requirements are set by individual Member States on the basis of Article 4 of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings.

On the basis of the projected energy performance class of a partially renovated building stock of central government because there was progress towards this obligation already in the current 2014–2020 period according to the 'Update of the Reconstruction Plan within the scope of Article 5 of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency'[26] approved by the Government, falling under the renovation obligation under Article 5 of Directive 2012/27/EU in 2021, the minimum energy savings were set for buildings not meeting the minimum energy performance class such that the savings would be achieved at the annual renovation rate of 3 % of the total useful floor area of non-compliant buildings. This approach is in line with the requirements of Article 5 of the Energy Efficiency Directive.

[26] Link to the document: https://www.mpo.cz/cz/energetika/energeticka-ucinnost/strategicke-dokumenty/plan-renovace-budov-ustrednich-vladnich-instituci-dle-cl--5-smernice-2012-27-eu-o-energeticke-ucinnosti--236718/

The determination of the annual energy saving commitment of 12.4 TJ assumes the implementation of all planned projects approved under the document 'Update of the Reconstruction Plan within the scope of Article 5 of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency'[27].

ii. The indicative milestones for 2030, 2040 and 2050, the domestically established measurable progress indicators, an evidence-based estimate of expected energy savings and wider benefits, and their contributions to the Union's energy efficiency targets as included in the roadmaps set out in the long-term renovation strategies for the national stock of residential and non-residential buildings, both public and private, in accordance with Article 2a of Directive 2010/31/EU

Indicative milestones of the long-term building renovation strategy

In accordance with Article 4 of Directive 2012/27/EU, an Update of the Building Renovation Strategy as part of the fifth Update of the National Energy Efficiency Action Plan[28] was prepared in 2017. The elaborated strategy analyses the different scenarios of the renovation of building stock, their costs and benefits, and proposes policy, legislative and economic tools for their implementation[29]. The energy and economic impacts of individual scenarios were evaluated on the basis of outputs of individual parts until 2020 (building stock overview, savings options in the building stock, renovation costs, defining individual renovation scenarios).

In view of the new requirements for the Long-term Building Renovation Strategy under Article 2 of Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018, the current strategy can no longer be considered decisive.

A revision of the existing building renovation strategy was launched to meet all new requirements as soon as in early 2019[30]. However, as of October 2019, the complete update work has not yet been completed. For this reason and with regard to the approval process of the final version of the National Energy and Climate Plan of the Czech Republic, this material does not contain the complete input of the Long-term Building Renovation Strategy, but only partial outputs.

The scenario design for setting building renovation milestones by 2050 is set on the basis of an analysis of the current status of the building stock, the building renovation policy and its effect on improving energy performance of the building stock of the Czech Republic. Furthermore, the chosen scenario will reflect the extension of existing policies planned to be implemented after 2020.

The current development of the renovation of the building stock (BaU scenario) reflects the current market situation. This scenario is based on data available from the Czech Statistical Office and the Ministry of Industry and Trade. This is a scenario reflecting the effect of the state's policy on improving energy performance of buildings. These are mainly legislative, fiscal and behavioural measures. As regards fiscal measures on the part of the state, CZK 66 1777 million was allocated in 2014–2020.

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[27] The value is an estimate based on the current renovation plan of the buildings of the central institutions. The commitment will be revised on the basis of the current data in 2020 following the planned renovations.

[28] Link to the document: https://www.mpo.cz/cz/energetika/energeticka-ucinnost/strategicke-dokumenty/narodni-akcni-plan-energeticke-ucinnosti-cr--150542/

[29] The strategy works with the quality of buildings without any significant reflection on the purpose of their use, i.e. assesses buildings in particular in terms of their energy performance in accordance with Directive 2010/31/EU.

[30] Already in 2018, activities were started on a project called 'Preparing Tools for Implementing the Optimal Scenario of Building Renovation and Adaptation by 2050', which will review the current building renovation strategy under Article 4 of the Energy Efficiency Directive.

Table 29: *List of fiscal measures for the renovation of the building stock for the preceding and following periods*

Fiscal measures	Sector	Allocation 2014–2020 (NAPEE-III, CZK million)	Current allocation for 2014–2020 (CZK million)	Allocation 2021–2030 (CZK million)
OP E	residential, public authorities	31 500	23 214	14 000
OP EIC / OPC	commercial	13 333	11 533	5 333
IROP	residential – excl. City of Prague	16 900	9 600	Transport-oriented programme
NGS	commercial, residential, public authorities	27 000	17 200	40 000
PANEL 2013+	residential	4 500	4 500	15 000
ENERG	commercial – City of Prague	Not stated	130	-
Modernisation Fund	public authorities, commercial	-	-	
Total allocation		**93 233**	**66 177**	**74 333**

Source: Prepared by MIT for the purposes of the National Plan

In the period under review for the determination of the BaU scenario, data were analysed to identify the renovation rate, the number of new buildings and demolitions, the 'depth' of renovation, and taking into account ownership ties policies.

The buildings within the scenario were differentiated into residential and non-residential sectors. The single-family and multi-family (apartment) buildings were also evaluated separately within the residential sector. For example, for apartment buildings, the owners and differences in the depth of renovations that they have implemented have been identified to better single out the target groups for drawing funds from fiscal measures. For the residential sector, a renovation rate of 1.4 % is calculated, which means that 1.4 % of residential buildings in the Czech Republic will undergo renovation annually.

Table 30: *Depth of renovation for BaU scenario for apartment buildings by ownership ties*

	Cooperative	Natural and legal persons	Associations of unit owners	Municipality/State	Weighted average of the total	Original value of the model
Shallow	28 %	34 %	30 %	33 %	**31.1 %**	35 %
Moderate	57 %	35 %	58 %	41 %	**49.6 %**	40 %
Thorough	15 %	31 %	12 %	27 %	**19.3 %**	25 %

Source: Prepared by MIT for the purposes of the National Plan

Non-residential buildings were divided into public and commercial buildings. The renovation rate was calculated at 1.4 % for the non-residential sector as well.

Table 31: *Renovation depth for BaU scenario for non-residential buildings*

	Public buildings	Commercial and corporate buildings	Weighted average of the total	Original value of the 2017 model
Shallow	28.08 %	26.13 %	**26.7 %**	35 %
Moderate	41.03 %	44.67 %	**43.6 %**	40 %
Thorough	30.90 %	29.21 %	**29.7 %**	25 %

Source: Prepared by MIT for the purposes of the National Plan

The BaU scenario is based on measures already in place that contributed to the renovation of the building stock in 2014–2020 and on the assumption that the set renovation rate and renovation depth, including other input factors, will continue according to the current trend.

The setting of the Real Scenario is based on the above values (renovation rate, final energy consumption, renovation depth, etc.), assuming a greater extent of state intervention by 2030 and fiscal and legislative measures aimed to shift the depth of renovations. Based on the policies for complying with Article 7 of the Directive, in particular, financial support for the renovation of public sector buildings can be expected; see the table above. As a result of this support, an increase in the renovation rate can be expected in this sector. The motivation for complex projects and 'deep' renovations will be initiated mainly by legislative adjustments and information campaigns, focusing on the residential sector, where partial renovations without expert supervision currently prevail. As a result of the policies envisaged, see Chapter 3.2, the Real Scenario considers the following input parameters:

The Real Scenario for residential buildings does not expect an increased number of renovated buildings, so the renovation rate for both scenarios remains unchanged and the predicted depth of renovation has a major influence on the development of building renovation.

Table 32: *Depth of renovation for Real Scenario for apartment buildings by ownership ties*

		2019	2025
Associations of unit owners	Shallow	30 %	20 %
	Moderate	58 %	40 %
	Thorough	12 %	40 %
Natural and legal persons	Shallow	34 %	20 %
	Moderate	35 %	40 %
	Thorough	31 %	40 %
Cooperatives	Shallow	28 %	20 %
	Moderate	57 %	40 %
	Thorough	15 %	40 %
Municipalities	Shallow	33 %	20 %
	Moderate	41 %	40 %
	Thorough	27 %	40 %

Source: Prepared by MIT for the purposes of the National Plan

For non-residential buildings, an increase in the number of renovated buildings is also expected in addition to a greater depth of renovation. Renovation rate should reach 2.0 %.

Table 33: *Renovation depth for 'Real Scenario' for non-residential buildings*

	Public buildings	Commercial and corporate buildings	Weighted average of the total	Original value of the 2017 model	Real Scenario
Shallow	28.08 %	26.13 %	**26.7 %**	35 %	20 %
Moderate	41.03 %	44.67 %	**43.6 %**	40 %	40 %
Thorough	30.90 %	29.21 %	**29.7 %**	25 %	40 %

Source: Prepared by MIT for the purposes of the National Plan

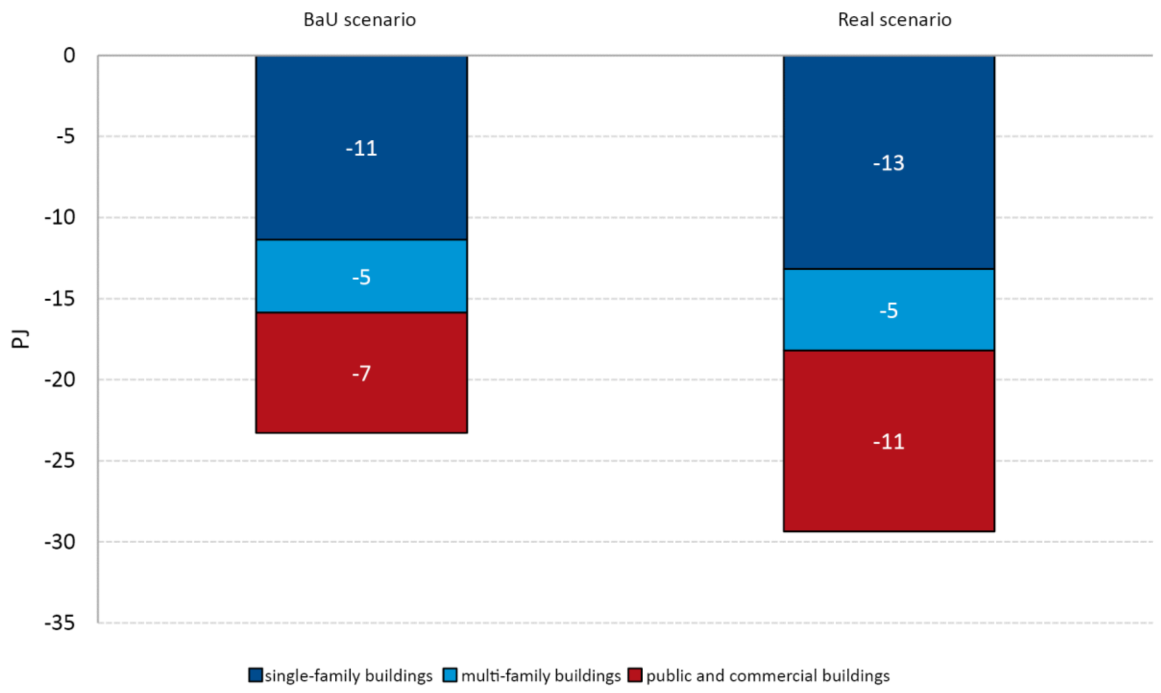
Based on the above input data, the expected development in the area of renovation of the building stock can be simplified as follows:

Table 34: *Final energy consumption savings in a given year and accumulated investment costs*

For 2021–2030	Baseline	Real Scenario
Final energy consumption savings in a given period [PJ]	-23	-29
single-family houses	*-11*	*-13*
apartment buildings	*-5*	*-5*
public and commercial buildings	*-7*	*-11*
cumulative investment costs [CZK billion]	*218*	*262*
single-family houses	*113*	*120*
apartment buildings	*30*	*33*
public and commercial buildings	*75*	*109*

Source: Prepared by MIT for the purposes of the National Plan

Chart 7: *Final energy consumption savings for 2021–2030 (in PJ)*



Source: Prepared by MIT for the purposes of the National Plan

However, the specific setting of the milestones (determination and monitoring) will be supplemented after the Long-term Building Renovation Strategy in accordance with Article 2 of Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 is approved by the Government of the Czech Republic, which shall happen no later than at end of March 2020.

iii. Where applicable, other national objectives, including long-term targets or strategies and sectoral targets, and national objectives in areas such as energy efficiency in the transport sector and with regard to heating and cooling

In this regard, it is possible to mention the target in relation to the heating and cooling sector, which follows from the approved State Energy Policy. This target states that 60 % of supplies in heat supply systems should be covered by cogeneration by 2040. This target is currently being met, but its future progress depends, inter alia, on the promotion of cogeneration. For more information on the support for CHP after 2020, see the Chapter 3.1.2.

2.3 Dimension 'Energy security'

i. The elements set out in Article 4(c)

2.3.1.1 Cross-cutting targets

Diversification targets are summarised in the target corridors of the State Energy Policy of the Czech Republic.

Table 35: *Share of individual fuels in total primary energy sources (excluding electricity)*

	2016 level	2040 target level
Coal and other solid non-renewable fuels	40 %	11–17 %

Oil and petroleum products	20 %	14–17 %
Gaseous fuels	16 %	18–25 %
Nuclear energy	15 %	25–33 %
Renewable and secondary energy sources	10 %	17–22 %

Source: State Energy Policy of the Czech Republic (2015)

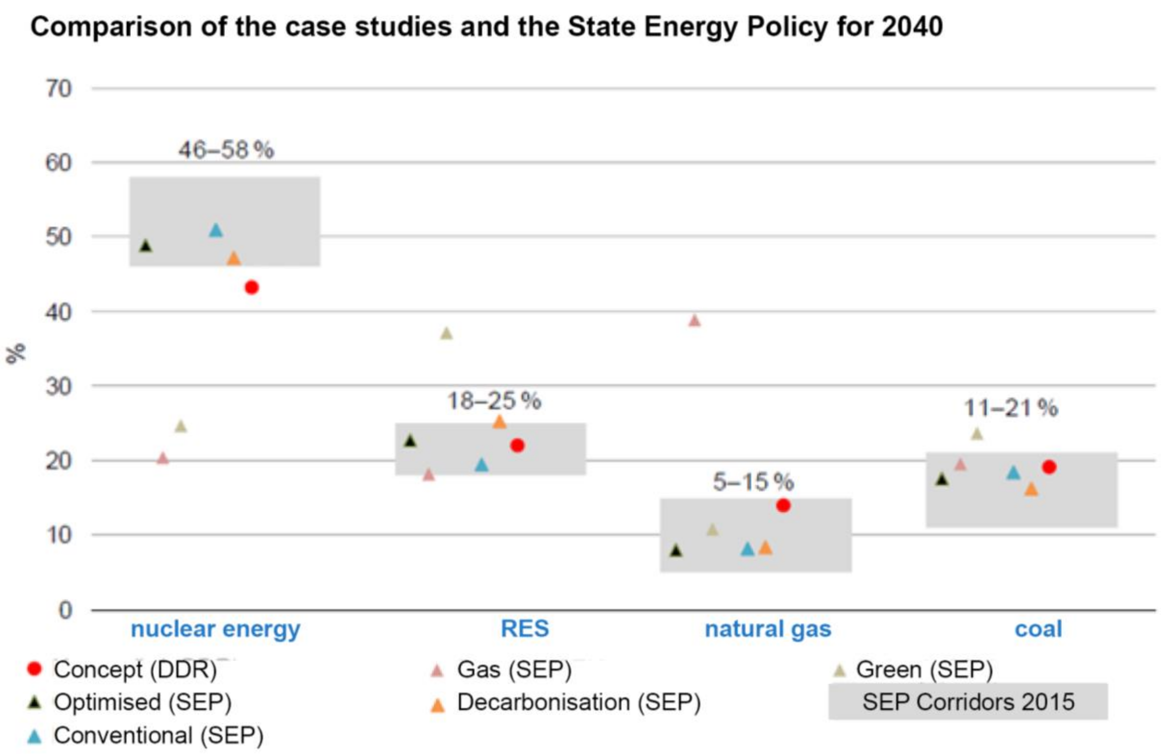
Table 36: *Share of individual fuels in gross electricity generation*

	2016 level	2040 target level
Coal and other solid non-renewable fuels	50 %	11–21 %
Nuclear energy	29 %	46–58 %
Natural gas	8 %	5–15 %
Renewable and secondary energy sources	13 %	18–25 %

Source: State Energy Policy of the Czech Republic (2015)

The development of the energy sector towards the target corridors is evaluated on an annual basis under the so-called 'Expected Balance', which further analyses the marginal development scenarios on a periodic basis.

Chart 8: *Comparison of the case studies of the State Energy Policy of the Czech Republic for 2040*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

The import dependence target is not to exceed 65 % of import dependence by 2030 and 70 % of import dependence by 2040[31].

2.3.1.2 Electricity sector

In the electricity sector, the Czech Republic has the following main targets:

- Maintaining the high quality of energy supply and meeting the parameters of the adequacy of production capacities.
- Ensuring self-sufficiency in electricity generation, based in particular on advanced conventional technologies with high efficiency of conversion and increasing share of renewable and secondary sources.
- Gradual decline in electricity exports and maintaining the balance between +/- 10 % of domestic consumption in line with the conditions of the internal market.
- Maintaining a positive power balance and ensuring the adequacy of the power reserves and control outputs (providing for the necessary support services) and permanently ensuring the power adequacy of -5 % to +15 % of the maximum load of the electricity system (free available capacity according to the ENTSO-E methodology).
- Ensure a systematic solution to the loop electricity flows and transit from a safety and cost compensation perspective.
- Ensure diversification of primary energy sources in accordance with the target corridors of the State Energy Policy of the Czech Republic, which, inter alia, means the continued development of nuclear energy in the Czech Republic.

2.3.1.3 Gas sector

In the gas sector, the Czech Republic has the following main targets:

- Ensure diversification of gas sources and transport routes through the implementation of planned infrastructure projects as well as the effective functioning of domestic gas storage facilities.
- Ensure effective access to transit capacities for natural gas supplies to Czech consumers.
- Permanently ensure the ability of reverse flow and the renewal and development of the gas transmission system. Ensure capacities for an increase in natural gas supply (increase necessary for heat supply, electricity generation and transport).
- Maintain and potentially further strengthen the transit role of the Czech Republic in gas transmission.
- Support projects ensuring the capacity of gas storage facilities in the Czech Republic at 35–40 % of annual gas consumption and deliverability guaranteed for at least 70 % of the peak daily consumption in the winter. Create conditions for the reverse flow of the transmission system and the capacity to deliver gas from the North or the West of at least 40 million m^3 per day.
- Support financially and institutionally both the transformation of existing biogas stations to biomethane production, synthetic gas production stations and hydrogen production equipment, and new biomethane stations including their connection to the gas system.
- Provide for the connection and potential gas transmission and distribution capacities for substitution of coal with gas for large customers (heat plants).

[31] Under this target, nuclear fuel is considered as an imported resource. For this reason, this value is not directly comparable to the value given in the analytical annexes to this document, because according to the energy balance, it includes nuclear reaction heat, which is not imported by definition.

- In connection with the decarbonisation targets, prepare the gas transmission and distribution system for a higher share of new gas types and sector coupling.

2.3.1.4 Oil sector

In the oil sector, the Czech Republic has the following main targets:

- Support other projects increasing the diversification of oil and petroleum product supplies to the Czech Republic, e.g. increasing the capacity of the TAL oil pipeline, construction of an oil pipeline connection between the Litvínov and Leuna (Spergau) refineries.
- Support the development and strengthening of the existing system for oil transport to the Czech Republic in order to provide for and maintain sufficient transport capacity for the needs of refineries in the Czech Republic and, in cooperation with other countries (Slovakia, Ukraine, Russia), maintain the operability of the entire transmission system built in the past at high costs.
- Preserve two functional supply routes for the transport of oil to the Czech Republic from two different directions as the basis of the Czech Republic's oil security.
- Maintain emergency stocks of oil and petroleum products in accordance with the new calculation methodology under Council Directive 2009/119/EC of at least 90 days of net imports and verify their availability for crisis use.
- Ensure that oil processing capacities in the Czech Republic are permanently operational at least at 50 % of usual domestic consumption.

2.3.1.5 Heating sector

In the heating sector, the Czech Republic has the following main targets:

- As a priority, maintain economically efficient and energy-efficient heat supply systems.
- Cover at least 60 % of heat supply from heat supply systems by high-efficiency cogeneration.
- Renewal, transformation and stabilisation of heat supply systems, based primarily on national sources (nuclear, coal, RES, secondary sources) supplemented with natural gas.
- Promote the transition of especially medium and small heat supply systems, multi-fuel systems using locally available biomass, natural gas, or, if applicable, other fuels, where especially natural gas will play the role of a stabilising and supplementary fuel.
- Create conditions in heat supply systems for the efficient use of heat from renewable and secondary energy sources available at regional and local levels.
- Provide for the necessary long-term supply of coal for the heat sector in a situation of decreasing exploitable reserves using legislative and regulatory measures, while respecting competition rules, giving priority to increasing efficiency and savings.
- Significant increase in the recovery of waste in waste energy recovery facilities in order to achieve a high recovery rate of the incinerable component of waste after sorting by 2024.
- Promote the use of preferably larger heating plants for regulatory services.
- Create conditions for heating plants in island operations of individual areas to play their role in emergency situations.
- Ensure the integration of smaller heat plants into smart grids and decentralised management.
- Support and develop the energy supply capability in local (island) subsystems in the event of a system breakdown due to large-scale failures caused by natural events or terrorist or cyber attacks to the extent necessary to ensure the minimum supply to the population and maintain the functioning of critical infrastructure.

- In connection with the ongoing decentralisation of electricity sources, it will be necessary to ensure the overall flexibility of the energy system. From this perspective, heating sources should be more involved in the provision of support services at the distribution and transmission system level. At the same time, thanks to the possibility of using cogeneration, production sources contribute to flexible electricity supplies; on the other hand, technology such as electric boilers and heat pumps have the potential to increase the ability to control electricity generation/consumption.

ii. National objectives with regard to increasing: the diversification of energy sources and supply from third countries for the purpose of increasing the resilience of regional and national energy systems

The Czech Republic has a relatively well diversified energy mix. The targets for the diversification of energy sources are mainly incorporated in the target corridors of the State Energy Policy of the Czech Republic (see Chapter 2.3.1.1). With regards to the targets concerning the supply of energy commodities from third countries, more information is provided in point (iii) of this Chapter (see also Table 6).

iii. Where applicable, national objectives with regard to reducing energy import dependency from third countries, for the purpose of increasing the resilience of regional and national energy systems

Table 6 shows strategic targets of the State Energy Policy. In relation to reducing the dependence on energy imports / increasing the diversification of consumed (imported) resources, the following targets (or, more precisely, quantifiable indicators) can be emphasised.

- ensure permanent self-sufficiency in electricity supply at a minimum level of 90 %;
- reduce and sustain the diversification of primary energy sources below 0.25;
- reduce and sustain the diversification of gross electricity generation below 0.35;
- reduce and sustain the diversification of imports below 0.30;
- reduce the share of energy imports in gross value added below 2010 levels;
- stabilise the effect of energy imports on the balance of payments.

iv. National objectives with regard to increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand response and energy storage

Possible measures in this area will depend on the implementation of new national legislation, especially the legislation that will implement the 'Clean Energy for All European' package currently under discussion, specifically the revised texts of the draft regulations and the Internal Electricity Market Directive.

2.4 Dimension 'Internal energy market'

2.4.1 Electricity interconnectivity (2030 Framework target)

i. The level of electricity interconnectivity that the Member State aims for in 2030 in consideration of the electricity interconnection target for 2030 of at least 15 %, with a strategy with the level from 2021 onwards defined in close cooperation with affected Member States, taking into account the 2020 interconnection target of 10 % and the following indicators of the urgency of action:

(1) Price differential in the wholesale market exceeding an indicative threshold of EUR 2/MWh between Member States, regions or bidding zones;

(2) Nominal transmission capacity of interconnectors below 30 % of peak load;

(3) Nominal transmission capacity of interconnectors below 30 % of installed renewable generation.

Each new interconnector shall be subject to a socioeconomic and environmental cost-benefit analysis and implemented only if the potential benefits outweigh the costs.

2030 interconnectivity target

The 2030 framework transmission system interconnectivity target corresponds to maintaining the transmission system import and export capacity relative to the maximum load at a level of at least 30 % and 35 %, respectively[32]. However, this target is not directly comparable to the 2030 EU target of 15 %, as this target is expressed in relation to installed capacity. In general, it can be stated that the target under the State Energy Policy of the Czech Republic corresponds to the 15 % target, because the share of the maximum load in relation to the installed capacity corresponds to approximately 50 % (53 % in 2017)[33]. The Czech Republic therefore commits itself primarily to fulfilling the target under the State Energy Policy of the Czech Republic, which is already achieved and way above the target, but the achievement of this target should correspond to the implementation of the Barcelona Agreement (2030 target of 15 %), even though the developments of the maximum load and the installed capacity may be somewhat different.

The level of the Czech transmission system interconnectivity is an area which is monitored and evaluated on an ongoing basis, in particular by ČEPS, a.s., the transmission system operator, both on the national level in accordance with the State Energy Policy of the Czech Republic, which directly requires to maintain import and export capacity of the Czech transmission system in relation to the maximum load at least at 30 % and 35 %, respectively, and at European level within the European Ten-Year Network Development Plan, which assesses the progress towards the 2012 Barcelona criterion of 10 % of the transmission systems interconnectivity and the 2030 connectivity target at 15 %. Table 37 specifies the projected 2030 interconnectivity level (both for export and import) relative to the maximum load in two scenarios. In both cases, the 30 % and 35 % targets should be achieved with a relatively significant margin. Table 38 then shows the assumed interconnectivity level relative to the installed capacity. Both Scenario A and Scenario B assume the same installed capacity in this respect, so there are no differences between these scenarios. The current interconnectivity level is described in Chapter 4.5.1.

Table 37: *Assumed interconnectivity in 2030 (relative to maximum load)*

	Scenario A	Scenario B
Interconnectivity (export)	58.0 %	60.2 %
Interconnectivity (import)	50.0 %	51.8 %

Source: ČEPS, a.s.

[32] Target state, or PIII.1. strategy under Priority III – Infrastructure and International Cooperation.
[33] In 2017, the maximum load (according to the Energy Regulatory Office) was 11 768 MW and the installed capacity (according to ČEPS, a.s.) was 22 216 MW.

Table 38: *Assumed interconnectivity in 2030 according to the Barcelona Agreement (relative to installed capacity)*

	Scenario A	Scenario B
Interconnectivity (export)	44.1 %	44.1 %
Interconnectivity (import)	38.0 %	38.0 %

Source: ČEPS, a.s.

Calculation methodology

The current model of international transmission systems is used to calculate the export and import capacity of the Czech transmission system; in the case of the Czech Republic, the model is supplemented to include parts of the transmission system with investment plans to be implemented by the reference year. Cross-border capacities are calculated using the ENTSO-E NTC methodology, modified for the needs of transit systems such as the Czech transmission system (strong link between individual boundaries and their interaction). The procedure for determining cross-border capacities is laid down in ČEPS's internal workflow, which is in line with the procedure for determining the free tradable capacities for auctions, which is available on ČEPS website. The calculation of the percentage of export and import capacity of the Czech transmission system is then given by the share of the determined summary export/import capacity in MW for the year and the net load outlook for the year.[34]

Formula for calculating interconnectivity (export):

$$P_{ex\%} = \frac{P_{sumEXPORT}}{P_{\max LOAD}} * 100$$

Formula for calculating interconnectivity (import):

$$P_{im\%} = \frac{P_{sumIMPORT}}{P_{\max LOAD}} * 100$$

2.4.2 Energy transmission infrastructure

i. Key electricity and gas transmission infrastructure projects, and, where relevant, modernisation projects, that are necessary for the achievement of objectives and targets under the five dimensions of the Energy Union Strategy

Electricity sector

In accordance with the Energy Act, ČEPS, a.s., the transmission system operator, prepares every two years the 'Ten-Year Plan for the Development of the Transmission System of the Czech Republic', which is approved by the ERO following an opinion of the Ministry of Industry and Trade. The Ten-Year Development Plan is published on the ČEPS website[35]. The Czech Development Plan complies with the obligations imposed on its subject matter in the Energy Act, the subject matter being the measures taken to ensure appropriate capacity of the transmission system so that it meets the

[34] The outlooks for load and installed capacity are not fully consistent with the outlooks for the purpose of this document, which is also due to the different detail and purpose of these outlooks. However, there should be no significant disproportion/inconsistency in this respect.

[35] The Ten-Year Plan for the Development of the Transmission System of the Czech Republic is available at: https://www.ceps.cz/en/rozvoj-ps

requirements necessary to ensure the security of electricity supply. For more information on the expected developments in the electricity system, see the Chapter 4.5.2.3.

Gas sector

In accordance with the Energy Act, NET4GAS, a transmission system operator, prepares each year the Ten-Year Plan for the Development of the Transmission System of the Czech Republic, which aims to analyse the development of maximum daily and annual consumption and the adequacy of input and output capacity for the Czech Republic. The plan includes completed and upcoming investment projects which increase the capacity of the transmission system, and also a supply security analysis. The Ten-Year Plan is approved by the ERO following an opinion of the MIT, and is published on the NET4GAS website.[36] For more information on the expected developments in the transmission system, see the Chapter 4.5.2.4.

ii. Where applicable, main infrastructure projects envisaged other than Projects of Common Interest (PCIs)[37]

Electricity sector

The above Czech Development Plan is also reflected in the content of the regional investment plan of Central and Eastern Europe and the Ten-Year EU Network Transmission Plan, which are adopted by ENTSO-E at a two-year interval. The Czech Development Plan contains not only PCI projects, but also projects that ensure appropriate capacity of the Czech Republic's transmission system so that it meets the requirements necessary to ensure electricity supply security.

Gas sector

The development of the gas infrastructure will be in line with the approved Ten-Year Plan for the Development of the Transport System in the Czech Republic. The projects are aimed both at maintaining the capacity of the transmission system and its modernisation, and at its development. As of 2018, the most important such project is C4G, which is implemented in accordance with the priorities of the State Energy Policy of the Czech Republic, and is based on binding contracts for the transmission of natural gas. Implementing the Capacity4Gas project will significantly increase the transit role of the Czech Republic in the field of natural gas and strengthen the Czech Republic's energy security in the gas sector.

In the period of the Ten-Year Development Plan, the development of gas infrastructure in line with future trends can be expected. Gradual decarbonisation of the European economy could build on a 'hybrid system', which will benefit from the synergies between the electricity and gas networks.

According to the State Energy Policy of the Czech Republic, the objective is to maintain the transition role of the Czech Republic, diversify gas sources, deepen the integration of European gas markets, and increase the resilience and use of the Czech transmission system. Operating conditions for North or West flows should reach capacity levels of at least 40 million m^3/day. This criterion is currently met. Both the transmission and distribution systems will have to be able to supply the energy source base (power stations and heat plants) – expanding sources firing natural gas to 15 % of installed capacity (currently over 8 %) and with BAT (Best Available Technology) parameters, expansion of micro-cogeneration sources and the use of gas in transport. This will mean potential connection of new direct

[36] The Ten-Year Plan for the Development of the Transmission System of the Czech Republic is available at: https://www.net4gas.cz/cz/projekty/rozvojove-plany/

[37] In accordance with Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 laying down guidelines for trans-European energy networks and repealing Decision No 1364/2006/EC and amending Regulation (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009 (OJ L 115, 25.4.2013, p. 39).

gas customers from both the transmission system and especially distribution systems (power plants, heating plants) and creation of adequate capacities on these systems. If the SEP targets are to be achieved in a liberalised gas sector, cooperation of all stakeholders is necessary.

2.4.3 Market integration

i. National objectives related to other aspects of the internal energy market such as increasing system flexibility, in particular related to the promotion of competitively determined electricity prices in line with relevant sectoral law, market integration and coupling, aimed at increasing the tradeable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, and real-time price signals, including a timeframe for when the objectives shall be met

2.4.3.1 Electricity sector

The integration of day-ahead and intraday markets in Europe, on the basis of the implicit cross-border capacity allocation, has more than a 15-year history when this coupling initially involved only neighbouring States[38] on the basis of bilateral or multilateral agreements. Consequently, these already coupled markets were further integrated into larger regions.

The main benefits of market integration include access to a larger – single electricity market. The energy market segmented into individual national markets (although physically coupled) is inefficient and the trading on it is more risky and, therefore, expensive. In coupled markets, participants can better respond to changes in production and consumption. This way, the system opens up space for other players, the market becomes stabilised and more transparent. As a result, competition increases, leading to downward pressure on prices. Savings from coupled markets can then be reflected by traders in their pricing policy.

Other benefits resulting from the integration of short-term electricity markets can be summarised as follows:

- optimal use of cross-border transmission capacities;
- integration helps to balance the electricity systems of individual countries;
- price indices become stabilised and the volatility of the difference in spot electricity prices across EU markets decreases;
- purchases of often unused capacities of cross-border profiles in explicit auctions are limited;
- there is a decrease in risks associated with the purchase of cross-border capacity without the ownership of electricity in export/import and vice versa.

An important step, which was not only to promote the creation of a single EU electricity market but which also showed the attention the European Commission pays to the issue of integration, was the adoption of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (CACM Regulation) based on Regulation (EC) No 714/2009 on conditions for access to the network for cross-border exchanges in electricity.

[38] For example, 2009 saw the Czech and Slovak day-ahead electricity coupling.

In accordance with the requirements of the CACM Regulation, on 7 October 2015 OTE, a.s. was appointed by the Energy Regulatory Office as the Nominated Electricity Market Organiser (NEMO)[39], which will ensure a single day-ahead or intraday coupling in the Czech Republic[40]. The appointment of the market operator as the Nominated Electricity Market Organiser is not only a clear confirmation and a positive evaluation of the market operator's activities so far, but also a commitment by the market operator to actively participate in EU integration activities. Together with other European exchanges appointed as NEMO and transmission system operators in Europe, OTE a.s. cooperates towards the obligation to complete and further develop and, finally, operate the single day-ahead and intraday coupling in the EU, as required by the CACM Regulation.

In cooperation with all NEMOs in the EU, in June 2017 a plan was created to jointly establish and perform the functions of a market coupling operator – the 'MCO plan'. It established rules for the management and cooperation between NEMOs, defines the relationship with third parties, and also describes the transition of existing initiatives of interconnected day-ahead and intraday markets into a single interconnected day-ahead and intraday market.

Following the CACM Regulation, for example the following methodologies were further developed and subsequently approved in 2017 and 2018:

- the methodology of products that NEMOs can include in a single interconnection of
- day-ahead and intraday markets,
- methodology of alternative procedures,
- methodology of harmonised maximum and minimum clearing prices.

In 2018, based on the decision of the Agency for the Cooperation of Energy Regulators – ACER, the methodology of the algorithm for reconciling interconnected day-ahead markets and the algorithm for continuous trading pairing was adopted.

Some of these methodologies will be updated in 2019 to:

- include newly prepared intraday auctions, which will be organised on the basis of intraday capacity pricing methodology;
- incorporate rules for change in the single day-ahead and intraday electricity markets;
- incorporate rules for monitoring the single coupling of day-ahead and intra markets; and
- update some articles based on operational experience.

Table 39: *Main national market integration objectives (electricity)*

National objectives and targets	Description
Complete, further develop and last but not least operate the single day-ahead and intraday electricity market in the EU as required by Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity	The aim is to implement the Single Market Framework as set out in Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management based on Regulation (EC) No 714/2009 of the European Parliament and of the

39 At the time of the finalisation of the National Energy and Climate Plan of the Czech Republic, OTE, a. s. was renominated for the next period by decision from 1 October 2019 for the period from 10 October 2019 to 31 December 2023.

40 For more information see: http://www.ote-cr.cz/kratkodobe-trhy/integrace-trhu/all-nemo-cooperation

allocation and congestion management (CACM Regulation).	Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity.
Implement the ‘MCO plan’.	The MCO plan establishes rules for the management and cooperation between NEMOs, defines the relationship with third parties, and also describes the transition of existing initiatives of interconnected day-ahead and intraday markets into a single interconnected day and intraday market.
To secure, within the framework of the **long-term electricity market**, the supply of all the products of long-term capacity rights relevant to the bidding zone border of the Czech Republic through the Central Auction Office.	The aim is to offer all the products of long-term transmission rights relevant to the bidding zone border of the Czech Republic through the Single allocation platform already for 2019.
To secure, within the framework of the **day-ahead electricity market**, the interconnection of the Czech electricity market with the remaining markets in Europe by 2021.	The Czech Republic has day-ahead coupling with the Slovak, Hungarian and Romanian markets within the 4M MC[41]. At the same time, the work is underway to link this market to the Western European Connected Market (MRC) through the Interim Coupling project, which uses cross-border capacities calculated by the NTC method. The target solution is to ensure that all day-ahead electricity markets in the EU are fully integrated into one EU electricity market (coupled), which is also the main objective of the CACM Regulation. The Czech Republic will be involved in the Single Day-ahead Coupling (SDAC) in the EU after the finalisation of the Interim Coupling regional project or the launch of the CORE flow-based market coupling project, whichever is the earlier. Regardless of the project, the Czech day-ahead electricity market will be implicitly linked to the EU market by the end of 2021.[42]
To implement, within **the intra-day electricity market** , the LIP 15 project and to continue according to the XBID project schedule to achieve the integration of the Czech Republic within the single intra-day coupling (SIDC) in the EU according to the CACM Regulation.	ČEPS, a.s., as the transmission system operator in the Czech Republic and OTE, a.s. as the nominated electricity market operator in the Czech Republic, together with similar entities in Bulgaria, Austria, Germany, Hungary, Poland, Romania, Slovenia and Croatia, form the LIP 15 project. All the parties to the project expressed their interest in implementing continuous cross-border trading and introducing implicit intraday

[41] For more information see: http://www.ote-cr.cz/kratkodobe-trhy/integrace-trhu/pcr-price-coupling

[42] For more information see: http://www.ote-cr.cz/kratkodobe-trhy/integrace-trhu/pcr-price-coupling

	cross-border transmission capacity allocation on the Czech–German, Czech–Austrian, Austrian–Hungarian, Austrian–Slovenian, Hungarian–Romanian, Hungarian–Croatian and Croatian–Slovenian border. The inclusion of the Czech-Polish, and the Bulgarian-Romanian border is under discussion. According to the schedule of the XBID project, which may be subject to additional modifications, the operating involvement of the second wave is expected in mid-2019[43]. This will achieve the integration of the Czech Republic into the single intraday coupling (SIDC) in the EU in accordance with the CACM Regulation. SIDC was launched on 19 November 2019 with trading on the day of delivery on 20 November 2019 (connection of the Czech Republic to SIDC). The integration of the Czech-Slovak border is not included in the project due to the absence of Slovak representatives.
To harmonise, **within the balancing services market**, the valuation of regulatory energy from standard products with the rest of Europe by connecting to all relevant regional platforms by the end of 2023.	The Czech Republic, through ČEPS, a.s. as the national transmission system operator, is already involved in regional implementation projects IGCC[44], TERRE[45] and the pan-European projects PICASSO[46] and MARI[47]. All projects with the exception of IGCC are implemented by transnational Platforms for automatic Frequency Restoration Reserves. Since 2012, ČEPS has been a member of the IGCC platform for operating the imbalance netting process. The Czech Republic is planning to become a member of TERRE in January 2020, and of the remaining two platforms by the end of 2023. Thanks to ČEPS's participation in the implementation of the regulatory energy pricing methodology in accordance with Article 30 of the EBGL Regulation, the valuation of standard regulatory energy products across the European platforms will be harmonised.
The goal within **the balancing services market** is to introduce a 15-minute interval for the	In line with the applicability of the EBGL Regulation, the target in the Czech Republic is to

[43] For more information see: http://www.ote-cr.cz/kratkodobe-trhy/integrace-trhu/xbid
[44] International Grid Control Cooperation
[45] Trans-European Replacement Reserves Exchange
[46] Platform for the International Coordination of the Automatic frequency restoration process and Stable System Operation
[47] Manually Activated Reserves Initiative

settlement of imbalances by early 2025 at the latest.	introduce a 15-minute clearing period for settling imbalances by 2025 at the latest.

2.4.3.2 Gas sector

The integration of gas markets within the creation of a single gas market in the EU lags far behind the integration of electricity markets. In addition to infrastructure projects that are geared towards facilitating the reservation of capacities for gas traders or making areas that are not directly coupled accessible for trading, no integration projects are currently under discussion with the aim of coupling organised gas markets in our region.

The Czech Republic intends to help complete the internal energy market, in particular the internal gas market, by removing infrastructure bottlenecks between the Czech Republic and its neighbours, namely Poland and Austria. This should be facilitated by the fact that the national gas market legislation has been adapted to two regulations designed to ensure uniform principles for the creation of a single internal gas market in the EU – Regulation (EU) No 2017/460 establishing a network code on harmonised transmission tariff structures for gas, Regulation (EU) No 2017/459 establishing a network code on capacity allocation mechanisms in gas transmission systems and repealing Regulation (EU) No 984/2013.

This should be further facilitated by the support for the implementation of PCI status projects (projects of common interest), enabling direct interconnection with the gas systems of neighbouring countries. These projects contribute to the integration of national markets in the region and the creation of a Central European gas market. The interconnection with Germany and Slovakia is already sufficiently robust. The Czech Republic is interconnected with Poland by the STORK gas pipeline. There is no physical interconnection between the Czech Republic and Austria.

The national gas market in the Czech Republic has been fully liberalised since 2007; the ERO regulates only those prices which, for technical or organisational reasons, cannot be formed by market mechanisms within a competitive environment. There are several dozen gas traders on the Czech gas market, which offer their services to customers. The Czech gas market operates on the principle of non-discrimination, where each trader may reach out to any customer, and any customer may enter into a contract with any trader. Supply prices and other supply terms depend only on a mutual agreement. The developed competitive environment on the gas market has enabled a wide range of trader offers, both in terms of price, and the related business terms. The market dynamics thus depends more on the ability and willingness of customers to change suppliers to get more favourable conditions. The Energy Act and its implementing legislation guarantee all customers the right to change their gas supplier. This change is free. If the customer meets the existing business conditions, he may thus choose his gas supplier.

Trading in the internal gas market then takes place either through bilateral trading or an organised short-term market. For more information, see Chapter 4.5.3.

ii. Where applicable, national objectives related to the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets, including a timeframe for when the objectives are to be met

Integration of renewable energy sources, demand-side response, energy storage and flexibility aggregation are addressed in the National Action Plan for Smart Grids and its updated version, the

‘National Action Plan for Smart Grids 2019–2030’. National targets, including the timeframe for achieving them, are set out in this document. Detailed information is provided in part (ii) of Chapter 3.4.3. Directive (EU) 2018/2001, which will be transposed into national legislation by 30 June 2021, is also important in this respect.

iii. Where applicable, national objectives with regard to ensuring that consumers participate in the energy system and benefit from self-generation and new technologies, including smart meters

The conditions for the implementation of smart metering in the Czech Republic are being prepared within the framework of the National Action Plan for Smart Grids (see information in part (ii) of Chapter 3.4.3). The prepared solution also takes into account legislative measures issued under the ‘Clean Energy for All Europeans’ package in the field of the internal electricity market (Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity).

iv. National objectives with regard to ensuring electricity system adequacy, as well as for the flexibility of the energy system with regard to renewable energy production, including a timeframe for when the objectives are to be met

The Czech Republic aims to ensure the maximum possible adequacy with an acceptable level of risk. Ensuring system adequacy is in the competence of the transmission system operator, i.e. ČEPS, a.s. in the Czech Republic. Ensuring production adequacy is also in the competence of ČEPS, a.s., but it must be carefully monitored by the State, which creates the conditions for ensuring this adequacy. The safe operation of the electricity system and the required quality of the electricity supply depends, in addition to the reliability parameters of the transmission and distribution system, also on a balanced production mix that cannot be directly influenced by the transmission and distribution system operators. The current State Energy Policy of the Czech Republic anticipates the balance for the Czech Republic to be equal over the medium term and does not expect a significant import dependence.

In accordance with Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003, the transmission system operator carries out an annual outlook for the adequacy of production capacities, including the proposal of measures to address any problems with ensuring the adequacy of production capacities. The document prepared by the transmission system operator is then based on an analysis of systemic risks concerning the ES power balance reliability using probabilistic approach for different periods and consumption scenarios, levels of construction and recovery / lifespan of conventional sources, the throughput of international couplings, and the share of renewable energy sources and decentralised energy sources in different scenarios. The evaluation also includes the preparation of critical scenarios and the evaluation of potential risks requiring measures in production and system adequacy. When preparing the critical scenarios, we draw on the experience of other transmission system operators, relying on the ‘low probability–high impact’ principle, which allows the evaluation of risks even in extreme operational situations.

The Czech Republic currently has no established and legislatively or non-legislatively prescribed supply reliability standard, expressed by relevant indicators such as the Loss of Load Expectation (LOLE) or Value of Loss Load (VoLL), which would allow a target to be expressed in terms of production adequacy exactly through these values. Without these parameters, it is not possible to easily justify measures to ensure the necessary reliability and adequacy of production capacities of the Czech electricity system. In accordance with Article 11 of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity, the VoLL value shall be determined by 5

July 2020. In accordance with Article 22 of the same Regulation, from 5 January 2020, ENTSO should submit to ACER a draft methodology for the calculation of VoLL and the safety standard referred to in Article 25[48].

The assessment of the adequacy of the Czech electricity system production capacities up to 2030, prepared by the transmission system operator in August 2017, works with an indicative reliability standard at LOLE level of 3 hours for P50 % and 6 hours for P95 %.

Higher flexibility of the electricity system can also be facilitated by a higher degree of integration with other sectors such as heating, gas or transport. In the case of heating, it mainly involves the power2heat technology, which has been deployed for a long time in the Czech Republic; however, it is appropriate to consider the support of their development. In the case of the gas sector, it involves the production of hydrogen by electrolysis (Power2Gas technology) and possibly its methanisation into the form of synthetic methane. Specific measures on financial support for energy stored in gaseous form in the gas system may depend on the EU legislative framework, which will be introduced in the European Commission's '2020 gas package'. In transport, this may involve the use of electricity storage in electric cars and the coordination of their charging in the surplus electricity period.

The flexibility of the energy system in terms of renewable energy production is specifically addressed in the National Action Plan for Smart Grids and its updated version 'National Action Plan for Smart Grids 2019–2030'. National targets, including the timeframe for achieving them, are set out in this document. Detailed information is provided in part (ii) of Chapter 3.4.3.

v. Where applicable, national objectives to protect energy consumers and improve the competitiveness of the retail energy sector

For more detailed information, see Chapter 3.4.3, specifically point (iv), which addresses policies and measures to protect consumers, especially vulnerable and, where relevant, energy-poor consumers, and to enhance the competitiveness and competitiveness of the retail energy market.

2.4.4 Energy poverty

i. Where applicable, national objectives with regard to energy poverty, including a timeframe for when the objectives are to be met

2.4.4.1 National energy poverty objectives

The definition of energy poverty is yet to be laid down in Czech legislation. In research projects, energy poverty is generally defined as a situation where a household does not have the socially and materially necessary level of energy services. Energy poverty is caused by a combination of three basic factors at household level: energy prices, energy efficiency and household income.

In the Czech Republic, a working group was set up in 2015 to deal with energy poverty within the National Action Plan for Smart Grids. The aim of the group's activities is to set up a methodology for identifying 'vulnerable customers' and households affected by energy poverty. In line with the outcomes of previous projects, the following factors for identifying 'energy poverty' in the Czech Republic were defined: the quality and energy performance of a building, the price of energy at the given place, the

[48] Currently, there is an ongoing research project entitled: 'Transposition of reliability indicators according to the MAF methodology into the national reliability standards, which can be used in the planning of corrective measures in case of indication of resource inadequacy within the Czech electricity system'. The project aims, inter alia, to propose a methodology for setting production adequacy targets.

income of the household, the conditions and the quality of the indoor environment. The adequacy of living area is an additional indicator.

Because finding the links between these factors and assessing the impacts of their combinations on households is difficult, an energy poverty project was awarded in a public tender. The output of the project is to set up a certified methodology for evaluating energy poverty and vulnerable customer in the Czech Republic and to propose measures to prevent and address these phenomena. Project outputs can be expected by 30 November 2020, but partial outputs will be available throughout the project according to its schedule.

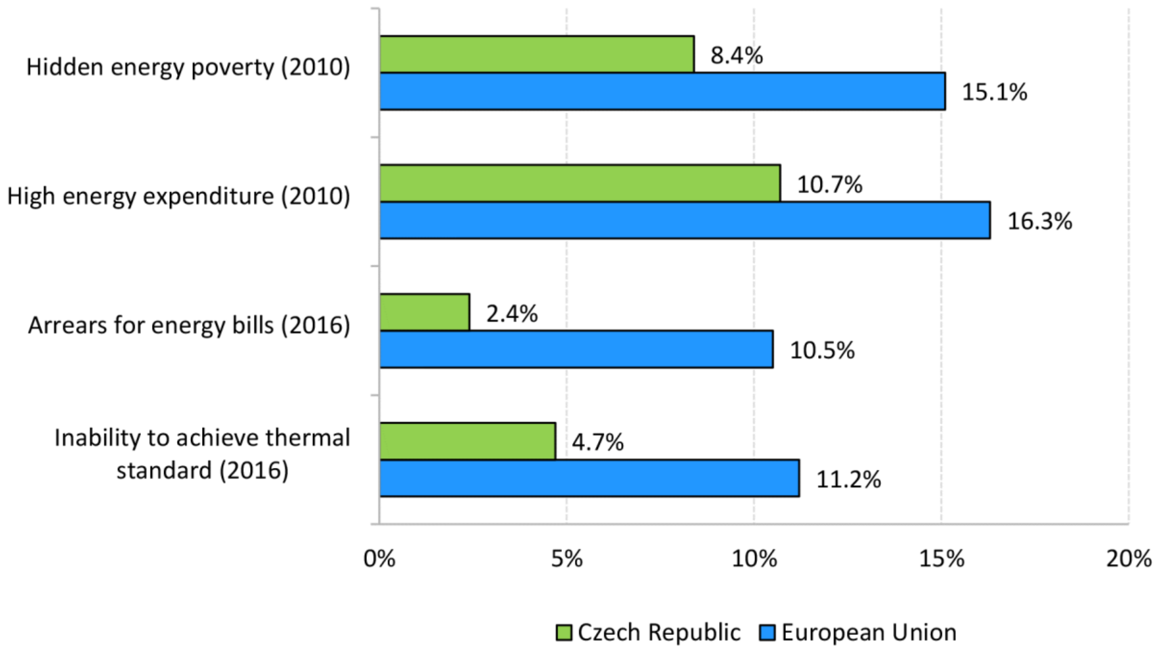
At the same time, to meet its obligation under Article 7 of Directive 2012/27/EU, the Czech Republic will set up the instruments so as to ensure increase in energy efficiency also for low-income groups, see Chapter 3.2.

2.4.4.2 Context information for energy poverty[49]

The Czech Republic considers the project output deadline to be sufficient given that the Czech Republic achieves better household sector indicators than the EU average. Approximately 4.7 % of households were unable to maintain sufficient heating comfort in 2016 and only 2.4 % had problems paying energy bills.

The Czech Republic is slightly better than the EU average in expenditure-based indicators. Approximately 10.7 % of households spend more than double the median on energy and 8.4 % spend so little on energy that they probably live in hidden energy poverty.

Chart 9: *Comparison of indicators with respect to the EU average*



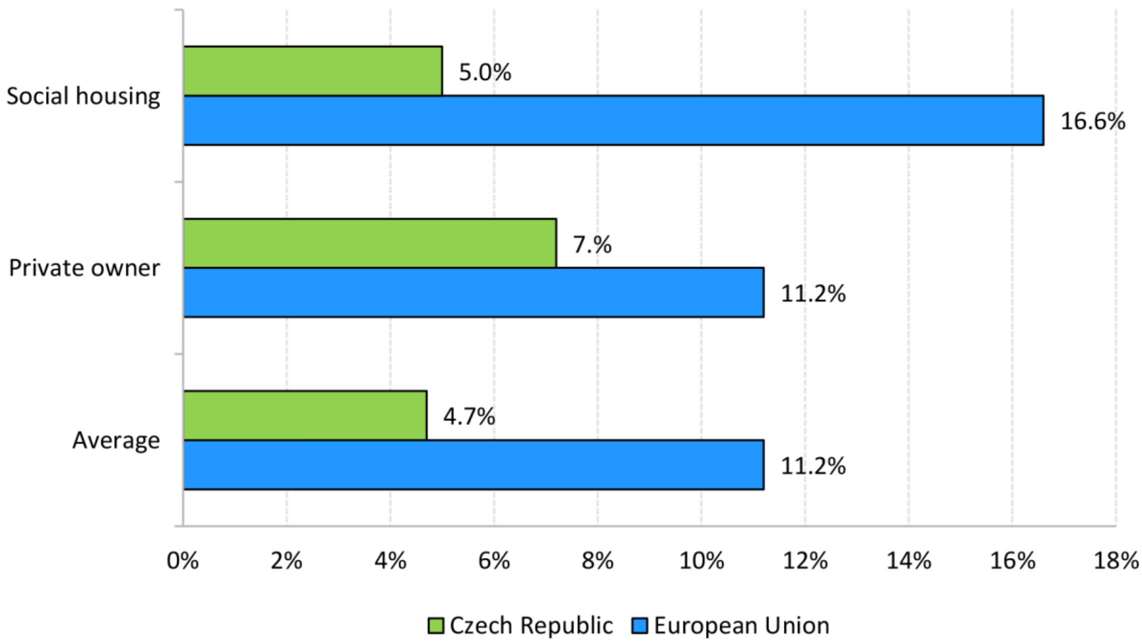
Source: Energy Observatory

[49] This information is taken from 'Energy Poverty Observatory' materials on the Czech Republic. However, these data (their information value for the Czech Republic) will need to be verified, also on the basis of the established methodology.

Energy poverty (its indicators or indicators expressing it) in the Czech Republic has been gradually decreasing since 2005. The share of households that could not maintain sufficient thermal comfort decreased from 11 % in 2005 to 5 % in 2016 and the number of households with energy bill arrears fell from 5 % in 2005 to 2 % in 2016.

The indicators in the household sector indicate that energy poverty in the Czech Republic mostly affects private tenants. However, there are no clear groups by the type of dwelling or urbanisation density where energy poverty is most significant. There seems to be no clear socio-economic group that is particularly vulnerable to energy poverty in the Czech Republic.

Chart 10: *Inability to provide for sufficient heating (comparison between the Czech Republic and the European average)*



Source: Energy Observatory

2.5 Dimension 'Research, innovation and competitiveness'

i. National objectives and funding targets for public and, where available, private research and innovation relating to the Energy Union, including, where appropriate, a timeframe for when the objectives are to be met

The Czech Republic has not set any specific quantifiable targets in public research, development and innovation specifically related to the Energy Union. The difficulty of setting energy and climate targets is due, inter alia, to the structure of public funding for research, development and innovation, which is not sector-focused, but is provided under national and ministerial support programmes. The strategic objectives are then described in more detail in the relevant strategy papers. These documents include in particular the National Research and Innovation Strategy for Smart Specialisation[50] and National Priorities of Oriented Research, Experimental Development and Innovation[51].

[50] The document is available at: https://www.mpo.cz/cz/podnikani/ris3-strategie/
[51] The document is available at: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=653383

The document National Priorities of Oriented Research, Experimental Development and Innovation identifies a total of six main priority areas, of which the priority area Sustainability of Energy and Material Resources best corresponds to the focus of the Energy Union. This area is further divided into three sub-areas: (i) sustainable energy; (ii) reducing the energy performance of the economy; and (iii) material base. For more information, see Chapter 3.5.

National priorities for oriented research, experimental development and innovation include indicative share of funds by priority area, which should be allocated for implementation within the overall R&D&I budget. On the basis of this strategic document, approximately 18 % of the total research, development and innovation budget should be allocated to the priority Sustainable Energy and Material Resources (see Table 40).

Table 40: *Indicative distribution of funds among the different priority areas*

Priority area title	Share of funds
Competitive knowledge-based economy	20 %
Sustainability of energy and material resources	18 %
Environment for quality life	18 %
Social and cultural challenges	10 %
Healthy population	20 %
Secure society	14 %

Source: National priorities for oriented research, experimental development and innovation

The area of research, development and innovation is also addressed specifically in the State Energy Policy of the Czech Republic. Table 41 identifies priority areas of research, development and innovation on the basis of this strategic document. The research, development and innovation areas are also partially addressed by other strategic energy documents such as the National Action Plan for the Development of Nuclear Energy in the Czech Republic, the National Action Plan for Smart Grids, or the National Action Plan for Clean Mobility.

Table 41: *Priority areas of research, development and innovation under the State Energy Policy*

Priority area	Detailed description
Renewable (alternative) energy sources	More efficient use of biomass, development of advanced biofuels made from non-food biomass and waste, development of new photovoltaic systems including control elements, geothermal sources in geological conditions of the Czech Republic, energy use of hydrogen including fuel cells, heat pumps of all categories with high efficiency.
Nuclear technologies	Research of promising 3rd and 4th generation nuclear technologies, enhancing the efficiency, durability and safety of nuclear sources, solution for radioactive waste and spent nuclear fuel, solution for the end of the fuel cycle, developments in the field and also in engineering / special construction technologies for nuclear power in relation to material engineering.
More efficient use of fossil energy sources	Research into more efficient and new combustion technologies for traditional fossil fuels such as clean coal technology with BAT or better parameters and with parameters complying with future economic and environmental requirements, development of high temperature materials,

	applied research and innovation of gas and steam turbines, heat exchangers, cogeneration systems, geological storage of carbon dioxide.
Increasing efficiency and reliability of energy systems and distribution networks	Increasing the efficiency and reliability of energy systems and distribution networks for energy media, integration of decentralised energy sources and their back-up in case of risk situations, development of control systems at the level of transmission and distribution networks; the development of smart grids and the use of decentralised network, production and consumption management, including the possibility of managing storage in central and local systems (in particular at the distribution system level); system reliability management systems and their regional integration, network maintenance and operation systems based on element monitoring and risk management, and emergency mechanisms of island subsystem management (especially at the transmission network level); the development of protection against cyber attacks and the protection of telecommunication systems, pilot projects in the field of electricity storage.
Energy recovery of waste	Research and development of new technologies for the energy recovery of secondary raw materials and wastes, which cannot be used for material recovery.
Transport systems	Increasing the efficiency of systems and means of public transport including electric traction vehicles and their drives; fuel cell development and battery development for the development of electric cars; the development of infrastructure for electric cars and hydrogen economy; the development of telematic traffic control systems aimed at automating and optimising individual transport; projects to reduce losses in supply systems and electrical traction equipment in transport.

Source: State Energy Policy of the Czech Republic (2015)

On the basis of the measures in the State Energy Policy of the Czech Republic, the sectoral programme of public support for research, development and innovations in the field of energy was also approved, which is administered by the Technology Agency of the Czech Republic. The programme is called THÉTA. The programme is approved for the period 2018–2025. For more information on THÉTA, see Chapter 3.5.1.4.

ii. Where available, national 2050 objectives related to the promotion of clean energy technologies and, where appropriate, national objectives, including long-term targets (2050) for deployment of low-carbon technologies, including for decarbonising energy and carbon-intensive industrial sectors and, where applicable, for related carbon transport and storage infrastructure

The Czech Republic has no specific national 2050 objectives for deployment of low-carbon technologies beyond those set out in other parts of this document. Also, the introduction of specific technologies should be primarily market-driven. The State may create conditions in research, development and innovation, possibly to partially support specific technologies in accordance with the State aid rules, but it is arguable whether the State should specify targets for the introduction of certain technologies and thereby distort the market environment.

iii. Where applicable, national objectives with regard to competitiveness

The national objectives / the strategy of the Czech Republic in this area are contained in specific strategy documents. In this regard, we should mention especially the National Research and Innovation Strategy for Smart Specialisation of the Czech Republic, the aim of which is to effectively target European, national, regional and private funds on priority innovation specialisations, thereby making full use of the knowledge potential of the Czech Republic. This way, the strategy also significantly contributes to increased competitiveness of the economy. Furthermore, we can mention the National Initiative Industry

4.0. The Czech Republic is currently also preparing the ‘Economic Strategy’, which should define the main objectives in the Czech economy by 2030. In this respect, it will be a key plan for the Czech economy based on ten pillars, such as industry and energy, innovation, raw materials policy, transport concept, business support and education reform. There is also the ‘National Investment Plan’ currently under preparation, which should map in detail the necessary investments, inter alia, in the energy sector, for at least the next ten years. Then there is the Innovation Strategy of the Czech Republic 2019–2030, which was approved by Government Resolution No 104 of 4 February 2019. It is a strategic framework plan that predetermines government policy in the area of research, development and innovation and it is intended to help the Czech Republic become one of Europe’s most innovative countries within twelve years. The innovation strategy consists of nine interconnected pillars, which contain the starting points, the basic strategic objectives and the instruments leading to their fulfilment. These pillars represent the following areas: Research and development funding and evaluation, Innovation and research centres, National start-up and spin-off environment, Polytechnic education, Digitisation, Mobility and construction environment, Intellectual property protection, Smart investment and Smart marketing. In this respect, the Czech Republic also acknowledges the importance of the EU Competitiveness Council, in which it is actively involved.

Top national competitiveness targets resulting from the approved State Energy Policy. These are the following goals (see also Table 6):

- Maintain transmission capacity for export and import at a level of at least 30 % of the electricity system load;
- Optimise discounted energy costs;
- Keep the energy prices at no more than 120 % of the OECD level;
- Achieve and maintain the levels of final electricity and gas prices below EU-28 level;
- Achieve and maintain the share of energy expenditure in total household spending as low as possible below 10 %;
- Optimise the share of the energy sector in gross value added;
- Reduce the share of energy imports in gross value added below 2010 levels;
- Maintain positive total economic value added of the energy sector;
- stabilise the effect of energy imports on the balance of payments.

3 Policies and measures

3.1 Dimension ‘Decarbonisation’

The Czech Republic has long been struggling with combustion process emissions of substances posing health risks (PM2.5, PM10, polycyclic aromatic hydrocarbons, benzo(a)pyrene, NOx, VOC, ground-level ozone, CO, dioxins, toxic metals and others), which are generated by the combustion of coal in household furnaces in almost every municipality in the Czech Republic. Also, emissions from old diesel and petrol engines in transport pose a health risk. Because of the seriousness and the national scale of the problem, it is desirable to reduce, as a priority, emissions of CO_2 from combustion processes in these major areas of household furnaces and old diesel and petrol engines, even as a major multiplier effect, which also justifies State subsidies to protect public health, because at present the damage to health and property is far from internalised into fuel and energy prices.

3.1.1 GHG emissions and removals

i. Policies and measures to achieve the target set under Regulation (EU) 2018/842 as referred in point 2.1.1 and policies and measures to comply with Regulation (EU) 2018/841, covering all key emitting sectors and sectors for the enhancement of removals, with an outlook to the long-term vision and goal to become a low emission economy and achieving a balance between emissions and removals in accordance with the Paris Agreement

3.1.1.1 Transport sector

The strategic and policy objectives and the main principles of development in the field of transport and transport networks are laid down by the Transport Policy of the Czech Republic 2014–2020, with a view to 2050. These are being gradually elaborated further in follow-up strategies. The main objective is to create conditions for the development of a quality transport system, which makes use of the characteristics of the various modes of transport and relies on the principles of competition with regard to its economic and social impacts and its impacts on the environment and public health. The State Environmental Policy of the Czech Republic 2012–2020 also includes requirements for the support of the use of alternative fuels, development of environmentally-friendly transport or economic instruments to include externalities from all modes of transport.

Transport policy envisages the gradual replacement of conventional fuels (i.e. oil-based fuels) for alternative energy in road transport and the further electrification of railways and urban public transport, with the gradual shift in freight transport from road to rail or water. A similar 2030 sub-target is set by the State Energy Policy of the Czech Republic (2015) and the National Emission Reduction Programme of the Czech Republic (2015).

A number of measures are being implemented in the Czech Republic to promote the use of different types of alternative fuels. In accordance with Act No 16/1993, on road tax, vehicles for the transport of persons or freight vehicles with a maximum permissible weight of less than 12 tonnes using alternative fuel (hybrid drives, electric motors, CNG, LPG and bioethanol E85) are exempt from road tax; lower excise rate is applied to natural gas used in transport, even though the advantage is gradually decreasing. A certain (although lower) advantage in this area also applies to the use of LPG in transport.

In order to meet the targets laid down in Directive 2014/94/EC of the European Parliament and of the Council concerning the requirement to establish a national policy framework for the development of alternative fuels in transport and related infrastructure, on 20 November 2015 the Government of the Czech Republic adopted the National Action Plan for Clean Mobility. For more detailed information on this programme, see Chapter 3.1.3.1 of the National Action Plan for Clean Mobility.

In the 2014–2020 period, support for ‘clean mobility’ is provided by several current Operational Programmes. While the Operational Programme Transport (OPT) is aimed at supporting the public infrastructure of charging and filling stations (CNG/LNG/hydrogen), the Integrated Regional Operational Programme (IROP) supports the development of clean mobility in public transport and the Operational Programme Entrepreneurship and Innovation for Competitiveness (OP EIC) supports the introduction of electromobility in the business sector. Also, the Operational Programme Prague – Growth Pole of the Czech Republic has created a new specific target for the purchase of zero-emission electric buses, including the development of the related infrastructure. The operational programmes also include other measures that have an impact on greenhouse gas emissions in all priority axes focusing on the development of railway infrastructure (TEN-T network completion) and infrastructure for other sustainable transport (e.g. modernisation of electric traction of urban public transport).

Act No 201/2012, on air protection, requires also a minimum share of biofuels in the total amount of vehicle gasoline and diesel for a calendar year to be put into free tax circulation. Fuel suppliers are obliged to gradually reduce greenhouse gas emissions per unit of energy contained in the fuel over the life cycle of the fuel. By 31 December 2014, they had to reach a 2 % reduction in emissions, then by 31 December 2017 they had to reach a 3.5 % reduction and a 6 % reduction by the end of 2020. Only biofuels meeting the sustainability criteria under Government Decree No 189/2018, on sustainability criteria for biofuels and on the reduction of greenhouse gas emissions from fuels can be counted towards the obligations. Act No 353/2003, on excise tax, then lays down the tax rate for individual fuels and the conditions under which pure and high-percentage biofuels are subject to a lower excise rate. The Multi-annual Programme for the Promotion of the Further Use of Sustainable Biofuels in Transport 2015–2020 (Government Resolution No 655/2014) aimed to maintain the existing system of promotion of the use of pure biofuels and high-percentage biofuel blends in transport. The Programme describes the use of liquid biofuels in transport both technically and legislatively and constitutes a framework that sets the optimum level of support for each biofuel type. However, its adjustments, which had to be made following the notification of the Programme to the European Commission, significantly reduced the interest of motorists in the use of high-percentage or pure biofuels in transport, whose current use is therefore only minimal.

An important tool for creating a sustainable urban transport system is the elaboration of a Strategic Sustainable Urban Mobility Plan. The aim is to comprehensively address the issue of mobility in bigger cities connected with suburban areas, not only in terms of transport issues, but also in terms of the possibilities of influencing mobility and how it is made possible. Strategic Sustainable Urban Mobility Plans should be developed and regularly updated in cities with a population of over 40 000.

Energy savings are based on increased use of public transport in passenger transport and on increasing the share of rail transport compared to road transport in freight transport. The public transport strategy, prepared as the initial strategic document of the Ministry of Transport for public transport in 2015–2020 with a view to 2030, therefore aims to improve the public transport system. Public transport operators and transport infrastructure managers can apply for support through the Integrated Regional Operational Programme for a range of activities related to the increase in sustainable forms of transport, such as fleet renewal. This will be necessary to comply with Government Decree No 49/2015, so that the average age of public transport vehicles is not more than 9 years.

In the area of freight transport, it is necessary to mention the Freight Transport Strategy 2017–2023 with a view to 2030, which, in view of the more difficult introduction of alternative energies in freight transport, highlights this especially in the area of urban freight transport and city logistics. According to this strategy, smaller, preferably alternative-drive lorries must be used for deliveries especially in historic city centres. The use of LNG (possibly even bioLNG) in the short term and electricity or hydrogen in the long term would have the greatest potential in this area. Road freight transport should be more broadly reflected in the forthcoming update of the National Action Plan for Clean Mobility.

Fuel savings are also facilitated by increased traffic safety and fluency in all modes of transport, which is the aim of the approved Action Plan for the Deployment of Intelligent Transport Systems 2020 with a view to 2050. Among other things, intelligent systems will allow the technical condition of transport routes to be monitored and serious traffic accidents to be prevented. Implementation of the National Cycling Development Strategy 2013–2020 aims to improve the coordination of the development and the conditions for the use of this environmentally-friendly non-motorised transport.

To support the use of environmentally-friendly vehicles, the National Emission Reduction Programme of the Czech Republic includes the measure ‘Renewal of the public transport vehicle fleet with alternative-drive vehicles'[52]. Under this measure, public authorities should, as part of its fleet renewal, regularly purchase M1 and N1 alternative-drive vehicles in order to achieve at least a 25 % share of alternative-drive vehicles in the total public administration fleet by the end of 2020 and a 50 % share of alternative-drive vehicles by the end of 2030.

Low-emission zones are geographically defined areas that limit access of vehicles on the basis of their emissions in order to improve air quality in these areas. The rules for the classification of road motor vehicles into emission categories and emission labels were laid down in Government Decree No 56/2013. The introduction of low-emission zones is also supported under the National Programme Environment. The National Programme is also geared towards supporting alternative modes of transport (e.g. carsharing, bikesharing, alternative drives, or non-motorised modes of transport). In 2016–2018 within the National Programme Environment, the Ministry of the Environment announced three calls with a total allocation of CZK 300 million for municipalities, regions and their organisations to support the purchase of alternative-drive vehicles. This call is complementary to the OP EIC calls for legal persons.

Another measure worthy of mention is the introduction of a special 'EL' registration plate (effective from April 2019), which entails the exemption from the registration fee, and the exemption from tolls for the use of toll roads ('vignettes') from 2020 for electricity or hydrogen vehicles with emissions of up to 50 g CO_2/km; from 2021, there is also a discount of vignettes for natural gas and biomethane vehicles.

3.1.1.2 Agriculture and forestry sector

An important way of using methane and preventing its spontaneous formation is the processing of residues of agricultural production in biogas stations. The main tool to promote biogas utilisation was the introduction of feed-in tariffs and green bonuses linked to the amount of electricity produced. The construction of biogas stations has been supported under operational programmes and is also supported in the current period. The Rural Development Programme supported the construction of agricultural biogas stations. The construction of biogas stations using biowaste is supported by the Operational Programme Environment, while the Operational Programme Enterprise and Innovation for Competitiveness provides support to the output of heat from the existing biogas stations for its efficient use.

The Action Plan for Biomass in the Czech Republic 2012–2020 foresees the possibility to achieve annual energy production from agricultural land and agricultural by-products and processing of agricultural products in the range of 133.9 to 186.8 PJ by 2020. The use of by-products and biodegradable waste accounts for the largest share (44 %), targeted cultivation of biomass for energy use on arable land accounts for about 40 % and energy use of grassland harvest makes up the rest (about 16 %). Such energy can replace the corresponding amount of fossil fuels, thereby contributing to the reduction of greenhouse gas emissions.

The Rural Development Programme of the Czech Republic 2014–2020 goes beyond the cross-compliance control measures and will address the achievement of climate targets by 2020, notably through the measures implemented under Priority 5 'Promoting efficient use of resources and supporting the transition to a climate-proof low-carbon economy in the agricultural, food and forestry sectors', as

[52] The measure will be de facto replaced by requirements arising from the transposition of Directive 2019/1161 on the promotion of clean and energy-efficient road transport vehicles. The Ministry for Regional Development in cooperation with the Ministry of Transport and other ministries is also currently working on a draft law on the support of low-emission and zero-emission road vehicles.

well as measures under Priority 4 ‘Renewal, protection and improvement of agriculture- and forestry-dependent ecosystems’. These targets will also be partially facilitated by measures under Priority 2 ‘Enhancing the viability of agricultural holdings and the competitiveness of all types of farming in all regions and promoting innovative agricultural technologies and sustainable forest management’.

An important tool for reducing the consumption of mineral fertilisers is the development of organic farming, where the use of nitrogenous mineral fertilisers is completely prohibited. The organic farming regime is laid down in Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91 and Act No 242/2000, on organic farming. The support provided under the Rural Development Programme of the Czech Republic has a substantial impact on the expansion of the area of agricultural land managed according to organic farming principles.

Carbon sequestration in soil is facilitated by mandatory compliance with the standards on Good Agricultural and Environmental Condition and compliance with mandatory farming requirements, transposed by Government Decree No 48/2017, laying down requirements in accordance with acts and standards on good agricultural and environmental condition for controls of cross-compliance and consequences of their infringement for the granting of certain agricultural support. Paying support to farmers is conditional, inter alia, on meeting these standards and requirements. Important measures under the Rural Development Programme include the agri-environmental climate measures, namely due to maintaining or enhancing the nitrogen retention capacity by setting appropriate land management or by the transition to a culture with higher retention potential. Another effect of this measure is the strengthening of anti-erosion measures with a high sequestration impact, especially in nitrate-endangered areas or along watercourses (grassing, grassland care).

One of the tools for addressing climate issues by expanding forest areas is local support for afforestation of agricultural land provided under the Rural Development Programme. Government Decree 185/2015, on the conditions for granting subsidies in the context of agricultural land afforestation measures and amending some related decrees, provides for subsidies for the establishment of and care for forests for a period of 5 years and for the termination of agricultural production on afforested land for a period of 10 years.

Another tool is the support for preventing forest damage by forest fires and natural disasters and catastrophic events, which also contributes to the reduction of forest fire emissions / the conservation of carbon in biomass and soil. Carbon sequestration in soil will also be facilitated by the support for sustainable management of permanent grassland.

2. The National Forest Programme includes ‘Key Action 6 – Reduce the impacts of the expected global climate change and extreme meteorological phenomena’, which is based on 12 specific measures. These measures are generally focused on creating more resilient forest ecosystems by supporting diversified forests with the greatest possible use of natural processes, varied tree species, natural renewal and cultivation process variability.

The Strategy of the Ministry of Agriculture with a view to 2030 under Objective D.2 ‘Competitiveness of the forest management-based value chain’ aims, inter alia, to: (i) create conditions for higher household use and consumption of wood and wood products; (ii) create conditions for investment in the forest management sector and the downstream value chain, which will lead to the production of higher added value wood products; (iii) reduce exports of wood mass from the Czech Republic; (iv) promote research and development towards better use of wood mass and explore new product opportunities with the use of wood.

All this should lead to increased use of wood as a renewable carbon-binding raw material and a substitute for other materials whose production is associated with high CO_2 emissions. Reducing exports of raw wood and its processing (especially to cut timber and timber boards) in the Czech Republic will positively contribute to the Czech Republic's emission balance.

3.1.1.3 Waste management sector

The EU principles in the field of waste management are enshrined in the Czech legislation by the Waste Act. In December 2019, the Government of the Czech Republic passed a new Waste Act, which transposes Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste into the Czech legislation.

Act No 477/2001, on packaging and amending certain acts, addresses the prevention of waste packaging. It defines the basic obligations for the handling of packaging and packaging waste, including the labelling of packaging, reusable packaging, returnable packaging, returnable deposit packaging and take-back.

New European regulations, together with new technological procedures for handling selected products, resulted in the need to adopt a special law on the handling of these products. The forthcoming draft End-of-Life Products Act lays down the rights and obligations of all those who handle electrical equipment, batteries and accumulators, tyres and vehicles from their placement on the market until their processing after they have become waste.

In addition, work is carried out on the preparation of the implementing legislation related to the amendment to the Waste Act, Act No 223/2015, as well as new implementing legislation defining the rules for solid alternative fuels produced from waste (SAF Decree), a list of wastes that will be banned from landfilling from 2024 (Landfill Ban Decree).

The basic strategic document and tool for waste management is the Waste Management Plan of the Czech Republic 2015–2024 (WMP), which also fulfils and further elaborates the State Environmental Policy of the Czech Republic 2012–2020. The WMP is designed in accordance with the waste management hierarchy in accordance with the above Directive 2008/98/EC, on waste. The strategic objectives of the plan are to prevent waste generation and to reduce specific waste production, minimise the adverse effects of waste generation and its management on human health and the environment, ensure sustainable development of the society, and move towards a European 'recycling society', maximise waste utilisation as a substitute for primary sources and transition to a circular economy.

The Waste Prevention Programme, approved by Government Resolution No 569 of 27 October 2014, is a strategic document with specific targets and measures, thus creating the conditions for lower consumption of primary sources and gradual reduction of waste production. Reducing the amount of waste also reduces the demand for its processing and the associated greenhouse gas emissions. This government programme introduces the following tools: education and training, elaboration of expert analyses for the possibility of setting new legislative requirements in the field of waste prevention, methodological and legislative measures, and support for research and development. The Waste Prevention Programme is part of the Waste Management Plan of the Czech Republic.

3.1.1.4 Household sector

Under the New Green Savings grant programme, funded from the revenues from auctioning of emission allowances, it is possible to combine the reduction of the energy performance of buildings with the greening of the heating source, where it is possible to obtain grants for biomass boilers, heat pumps or gas condensing boilers. Furthermore, it financially supports the construction of new buildings with very high energy performance (buildings approaching the passive energy standard) and installation of photovoltaic systems. The New Green Savings (NGS) supports energy savings and the replacement of heating sources in family houses throughout the Czech Republic, and in residential buildings only in Prague. The construction of new low-energy buildings is supported within the NGS throughout the Czech Republic. As part of the greening of heating, the installation of solar (photothermal) systems is also supported under the NGS. Reducing the energy performance of buildings outside of Prague Capital City is also supported within the Integrated Regional Operational Programme.

More efficient and cleaner heat production in households is also supported through the OP E 2014–2020. The grants are intended to replace old environmentally damaging solid fuel boilers with modern low-emission boilers (e.g. gas condensing boilers) and a heat pump; the highest subsidy is provided for biomass-only boiler with automatic fuel supply and heat pump.

3.1.1.5 Industry sector

In order to reduce greenhouse gas emissions in the industry sector, it is crucial to implement cross-cutting measures based on EU legislation. In addition to the EU ETS, especially integrated pollution prevention and control, in accordance with Act No 76/2002, on integrated prevention, has a major contribution to reducing emissions. Emissions of fluorinated gases are regulated by Act No 73/2012, on ozone-depleting substances and on fluorinated greenhouse gases, and Implementing Decree No 257/2012, on the prevention of emissions of ozone-depleting substances and on fluorinated greenhouse gases, which transpose the relevant EU regulations.

The achievement of climate and energy goals in the area of manufacturing industry, which includes, for example, the steel, chemical, ceramic, cement, glass, paper, brick and lime industries, is a separate and very complex issue. These industries have a particularly significant potential in this regard and this fact should be considered in the framework of creating national strategies and policies. It is mainly due to the specific needs of this sector and the great variety of technologies used and developed in it that this sector is not dealt with in detail in the submitted material. The prerequisite is the rapid development of an independent industrial policy of the Czech Republic for the period 2021–2030 with a view to 2050, which will address the sector in a comprehensive way, i.e. including maximising support (including state support) in developing and applying all technologies contributing to climate and energy goals, physical and price affordability of energy, maximum protection of competitiveness, etc. In this respect, the ‘National Economic Strategy 2030’ is being prepared, which includes also the National Investment Plan.

3.1.1.6 Energy sector

The contribution of the energy sector to greenhouse gas emissions (or their reduction) is described in detail in other parts of this document. However, it is useful to emphasise the role of individual energy sources within the energy mix in reducing greenhouse gases. In this respect, it is useful to briefly describe the role of nuclear energy as an emission-free energy source (the role and expected development of other emission-free sources, especially renewable sources, is described in other parts of this document).

A total of 6 nuclear power units in the Temelín power plant and the Dukovany power plant are currently in operation in the Czech Republic. The key national strategy documents clearly state that the maintenance of the current share of nuclear energy in the energy mix and its further development is crucial for achieving the long-term low-emission commitments of the Czech Republic. The current State Energy Policy of the Czech Republic envisages increasing the share of nuclear energy in primary energy sources to 25–33 % (from the current level of about 15 %) and increasing its share in gross electricity production to 46–58 % (from the current level of about 29 %). Following the approval of the State Energy Policy in the Czech Republic in May 2015, the National Action Plan for the Development of Nuclear Energy in the Czech Republic was approved in June 2015, which specifically elaborates on the requirement of the State Energy Policy of the Czech Republic to strengthen the role of nuclear energy. The strategic assignment is to ensure the continuity of operation of the Dukovany Nuclear Power Plant, which will have been in operation for 50 years in 2035. The process of obtaining key permits and preparation of both sites is currently under way. However, there has been no decision on the investment and financing model so far. The analytical parts of this document consider the further development of nuclear energy in accordance with the approved strategic documents. This development is relevant for the post-2030 period and will be updated, if necessary, together with the update/preparation of the next National Plan (for the period 2030–2040).

ii. Where relevant, regional cooperation in this area

The Czech Republic does not consider this area relevant at the National Plan level. More precisely, regional cooperation is regulated in detail at EU level and at the level of international institutions such as the UNFCCC.

iii. Without prejudice to the applicability of State aid rules, financing measures, including Union support and the use of Union funds, in this area at national level, where applicable

Reducing emissions outside the EU ETS is significantly facilitated by the support from EU funds for the development of renewable energy sources and improving energy efficiency, as described in Chapters 3.1.2 and 3.2 below. Operational Programme Transport 2014–2020 contributes to the reduction of greenhouse gas emissions in transport, mainly supporting the development of transport infrastructure, which leads to a reduction in fuel and energy consumption. The Rural Development Programme 2014–2020 contributes to reducing emissions and increasing declines in the agricultural and forestry sectors by supporting agri-environmental and climate measures and modernising agricultural and forestry operations. Key national programmes include the above New Green Savings programme, funded from the revenues from the auctioning of emissions allowances, which reduces greenhouse gas emissions, primarily in the household sector.

3.1.2 Renewable energy

i. Policies and measures to achieve the national contribution to the binding 2030 Union target for renewable energy and trajectories as referred to in point (a)(2) Article 4, and, where applicable or available, the elements referred to in point 2.1.2 of this Annex, including sector- and technology-specific measures[53]

[53] When planning these measures, Member States shall take into account the end of life of existing installations and the modernisation potential.

3.1.2.1 Existing policies for the promotion of renewable energy sources

The following table summarises existing policies on renewable energy sources. This is only a summary. Detailed information is provided in the Progress Report on the Promotion and Use of Renewable Energy in the Czech Republic[54].

Table 42: *Most important existing policies on renewable energy sources*[55]

Policy/measure	Characteristics
Indirect support (reduction of administrative requirements)	Reducing administrative requirements for connection and operation of small sources up to 10 kW
Indirect support (mandatory assessment of installation)	Mandatory assessment of the installation of alternative systems as part of compliance with the requirements on energy performance of buildings
Indirect support (guarantees of origin of energy)	Issue of guarantees of origin
Indirect support (overview of efficient heat supply systems)	Overview of efficient heat supply systems pursuant to Section 25(5) of Act No 165/2012, on supported energy sources and amending certain acts.
Indirect support (spatial planning)	Spatial planning
Operating support for electricity	Operating support for electricity in the Czech Republic is provided in Act No 165/2012, on supported energy sources, which implemented Directive 2009/28/EC on the promotion of the use of energy from renewable sources. Operating support is possible for the electricity sector by means of a feed-in tariff or green bonus.
Operating support for heat	Operating support for heat (biomass including biogas, biofuels, geothermal energy)
Investment support – electricity (State programmes)	State Programme for the Promotion of Energy Savings and the Use of Renewable Energy Sources (Ministry of Industry and Trade); Green Savings and New Green Savings (Ministry of the Environment); Operational Programme Environment 2014–2020 (Ministry of the Environment and selected regions)
Investment support – electricity (operational programmes)	Operational Programme Enterprise and Innovation for Competitiveness (Ministry of Industry and Trade) 2014–2020; Investment support – electricity (operational programmes)
Investment support – electricity (European Agricultural Fund for Rural Development)	European Agricultural Fund for Rural Development – Rural Development Programme (Ministry of Agriculture) – this type of support has already been terminated.
Investment support – heat (State programmes)	Green Savings and New Green Savings (Ministry of the Environment); Operational Programme Environment 2014–2020

[54] Report on progress in the promotion and use of energy from renewable sources in the Czech Republic under Article 22 of Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources. The last submitted report is for 2015 and 2016.

[55] This is not an exhaustive list, but rather the most important policies / policies specifically focused on renewable energy sources.

Investment support – heat (operational programmes)	Operational Programme Enterprise and Innovation for Competitiveness (Ministry of Industry and Trade) 2014–2020; Operational Programme Environment (Ministry of the Environment)
Investment support – heat (European Agricultural Fund for Rural Development)	European Agricultural Fund for Rural Development – Rural Development Programme (Ministry of Agriculture) – this type of support has already been terminated.
Tax instrument (tax exemption, reduction or refund)	The exemption from the electricity tax for electricity from renewable sources, which is consumed at the offtake point where it was produced and at the same time the installed capacity of the electricity generating plant does not exceed 30 kW in accordance with Section 8(1)(a) of Part 47 of Act No 261/2007, on stabilisation of public budgets
Tax instrument (tax exemption, reduction or refund)	Exemption from immovable property tax
Promoting the use of biofuels through the mandatory reduction of greenhouse gas emissions from fuels	Promoting the use of biofuels through the mandatory reduction of greenhouse gas emissions from fuels laid down in Section 20(1) of Act No 201/2012, on air protection, as amended
Aid for biofuels (mandatory blending)	Mandatory blending of biofuels into automotive petrol and diesel fuels
Aid for biofuels (high-percentage and pure biofuels)	Support for high-percentage and pure biofuels, support for advanced biofuels.

Source: Prepared by MIT for the purposes of the National Plan

3.1.2.2 Policies to ensure the achievement of renewable energy target by 2030

In order to meet its national contribution to the European RES target at 32 % by 2030, as set out in Chapter 2.1.2, the Czech Republic has amended Act No 165/2012, on supported energy sources. The policies proposed in this amendment can be seen as the main policies for ensuring the achievement of the transport target by 2030. Under Act No 165/2012, a new RES support scheme after 2020 is proposed, which should ensure progress towards the national contribution in this area. In this respect, however, it must be emphasised that this is only a draft amendment to the act, which still has to go through the legislative process of the Czech Republic, which usually lasts between one and two years.

At present, the overall 2020 EU target for the share of energy from RES to total final energy consumption of is 20 %, as well as binding targets for individual Member States where the target for the Czech Republic is set at 13 %. This national target of the Czech Republic was already achieved in 2013 and in 2016 the Czech Republic reached the share of energy from RES to total final energy consumption of 14.89 %. Between 2021 and 2030, at least a 7 % increase in the share of energy from RES to final energy consumption will have to be achieved. However, this increase does not take into account the fact that the Czech Republic will also have to 'cope' with the potential decrease in energy from RES after around 2028 in the case of electricity plants that are claiming and receiving operating support today, where the production of energy from renewable energy sources may terminate after the end of the current operating support for these plants, because without any operating support there is a risk that these plants will shut down. The risk of plant shutdowns and terminations may mean that without any further measures to maintain and motivate these plants to stay in operation, certain types of outages may occur (an indication of the possible ‘outage’ is provided in Chapter 2.1.2)**.** The most high-risk plants are fuel sources using biomass and biogas. These sources currently account for 6.3 % of the share of energy from RES to total final energy consumption of the current share of energy from RES of 14.89 %. The 6.3 % does not include the production of heat in households, which accounts for another 5.04 % of the share of energy from RES out of 14.89 % of the current share of energy from RES, or the use of biofuels in transport. It is therefore essential to keep these plants in operation if their production is still sufficiently efficient; any further support to maintain production in these plants will be more effective in achieving the targets. If current plants are not kept in operation, it would be necessary from the present perspective (2016) to have new generating plants and facilities to provide more than 7 % by 2030.

The setting and structure of the support system to ensure the achievement of energy targets from supported energy sources by 2030 in the draft amendment to the Supported Energy Act

In order for the Czech Republic to be prepared for this situation, Act No 165/2012 proposes the preparation of tools and measures with appropriate forms of support for all supported energy sources. The selected approach is conceived as a comprehensive solution for the new support setting in the period 2021–2030 for the development of new RES sources as well as for the maintenance of energy-efficient plants that are currently in operation. In simple terms, this principle can be summarised as follows:

a) modification of the current form of support for small sources up to 1 MW, where the support will no longer be used in the form of feed-in tariffs, but only in the form of an hourly green bonus. This is the most ‘pro-market’ approach and financially most effective form of support for small sources.
b) introduction of support through competitive tenders (auctions) for sources above 1 MW. This is a ‘pro-market’ principle, which, moreover, also follows for these sources as an obligation from EU legislation.
c) introducing a new form of support so that some existing sources can be maintained in operation and some other new sources can develop, and introducing new forms of support to ensure the required sectoral RES targets in heating and cooling.
d) This involves the introduction of new forms of support in order to ensure the achievement of sectoral RES targets in transport required by the revised RES Directive. This involves the promotion of biomethane.

1. <u>Adjustment of operating support for the construction of new plants in individual sectors</u>

Support for electricity from renewable energy sources

The scope of support will only be for non-fuel sources (except PVPP) and landfill or sludge gas. Fuel sources were redirected to heat support to ensure the achievement of the RES target in the heating and cooling sector. The form of support for new electricity plants will be applied by an hourly green bonus, with a division into electricity plants, which will compete for the support in an auction. For sources up to 1 MW (6 MW for wind power) support will be provided in the form of a green bonus laid down in an ERO price decision and for sources above 1 MW, the support will be provided by means of auctions in the form of the ‘auction bonus’. The duration of the support will remain unchanged – over the lifetime (20 or 30 years).

Support for electricity from secondary energy sources

The scope of the support will be limited to mining gases. Waste heat will be supported through investment support and municipal waste incineration plants will be supported through heat generation.

The form of support for new electricity plants will be applied by a yearly green bonus, with a division into electricity plants, which will compete for the support in an auction. For sources up to 1 MW – support will be provided in the form of an annual green bonus officially laid down in an ERO price decision and for sources above 1 MW, support will be provided by means of auctions in the form of the 'auction bonus'. New support period will be set for electricity plants from secondary sources – over the lifetime (15 years).

Support for electricity from high-efficiency combined heat and power

The scope of the support will continue to be determined for all cogeneration plants as 'fuel-neutral'. Support for CHP electricity will not be announced if other operating support is announced for the given type of supported energy source – for example, if operating support for RES electricity and operating support for SES electricity is announced, the support for CHP electricity will be announced only for non-renewables. The generating facility will only be able to use one type of operating support. The form of support for new electricity plants will be applied by a yearly green bonus, with a division into electricity plants, which will compete for the support in an auction. For sources up to 1 MW support will be provided in the form of an annual green bonus officially laid down in an ERO price decision and for sources above 1 MW, the support will be provided by means of auctions in the form of the 'auction bonus'. New support period will be set for electricity plants from high-efficiency cogeneration – over the lifetime (15 years).

Aid for heat from renewable energy sources

The scope of the support will be used to build new biogas, biomass and geothermal power plants and to compensate for fuel costs for RES compared to fuel costs for non-RES in the case of biomass and geothermal energy (this is not about supporting new plants, but about supporting heat to keep the heat plant in operation, see below). The form of the support will be determined by an annual green bonus. The duration of support for the construction of new biogas, biomass and geothermal energy plants will be set over the lifetime (20 years). The duration of 'maintenance support' will be set at least 3 years after the announcement of the support in a government decree.

2. <u>New types and forms of support</u>

In order to maintain energy-efficient power and heat plants in operation, support will be put in place to maintain the plants in operation.

Support for electricity to maintain the operation of a power-generating facility

The support is intended to offset the difference between the price of biomass and the price of solid fossil non-RES fuels in biomass-fired power-generating facilities or operating costs and the market price of electricity and heat in a high-efficiency CHP power-generating facility, a secondary source power-generating facility. The form of the support will be determined by an hourly or annual green bonus. The duration of the support will be set at least 3 years after the announcement of the support in a government decree, and if the market situation is the same – i.e. the operating costs and the biomass price are higher than the market price of solid fossil non-RES fuels or the market price of electricity and heat.

Support for heat to maintain the operation of a heat-generating facility

Heat-generating facilities are subject to the same principle and rules as the above electricity support to maintain the operation of a power-generating facility. In the case of heat support to maintain the operation of a heat-generating facility, this support will also apply to the co-incineration of RES and non-RES, it is the transition from electricity support to heat support. The form of the support will be determined in this case by an annual green bonus.

Support for electricity to modernise a power-generating facility

The support is intended for electricity produced in a power-generating facility in which modernisation was carried out under the conditions laid down in the Implementing Decree. By using electricity support on the modernised power-generating facility, the right of electricity support which was created prior to the modernisation of the power plant terminates. The support applies to electricity produced in the power-generating facility meeting the conditions imposed on new plants. The support will be in the form of an hourly or yearly green bonus or auction bonus. The duration of the support will be for the lifetime of the power-generating facility; support may also be set for a shorter period of time.

New type of support to ensure the fulfilment of the RES target in the transport sector – support for biomethane

In order to ensure the achievement of the RES target in the transport sector and the sub-target in this sector for advanced biofuels, it is necessary to introduce new support, which will initiate the production of ‘advanced’ biomethane and its supply to the transport sector. The form of the support will be set as an annual green bonus over the lifetime (20 years). Operating support financing is proposed from the State budget, mainly from the savings for the support of RES electricity for biogas power-generating facilities which will be converted to biomethane plants. This support will set the following conditions: support for generating plants in the Czech Republic connected to the distribution or transmission system operated by a gas production licence holder in accordance with the quality requirements for biomethane, odourisation and measurement. At the same time, the same requirements as for the support of electricity and heat will apply, i.e. the registration of the plant and support in the OTE system or requirements for measuring and reporting the amount of biomethane etc. Preparations are underway to extend the issue of guarantees of origin for biomethane and to use their extended form for reporting the volume of biomethane production and consumption in the Czech Republic. The possibility of extending the issue of guarantees of origin for biomethane and the use of their extended form for reporting the volume of production and consumption of biomethane in the Czech Republic is also being analysed.

3. <u>New forms of support – support by means of auction bonus</u>

The amendment to the Act introduces an adjustment in the provision of operating support for electricity from RES according to the Environmental and Energy State Aid Guidelines 2014–2020, which are very likely to be set for 2021–2030 and at the same time responds to the revised RES Directive. In both EU regulations, larger sources must tender the amount of operating support. A mandatory auction bonus is therefore introduced to support electricity from RES for generating facilities with a capacity exceeding 1 MW (with a capacity exceeding 6 MW or 6 units for wind power plants) and for CHP plants and secondary energy source plants with a capacity exceeding 1 MW. In the case of electricity generation from renewable energy sources, ‘reference price’ needs to be tendered, in the case of CHP and SES plants, the auction bonus is tendered. In the case of the CHP and SES power-generating facilities, the generating facility is supported by the directly tendered annual auction bonus, in the case of a RES power-generating facility the producer is supported by an hourly auction bonus, which is determined as the difference between the reference price and the hourly market price of electricity. The support in the form of the auction bonus will be paid to the generating facility by OTE, a.s. The amendment to the Act contains provisions concerning the announcement of the auction, the evaluation of the tenders received, auction support contracts, the exercise and termination of the right under financial guarantee, the extinction of the right to support from the auction and the publication auction result. The auction may be cancelled, but this action must be duly substantiated it must be determined whether the auction will be repeated. The act also provides details of the auction support contract. The MIT undertakes to ensure the provision of support in the amount and manner specified in the contract, and the producer undertakes to commission the power-generating facility or modernise it, keep it in operation and produce electricity under the conditions laid down by the contract and the law. An amendment to the contract may only be made in writing; it is not possible to change the tendered reference price or auction bonus.

4. New form of regulation of supported energy sources

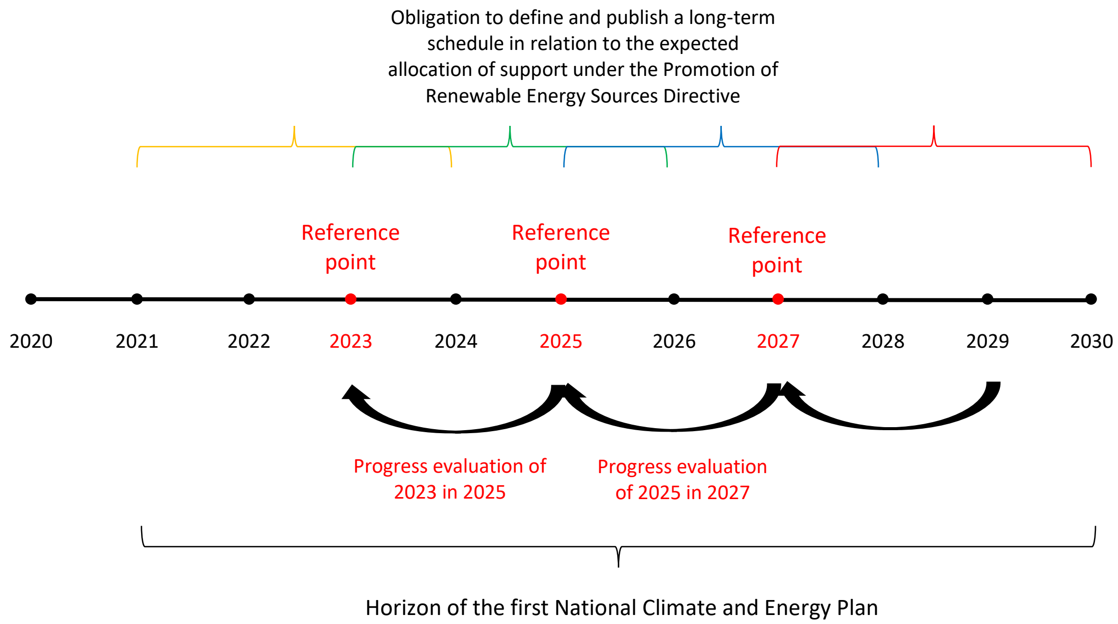
A new form of regulation in the law is set in several steps. The first step is to create the actual Integrated Plan with a forecast for 2021–2030. The Integrated Plan is implemented in accordance with a government decree, which will cover at least 3 subsequent years. The government decree (GD) is issued 12 months before the first year of the period defined in the government decree, and for the next period the government adds the values for the following period (year) by a decree. The right to the above forms of support for power-generating facilities, heat-generating facilities or biomethane-generating facilities commissioned from 1 January 2021 or for modernised generating facilities and generating facilities receiving 'maintenance' support applies to the supported sources specified in this decree – there will no longer be an automatic statutory entitlement to support. The act also stipulates the content of the government decree, which will at least specify the types of supported sources, the types and forms of support, the types of facilities and the amount of installed capacity of power-, heat- and biomethane-generating facilities to be supported, the maximum amount of financial security and its form in the case of an auction, the definition of the types of supported energy sources (SES) which, in the case of auctions, cannot participate without a building permit or the determination of whether there will be a joint auction for new and modernised power-generating facilities, and the duration of the electricity support and heat support to maintain the operation of a power-generating facility and heat-generating facility. Effective regulation and control of the achievement of predicted and target values of energy from RES will be carried out every month by entering the data in OTE register. If the values are exceeded, the support for other generating facilities will no longer be provided. The amendment to the Act sets out the procedure and the process for the completion of generating facilities under construction.

Relation between the new support scheme and the National Plans

Any support for sources beyond 2020 will be linked to the implementation of the National Energy and Climate Plan (for 2021–2030). State support will be granted in such a way as to achieve the trajectory / the target point and control points specified in this document.

The initiator for the use of appropriate tools to support RES (including SES) is the MIT, after identifying the possibility of non-compliance with the National Action Plans, which will always choose which form of support is most appropriate at the moment to ensure the achievement of the national RES target. In order to ensure predictability of the planned support for investors, in 2021, 2023, 2025 and 2027 the MIT will determine the expected timetable in relation to the expected allocation of total State aid (investment support + operating support, both in the form of officially determined support and in the form of auctions), covering the following three years. This timetable and the estimate of all the support provided for RES (and other SES) for the following 3 years will be set out in a government decree. The government decree will be updated annually, thereby 'activating' the different forms of support for new sources, depending on the need for development and the achievement of targets.

Figure 1: *Relation between support scheme under amendment to Act No 165/2012 and National Plans*



Source: Prepared by MIT for the purposes of the National Plan

ii. Where relevant, specific measures for regional cooperation, as well as, as an option, the estimated excess production of energy from renewable sources which could be transferred to other Member States in order to achieve the national contribution and trajectories referred to in point 2.1.2

Specific measures in the field of regional cooperation may be identified as follows: (i) statistical transfer; (ii) projects of common interest; (iii) the Union Fund for RES; (iv) opening of support schemes; and (v) National Energy and Climate Plan; (vi) cross-border cooperation projects.

Statistical transfer

The Czech Republic does not currently plan on using a voluntary statistical transfer of production from domestic renewable sources to another Member State. Nevertheless, such a potential transfer should not be ruled out. However, the Czech Republic will primarily try to meet the contribution to the European target specified in Chapter 2.1.2. However, the development of renewable sources can of course exceed this target. In this case, statistical transfer of the Czech Republic (in the role of a RES share provider) to another Member State could be considered. The Czech Republic also does not plan on using the transfer to achieve the Czech Republic's target (in the role of a RES share recipient); the target is designed so that the Czech Republic is able to achieve it using national sources. Again, it is not sensibly to exclude the relevant use of statistical transfer in the event that it would not be possible to meet the stated objective on the basis of the domestic development of RES.

Projects of Common Interest (PCI) / Connecting Europe Facility (CEF) projects

The Czech Republic would also welcome its potential involvement in RES-related projects of common interest (PCI) or projects supported by the Connecting Europe Facility (CEF). At this point, however, it is not possible to provide more specific information. Projects of common interest also depend to a large extent on the interest of investors and the availability of suitable sites.

European RES Fund

The Czech Republic also does not rule out its involvement in the European RES Fund. However, the exact functioning of this fund is not yet fully defined; therefore, it is not possible to provide more specific information in this respect.

Opening of support schemes

The legislative framework for the opening of support schemes is laid down in Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources, in particular Article 5 thereof. The Directive states that Member States may allow participation in renewable electricity support schemes for producers located in other Member States. When making available support schemes for renewable electricity, Member States may provide that the aid for the indicative share of the newly supported capacity or the budget allocated to it is made available each year to producers located in other Member States. These indicative shares may reach at least 5 % each year between 2023 and 2026 and at least 10 % between 2027 and 2030 or the level of electricity network interconnection of the Member State concerned in any given year, whichever is the lower. The Czech Republic reflected the above legislative framework in the preparation of the amendment to Act No 165/2012, on supported energy sources (the Directive was not effective when the amendment was being prepared). If necessary, the above Article will be further transposed into national legislation by 30 June 2021.

National Energy and Climate Plan

The Czech Republic considers the preparation of the National Energy and Climate Plan to be a measure for regional cooperation in the field of RES in itself. On the basis of this planning document, it will be possible to compare the planned approaches of individual Member States and, where appropriate, to identify opportunities for joint RES projects or cross-border impacts of individual policies.

Cross-border cooperation projects

We can specifically mention the RESINDUSTRY project, which aims, inter alia, to exchange best practices in setting up subsidy programmes. The Czech Republic, Spain, Malta, Austria, Poland, Estonia and Finland are involved in this project[56].

iii. Specific measures on financial support, where applicable, including Union support and the use of Union funds, for the promotion of the production and use of energy from renewable sources in electricity, heating and cooling, and transport

Financial support for the development of renewable sources can be divided into three basic groups:

- **Measures paid by the owners and constructors of buildings without support –** measures and instruments based on the option of 'mandatory' or 'forced' installation of renewable energy generating facilities by owners and constructors of building as part of meeting the requirements for energy performance of buildings, and gradual tightening of these requirements up to nearly zero-energy buildings.

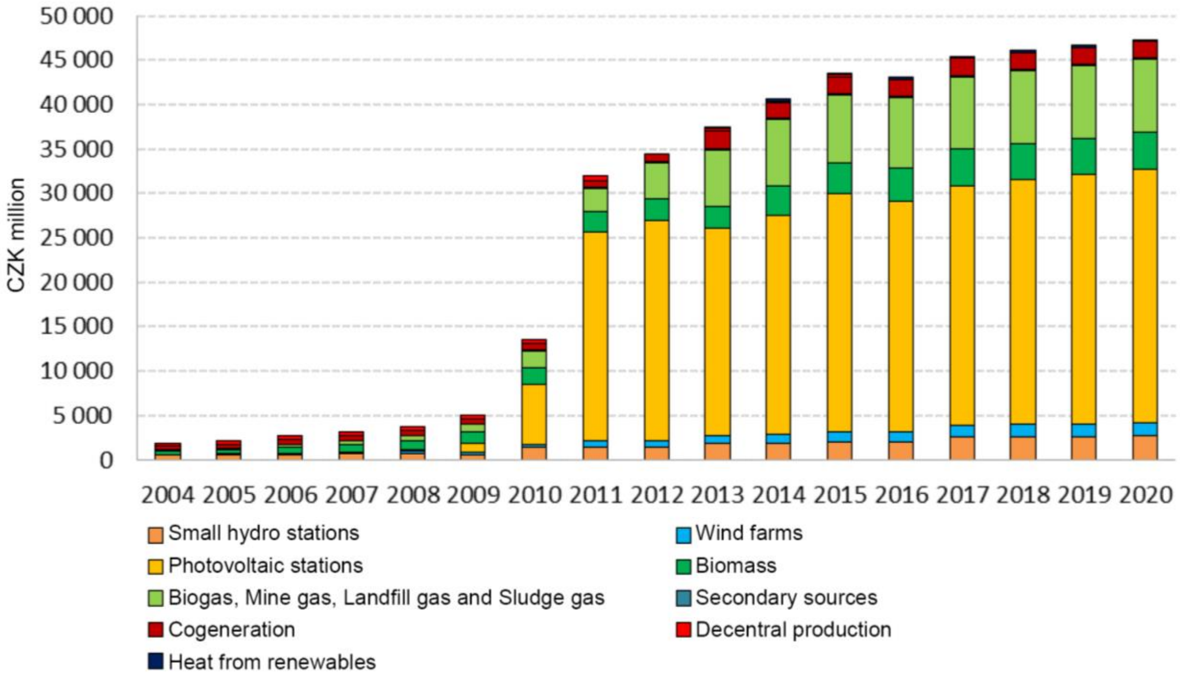
- **Investment support** – maximum use if the Czech Republic has sufficient funding from EU funds or, if available, earmarked funding (for more information, see Chapter 3.2). In addition, the 'Modernisation Fund' consisting of the revenues from the sale of emission allowances and other EU ETS-related instruments will be used to support RES investments. (for more detailed information on the revenues from the auctioning of emission allowances and their potential use, see Chapter 3.2, part viii.).

- **Operating support** – support will be provided for certain types of RES whose production cost is currently higher than the market price and investment support alone will not ensure their further development. For biomass and biogas sources, support will be provided to the maximum possible energy efficiency of using this primary fuel, i.e. methane production and power generation in a high-

[56] For more information see the following link.

efficiency CHP facility. This support will also be used to cover the fuel cost difference, as the amount of support will be determined so as to offset the increased cost of purchasing RES fuel compared to fossil fuel or to offset the increased cost of producing RES energy compared to the market price of energy. Chart 11 illustrates historical cost of operating support for existing sources (with extrapolation for 2020). Chart 12 development of funds for operating support from the State budget.

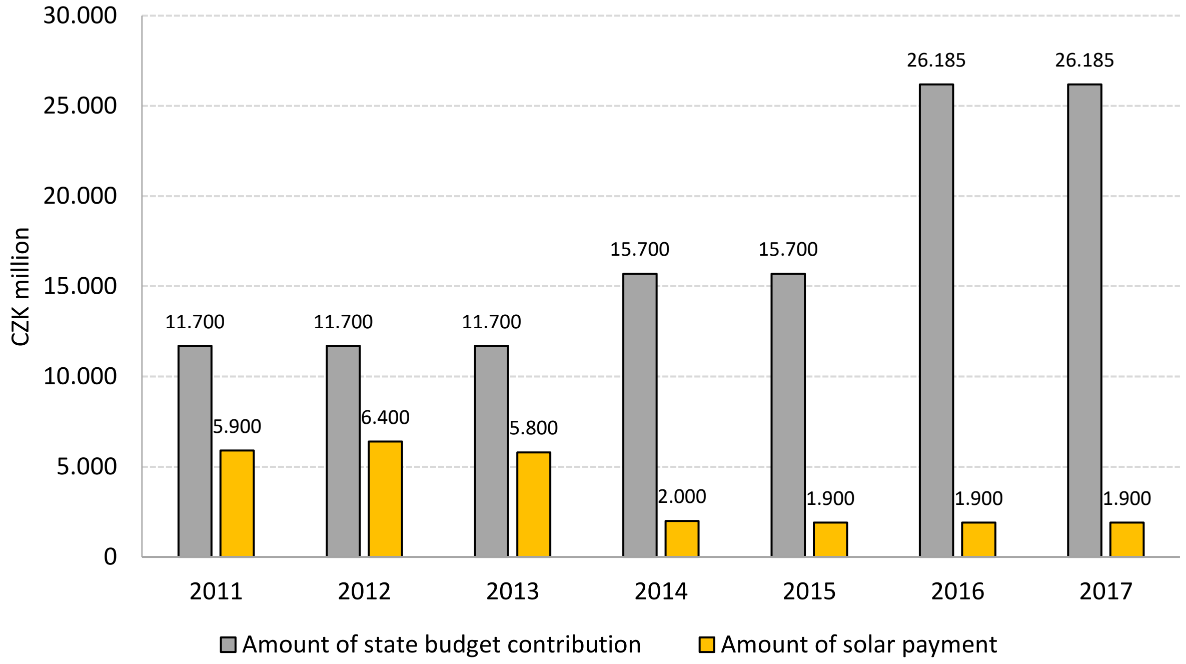
Chart 11: *Historical cost of existing operating support for SES (2004–2020)*[57]



Source: 2004–2012 – ERO; 2013–2017 – OTE, a.s., 2018–2020 forecast

[57] An extrapolation for 2019 and 2020.

Chart 12: *Developments in the amount of the State budget contribution and solar deduction in 2011–2017*[58]



Source: Ministry of Industry and Trade; Ministry of Finance

For more information regarding the funding of RES development, see Chapter 5.3.

iv. Where applicable, the assessment of the support for electricity from renewable sources that Member States are to carry out in accordance with Article 6(4) of Directive (EU) 2018/2001

In accordance with the requirements of the Promotion of Renewable Energy Sources Directive, the Czech Republic shall, at least every five years, assess the effectiveness of its national support schemes for electricity from renewable sources and their effects on different consumer groups and on investments. The results of this assessment will be taken into account in the long-term planning (as may be indicated in the update of the National Plan) and the results may be reported and commented on in the progress reports in accordance with the requirements of the Energy Union Governance and Climate Action Regulation.

v. Specific measures to introduce one or more contact points, streamline administrative procedures, provide information and training, and facilitate the uptake of power purchase agreements

Summary of the policies and measures under the enabling framework Member States have to put in place pursuant to Article 21(6) and Article 22(5) of Directive (EU) 2018/2001 to promote and facilitate the development of self-consumption and renewable energy communities

Simplifying administrative procedures

The newly set-up building law processes should aim to simplify, accelerate and streamline administrative processes related to issuing building permits. Priority should therefore be given to the

[58] The State budget contribution for RES support is partly financed using the revenues from the sale of emission allowances.

reduction of any administrative procedures leading to the permitting of buildings, focusing on having a single administrative procedure. Such a procedure should result in a single permitting decision replacing all the partial decisions of building authorities (land-use permit and building permit), and the decisions of other administrative bodies and authorities concerned issued in accordance with the applicable legislation. The purpose should be to remove the chain of administrative procedures and, subsequently, administrative decisions, and thus reduce the possibility of appealing against individual decisions and subsequent actions brought before administrative courts. One permitting decision will include all the existing aspects of the land-use permit and will be extended to include some aspects that are currently part of the building permit (construction and technical aspects); it will be issued on the basis of new building documentation with newly defined content and scope (simpler documentation). Subsequently, the building will be constructed on the basis of the 'detail design' notified to the building authority upon the commencement of construction. After completing the construction, the builder submits the as-built documentation with the announcement of the building's entry into use or with an application for use permit. Throughout the process, public interests would be monitored by authorised persons (designer, building manager, technical supervisor of the builder). The entire management process will focus on concentration, with the obligation of the parties, the authorities concerned and the public concerned to put forward their comments on the project as soon as possible, with penalties for non-compliance with that obligation, i.e. disregarding later objections or comments. The assumption is that this single permitting decision, which includes all the permits required to implement a project, will be issued by a single building authority, which will conduct the permitting procedure and issue a decision. The basic 'merging' of the procedure into a single procedure will be carried out in accordance with the Building Act. It is anticipated that, to the maximum extent possible, the relevant authorities defending public interests in accordance with special legislation will be integrated into the new system of state building administration. The concerned authorities which will not be integrated will submit observations for the purposes of proceedings under the new Building Act.

Regarding the issue of computerisation, building authorities will be able to use an entirely new IT system to handle a significant part of their activities electronically, including electronic submission of forms and documentation and other documents relevant to the procedure. Unifying all document formats and creating an information system for electronic procedures before building authorities will reduce administrative burden and streamline activities, both financially and in terms of time. At the same time, it would increase the efficiency of public administration, thus increasing the international competitiveness of the Czech Republic. It would also increase the transparency of all the agenda processes in the entire Czech Republic, as well as the mutual coordination of the individual authorities concerned, persons concerned or the possibility of monitoring statistical data. By standardisation and building a unified information system, building authorities will be able to provide higher quality services. By the end of January 2020, a sectional draft of the new Building Act should be submitted to the Government, and a new Building Act should be published in the Collection of Laws by the end of 2020, with individual provisions expected to gradually come into effect during 2021.[59]

Encouraging and facilitating the development of renewable energy self-consumption and renewable energy communities

The Czech Republic will establish a framework to support and facilitate the development of the renewable energy community ('community energy'), through both legislative and non-legislative measures. This framework will be developed on the basis of an evaluation of existing barriers to the

[59] The information given in this subchapter is drawn from the factual intent of the new Building Act, approved by Government Resolution No 448 on 26 June 2019.

development of community energy and will include specific objectives, plans and policies. In this context, the EU directive on the promotion of the use of energy from renewable sources will be transposed into the Czech legal system, which will strengthen the rights of community energy participants and lead to the expansion of a number of related projects.

Currently, it is also planned to introduce some financial support for the 'community projects', which can also be seen as a community for renewable energy sources. However, specific support settings cannot be anticipated at this point. Some partial information and assumptions about funding in this area are provided in Chapter 5.3.

vi. Assessment of the necessity to build new infrastructure for district heating and cooling produced from renewable sources

Heat supply systems represent energy infrastructure that is necessary for the efficient use of heat from renewable and secondary energy sources which are impossible or inefficient to be acquired and used separately in individual buildings (less valuable biomass, biogas from biowaste, geothermal energy, waste heat from industrial processes, etc.). The use of locally available heat sources contributes to the decentralisation of the energy sector, reduces dependence on fossil fuel imports and strengthens the local economy.

The Czech Republic has a developed heating sector that needs to be gradually transformed for the use of low-carbon energy sources, including energy from secondary sources and waste heat, and their transport to consumers, especially in urban agglomerations.

In view of achieving the Czech Republic's 2030 target, the development of the use of renewable energy sources in existing heat supply systems will be crucial. The Czech Republic therefore plans to support mainly the modernisation of existing heat supply systems in order to meet the requirements for efficient energy supply systems under the Energy Efficiency Directive. However, there is also room for the creation of new (especially smaller) renewable heat supply systems, for example through the use of heat from biogas stations, which today are mostly used only for electricity generation and potentially have a large amount of heat produced from renewable sources. The solution could be the conversion of existing biogas power plants to biomethane plants and the use of biomethane for CHP in a place using heat.

vii. Where applicable, specific measures on the promotion of the use of energy from biomass, especially for new biomass mobilisation taking into account: (i) biomass availability, including sustainable biomass: both domestic potential and imports from third countries; (ii) other biomass uses by other sectors (agriculture and forest-based sectors); as well as measures for the sustainability of biomass production and use

The following measures can be considered as measures on the promotion of the use of energy from biomass:

- Investment support – operational programmes and State programmes
  - New Green Savings (Ministry of the Environment)
  - OP E 2014– 2020 (Ministry of Environment and Regions)
- Operational programmes
  - Operational programme Enterprise and Innovation for Competitiveness (Ministry of Industry and Trade)
  - Operational Programme Environment (OP E) (Ministry of the Environment)
- Exemption from real estate tax (in accordance with Act No 338/1992) for selected groups of sources (geothermal energy sources including heat pumps, solar collectors and biomass energy sources)

– Indirect support by promoting cogeneration from renewable energy sources
– Direct operating support of renewable heat in accordance with Act No 165/2012.
– Higher charges for landfilled municipal waste, prohibition of landfilling of recoverable waste

The implementation of appropriate measures leading to an efficient and effective use of the biomass energy potential in the Czech Republic is described in the Action Plan for Biomass in the Czech Republic[60].

For detailed information regarding the availability of biomass, see Chapter 2.1.2.

3.1.3 Other elements of this dimension

i. Where applicable, national policies and measures affecting the EU ETS sector and assessment of the complementarity and impacts on the EU ETS

The EU ETS is partly affected by the promotion of the production of electricity from renewable sources and energy savings in final consumption, leading to a reduction in the demand for emission allowances in installations within the EU ETS.

Energy savings programmes (such as New Green Savings) are gradually influencing the EU ETS in terms of the number of installations included in the system. About 30 % of the approximately 300 installations are just above the thermal input threshold for inclusion in the EU ETS (20 MW). Energy consumption, including heat off-take from central heat supply systems within the EU ETS, is decreasing due to the programmes, and these installations are gradually forced to shut down oversized low-efficiency solid fossil fuel boilers and replace them with a new appropriate source such as natural gas. This reduces the applicable heat input below the 20 MW threshold and the facility ceases to fall within the EU ETS. Since 2013, this has annually eliminated an average of five installations from the EU ETS, and this trend is gradually accelerating.

ii. Policies and measures to achieve other national targets, where applicable

Policies and measures to achieve national targets are detailed in other parts of this document. The Czech Republic considers it relevant to mention in this section the plans and measures to adapt to climate change.

The Strategy for Adaptation to Climate Change in the Czech Republic (hereinafter the ‘Adaptation Strategy of the Czech Republic’) was approved by Government Resolution No 861 of 26 October 2015. The document has been prepared for 2015–2020 with the view to 2030. It is the result of inter-ministerial cooperation, with the Ministry of the Environment being responsible for the overall coordination. The aim of the Adaptation Strategy of the Czech Republic is to adapt to the impacts of climate change as much as possible, to maintain good living conditions and to preserve and potentially improve the economic potential for future generations.

The Adaptation Strategy of the Czech Republic identifies the following priority areas (sectors), which are expected to be most affected by climate change. These sectors are forestry, agriculture, water regime in the landscape and water management, urbanised landscape, biodiversity and ecosystem services,

[60] The document is available at: http://eagri.cz/public/web/mze/zivotni-prostredi/obnovitelne-zdroje-energie/biomasa/akcni-plan-pro-biomasu/akcni-plan-pro-biomasu-v-cr-na-obdobi.html

health and hygiene, tourism, transport, industry and energy, emergencies and the protection of the population and the environment.

Continuous implementation of the Adaptation Strategy of the Czech Republic will be evaluated in 2019 and then every 4 years.

The Adaptation Strategy of the Czech Republic is implemented by the National Action Plan for Adaptation to Climate Change (hereinafter the 'Action Plan'), which was approved by Government Resolution No 34 of 16 January 2017. The Action Plan elaborates the measures outlined in the Adaptation Strategy of the Czech Republic into specific tasks, assigning responsibilities, implementation deadlines, relevance of measures concerning individual climate change manifestations and sources of funding.

The Action Plan is structured on the basis of climate change manifestations such as long-term drought, rising temperatures, extreme meteorological phenomena and natural fires. Given that these phenomena cut across sectors, inter-ministerial cooperation is needed to prevent and address negative impacts, in order to ensure coordination of the implementation of adaptation measures across sectors. The Action Plan contains 33 specific targets and 1 cross-cutting target on education, training and awareness-raising. The individual targets are pursued by 52 priority measures and 160 tasks. The 34 specific targets include a total of 350 tasks, of which 160 are priority 1 tasks, 150 are priority 2 tasks and 40 tasks fall under the cross-cutting education and training target.

As an EU Member State, the Czech Republic is committed to common EU targets and is actively involved in negotiating the adaptation policy within the EU. The Adaptation Strategy of the Czech Republic is in line with the EU Adaptation Strategy.

iii. Policies and measures to achieve low emission mobility (including electrification of transport)

3.1.3.1 National Action Plan for Clean Mobility[61]

National Action Plan for Clean Mobility

Policies and measures to support the development of low emission mobility are contained, in particular, in the National Action Plan for Clean Mobility 2015–2018 with a view to 2030 (NAP CM). The NAP CM is based on the requirement of Directive 2014/94/EU on the deployment of alternative fuels infrastructure to adopt the relevant national policy framework for the development of alternative fuels markets in the transport sector and related infrastructure. The NAP CM deals with electromobility, CNG, LNG and also with hydrogen technology (or fuel cell technology)[62]. Due to the direct link to Directive 2014/94/EU, this document applies primarily to those alternative fuels for which that Directive requires the Member States to define national targets for the development of the relevant charging and filling station infrastructure within the above national framework, where this is considered desirable (see area of hydrogen filling stations). This focus of the NAP CM is also in line with the effort to support primarily technologies that are currently on the brink of full commercial use.

The NAP CM contains a total of 49 specific measures, including the determination of the deadline and responsibilities, which are divided into the following thematic areas: (i) legal/legislative measures; (ii) direct incentives to purchase alternative fuel vehicles; (iii) tax incentives; (iv) non-financial incentives

[61] The document is available at: https://www.mpo.cz/cz/prumysl/zpracovatelsky-prumysl/automobilovy-prumysl/narodni-akcni-plan-ciste-mobility--167456/

[62] The update also partially addresses other alternative fuels, such as LPG / bio-LPG, synthetic fuels and ammonia-based fuels.

on the demand side (including related administrative measures); (v) research, technological development and demonstration; (vi) other measures.

The implementation of the NAP CM is continuously monitored and evaluated; the outputs from this evaluation are included in the annual reports, which are submitted to the Government of the Czech Republic for approval/information by 30 June of each year. Table 43 shows a comprehensive summary of the development of clean mobility based on the document Information on the implementation of the measures under the National Action Plan for Clean Mobility (NAP CM) for 2017.

Table 43: *Indicators of clean mobility development*

Indicator	Year	Estimated number according to NAP CM for the year	Actual number for the year
Number of electric vehicles (battery-only electric vehicle / plug-in hybrid)	2017	1 200/3 800	1 472/600[63]
Number of charging points	2017	270[64]	280
Number of CNG vehicles	2017	22 830[65]	18 900
Number of public CNG filling stations	2017	135	164
Number of LNG filling stations	2017	0	1[66]
CNG consumption in transport (m^3 million)	2017	64.5[67]	67.5
LNG consumption in transport (m^3)	2017	0	0

Source: Information on the progress towards the National Action Plan for Clean Mobility (NAP CM) for 2017

During 2019, the Update of the National Action Plan for Clean Mobility (below also the 'NAP CM Update') was prepared, but it was not subject to commenting at the time of preparation of the National Plan of the Czech Republic. In order to provide the most up-to-date information, below is, among other things, the information from this proposal, but it should be stressed that this is not an approved version of the document; it is still subject to change and the formulation do not anticipate the final version of this document. At the beginning of 2020, the NAP CM Update should be submitted for approval to the Czech Government. This document will then be provided to the representatives of the European Commission.[68]

Beyond the NAP CM there are also some other strategic materials that contain measures and policies aimed at achieving more extensive development of low emission mobility. These include, for example,

[63] Plug-in hybrids were not independently monitored before 2018. According to 2018 statistics, it can be estimated that plug-in hybrids account for less than 10 % of total hybrid registrations.
[64] Electrical engineering Industry Association (270 stations and 631 available charging points)
[65] This is a moderately optimistic scenario (Option 1)
[66] The filling station was in trial mode.
[67] This is a moderately optimistic scenario (Option 1)
[68] The information below is from the NAP CM Update, in order to keep the National Plan as up-to-date as possible. However, it should be stressed that at the time of preparation of the National Plan it is still unapproved material that may still be subject to partial changes during the approval process.

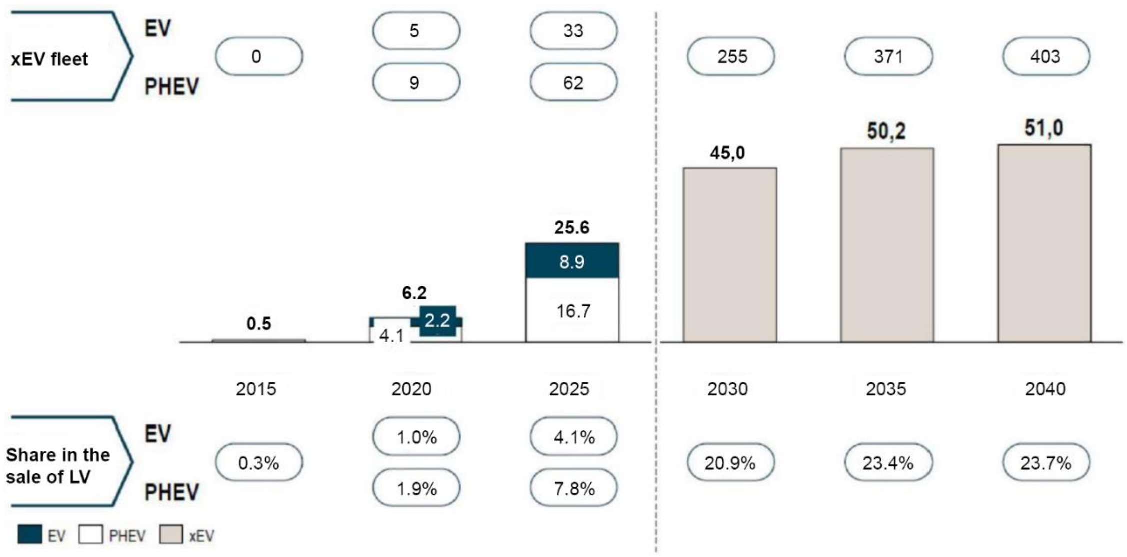
the Action Plan for the Future of the Automotive Industry in the Czech Republic[69], or the Memorandum on Long-Term Cooperation in the Development of Natural Gas Vehicles 2025[70].

3.1.3.2 Electromobility

Expected development

Chart 13 shows a baseline scenario for the development of electromobility until 2040 with a detailed focus on the period until 2025 that was formulated as a part of the NAP CM in 2015. Chart 14 then shows the prediction of the development of electromobility prepared by the Car Importers Association for the purpose of NAP CM Update. Here, the number of clean electric vehicles (BEVs) in the streets is estimated at 217 200 vehicles by 2030, which is about 3 % of the fleet. At the same time, this objective corresponds to the medium-term forecast prepared for the purposes of the NAP SG. For the purpose of setting the strategic electromobility development goal within the NAP CM Update, an interval was chosen that corresponds to reaching a number of 220 000 to 500 000 electric vehicles (BEV) in the streets by 2030. The upper limit of the interval represents approximately 7 % share of electric vehicles (BEV) in the Czech fleet. The estimate of the development of the number of electric buses in the Czech fleet in 2030 corresponds to a level of approximately 800 to 1 200 units (without trolleybuses). It is also desirable to focus on the introduction of electromobility in the freight transport segment at least in the medium term. The NAP CM or the NAP CM Update indicate the specific measures needed to ensure the above development.

Chart 13: *Baseline scenario of electromobility development in the Czech Republic according to NAP CM (thousands of vehicles)*

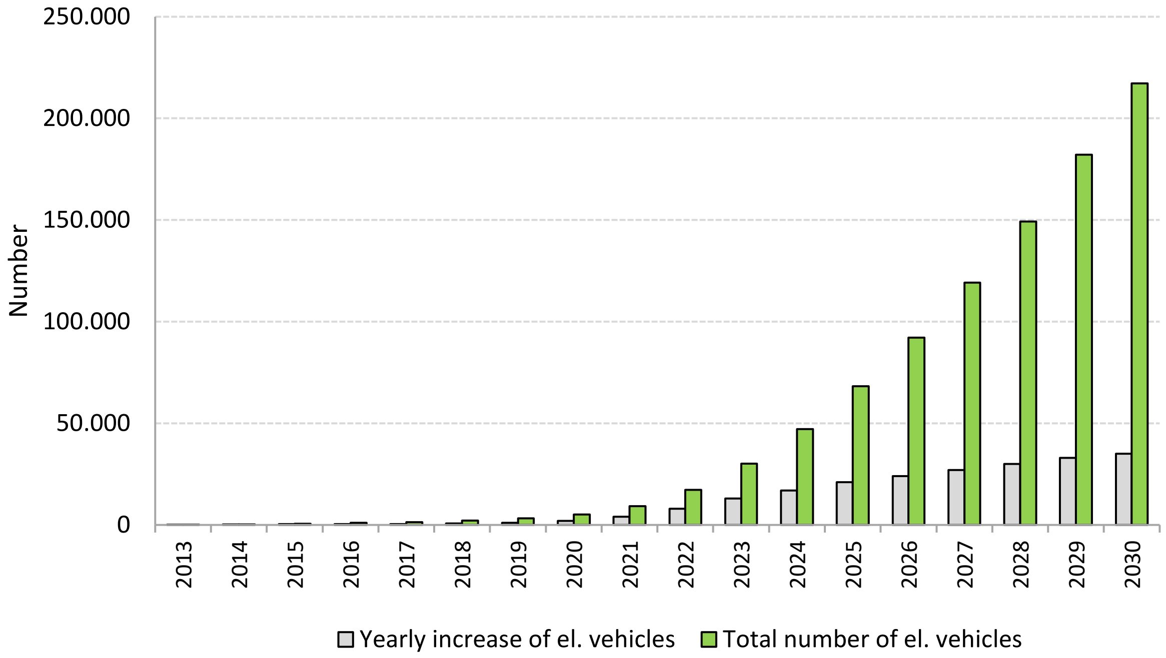


Source: National Action Plan for Clean Mobility

69 The document is available at: https://www.vlada.cz/assets/media-centrum/aktualne/Akcni-plan-o-budoucnosti-automobiloveho-prumyslu-v-CR.pdf

70 The document is available at: https://www.mpo.cz/assets/cz/prumysl/2018/5/Memorandum-CNG.pdf

Chart 14: *Number of BEVs prediction according to CIA*



Source: Car Importers Association for the purposes of the NAP CM Update

Charging infrastructure

When estimating the electric vehicle market at the target level for the above vehicles, taking into account the expected factors (increase of charging stations performance, building of charging hubs, share of public and non-public charging), the need for public charging stations is expected to be such as to allow a supply of 1 000 – 1 500 GWh of electricity/year (low), up to 2 000 – 3 000 GWh of electricity/year (high) by 2030. In order to develop electromobility at the level of 220 thousand, the NAP CM Update quantifies the need for publicly accessible infrastructure in 2025 at 6 200 charging points and 19 000 charging points in 2030. Achieving development in the amount of 500 thousand vehicles then corresponds to the need of 11 000 charging points in 2025 and 35 000 charging points in 2030[71].

The initial demand for public charging stations in the medium and high scenarios can also by satisfied by the involvement of DSOs, provided that this could not be ensured by market means and subject to meeting the conditions laid down by Article 33 of Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity.

Link to increasing the share of RES in the transport sector

The developments in electromobility and future electricity consumption in the transport sector are also very important in terms of contributing to the 14 % target of share of renewable energy in transport. In 2016, total electricity consumption in transport amounted to 1 636 GWh, with the rail transport accounting for the vast majority (94 %). In line with the possibility to use the European renewable energy mix in dividing electricity production into renewable and non-renewable components in line with

[71] Within the NAP CM Update, these charging infrastructure values are also divided into more detailed performance-based intervals.

the current text of the Directive, the total electricity consumption of RES in transport totalled 449 GWh in 2016. In 2016, electricity from RES in transport accounted for 1.6 % of the total of 6.42 %.

Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources brought many partial changes. These include, in particular, the change in the rail transport multiplier from 2.5 times to 1.5 times. Furthermore, the change in the road transport multiplier from 5 times to 4 times, the implicit limitation of the possibility to use the European mix[72] and the addition of other fuels to be included in the denominator. Based on the analyses carried out by the Czech Republic, the contribution of electricity consumption in transport in 2030 is expected at 0.8 %[73]. This corresponds to the total electricity consumption in road transport at approximately 419.8 GWh[74] (including trolleybus transport), where approximately 67.5 GWh corresponds to the share of renewable electricity, assuming an approximate 16.1 % share of RES in electricity by 2030 (this share corresponds to the methodology for the period 'n-2', i.e. the share in 2028). This is an increase of about 350.8 GWh compared to the current situation (in 2016 the electricity consumption in road transport was 69 GWh the vast majority of which was attributed to trolleybus transport). Chart 15 It shows the target consumption of electricity in road transport depending on the share of RES in the national electricity mix. Chart 16 then shows the dependence of the electricity consumption in road transport on the development of consumption in rail transport (assuming a 16 % share of RES in the electricity mix), which amounted to 1 536 GWh in 2016.

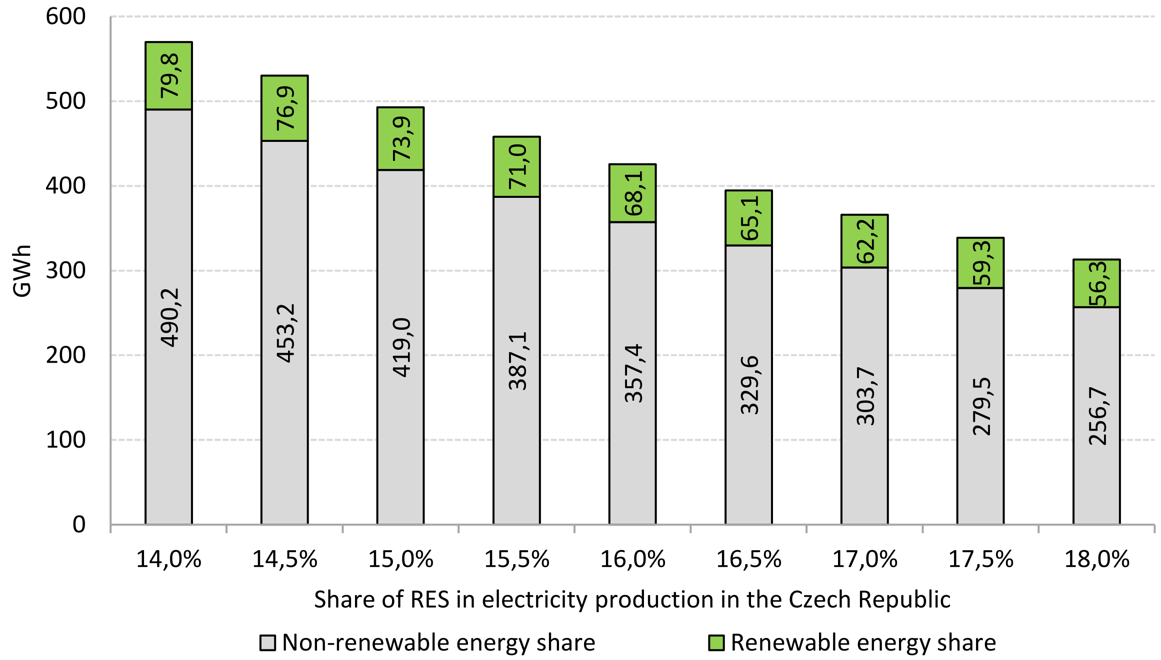
The strategic objective of the NAP CM Update is to achieve 220–500 thousand electric vehicles (BEV) in 2030 (see above). Based on the material prepared for the purposes of NAP SG, it is stated below that the consumption of 200.65 thousand passenger electric cars, which is approximately comparable to the lower limit of the interval defined in the NAP CM Update, corresponds to approximately 296.5 GWh (this depends, of course, on the accepted assumptions). In this case, in order to achieve a 14 % transport sector contribution to the RES share target, the other segments, namely bus transport and the commercial vehicle category, would need to develop at around 120 GWh to reach 420 GWh. If the development exceeds the minimum value of the NAP CM Update interval, the contribution of electricity consumption in the transport sector to the fulfilment of the RES share in this sector should be fulfilled or even exceeded, which may compensate for insufficient development in other segments or in this case, a higher proportion than the indicated 14 % may be achieved.

[72] In the opinion of the Czech Republic, this unfairly discriminates against countries which meet their RES targets primarily in the heating and cooling sector compared to countries with a higher RES share in the electricity sector, which may also lead to a lower motivation for the development of electromobility if this development is seen strictly as an instrument for meeting renewable energy targets. Also, the Czech Republic believes that the prohibition to use the European mix was not sufficiently discussed and the impact of this change was not sufficiently considered.

[73] The conservative value compared to the current contribution to the 1.6 % share is mainly due to changes in the parameters of the Directive, which relatively reduce the share of electricity from RES.

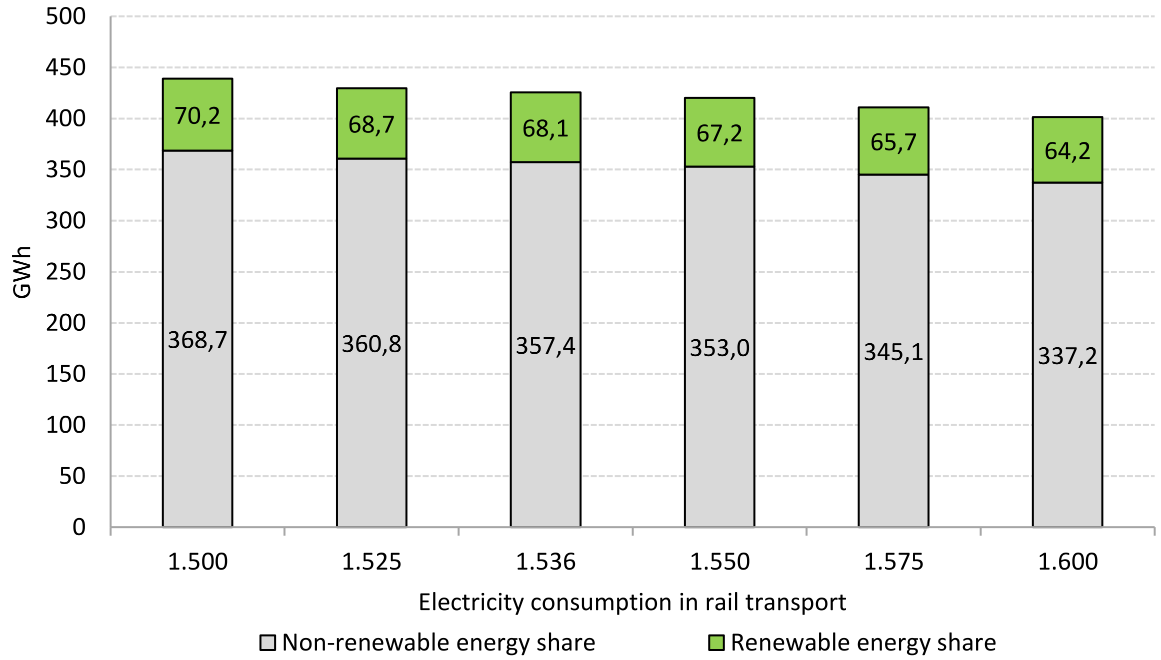
[74] This is a decrease compared to the value of 551.3 GWh, which was provided in the Draft National Plan due to an increase in the share of RES and, in particular, an increase in the share of RES in the electricity sector.

Chart 15: *Contribution of road transport necessary for progress towards the RES target depending on the share of electricity from RES*



Source: Prepared by MIT for the purposes of the National Plan

Chart 16: *Necessary contribution of road transport for the progress towards the RES target depending on consumption in rail transport (for 16 % RES share)*



Source: Prepared by MIT for the purposes of the National Plan

Development of electromobility in terms of network infrastructure development

Another relevant document in the field of the future development of electromobility is the National Action Plan for Smart Grids with its accompanying materials. This is, in particular, a study for the purposes of the National Action Plan for Smart Grids, which focuses, among other things, on analysing the measures necessary to ensure the readiness of distribution systems. These values then also constitute the default data for the respective network models. The medium development scenario reflects the lower limit of the interval defined in the NAP CM Update and roughly corresponds to it.

Table 44: *Low scenario of electromobility development according to NAP SG (for 2030)*

Vehicle category	Number of vehicles	Share	Consumption in GWh
Passenger cars (cat. M1)	74 331	1.33 %	109.85
Buses (cat. M2, M3)	286	1.34 %	25.43
Utility vehicles (cat. N1, N2, N3)	6 679	0.95 %	91.11

Source: Prediction of electromobility development in the Czech Republic for NAP SG purposes (April 2018)

Table 45: *Medium scenario of electromobility development according to NAP SG (for 2030)*

Vehicle category	Number of vehicles	Share	Consumption in GWh
Passenger cars (cat. M1)	200 647	3.59 %	296.52
Buses (cat. M2, M3)	583	2.72 %	51.80
Utility vehicles (cat. N1, N2, N3)	15 949	2.17 %	217.55

Source: Prediction of electromobility development in the Czech Republic for NAP SG purposes (April 2018)

Table 46: *High scenario of electromobility development according to NAP SG (for 2030)*

Vehicle category	Number of vehicles	Share	Consumption in GWh
Passenger cars (cat. M1)	785 788	14.04 %	1 161.23
Buses (cat. M2, M3)	978	4.56 %	86.88
Utility vehicles (cat. N1, N2, N3)	45 497	5.94 %	620.61

Source: Prediction of electromobility development in the Czech Republic for NAP SG purposes (April 2018)

3.1.3.3 Natural gas

From a European perspective, the development of CNG in the Czech Republic has long been favourable. The development of the CNG car fleet, despite the decrease in sales in 2018 and in the first half of 2019, caused by the lack of CNG cars on the Czech market, has been growing by about 30 % year-on-year for a long time. There are currently around 23 000 natural gas vehicles in the Czech Republic (see Table 47). The average year-on-year growth of the vehicle fleet has long been maintained at 32 %. The number of CNG buses has been growing every year thanks to the use of grants for their purchase, and there are currently 1 300 of them in operation, which represents more than 6 % of the Czech fleet. The issue parking the CNG cars in collective underground garages remains one of the significant barriers affecting their development.

The infrastructure of CNG filling stations is developing every year. There are currently 199 public CNG filling stations in the Czech Republic, as well as about 50 non-public CNG filling stations and about 200 in-home slow filling stations. More than 60 % of public dispensing points are found in gas stations, others are accessible at company premises or as stand-alone dispensing points. Private companies and some transport companies operate non-public CNG filling stations, of which there are over 50. Companies and small traders also use slow CNG filling equipment (home filling machines), of which there are more than 200. The average year-on-year growth is 25 %.

The development of LNG infrastructure is still in its infancy in the Czech Republic. There is one public LNG station and several LNG mobile filling stations, mainly used by companies to test LNG-powered trucks. However, it is important that there is currently a project being prepared with the subsequent implementation of 13 new LNG public filling stations, which will be created by 2022 thanks to the subsidy support of the Ministry of Transport within the Operational Programme Transport.

The potential and use of biomethane, both in the form of bioCNG and bioLNG, is also an integral part of this issue. In the long run, this is a key issue, since biomethane has significantly lower greenhouse gas emissions than fossil CNG and LNG. The gradual replacement of fossil CNG and LNG with biomethane is essential for the environmental benefits of this alternative fuel.

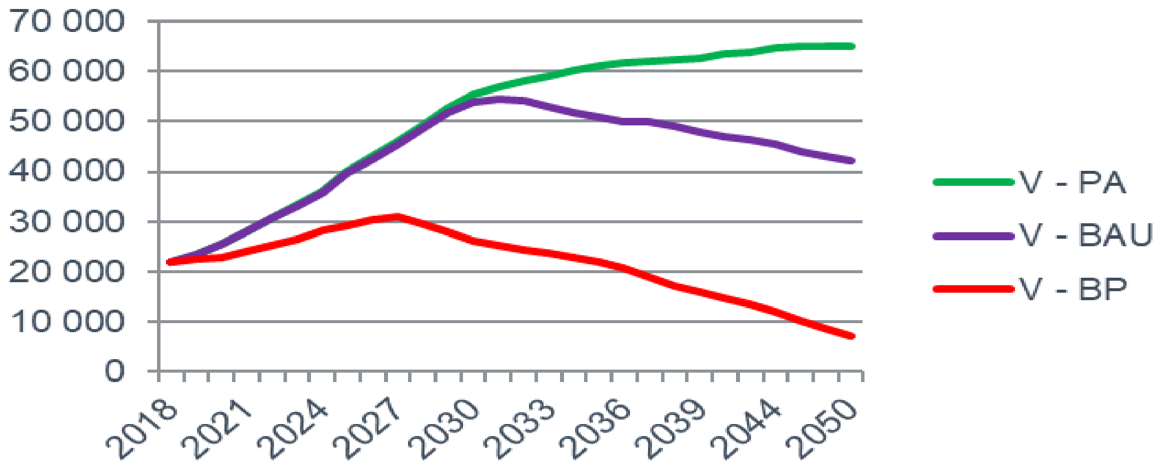
Table 47: *Number of filling stations, vehicles and CNG sales*

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Public filling stations	32	34	45	50	75	108	143	164	185
Vehicles total	2 500	3 250	4 300	6 300	8 055	12 000	15 500	18 900	22 600
Passenger cars	2 112	2 807	3 818	5 747	7 205	10 750	13 970	17 160	20 660
Buses	300	336	362	404	518	820	1 020	1 120	1 234
CNG sales (m^3)	10.058	12.089	15.242	21.952	29.912	43.589	59.346	67.603	75.832
CNG sales growth (%)	24.4	20.2	26.0	44.0	36.3	45.7	36.1	13.9	12.2

Source: CNG4you

Chart 17 shows the expected development of the number of natural gas vehicles based on the NAP CM Update. In the case of natural gas, it is a range of approximately 26 000 to 55 000 vehicles by 2030, of which the LNG segment should represent a market of 3 500 to 6 900 vehicles during this period. The expected development of the number of natural gas vehicles is significantly more conservative than the corresponding target contained in the original NAP CM. This is a reaction, among other things, to the current developments in the field of European legislation, which is pushing manufacturers to develop emission-free vehicles.

Chart 17: *Development of the number of natural gas vehicles with a view to 2050*



Source: Czech Gas Association for the purposes of preparing the NAP CM Update

According to the strategic objectives of the NAP CM Update, the development of the CNG vehicle market should reach 35 000 vehicles by 2030. In the case of LNG vehicles, the aim of the NAP CM Update is to reach 5 000 vehicles by 2030. This development is of course conditioned by a number of factors, which are described in more detail in the NAP CM Update. With regard to the expected further development of the CNG car fleet in the Czech Republic, the NAP CM Update expects an infrastructure of approximately 350 to 400 public CNG filling stations by 2030. With respect to LNG, the NAP CM Update aims to reach 30 LNG filling stations. While it can be expected that the projected development of the CNG infrastructure may already happen on a purely market basis (i.e. without any public support), the development of LNG infrastructure may need to be supported at least partially from public sources. If natural gas in the transport segment is to be perceived by the general public as an environmentally friendly fuel, it is necessary to gradually replace it with advanced biomethane, which is also related to meeting the targets for increasing the share of RES in the transport sector under Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources (see Chapter 4.2.2, part (ii)). Therefore, the development of biomethane production and its application in the transport sector in the Czech Republic is one of the strategic objectives of the NAP CM Update. The NAP CM or the NAP CM Update indicate the specific measures needed to ensure the above development.

3.1.3.4 Hydrogen mobility

As mentioned above, the original NAP CM focuses on the use of hydrogen in transport rather marginally. The reason is that in 2015, when this document was being prepared, there was no hydrogen vehicle registered in the Czech Republic, and that the only hydrogen station in the Czech Republic is not publicly accessible and is used primarily for a single hydrogen bus operated under the project TriHyBus of Nuclear Research Institute Řež in 2009–2015.

Nevertheless, the NAP CM declares the interest of the Czech Republic to include hydrogen in the national policy framework for alternative fuels in transport under Directive 2014/94/EU on the implementation of alternative fuels infrastructure. This is evidenced by the target set by the Czech Republic for the development of hydrogen filling stations. According to this document, 3–5 stations should be built in the Czech Republic by 2025. This is the initial target, with the NAP CM expecting it to increase in the future, based on a study that would more fully assess the potential of hydrogen mobility in the Czech Republic. The NAP CM also notes that hydrogen mobility should be supported by the same measures as electromobility, because it constitutes ‘hydrogen electromobility’. Therefore, the development of infrastructure for hydrogen filling stations should be stimulated, for example by investment support. Similarly, it is assumed that hydrogen vehicles will enjoy from the same benefits as electric vehicles, whether in terms of parking in cities or the use of preferential lanes. These vehicles are also assumed to be exempt from paying the motorway toll charges. In order to realise these benefits, hydrogen vehicles will be classified as ‘electric vehicles’, which will be issued free special registration plates (beginning with ‘EL’). The issue of these special registration plates (including for hydrogen vehicles) will begin in April 2019.

The task of the NAP CM regarding the study of hydrogen mobility opportunities in the Czech Republic was fulfilled in 2017, when the study was prepared for the Ministry of Transport by Grant Thornton Advisory[75]. This study contains 4 scenarios of possible long-term development in the area of hydrogen mobility in the Czech Republic, with the baseline scenario considered the most realistic. This scenario envisages that there should be 115 886 hydrogen passenger cars and 1 091 hydrogen buses in 2030.

The study also states that one of the main requirements for the development of hydrogen mobility is the existence of a functioning and safe filling station infrastructure. However, its costs cannot be expected, at least in the initial phase, to be borne exclusively by private operators. It is therefore desirable for the State to actively support the construction of both public filling stations for ordinary citizens and the non-public part of the hydrogen infrastructure for public transport or municipal services. In view of this, within the forthcoming grant programme ‘Supporting the Development of Alternative Fuel Infrastructure’, the study recommends that the planned allocation for the sub-programme to support hydrogen stations be doubled compared to the original plan (CZK 100 million).

On the basis of the simulation of possible future scenarios for hydrogen vehicle market development, the study includes the prediction of the number of vehicles and hydrogen filling stations for the years 2025, 2030 and 2050. The model outputs of this study clearly show that if at least the baseline development scenario is to be achieved, at least 12 hydrogen filling stations should be built in the Czech Republic by 2025. For this reason, in the future update of the NAP CM, the Ministry of Transport should adjust the national target of the number of hydrogen filling stations from the current 3–5 to 12 stations.

In June 2017, this study was approved at the Minister of Transport’s Meeting, which stated that this should form the basis for the Ministry of Transport to update the NAP CM. It was subsequently submitted for information to the Government of the Czech Republic. In 2018, some parts of the study (including prediction in the baseline scenario) were further updated. Future update of the NAP CM can see further refinement of developments in this area.

Table 48: *Main conclusions of the updated Study of Hydrogen Mobility Development in the Czech Republic – basic scenario of development of hydrogen mobility in the Czech Republic (September 2018)*

	2020	**2025**	**2030**
Number of hydrogen cars	**53**	**12 782**	**117 169**
Number of hydrogen buses	**2**	**119**	**1 091**
Additional costs per car (CZK thousand)	686	417	84
Additional costs per bus (CZK thousand)	6 037	3 617	2 053

[75] The study ‘Use of Hydrogen Powered Vehicles in Transport in the Czech Republic’ is available at: https://www.mdcr.cz/Dokumenty?lang=en-GB&mssfd=Strategie

Differential costs compared to conventional fuels, in aggregate – hydrogen cars (CZK million)	37	6 006	25 853
Differential costs compared to conventional fuels, in aggregate – hydrogen buses (CZK million)	12	470	2 999
Avoided CO_2 emissions (thousands of tonnes)	**1**	**35**	**308**
Number of filling stations	3	12	117
Aggregate costs of infrastructure support (CZK million)	86	386	3 936

Source: Use of hydrogen drive in transport in the Czech Republic

The NAP CM Update deals with hydrogen technology, or the propulsion of vehicles through hydrogen, in more detail than the original NAP CM and it formulates strategic goals in this area. The NAP CM Update is based on the above study and aims to achieve a range of 40–50 thousand passenger hydrogen vehicles by 2030 in the field of hydrogen mobility. This represents approximately one quarter of the battery electromobility objective. At the same time, the NAP CM aims to reach 95 hydrogen buses by 2025 and 870 hydrogen buses by 2030. In the area of freight transport, it is not yet possible to set such a specific objective, as the above study did not address the area. The target value for 2025 within the Czech Republic is the construction of 15 hydrogen filling stations. Up to 80 hydrogen filling stations should be built by 2030, and this objective may be further specified in the next NAP CM Update following further developments in the hydrogen vehicle market not only in the Czech Republic but also throughout the EU.

3.1.3.5 Other alternative fuels

Other alternative fuels include, in particular, LPG / bioLPG, synthetic fuels and ammonia-based fuels. The NAP CM Update deals with these fuels in more detail, especially in the accompanying analytical material. The following text provides information on expected / possible development only for bioLPG, because bioLPG is the fuel that is most likely to develop among those from the alternative fuels category, at least in the medium term, when compared to other alternative fuels such as synthetic fuels and ammonia-based fuels. In the Czech Republic, alternative fuels from renewable sources can temporarily play a very important role in reducing CO2 production due to the age of the car fleet, the renewal of which is not happening fast enough.

LPG / bio LPG

Fossil LPG

With regard to the way in which LPG is obtained (it is produced as a ‘residue’ in oil refining or extracted as a ‘secondary gas’ in the natural gas extraction, in both cases its volume being about 3 to 4 % of the product produced), LPG is considered as a product whose consistent availability on the market will last for as long as other fossil fuels are available. The decline in its availability can be expected only after a reduction in the supply of fossil fuels to the European market.

BioLPG

A gradual increase in the supply of bioLPG is expected after 2020. BioLPG is created as a by-product in the production of HVO (i.e. essentially waste, as in the case of conventional LPG). New technologies are also being tested for the direct production of bioLPG from waste cellulose, and it can be assumed that other production methods will follow.

Specifics of LPG / bioLPG utilisation on the Czech market

The advantage of LPG on the Czech market is a fully developed distribution infrastructure (about 900 petrol stations) and a high popularity of this fuel (about 170 000 vehicles).

The main potential of this fuel is in the conversions of older vehicles with worse emissions parameters. LPG can thus partially address the emissions of the older fleet for a large part of drivers who do not have enough money to buy a 'cleaner' vehicle and who constantly use cars of an above-average age.

At present, LPG is used almost exclusively in passenger cars and small municipal vehicles. Some development projects (e.g. in Spain, USA) test the further use of LPG in heavy vehicles (e.g. buses). These can be expected to appear very quickly in the Czech Republic as well, because unlike in other alternative technologies there is no need to develop the supply infrastructure.

LPG (propane-butane) as an energy source for households

LPG is used in households as a source for heat production (bulk, in limited cases bottles) or cooking (bottles), in the Czech Republic it is about 80 000 tonnes per year. LPG is an effective alternative in places not connected to natural gas distribution. The advantages of using LPG are again lower emissions (compared to local solid fuel furnaces) and easy handling. Product availability, as well as experience from other countries (UK, Spain, France, Italy…), suggest that LPG may see an increase in consumption in this area if consumers are encouraged to switch to cleaner fuels.

Future of bioLPG 2050+

BioLPG development projects focus on waste recovery. In terms of GHG, it is an emission-neutral source. Current LPG RDE tests also show very low pollutant emissions, so it is a source that is suitable for long-term use also in inhabited areas. The ease of use is also facilitated by the good fuel storability, the long range of the vehicle and minimal technical constraints in production / conversion (a relatively lightweight and well-placeable tanks compared to CNG)

Possible restriction

Like any other alternative fuels, LPG is accepted by the market thanks to tax relief (the current tax rate in the Czech Republic copies the minimum requirements of the EU). The consumption forecast has been prepared on the assumption of keeping the existing tax burden / the LPG tax ratio relative to other available classical or alternative fuels unchanged. Any unilateral increase in the tax on LPG would result in a reduction in the consumption of this fuel.

3.1.3.6 Requirements of Article 25 of Directive (EU) 2018/2001 of the European Parliament and of the Council regarding the achievement of a 14 % share of RES in the transport sector

According to Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, energy suppliers for the transport sector must collectively achieve a 14 % share of energy from renewable sources in a given Member State by 2030. The share of first-generation biofuels must not be higher than 7 % (2020 + 1 %, maximum 7 %), the share of advanced biofuels and biogas must be at least 3.5 % in 2030 (at least 0.2 % in 2022; at least 1 % in 2025). The Czech Republic is trying to break down this target by the suppliers of individual types of individual types of transport fuels, for which certain mandatory percentages of RES will be prescribed, by means of the prepared changes of national legislation. At the same time, the use of first-generation biofuels will be utilised to the maximum extent possible, while respecting both the technical parameters of the quality of individual fuels given by normative documents and the possibility of actual use of the fuels in question given by the fleet in the Czech Republic, which is quite obsolete (average fleet age in 2018 was 14.75 years) and its renewal is slow.

Car manufacturers will also have a significant impact on the use of individual fuels in transport in the coming years, where Regulation (EU) 2019/631 of the European Parliament and of the Council sets average emissions for the passenger cars sold by them within EU to 130g O_2/km, then to 95 g CO_2/km from 2021, with another 15 % decrease from 2025 (compared to 2021) and a 37.5 % decrease from 2030 (compared to 2021). Similar targets are defined for light commercial vehicle manufacturers and even manufacturers of heavier trucks, but there is a time offset for the latter so the process starts from 2025 (the revision of Regulation (EU) 2019/1242 of the European Parliament and of the Council envisages extending the scope to include trailers, buses and other groups of trucks in 2022). The targets for manufacturers will have a decisive impact on the fleet composition and they can potentially improve the use of alternative fuels and propulsion. Given that emission targets for manufacturers are set at EU level and not by individual Member States, it is essential that relevant measures are implemented in the Czech Republic to support the development of the market for alternative fuel vehicles. At the same time, if the fleet is not sufficiently renewed (mainly as a result of insufficient support), imports of older used vehicles, along with all the negative consequences, may increase in the conditions of the passenger car market in the Czech Republic. The assumptions that the targets set for manufacturers will automatically contribute to the renewal of the vehicle fleet may be in line with the conditions of the Czech market. EU requirements for car manufacturers and fuel suppliers are not mutually compatible. For this reason too, as it is currently very difficult to estimate real future developments in these areas, the domestic legislation will allow suppliers of individual fuels to meet their obligations in the field of RES in transport not only directly, but also by exploiting the potential of RES utilisation by other fuel suppliers by associating with them in a similar way the national legislation already allows for emission savings.

At the time of preparation of the National Plan, no precise allocation of obligations to individual fuel suppliers as required by Directive (EU) 2018/2001 was available. The relevant provisions will be transposed into the national legislation of the Czech Republic by 30 June 2021 at the latest. However, the Czech Republic will inform the European Commission of further progress in this area through the relevant progress report.

3.1.3.7 Voluntary commitments of municipalities and cities

Municipalities and cities are among the major emitters of greenhouse gases, where the main sources of pollution are energy consumption (buildings, public lighting, new construction) and transport. As part of strategic planning, many cities and municipalities are becoming aware of this problem and they are undertaking commitments under their own self-governing authority to reduce greenhouse gas emissions in their territory that go beyond national or European legislation. Covenant of Mayors is an example of this. In the future it is necessary to take this trend into account and to support the activities of municipalities in the area of transition to the low-emission regime from the national level.

iv. Where applicable, national policies, timelines and measures planned to phase out energy subsidies, in particular for fossil fuels

A list of energy and fossil fuel subsidies is provided in 4.6, specifically part (iv). These subsidies are key to meeting the EU's climate protection objectives, reducing air pollution, increasing the share of renewable energy sources and improving energy performance. Therefore, the Czech Republic does not intend to systematically phase these subsidies out, also in view of the increased ambition of the EU in these areas by 2030. Information on the projected phasing out of fossil fuel subsidies is also provided in 4.6 part (iv).

3.2 ‘Energy efficiency’ dimension

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2, including planned measures and instruments (also of a financial nature) to promote the energy performance of buildings, in particular with regard to the following:

i. Energy efficiency obligation schemes and alternative policy measures under Articles 7a and 7b and Article 20(6) of Directive 2012/27/EU and to be prepared in accordance with Annex III to this Regulation

When setting up the energy efficiency obligation scheme in accordance with Article 7 of the Energy Efficiency Directive, the Czech Republic draws on experience from the programme period 2014–2020. The design of individual measures is based on knowledge of the potential for energy savings in individual sectors, the cost-effectiveness of these measures and the feasibility of implementing these measures in the Czech conditions. In the period 2014–2020, the Czech Republic encountered limits for the implementation of some alternative measures; and at the same time, the potential of utilising other measures that it has not yet implemented has been identified.

In view of the above, the Czech Republic will fulfil its obligation under Article 7 of the Energy Efficiency Directive by alternative policy measures including financial mechanisms to support energy-saving measures, schemes for voluntary energy efficiency agreements, energy taxes, regulatory and behavioural measures. The choice and setting of measures to fulfil the commitment maximises the potential for achieving synergies between measures.

Table 49: *Measures to comply with Article 7 of the Energy Efficiency Directive*[76]

Measure type	Share in new savings	Share in cumulated savings
Financial mechanisms	41 %	44 %
Voluntary agreements	24 %	32 %
Regulatory measures	4 %	13 %
Behavioural measures	12 %	7 %
Tax measures	20 %	4 %

Table 50 contains a proposal for the implementation of measures meeting the criteria of Article 7 of the Energy Efficiency Directive, including estimated new and cumulated energy savings in the 2021–2030 period, which should ensure that the Czech Republic fulfils the cumulative savings commitment by 2030. Overlaps are taken into account in the calculation of the benefits of each measure and double counting of savings is removed. Detailed information meeting the requirements of Article 7 and Annex V of the Energy Efficiency Directive and Annex III of the Energy Union Governance Regulation is provided in Annex 4 to this document.

The measures are divided into two levels according to the degree of completion of their implementation. The measures in the first part can be considered to be implemented in the Czech Republic by 2020 at

[76] The ratios may vary depending on the specific areas of support (especially with regard to the Modernisation Fund setting).

the latest. At the end of 2020, the Czech Republic will evaluate the success of the implementation and it will revise the amount of achieved energy savings. The amount of energy savings for fiscal measures may be affected by the final amount of allocated funds and the conditions for the use of these funds set by EU or national legislation. In the case of a voluntary agreement scheme, the amount of energy savings will depend on the actual number of actors involved and their expected contributions. In view of the above (possible changes in the settings of measures and the subsequent prediction of energy savings), the possibilities of implementing measures from the 'Additional measures' section of the table will continue to be developed in order to be ready for implementation, not only in case the selected policy measures from the first part of the table prove to be inadequate. The amount of public support, or total investment, is provided in Chapter 5.3.2.2 (Table 125).

Table 50: *Overview of measures in accordance with Article 7 and estimated energy savings for 2021–2030*

Measure	Measure type	New Savings (TJ)	Cumulative savings (TJ)
Policy measures 2021–2030			
Operational Programme Competitiveness 2021–2027	Financial mechanism	2 000	11 000
Operational Programme Environment 2021–2027	Financial mechanism	2 000	11 000
Integrated Regional Operational Programme 2021–2027	Financial mechanism	400	11 500
New Green Savings Programme / Succession NGS Programme	Financial mechanism	19 000	85 600
EFEKT Programme	Financial mechanism	3 000	16 500
PANEL 2013+ Programme	Financial mechanism	1 000	5 500
Modernisation Fund	Financial mechanism	12 300	-[77]
Taxation of household fuels	Tax measure	500	500
Taxation of fuel	Tax measure	20 000	20 000
Prohibition of boilers for 1st and 2nd emission class solid fuels	Regulatory measures	8 000	64 000
Ecodriving Support	Behavioural measures	2 000	6 000
Policy measures from 2014–2020 generating new individual measures			
Operational Programme Enterprise and Innovation for Competitiveness	Financial mechanism	1 200	12 000
Operational Programme Environment 2014–2020	Financial mechanism	50	500
Integrated Regional Operational Programme 2014–2020	Financial mechanism	50	500
New Green Savings Programme	Financial mechanism	800	8 000
Voluntary scheme for improving energy efficiency[78]	Voluntary agreement	23 200	157 000
Overlaps and elimination of double counting of energy savings		-12 400	-78 200
Estimated energy savings based on approved measures		**83 100**	**331 400**

77 It will be specified in relation to the settings of the supported areas.

78 This is the theoretical potential declared to be achievable by the representatives of the entities concerned (distribution companies and energy traders in the gas, electricity and heating sectors). The prerequisite for its use is the involvement of most major market players in this scheme.

Additional measures			
Voluntary agreement with distributors and sellers of energy receivers	Voluntary agreement	1 200	6 600
Information campaign	Behavioural measures	10 000	30 000
Additional measures the energy saving potential of which will be analysed, and their calculation methodology subsequently notified			
Voluntary agreements with major energy consumers	Voluntary agreement		
Promoting modal change in favour of public transport	Financial mechanism		
Improving energy performance of freight transport	Regulatory measures		
Support for the replacement of energy-intensive vehicles (scrapping bonuses)	Financial mechanism		
Obligations linked to the payment of industry compensations	Financial mechanism		
Clean urban mobility plan	Regulatory measures		
Energy efficiency obligation scheme	Regulatory measures		
Estimated energy savings, including additional measures		**94 300**	**368 000**

ii. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private,[79] including policies, measures and actions to stimulate cost-effective deep renovation and policies and actions to target the worst performing segments of the national building stock, in accordance with Article 2a of Directive 2010/31/EU

General information on the long-term renovation strategy for the residential buildings fund

Due to the deadline for the implementing of the revision of Directive (EU) 2018/844 amending Directive 2010/31/EU, the milestones under the current Building Renovation Strategy cannot be considered as decisive and applicable for defining policies for their implementation. For this reason, the draft National Plan does not contain specific tools for implementing the Long-Term Building Renovation Strategy under the revised Energy Performance of Buildings Directive. However, the Czech Republic considers the following measures to be the possible measures to decarbonise the building fund by 2030. However, their implementation requires discussion across the political spectrum and an assessment of its feasibility.

Economic measures

The high initial investment costs of the energy-saving renovation of buildings are one of the main barriers to their implementation. The Czech Republic has more than ten years of experience in offering support programmes that help different groups of property owners to achieve energy savings in the operation of their properties. After 2020, the Czech Republic therefore plans to introduce a financial support scheme for the renovation of buildings. Currently, a suitable combination of grants and an extension of the financial instruments portfolio is being addressed.

In this area, ongoing discussions focus on the setting of support under national programmes as well as under European Structural and Investment Funds. An analysis is being conducted of the extent to which Union programmes and financial instruments can be used. In addition to grants, the discussions focus on extending the portfolio of financial instruments according to the needs of individual actors. An analysis of possible energy savings and investment assets shows that a total renovation of a building is an investment with a long return (typically around 20 years), but at the same time this means that the return on this investment is roughly 4–6 % per annum or higher. This is an attractive value given comparable investment opportunities (not for the business sector, but for institutions and households, and also for investment funds or banks). In this respect, an analysis of which barriers to massive investment in building renovation are key and which can be removed is being conducted. It is necessary to analyse these market failures based, inter alia, on the ownership structure of buildings, the necessary co-financing by the owners, the expected benefits of renovation, the great diversity and the relatively small (financial) size of the projects and the high transaction costs of implementation. It will then serve as a basis to discuss the possible use of innovative financial instruments to realise energy savings in buildings.

Legislative and administrative measures

Measures already implemented include the updated amendment to Act No 406/2000, on energy management, due to the transposition of Energy Performance of Buildings Directive (amendments: Act No 318/2012, Act No 103/2015). In accordance with the Directive, this act defines the minimum energy performance requirements for new buildings, larger changes to completed buildings and non-large (i.e. smaller) changes to completed buildings. These requirements are defined at a cost-optimal level. For the

[79] In accordance with Article 2a of Directive 2010/31/EU [as amended by the draft of COM(2016) 765].

purposes of publicly financed support programmes, the criteria should be more progressive, but should still be set at a cost-optimal level.

In the second step, the Energy Management Act requires the construction of buildings with ‘near-zero’ consumption (gradually for new buildings with application for building permit submitted after 1 January 2016 until 1 January 2020). However, this standard is defined very softly and inadequately in the Implementing Decree on the energy performance of buildings. For this reason, this definition is being revised and the second step of near-zero-energy buildings is being introduced; this obligation will take effect for example from 2022.

Education and consultation measures

The ignorance of concrete appropriate measures to reduce the energy performance of a building, their cost and savings potential increases transaction costs for building renovation. This barrier can be somewhat reduced by strengthening the role of State-guaranteed consultation in the ‘Energy Consultation and Information Centres’. In addition, preparation of model projects for common types of buildings, with a calculation of investment costs and savings achieved, is being considered.

The above is to be understood rather as an overview of the areas in which the Czech Republic will focus on the setting of specific measures. These measures will be complemented in relation to the transposition and implementation of the revision of the Energy Performance of Buildings Directive.

iii. Description of policy and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency service models[80]

For the period 2021–2030, continued support for the use of the EPC method is expected, particularly in the public sector, in order to maximise the efficiency of public funds invested and energy savings achieved. To this end, plans are being made to remove barriers to the use of the EPC method by public bodies, especially through education related to public procurement for comprehensive services, support for energy provider information centres and support for regional offices focusing on the support for the use of energy services.

iv. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2 (for example measures to promote the exemplary role of public buildings and energy-efficient public procurement, measures to promote energy audits and energy management systems[81], consumer information and training measures[82], and other measures to promote energy efficiency[83])

All relevant policies, measures and programmes are described in the other sections of this chapter or other parts of this document.

v. Where applicable, a description of policies and measures to promote the role of local renewable energy communities in contributing to the implementation of policies and measures in points i, ii, iii and iv

As stated in the previous sections summarising policies to meet the energy efficiency targets and commitments, the Czech Republic will make efforts to create local information centres for the general

[80] In accordance with Article 18 of Directive 2012/27/EU.
[81] In accordance with Article 8 of Directive 2012/27/EU.
[82] In accordance with Article 12 and 17 of Directive 2012/27/EU.
[83] In accordance with Article 19 of Directive 2012/27/EU.

public. With regard to public opinion, it is necessary that these services are affordable for the public, especially at a minimum price. Furthermore, we consider it important to strengthen the self-government capacities in relation to energy and energy efficiency, increase the professional education of employees and strengthen their powers in the implementation of instruments and measures at both national and local levels. To implement such a scheme, the Czech Republic is considering the use of the Union's LIFE programme.

vi. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure[84]

Electricity sector[85]

Losses in the transmission system are mainly determined by the amount of transformation power transmitted with the distribution system operator, the output from power plants connected to the transmission system, and the flow through the transmission system, which is determined by the transactions between the individual trading zones in the interconnected European system.

In an area which can be influenced by the transmission system operator and which does not reduce the security of operation and reliability of electricity supplies, two loss reduction areas can generally be considered. These areas are investment in infrastructure and system management resources.

Investments in infrastructure

Increasing network throughput and thereby achieving greater interconnection, which, if applied specifically, ultimately results in a reduction in system losses. An increase in the throughput of the system resulting in loss reduction is largely motivated by the need to increase the possibilities of transferring active power from sources to consumption and within the interconnected European electricity system which, in the long run, secondarily leads to meeting the loss reduction requirements. Examples of implementation include the assessment of the needs in individual corridors where, when necessary, lines with higher parameters (higher current carrying capacity, line doubling) are built, resulting in a lower unit loss factor.

Within the standard renewal of installations at the end of their service life, a predetermined number of transformers between transmission and distribution systems are replaced annually. These transformers are replaced by completely new ones with higher unit output, with gradual replacement of 220/110 kV transformation for 400/110kV transformation.

Regarding the reduction of losses in lines and in the transmission system, the fully modernised lines use cables with a larger cross-section, which leads to reduced losses of this line. For example, the difference when using the 434-AL1/56-ST1A cable instead of 350AlFe4 means a drop in unit active losses of about 30 % with the same active power transmission. At present, 490-AL1/64-ST1A cables are being introduced, which will further contribute to the reduction of active power transmission losses in key lines, which are modernised or duplicated with an estimated rated transmission capacity of around 2 500 A. Significant investments in the transmission system involving the use of cables with lower resistivity.

System management resources

[84] In accordance with Article 15(2) of Directive 2012/27/EU.

[85] There is a more detailed document in this area, which was created with the contribution of ČEPS a.s., ČEZ Distribuce, a.s. and PREdistribuce, a.s., which deals with this issue in more detail. Only a certain summary of this more detailed document is given in this material.

Loss reduction in the transmission system through a change in network operation is very limited. A deviation from the basic connection generally results in increased losses in the transmission system. The parameter in the form of the place and amount of the supply/consumption of active power, which significantly affects the magnitude of losses, cannot be influenced by the transmission system operator and, if so, at significant costs. From this perspective, only the production of reactive power, which partly contributes to losses in the transmission system, can be influenced. In this area, there are possibilities to implement source management and offset resources, in order not only to ensure the security and reliability of operation, but also to reduce losses. Approaches or tools applied in this area specifically include automatic voltage regulators in conjunction with an optimisation tool.

In general, measures taken to reduce losses should always be applied with regard to the given site and always with the aim of reducing overall losses and not with respect to losses of one type of equipment. The choice of system management tools is limited by the possibility to use the available control resources, which are already fully utilised in the transmission system, but the choice is wider in pilot project allowing greater integration and coordination.

Approaches to reducing energy performance in the distribution system

A distributor's options to influence the reduction of electricity consumption are greatly limited by legislation and the obligation to supply the contractual volume of electricity to end customers. It should also be noted that, despite the distributor's efforts to implement procedures and technologies to help reduce losses, there are a number of trends related to the development of renewable sources which lead to increased losses. For example, wider deployment of renewable sources usually increases the amount of reactive energy in the network, leading to increased losses. In addition, small intermittent sources are connected to the network asymmetrically, which can lead to disproportionate loading of some outlets, and thereby increase losses. In addition, the development of decentralised energy production and some appliances (e.g. pulse-controlled sources) may also involve the propagation of higher harmonic frequencies into the network, which may also result in higher losses.

The power consumption reductions that the distributor can influence is mainly possible in the area of technical and non-technical losses. These include, for example, the introduction of new technologies, voltage unification, the renewal of existing installations and the replacement of existing elements of the distribution system with new elements with higher efficiency and better parameters, as well as inspections of off-take points with the aim of detecting unauthorised electricity off-take.

Data on electricity consumption and losses for individual voltage levels show that the largest space for reducing consumption / technical losses is at low voltage (lv) level and partly at high voltage (hv) level.

Thus, measures to reduce losses can be generally divided into two groups:

- network renewal through the replacement of key network elements for elements with higher efficiency and better parameters. Within distribution, this mainly includes the replacement of transformers and the enlargement of cable cross-sections. In terms of cost-effectiveness, this includes the scenario, which needs to be assessed with regard to the specific conditions of its application, because the financial costs may not always justify the results – mainly in terms of local load and network topology.
- The second set of measures represents an alternative to the general application of elements with higher efficiency and better parameters. It involves the deployment of such elements that enable, for example, advanced methods of network management and monitoring. Within the synergies, these elements are deployed both for reasons of better load distribution (and thus loss reduction), but also because of the need for better network monitoring at lower voltage levels, which, given the changing patterns of consumption/production, is one of main challenges for distribution.

Gas sector

With a gradual phasing out of coal sources, the use of natural gas, biogas and, prospectively, synthetic methane and hydrogen will increase in the Czech Republic. The gas system has the potential to contribute to achieving the energy efficiency target, for example by the installation of more efficient equipment, which will increase the energy performance of the system's operation. This can be done in the context of continuous maintenance and modernisation of the system. For example, more efficient compressor stations could be installed with the help of the EU Structural Funds.

vii. Regional cooperation in this area, where applicable

Below is basic information on the regional dimension at the Czech Republic level.

Act No 406/2000 obliges the regions and the Prague Capital City to prepare the regional energy strategy and to regularly assess it. Beyond the scope of this obligation, regions and municipalities above a certain size carry out energy audits or introduce an energy management system. The above documents allow the energy efficiency to be assessed by region. These assessments are important for setting up appropriate measures that are acceptable across the public administration.

The Ministry of Industry and Trade and the regions are in negotiations to create a platform where it is possible to address the implementation issues of the above documents. There are intensive discussions with the representatives of these units in order to promote the interest in the issue of improving energy efficiency, identifying potential in a given area and looking for possibilities to realise this potential. Self-governing units are the bodies concerned for the approval of legal acts as well as strategic documents. Therefore, they are indirectly involved in the making of State energy efficiency policy.

viii. Financing measures, including Union support and the use of Union funds, in the area at national level

Financial measures and sources of financing are summarised in Chapter 5.3.

ix. Energy efficiency instruments and measures beyond the scope of Article 7 of the Energy Efficiency Directive

The tables below list the instruments and measures beyond the scope of Article 7. This point (point / part ix) has been added beyond the structure required by Regulation (EU) 2018/1999.

Table 51: *Instruments and measures beyond the scope of Article 7 (investment measures)*

Measure	Description
Investment support for the introduction of CHP	There is stable investment support for the implementation of CHP in both operational and national programmes. Within the current programming period, support for the business sector is allocated in the Operational Programme Enterprise and Innovation for Competitiveness. This is in particular the broad-based specific objective 3.2 *Energy Savings* and also the narrow-focused specific objective 3.5 *Energy Savings in the HSS*. Furthermore, investment support is allocated in the Operational Programme Environment, specifically in specific objective 2.2 Reducing emissions of stationary sources and specific objective 3.2 Increasing the share of material and energy recovery of waste. Specific objective 5.1 Reducing the energy performance of public buildings and increasing the use of renewable energy sources provides support for the public sector.
Operating aid for the introduction of CHP	CHP in the Czech Republic also receives operating aid, which ensures the development of high-efficiency CHP and reduction of primary energy consumption. Operating aid for high-efficiency CHP is part of the system to support the production of electricity and heat from RES. Legislative support is enshrined in Act No 165/2015, on supported energy sources.
Investment support for the modernisation of the transmission and distribution networks in order to increase efficiency, and support for the renovation and modernisation of distribution heating facilities	Within the framework of the Operational Programme Enterprise and Innovation for Competitiveness, funds are allocated for the modernisation of the transmission and distribution networks in order to increase their efficiency and implement smart grid measures within the Priority Axis 3 – 'Effective energy management, development of energy infrastructure and renewable energy sources, support for the introduction of new technologies in the area of energy management and secondary raw materials'. There is also support for the renovation and modernisation of heat distribution facilities within the support programme Energy savings in heat supply systems.
Investment support for the construction of the charging infrastructure for electric vehicles and	Under the specific objective – *Creating conditions for wider use of alternative-drive vehicles on the road network*, investment support is provided from the Operational Programme Transport for the construction of backbone and additional networks of charging stations and other infrastructure for alternative vehicles. The investment support contributes to the creation of an environment for accelerating the introduction of

other infrastructures for alternative-drive vehicles	alternative-drive vehicles on the Czech market, which positively contributes to increasing the efficiency of passenger transport and thus directly reduces the final energy consumption.

Table 52: *Instruments and measures beyond the scope of Article 7 (legislative measures)*

Measure	Description
The obligation to improving energy performance of buildings	In accordance with Section 7 of Act No 406/2000, on energy management, as amended, in the case of construction of a new building, the builder is obliged to meet the building energy performance requirements in accordance with the implementing legislation and he is obliged to document this by providing an energy performance certificate when applying for a building permit, a joint planning and building permission, a request to change the building before its completion with an impact on its energy performance or when providing documents for building notice. In addition, obligations are imposed in the event of major changes to the completed building, but also for other than major changes to the completed building.
Obligation to prepare energy performance certificate of a building	In accordance with Section 7a of Act No 406/2000, on energy management, as amended, entities listed by law are obliged to prepare an energy performance certificate of a building under the conditions specified by law.
Obligations linked to energy labels	Section 8 of Act No 406/2000, on energy management, as amended, determines the obligations of suppliers of products that are associated with energy consumption and which are subject to energy labelling requirements.
Obligation to carry out an energy audit and to prepare an energy assessment	In accordance with Section 9 and Section 9a of Act No 406/2000, on energy management, as amended, the entities listed by law are obliged to perform, under the conditions specified by law, an energy audit or energy assessment for a building or an energy system, even beyond the EU requirements.
Obligations linked to the setting of specific energy efficiency conditions for public procurement	In accordance with Section 9b of Act No 406/2000, on energy management, as amended, in the case of over-limit public procurement of central institutions for supplies or services, the contracting authority must lay down specific technical conditions in the field of energy efficiency, in particular in relation to labelling related to energy consumption, ecodesign, and energy performance class of the building. The following conditions shall apply to public procurement: (i) the highest available class for products with energy labels; (ii) the most efficient product on the market where ecodesign applies; (iii) the highest fuel efficiency class for tires; (iv) for the acquisition of buildings, an obligation not to purchase a building with efficiency class

	lower than C; (v) for the rental of buildings, an obligation to rent a building with than efficiency class better than D.
Minimum energy efficiency obligation for energy sources and distribution	In accordance with Section 6 of Act No 406/2000, on energy management, as amended, there is an obligation to ensure minimum efficiency in the use of energy in newly established electricity or thermal energy generating plants and in power plants undergoing changes of the finished construction. In accordance with Section 6, there is also an obligation to ensure the efficiency of energy distribution for newly established installations and for installations undergoing changes of the finished construction.
Combustion sources inspection obligation	In order to ensure the declared efficiency of combustion sources, according to the valid legislation (Act No 201/2012, on air protection and Act No 406/2000, on energy management), there are obligations to carry out regular inspections of combustion sources with nominal output exceeding 10 kW or 20 kW and of associated heat distribution. The existence of mandatory inspection ensures energy efficient operation of combustion sources and thus eliminates the increase in energy consumption due to non-optimal operation of combustion sources.
Regulatory measures to reduce transmission, transport and distribution losses	The Czech Republic has implemented a regulatory framework in accordance with Act No 458/2000, on business conditions and state administration in the energy sectors, to reduce losses in the transmission, transport and distribution of energy. For this purpose, a regulation methodology applicable to regulated entities in transmission, transport and distribution is prepared, which includes an efficiency factor that motivates entities to reduce regulated costs. The established regulatory framework has stimulated loss reduction for a long time.
Obligation to prepare Territorial Energy Concepts at the level of regions and City of Prague	The Territorial Energy Concept sets out the objectives and principles of energy management in a defined area. The territorial energy concept includes an assessment of the technical and economic potential of energy savings, the definition of tools for achieving them and the design of scenarios for future development. The elaboration of the territorial energy concept creates conditions for reducing energy consumption at the level of regional self-government in accordance with the energy and climate goals of the Czech Republic.

Table 53: *Instruments and measures beyond the scope of Article 7 (other measures)*

Measure	Description
Promoting modal change in freight transport	To create, based on the Government-approved Freight Transport Concept for 2017–2023, such an environment in which logistics and freight transport can provide the necessary level of services to ensure economic competitiveness and at the same time economically use existing resources. The concept aims to maximise the use of efficient forms of freight transport.

3.3 Dimension 'Energy security' [86]

i. Policies and measures related to the elements set out in point 2.3[87]

3.3.1.1 Energy sector

The main policies and measures to ensure the security of energy supplies in the electricity sector are:

- Development of the transmission system (distribution systems) in order to ensure system and production adequacy and security of electricity supply ensuring long-term fulfilment of the N-1 criterion;
- measures to ensure the adequacy of production capacities;
- development of an integrated electricity market;
- measures following from European legislation;
- diversification of the electricity mix;
- emergency system management and emergency prevention.

Transmission system development

The development of the electricity system is crucial to ensuring the security of electricity supply. In the Czech Republic, the transmission system operator has the primary responsibility for the development of the transmission system. The development of the transmission system is also significantly coordinated at EU level. Detailed information on the current state and the expected development of the electricity infrastructure is given in Chapter 4.5.2.

Measures to ensure the adequacy of production capacities

In relation to ensuring the adequacy of generation capacities, the generation adequacy outlook, including the draft measures to resolve potential problems with ensuring the adequacy of generation capacities, is prepared annually as needed in accordance with the requirements of Regulation No 714/2009 of the European Parliament and the Council.[88] Currently, work is underway on the preparation of a detailed analysis and methodology for determining the reliability standard with the use of commonly used reliability indicators, which should subsequently form the basis of legislative (non-legislative) provision of the security standard in the area of generation adequacy. A summary of the generation adequacy outlook is given in Chapter 4.4.1.5. The need to ensure sufficient production capacities, inter alia, in view of the gradual decline in conventional fossil fuel sources, will most likely require some form of strategic reserve, probably for the period 2025–2035, when the Czech energy market may experience the first major shortage of electric energy or power. The setting of this reserve will be based on the legislative requirements laid down in particular by Regulation (EU) 2019/943. Any strategic reserve will be established or defined by law, which will be preceded by an impact assessment of this measure. Strategic reserve settings and parameters are already being discussed at the level of a specific working group.

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[86] Policies and measures reflect the first energy efficiency principle.

[87] Consistency with preventive action plans and emergency plans under Regulation [proposed through COM(2016) 52] concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010, and risk-preparedness plans under Regulation [proposed through COM(2016) 862] on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC.

[88] The latest Assessment of the Czech Electricity System Production Adequacy is from 2018 and is available at: https://www.mpo.cz/cz/energetika/elektroenergetika/hodnoceni-vyrobni-primerenosti-es-cr-do-roku-2030--233193/

Development of an integrated electricity market

One of the important elements for enhancing energy security is the further development of the internal electricity market / its continued integration. The internal energy market is a separate dimension of the Energy Union and is described in more detail in the other parts of this document, specifically in Chapters 2.4, 3.4 and 4.5.

Measures following from European legislation

The security of electricity supply is already very well regulated by specific European legislation. In this respect, we may specifically mention Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC, which published as part of the 'Clean Energy for All Europeans' legislative package and became effective on 4 July 2019.

Diversification of the electricity mix

The Czech Republic will strive for the highest possible diversification of the energy/electricity mix and the minimisation of sources using large quantities of input fuel which must be imported from abroad. The strategically optimal electricity mix for 2040 is specified in the approved State Energy Policy of the Czech Republic and is referred to in Chapter 1.2.1.1. In this respect, it is important to emphasise the role of nuclear power, which should gradually replace coal in the electricity mix. An increase in the share of nuclear energy and renewable sources at the expense of fossil fuels is also a key prerequisite for achieving long-term commitments to reduce greenhouse gas emissions, as set out in Chapter 3.1.1.6. The Czech Republic no longer has its own sources of uranium ore (more precisely, it has resources, but mining has been discontinued), so fuel for nuclear power plants is imported from abroad. However, in comparison especially with natural gas, the quantity of nuclear fuel that can be stored allows consumption for several years ahead. Therefore, although it is not a domestic source, in terms of energy security or import dependence this energy source is a better alternative than, for example, natural gas. For more details on nuclear fuel diversification, see 4.4.1.6.

Emergency system management and emergency prevention

The issue of managing crisis situations is mainly regulated in Act No 240/2000, on crisis management (the Crisis Act), as amended, which establishes the scope of competence and powers of State bodies and bodies of territorial self-governing units and the rights and obligations of legal and natural persons in the preparation for crisis situations not related to the defence of the Czech Republic against external attack and in their resolution and protection of critical infrastructure, and the responsibility for violation of these obligations.

On the other hand, emergency situations are regulated by Act No 458/2000, on the conditions for business and on the performance of State administration in the energy sectors and amending certain acts (the Energy Act), as amended, which transposes the relevant European Union regulations and, in relation to the directly applicable European Union regulations, regulates the conditions for business and the performance of State administration in the energy, electricity, gas and heating sectors as well as the rights and obligations of natural and legal persons associated with them.

Emergency in the energy sector

According to the Energy Act, emergency means a state in the electricity, gas or heat supply system as a result of natural events, measures of State authorities under a state of emergency, threats to the State or the state of war, accidents or accumulation of failures on facilities for the production, transmission and distribution of electricity, accidents on facilities for the production, transmission, distribution and storage of gas, accidents on heat supply system facilities, smog alerts pursuant to special regulations, terrorist acts, unequal balance of the electricity system or its part, unequal balance of the gas system or its part, unequal balance in the heat supply system, transmission of a fault from a foreign electricity system, threat to physical security or protection of persons causing a significant and sudden shortage of electricity, gas or heat or threat to the integrity of the electricity system, gas system or heat supply system, its security and operational reliability, in the case of the electricity system or gas system on the entire the territory of the State, on a defined territory or its part.

The Act further defines the term ‘emergency prevention’ as a set of measures and activities carried out in a situation where there is a real risk of an emergency. In the case of the gas system, it consists of two phases: early warning, where there is information of a possible emergency, and alert, where there is an actual deterioration in the supply to customers, but it is not yet necessary to introduce a general reduction in consumption.

The transmission system operator announces the exact time of start or termination of an emergency for the entire territory of the State in mass media and by means of dispatching management and immediately notifies the Ministry of Industry and Trade, the Energy Regulatory Office, the Ministry of the Interior, the market operator, the regional authorities and the Prague City Hall. Similarly, the transmission system operator notifies emergency prevention without delay to the Ministry of Industry and Trade, the Energy Regulatory Office, the Ministry of the Interior, the market operator, the regional authorities and the Prague City Hall within one hour after the commencement of the respective activities. For the defined area or its part, these obligations lie with the distribution system operators. In the heating sector, emergency and its termination are declared through the media or by another appropriate manner by the Ministry of Industry and Trade for the entire territory of the State and by a regional authority or the Prague City Hall for its part. The body which has declared the emergency is obliged to immediately inform the Ministry of the Interior and the competent regional fire rescue service of the expected duration of the heat supply restrictions.

Pursuant to the enabling provisions of Act No 458/2000, on the conditions for business and the performance of State administration in the energy sector and amending certain acts (the Energy Act), the Ministry of Industry and Trade shall issue an Implementing Decree laying down the measures and procedures to be applied to preventing emergencies, during emergencies and the removal of the consequences of emergencies, the methods to declare emergencies and notify the prevention of emergencies and the procedures in restricting the generation of electricity, the consumption of electricity, gas and heat including the balancing, cut-off and frequency plans, the method to ensure gas security standards, the requirements for the content of emergency plans, the method to ensure gas security standards, requirements for the content of documents for the preparation of preventive action plans in accordance with a directly applicable EU regulation and the deadlines for their submission to the Ministry. In the electricity sector, such enabling provisions are laid down in Implementing Decree No 80/2010, on the state of emergency in the electricity sector and on the content of the emergency plan; in the gas sector, such enabling provisions are laid down in Implementing Decree No 344/2012, as amended by Implementing Decree No 215/2015; and in the heating sector, such enabling provisions are laid down in Implementing Decree No 225/2001, establishing the procedure for the occurrence and elimination of a state of emergency in the heating sector.

Critical infrastructure protection

In accordance with Act No 240/2000, on crisis management and amending certain acts (the Crisis Act), critical infrastructure means a critical infrastructure element or a system of critical infrastructure elements, the disruption of whose function would have a serious impact on the security of the State, securing of the basic living needs of the population, human health or the economy of the State. A critical infrastructure element means, in particular, a structure, equipment, resource or public infrastructure, determined according to the cross-cutting and sectoral criteria set out in Government Decree No 432/2010, on the criteria for the identification of critical infrastructure elements. These elements are determined by assessing their criticality, the impact of the loss of their function and their irreplaceability or, where relevant, the possibility to provide an alternative to their function.

According to law, critical infrastructure protection means a measure aimed at reducing the risk of the critical infrastructure element's function becoming disrupted. A critical infrastructure entity means the critical infrastructure element operator; a European critical infrastructure element operator is considered to be a European critical infrastructure entity.

Type crisis management plans

Type plans set out recommended type procedures and principles for a particular type of crisis situation and measures to address such a situation. According to Government Decree No 462/2000, type plans are part of the crisis plan. Within the scope of MIT's competence, these include: (i) the type plan for addressing crisis situations concerning a large-scale electricity supply disruption; (ii) the type plan for addressing crisis situations of a large-scale gas supply disruption.

Emergency plans

Emergency preparedness is a prerequisite for the successful resolution of extraordinary events (from calamities, floods, system failures to declaration of emergency in accordance with Act No 458/2000). Emergency preparedness consists in the ability to respond, correctly and in due time, to the occurrence of an emergency or crisis situation and to eliminate the risk to life, health, property or the environment to the maximum extent possible.

In accordance with Act No 458/2000, the Energy Act, it is necessary to prepare emergency plans, which represent a set of planned measures for the prevention of emergencies and for the effective and rapid elimination of these situations.

The procedure for restoring electricity supply within the distribution network

The procedure for the reduction of electricity consumption and the restoration of electricity supply within the distribution system is laid down primarily in Implementing Decree No 80/2010, on emergency in the electricity sector and on the requirements for the content of emergency plans.

In accordance with Section 1 of this Implementing Decree, the reduction of electricity consumption in areas where there is a risk of emergency or where an emergency has been declared is determined by the application of the appropriate level of the control plan, cut-off plan, operative shutdown of a part of facility or automatic operation of frequency relays in accordance with the frequency plan, to the extent necessary to equalise the power balance of the relevant part of the electricity system.

In accordance with Section 3(2), regional distribution system operators submit to the transmission system operator by 30 September of each year the updated capacity values for the individual control levels and the cut-off plan and frequency plan levels.

The use and the requirements for the content of the control plan, the cut-off plan, the frequency plan and the emergency plan are set out in the relevant annexes to the Implementing Decree.

3.3.1.2 Gas sector

The main policies and measures to ensure the security of energy supplies in the gas sector are:

- diversification of gas sources and gas transit routes (closely linked to the development of the transmission system);
- measures following from European legislation;
- development of the transmission system (distribution systems) in order to ensure system adequacy and security of gas supply ensuring long-term fulfilment of the N-1 criterion;
- development of an integrated gas market;
- a rigorous monitoring of compliance by the gas traders with the security standard of supply for protected customers;
- measures to ensure sufficient storage capacity and the efficient use of gas storage facilities;
- emergency gas system management and emergency prevention.

Diversification of sources and gas transit routes

The Czech Republic is almost exclusively dependent on the import of natural gas. Domestic gas production covers only a negligible share of domestic consumption (approximately 2–3 %). For this reason, it is very important to ensure diversification of natural gas sources and routes. As regards the diversification of natural gas transport routes, the Czech transmission system operator is currently planning two infrastructure projects. The first is the Bidirectional Austria-Czech Interconnection (BACI), which would create the first direct interconnection between the Czech Republic and Austria. The second project is the Czech-Polish interconnection (the STORK II project), which would also contribute to the diversification of gas sources. Both projects are part of the 'north-south interconnection' and the Czech Republic could potentially gain access to the LNG terminal in Swinoujscie, Norwegian gas transported by the Baltic Pipe to Poland, sources from the LNG terminal Krk in Croatia or sources from the Caspian region (especially the Southern Gas Corridor). Both infrastructure projects are part of the Update of the State Energy Policy and are regularly part of the Ten-Year Plan for the Development of the Transmission System in the Czech Republic.

Among other things, the Czech Republic uses a very good connection to the gas infrastructure of neighbouring countries, especially Germany and Slovakia, thanks to transit pipelines which lead east-west, west-east and partly north-south. In this respect, it is possible to mention the possibility of reverse flows following the limitation of gas supply in 2009 and the commissioning of the new Gazela transit pipeline in 2013, which resulted in a relatively significant increase in the capacity of inputs into the Czech system. In connection with the implementation of the Capacity4Gas project, new opportunities for the domestic market arise not only from the interconnection of this pipeline to the Nord Stream 2 pipeline, but also to the new LNG terminals in Germany. For more information, see Chapter 4.5.2.2.

The development of new types of gas (biomethane, synthetic gas, hydrogen) from domestic sources will bring greater security in the future, thus reducing the import dependence of the Czech Republic in this area.

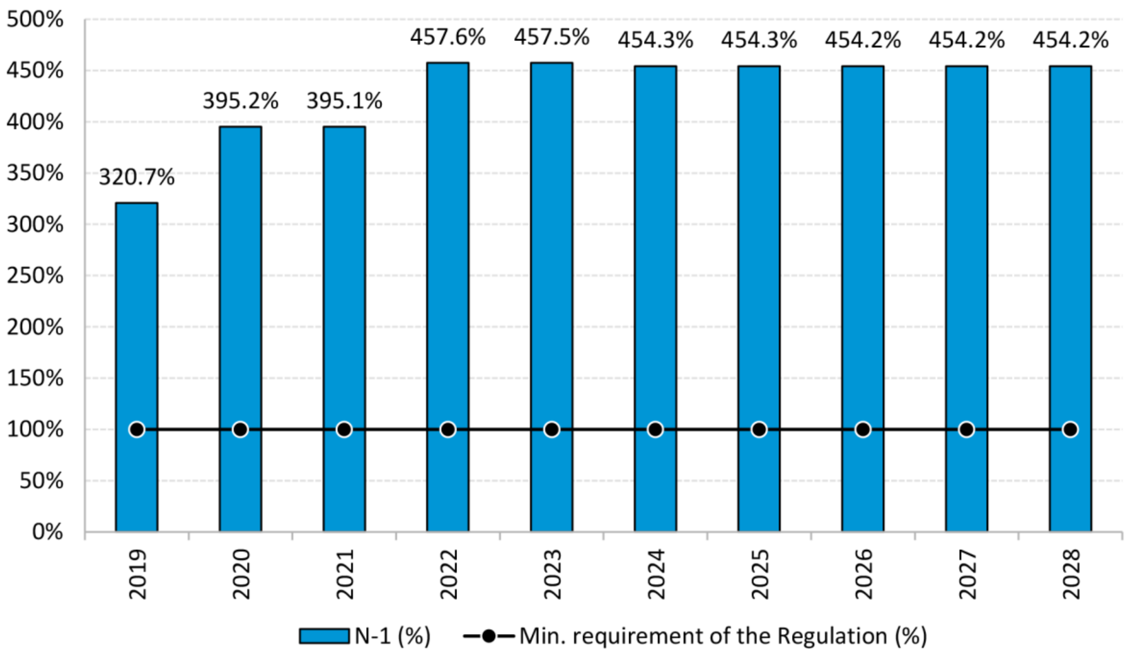
The security of supply with respect to the diversification of natural gas sources and transmission routes and the robustness of the transmission system is expressed within the N-1 criterion, in accordance with the requirements of Regulation (EU) 2017/1938. N-1 is quantified by the transmission system operator within the Ten-Year Plan for the Development of the Transmission System. The recommended value of this criterion according to Regulation (EU) 2017/1938 is 100 %. Table 54 quantifies the security of gas supply for the Czech Republic in 2019–2028 according to the N-1 criterion, based on the Ten-Year Plan for the Development of the Transmission System in the Czech Republic 2019–2028[89]. Chart 18 then shows a comparison of the minimum value required by the Regulation and the expected evolution of the N-1 criterion for 2019–2028.

Table 54: *Quantification gas supply security for the Czech Republic in 2019–2028 according to the N-1 formula*

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
P_m	6.1	6.4	6.3	6.5	6.4	5.6	5.2	5.0	4.8	4.6
S_m	644.9	655.6	655.6	655.6	657.7	659.8	659.8	659.8	659.8	659.8
EP_m	3 321.2	3 852.2	3 852.2	4 306.6	4 306.6	4 306.6	4 306.6	4 306.6	4 306.6	4 306.6
I_m	1 640.4	1 640.4	1 640.4	1 640.4	1 640.4	1 640.4	1 640.4	1 640.4	1 640.4	1 640.4
D_{max}	727.0	727.3	727.3	727.3	728.0	733.3	733.3	733.3	733.3	733.3
Min.	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
N-1	320.7 %	395.2 %	395.1 %	457.6 %	457.5 %	454.3 %	454.3 %	454.2 %	454.2 %	454.2 %

Source: Ten-Year Plan for the Development of the Transmission System in the Czech Republic 2019–2028

Chart 18: *Quantification gas supply security for the Czech Republic in 2019–2028 according to the N-1 formula*



Source: Ten-Year Plan for the Development of the Transmission System in the Czech Republic 2019–2028

The vast majority of imported natural gas comes from the Russian Federation. Business diversification is also important in this respect. The Czech Republic has taken the first major step towards securing

[89] At the time of preparation of the National Plan, a ten-year development plan for the period 2020–2029 was already available but was not yet formally approved.

greater business diversification already in 1997, with the validity of a 20-year gas supply contract concluded with Norway, which expired in 2017. Currently more than one third of natural gas is sourced at European gas exchanges. This, of course, is closely linked to the development of the internal market in natural gas, which is described in separate chapters of this document.

Measures following from European legislation

The security of natural gas supply is already very well regulated by specific European legislation. In accordance with Regulation No 994/2010 of the European Parliament and of the Council of 20 October 2010 concerning measures to safeguard security of gas supply and repealing Council Directive 2004/67/EC, preparation is underway of the Preventive Action Plan to ensure gas supply in the Czech Republic and of the Emergency Plan, which could affect the security of gas supply in the Czech Republic.[90]

In October 2017, Regulation (EC) No 2017/1938 of the European Parliament and of the Council concerning measures to safeguard the security of gas supply and repealing Regulation 994/2010 came into force. As part of the coordination of emergency planning at national, regional and EU level, the obligation to prepare preventive action plans and emergency plans is maintained. At the same time, other specific measures are introduced, such as the principle of solidarity. The Regulation also lays down an obligation to comply with the infrastructure standard at N-1 level or an obligation to establish and maintain a security standard of gas supply. These obligations are subsequently specified by national legislation, in particular Act No 458/2000 and Decree No 344/2012, as amended.

Development of the transmission system to ensure system adequacy and gas supply security

The transmission system development aims to ensure system adequacy and gas supply security in order to, inter alia: (i) strengthen the Czech Republic’s transit role on a European scale; (ii) increase interconnection of the transmission systems of the individual EU Member States; (iii) remove bottlenecks at national level.

The expected development of the transmission system is described in the ten-year network development plan, which is prepared by the transmission system operator. Under this plan, measures are taken to ensure system adequacy and gas supply security. The ten-year network development plan: (i) indicates which parts of the transmission system are to be built or extended over the next ten years; (ii) identifies all the investments in the transmission system that the transmission system operator has decided on and the new investments to be made in the next three years.

When making the Development Plan, the transmission system operator shall base its current and foreseeable future gas supply and demand on it. To that end, the transmission system operator shall analyse the development of gas production, supply, import and export, taking into account the planned development of the distribution systems connected to the transmission system, the planned development of gas storage facilities and the EU-wide transmission system development plan prepared pursuant to Regulation (EC) 715/2009.

The purpose of the ten-year network development plan is to provide an overview of anticipated investments increasing the capacity of the Czech transmission system and to assess the compliance of the transmission system with the requirements: (i) of the State Energy Policy (or other relevant strategic

[90] The Preventive Action Plan and the Emergency Plan (or their update) are available at: https://www.mpo.cz/cz/energetika/energeticka-legislativa/plany-dle-narizeni-ep-a-rady-c--994-2010--119187/

documents); (ii) for ensuring the supply security standard and ensuring compliance with the N-1 criterion.

Development of an integrated gas market

One of the important elements for enhancing energy security is the further development of the internal natural gas market / its continued integration. The internal energy market is a separate dimension of the Energy Union and is described in more detail in the other parts of this document, specifically in Chapters 2.4, 3.4 and 4.5.

Security supply standard

The key policy for ensuring the security of natural gas supply is to provide for the 'supply standard'. The obligation to ensure the security supply standard is laid down by Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010. The security supply standard is further regulated by Act No 458/2000, as amended. The manner to ensure the security standard, its determination and other related requirements are regulated by Implementing Decree No 344/2012, on the state of emergency in the gas sector and on the manner to ensure the security gas supply standard, as amended (as amended by Implementing Decree No 215/2015).

Within its competences, the Market Operator is entrusted with monitoring and evaluating the compliance with the security supply standard. In addition, as part of the monitoring of gas sector statistics, the Energy Regulatory Office publishes regularly during the heating season a monthly report on the assessment of the security standard of gas supply in the Czech Republic. This report contains aggregated information on compliance with the security standard, in particular with regard to the obligation to store at least 30 % in gas storage facilities, the structure and the manner of demonstration of the protected customers' shares and other relevant indicators.

Measures to ensure sufficient storage capacity and the efficient use of gas storage facilities

On the basis of the measure laid down in the State Energy Policy (2015), the overall capacity of gas storage facilities should be maintained at 35 to 40 % of annual gas consumption. In 2016, where natural gas consumption stood at 88.2 TWh, the value of this criterion was 37 %. Taking into account the expected consumption of natural gas and the development of storage capacity, this criterion should be met by 2030 (2028[91]). However, it should be emphasised that this is not an enforceable obligation (this obligation is not laid down in legislation). In the Czech Republic, natural gas storage facilities are operated on a commercial basis and investments in further storage capacities may be affected, inter alia, by the following factors: (i) the difference between summer and winter gas prices; (ii) greater market integration and gas systems coupling (i.e. greater market flexibility) leading to greater competition in the services offered by gas storage facility operators; (iii) the decision to build storage facilities is often made conditional on binding interest of a particular trader; (iv) the security supply standard has no direct effect on the extension of storage capacities connected to the Czech system; this is because it is possible to use foreign gas storage facilities provided there is sufficient agreed transmission capacity to the Czech Republic, which the storage facility operator can ensure and offer to the market within the standard product; (v) the setting of the gas market, including the level of transmission tariffs to and from the gas storage facility creates the essential conditions for storage and should be set up to ensure the efficient use of gas storage facilities and maintain optimal storage capacity as required by the State Energy Policy (2015).

[91] Based on the Ten-Year Network Development Plan of the Czech Republic 2019–2028

Also, the deliverability from the storage facilities should be guaranteed for 2 months at 70 % of the peak daily consumption in winter. The highest daily consumption was reached on 23 January 2006, namely 68 million m^3; the corresponding required deliverability is 47.6 million m^3. The maximum deliverability of all the tanks connected to the Czech system is 69.7 million m^3 – however, this value is usually reached if the storage facilities are at maximum capacity and, therefore, it can be reasonably assumed that at the end of the winter season the required deliverability may no longer be guaranteed. However, it should be emphasised that this criterion is only aggregate and, as such, it does not completely reflect the relevant features of Czech storage facilities, especially their geographical distribution, which cannot be described as optimal, because almost all of them are located in Moravia (in Bohemia, there is only the Háje storage facility), which is due to the suitable conditions for their location.

For more detailed information on the existing capacity and location of gas storage facilities, as well as the anticipated development of capacity and deliverability, see Chapter 4.5.2.2 or 4.5.2.4.

Emergency gas system management and emergency prevention

Emergency system management

The operation of the system is supervised by the gas dispatching of the transmission operator, which is informed of the network state by means of measuring devices and dispatching centres of other operators (distributors and storage facilities) , while the expected operational values for the given state can be obtained by simulating the operation. A significant difference between expected and actual values may indicate an accident on a facility. For reliable and safe operation, the dispatching centres of the transmission operator, storage facility operators and distributors are capable of cooperating, even in the event of an accident on the system. The NET4GAS Transmission System Emergency Plan is the key document dealing with emergency situations. In case of emergency prevention and emergency situations, the Gas System Emergency Plan of the Czech Republic is also prepared. The Emergency Plan is revised and refined every year. Furthermore, Implementing Decree 344/2012 lays down the procedure to declare an emergency. Article 13 of Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010 introduces a solidarity process in which a Member State is obliged to offer the requesting Member State natural gas for its solidarity-protected customers. In accordance with the upcoming amendment to national legislation, the Czech Government or the Ministry of Industry and Trade, as the competent authority, is responsible for providing solidarity and applying for solidarity based on the recommendations of the transmission system operator or the Central Crisis Management Staff established by it. The priority of the established procedures is to make maximum use of the application of solidarity to the market principle and to the non-market principle of reducing gas offtake to end customers who are not protected by solidarity.

Preventing emergency

When preventing emergency in the early warning phase (stage 1), use is made of the storage capacity of the transmission and distribution systems, storage facility operators examine the possibility of maximum off-take from the storage facilities, and the extraction operators examine the possibility of extraction and traders examine the possibility of increased gas imports to the Czech Republic. All of them immediately inform the transmission operator of the supply possibilities. Emergency in the early warning phase is reported by the transmission operator or distribution company without delay to the storage facility operators, gas producers, traders and customers in the area concerned and, within one hour after the declaration, to the Ministry of Industry and Trade, Energy Regulatory Office, the Ministry of the Interior and regional authorities. Emergency committees and crisis teams are activated. The market operator shall notify all market participants that imbalances will be settled in the emergency prevention regime.

The transmission operator may also declare the state of emergency prevention (stage 2) for the entire territory of the Czech Republic. This involves reduction in the agreed transmission, distribution and gas supply to all Group A customers' off-take points (customers with gas consumption above 630 MWh per year) to the extent that they can switch to substitute fuel. If the measure is not effective, the gas supply to the defined customer off-take points can be interrupted. The operator shall notify these points to the transmission operator or to the distribution companies and traders to which these off-take points belong. In addition to the entities above, the declaration of emergency in the warning phase will also involve the Czech Radio. Also, in the case of settlement, no compensation for lost profits may be claimed.

3.3.1.3 Oil and petroleum products

The main policies and measures to ensure the security of energy supplies in the oil and petroleum products sector are:

– diversification of sources and transport routes for oil transport;
– providing for emergency oil reserves.

Security in the oil and petroleum products sector is, of course, wider than the above. A detailed analysis within this document is not effective and is dealt with in more detail in other documents. Some more detailed information on the current situation is available, for example, in the Report on the Development of the Energy Sector in the Oil and Petroleum Products Sector[92].

Ensuring emergency oil reserves can be considered as one of the main measures to provide for energy security. The Czech law lays down the obligation to create and maintain emergency reserves of oil and petroleum products in Act No 189/1999, on emergency oil reserves, on dealing with oil emergency situations and amending certain related acts (Emergency Oil Reserves Act) of 29 July 1999, as amended. Section 2 of this Act provides for the creation and maintenance of emergency reserves, and Section 2(2) provides the following: 'Emergency reserves are created and maintained by the Administration of State Material Reserves from oil and selected petroleum products in an amount equivalent to at least 90 days of average daily net imports of the reference year.' In this respect, an important legal regulation is the Implementing Decree No 165/2013 on the types of oil and the composition of petroleum products for storage in emergency oil reserves, on the calculation of the level of emergency oil reserves, on storage facilities and on the reporting of emergency oil reserves.

3.3.1.4 Heat sector

Energy security can be viewed from several perspectives. The primary objective of the heating sector users (customers) is primarily to have stable heat supply. In terms of heat source and heat supply system operators, the primary objective is ensuring such entry conditions that their business in the sector is predictable and, ultimately, profitable.

In line with the strategic national documents, the following areas were identified as the primary objectives (trends) in the heating sector:

– diversification of energy sources and decentralisation of inefficient systems;

[92] This document is available in electronic form at: https://www.mpo.cz/cz/energetika/statni-energeticka-politika/zprava-o-vyvoji-energetickeho-sektoru-v-oblasti-ropy-a-ropnych-produktu-za-rok-2016--235988/

– flexibility of the supply of electricity and other products and services.

Diversification and decentralisation of sources

On the basis of the national strategic documents, a higher degree of diversification of heat sources is expected in the future due to the gradual replacement of coal (as one of the primary fuels in the heating sector used by larger sources) by alternative fuels. Namely, the increase concerns the share of:

– waste for energy purposes;
– biomass;
– natural gas.

In individual strategic documents (such as the Action Plan for Biomass in the Czech Republic 2012–2020), the heating sector is mentioned as one of the sectors with a high potential to use biomass, which should at least partially help to replace coal. Primarily, local biomass sources should be used, especially:

– residual biomass types;
– biomass grown for the particular purpose;
– biodegradable municipal waste.

The potential of biomass can be seen in individual heat production / its use in the case of central heat sources in relation to high-efficiency CHP.

In the case of inefficient systems, their disintegration into smaller units can be expected, especially by utilising cogeneration units.

At the same time, the strategic documents mention the effort of most heating plants to switch to high-efficiency cogeneration where this is technically feasible and economically advantageous.

Flexibility of the supply of electricity and other products and services

In connection with the ongoing decentralisation of electricity sources, it will be necessary to ensure the overall flexibility of the energy system. From this perspective, heating sources should be more involved in the provision of support services at the distribution and transmission system level.

At the same time, thanks to the possibility of using cogeneration, production sources contribute to flexible electricity supplies; on the other hand, technology such as electric boilers and heat pumps have the potential to increase the ability to control electricity generation/consumption.

Finally, it is necessary to mention the development of not only the market with heat and electricity, but also with cold.

3.3.1.5 Securing long-term supplies of nuclear materials and fuel

The State Energy Policy, in the section on instruments in the area of state administration performance defines the following instrument: 'Establishing mandatory security standards for gas supply and nuclear fuel stocks in accordance with the applicable legislation in proportion to the expected security of supply and international situation'.

In accordance with the requirements of the valid State Energy Policy of the Czech Republic and related strategies and priorities (including the National Action Plan for the Development of Nuclear Energy in the Czech Republic), the target security standard is defined as follows: 'The need to secure nuclear fuel stocks or to create such conditions (technical, commercial, licencing) for nuclear fuel supply as to guarantee the nominal operation of all units at all nuclear power plant locations for four years.' The Energy Security Priority Strategy by 2040 further states: 'Achieving this goal in time aligns with increasing the share of nuclear energy to the target level of 50–60 % of final consumption'.

In 2018, a 'Nuclear Fuel Supply Safety Standards' document was prepared containing a description of the current state and expected development of nuclear fuel reserves for individual power plants and it was partially discussed by the technical-investment working group of the Standing Committee on Nuclear Energy or the Standing Committee on New Nuclear Build in the Czech Republic[93]. Upon request, this material will be discussed by the Standing Committee for Nuclear Energy or the Standing Committee on New Nuclear Build in the Czech Republic. For more information on the current status and outlook for long-term nuclear fuel supply security, see 4.4.1.6.

3.3.1.6 Cyber security in the energy sector

The energy sector is an intermediary for the basic functions of the state. From a security point of view, this is a high-priority sector and the requirements for maintaining the sector's functionality are therefore crucial. In this respect, both the energy sector and individual sub-sectors were regulated by Act No 181/2014, on cyber security, from the very beginning of its effectiveness. The director and coordinator of this Act and its implementation is the National Cyber and Information Security Agency (NCISA). There, the main measures in the area of cyber security can be described as the fulfilment of Act No 181/2014, on cyber security, or Decree No 82/2018, on cyber security, which lay down the specific obligations that relevant entities must fulfil. Cyber security of individual organisations is thus ensured by the concerned entities through the fulfilment of obligations imposed on them by the Act on Cyber Security, or by Decree No 82/2018, on cyber security, depending on the nature of the entity.

There are criteria set out in the implementing legislation for assessing whether a system is critical and if its administrator must be included among the persons obliged under the above Act. These criteria are mostly based on certain limits of the impact of information security breaches in these systems that need to be taken into account.

Act No 181/2014, on cyber security, came into effect in 2015 and its main objective is to increase cyber security of the Czech Republic, especially in the crucial areas. In the energy sector, these are mainly major pipelines or power-generating facilities. The objective of the 'critical information infrastructure' is to cover the information and communication systems that are connected to these physical elements (critical infrastructure). The breach of information security of these information or communication systems could have significant negative impacts on the operation of critical infrastructure elements.

Criteria according to which critical infrastructure is determined are contained in Government Decree No 432/2010, on the criteria for determining the critical infrastructure element, as amended. The existing procedure under the Crisis Act (Act No 240/2000, on crisis management and amending certain acts, as amended) was thus extended to include the procedure for identifying critical information infrastructure. In this decree, the energy sector consists of the following subsectors: electricity, natural gas, oil and petroleum products and central heat supply. The identification of critical information infrastructure is carried out by NCISA through measures of a general nature. If a critical infrastructure operator is an organisational unit of the State, the Government decides on the determination of the critical infrastructure element by its resolution.

In 2016, the European Commission issued Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union (the 'NIS Directive'). The NIS Directive newly defines the

[93] On 18 February, by the Government Resolution No 132, the Statute was changed, including a change of its name.

institute of a ‘basic service operator’ in relation to the energy sector. After the transposition of the NIS Directive into national law of the Czech Republic, the basic service operator becomes another obliged entity within the meaning of Act No 181/2014. The introduction of the ‘basic service operator’ institute into the Czech legal environment has led to the expansion of the circle of obliged entities in the energy sector. Impact values required for the given information system administration to be included under the regulation of Act No 181/2014 are lower in relation to this institute than in the case of critical information infrastructure.

The NIS Directive obliges Member States to regulate three subsectors in the energy sector, namely the electricity, oil and gas subsectors. In addition to the mandatory subsectors, the Czech Republic has included the heating sector. The criteria for designating the basic service operator and the basic service information system are then laid down in Implementing Decree No 437/2017, on the criteria for designating the basic service operator, as amended. In contrast to critical information infrastructure, another formal process of NCISA identification of these systems was also adopted. It does so, unlike in the case of critical information infrastructure, by issuing a decision in administrative proceedings, which the NCISA initiates itself, ex officio.

ii. Regional cooperation in this area

Regional cooperation in the gas sector takes place, inter alia, on the platform to prepare the Gas Regional Investment Plan for Central and Eastern Europe (CEE GRIP). It is also possible to mention the Gas Coordination Group meetings. Regional cooperation also stems from the Security of Gas Supply Regulation, which lays down the solidarity principle and the elaboration of regional chapters on risk analysis, preventive action plans and emergency plans. In the electricity sector, the issue is addressed within a number of already existing structures, for example within ENTSO-E cooperation. Regional energy security cooperation is likely to be further strengthened on the basis of the Security of Electricity Supply Regulation, which was part of the ‘Clean Energy for All Europeans’ legislative package. In the framework of regional cooperation in the gas sector, other forms of cooperation can be mentioned, such as the Gas Regional Initiative SSE and various pan-European working groups at ACER, CEER or ENTSO-G.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Financial measures related to energy security at national level, including EU support and the use of EU funds, mainly concern the development of electricity and gas infrastructure. For more details, see Chapter 3.4.

3.4 Dimension ‘Internal energy market’ [94]

3.4.1 Electricity infrastructure

i. Policies and measures to achieve the targeted level of interconnectivity as set out in Article 4(d)

The framework target for Czech transmission system interconnectivity corresponds to maintaining the transmission system import and export capacity relative to the maximum load at a level of at least 30 % and 35 %, respectively. This is in line with the 15 % 2030 interconnectivity target (relative to installed

[94] Policies and measures reflect the first energy efficiency principle.

capacity). The Czech Republic is currently meeting this target with a relatively significant reserve and can be expected to do so in the future (see Chapter 2.4.1 and Chapter 4.5.1). Therefore, the Czech Republic does not consider it necessary to have specific policies and measures to achieve this target.

The expected export and import capacity of the Czech Republic and its adequacy for trade exchanges and especially for the secure operation of the transmission system is periodically assessed both within the preparation of the ten-year network development plan of the Czech Republic and within the cooperation on the ten-year development plan at ENSTO-E level.

With regard to the strengthening of export and import capacity, pre-project preparation (elaboration of the spatial-technical study) of a new line between the Czech Republic and Slovakia was started in coordination with the Slovak partners. Another aspect affecting the capacity of the cross-border transmission system, which should be mentioned in this context, is the strategy of ČEPS, the transmission system operator, which aims to replace the 220 kV system with a 400 kV system. For more information, see also Chapter 4.5.2.

ii. Regional cooperation in this area[95]

In accordance with Regulation (EU) No 714/2009 of the European Parliament and of the Council on conditions for access to the network for cross-border exchanges in electricity, the development plan is also reflected in the content of the regional investment plan for the Central and Eastern Europe on a two-yearly basis. Therefore, many of ČEPS's upcoming development investment projects are part of the regional investment plan of continental Central and Eastern Europe 2015 and are included in the TYNDP 2016, which is subject to assessment in accordance with established criteria.

One of the cooperative initiatives is 'Electricity Neighbours'. Electricity Neighbours is an initiative set up in 2015 on the basis of a joint declaration prepared by the German Federal Ministry of Economy and Energy in cooperation with the European Commission and the countries of the Pentalateral Energy Forum. The group consists of Germany, France, the Benelux countries, Denmark, Italy, Norway, Sweden, Poland and the Czech Republic. The declaration highlights the importance of the internal market as the most advantageous economic means of ensuring supply security.

The real development of operational security in individual regions and blackout response in Western Europe in 2006 led to the establishment of ad-hoc coordination platforms (Coreso, TSC, SSC) aiming to ensure operational coordination between the dispatching centres of the participating transmission system operators.

Over the years, and with increasing need for coordination, inter alia, due to the growing share of intermittent electricity sources in the interconnected European system, cooperation among the TSOs has become much more interlinked and more detailed.

In June 2017, TSCNet and Coreso, as two future RSCs (Regional Security Coordinators), in accordance with the SO GL (System Operation Guideline, laying down the guidelines for the operation of electricity transmission systems), signed a framework cooperation agreement.[96] This means sharing resources, methodologies and tools, joint or alternating provision of services and development of new services and resources. The adopted SO GL, together with the CACM (Capacitive Allocation and Congestion Management Guideline, establishing a guideline on capacity allocation and congestion management) and the Emergency Restoration Network Code (NC ER, establishing a network code on electricity

[95] Non-regional PCI groups established under Regulation (EU) No 347/2013.

[96] In this respect, it is relevant to mention Regulation (EU) 2019/943 of the European Parliament and of the Council on the internal market for electricity, which, under Article 35, legislatively establishes the regional coordination centres posed to replace the RSC entities.

emergency and restoration), sufficiently define the mandatory cooperation between the TSOs and the regional security coordinators.

On 23 January 2019, the Czech-Slovak common interest project ACON was also approved within the framework of the CEF. E.ON Distribuce, a. s., and Západoslovenská distribučná, a. s. have received EUR 91.2 million from the European Commission for the international project ACON Smart Grids. It is the first project of distribution companies in the region of Central and Eastern Europe that has succeeded in the EU among the Projects of Common Interest (PCI projects). In addition to distribution companies, ACON is also supported by transmission system operators in the Czech Republic and Slovakia – ČEPS, a. s., and Slovenská elektrizačná prenosová sústava, a. s., and other partners. Work on the modernisation of distribution networks will begin this year in both countries and it will continue until 2024. The aim of this project, which is implemented in the Czech Republic by E.ON Distribuce, a. s., is to modernise and increase the efficiency of the distribution system and to deepen cross-border cooperation between Slovakia and the Czech Republic. Thanks to the project, intelligent technologies will be introduced into the distribution network to help regulate energy exactly according to consumption; it will also allow for improved utilisation of renewable resources in the future. By investing in smart grids, stability and security of supply, as well as economic efficiency of networks, will increase, while also improving remote network management. All this to prepare the distribution system for the coming decades to enable the connection of electric vehicles, batteries and other devices that will become part of everyday life.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Investment in the electricity system can be considered as very important, also in relation to the use of EU funds. The reason for the need for these investments is that the age of a significant part of the production sources and electricity system is 35 years or more and requires corresponding investment in maintenance, renewal and modernisation. Furthermore, it is necessary to adapt to new technologies and further technological development both in terms of sources and consumption. Electricity networks should be modernised on an ongoing basis to allow for the further development of new electricity generation sources (increase of free connection capacity). In addition to EU funds, the Czech Republic plans to continue to use funds from the CEF programme after 2020.

The current use of the structural funds can be summarised as follows. Eight projects for modernising and improving the capacity of the transmission system with a total value of CZK 1 609 million have been approved so far, the EU contribution is CZK 643 million; as of 21 March 2018 CZK 23 million was reimbursed to three projects. In the area of modernisation and capacity increase of distribution systems, seven projects with total project expenditure of CZK 289 million are currently being administered, the EU contribution being CZK 116 million. In 2014–2020, the sub-area of transmission, distribution and storage of electricity and the modernisation of energy infrastructure is supported under the OP EIC, namely under Priority Axis 3, Investment Priority 3, Development and deployment of low and high voltage smart distribution systems, SO 3.3 'Increase the application of smart network elements in distribution systems'.

According to the OP EIC programming document, the total allocation for investment grants under this investment priority was EUR 37 million. As of 21 March 2018, a total of three applications with a total investment grant of CZK 152.641 million were approved. There was also less interest in grants for the construction of smart electricity networks, which should cover the expected significant increase in the number of decentralised sources connected into the system and the introduction of new consumption management services. However, the interest of the regulated entities is closely related to the setting of the fifth regulatory period.

In 2017, the European Commission approved the request for change / removal of the share for large enterprises in SO 3.2, 3.3 and 3.5. This should ensure a higher absorption capacity. OP EIC provides support to an increase in the applications of elements of Smart Grids I – distribution networks and Smart Grids II – transmission networks.

3.4.2 Natural gas transmission infrastructure

i. Policies and measures related to the elements set out in point 2.4.2, including, where applicable, specific measures to enable the delivery of Projects of Common Interest (PCIs) and other key infrastructure projects

The process to determine the incremental capacity of commercial infrastructure projects is governed by Commission Regulation (EU) 2017/459 of 16 March 2017 establishing a network code on capacity allocation mechanisms in gas transmission systems and repealing Regulation (EU) No 984/2013. In addition, it also specifies non-commercial projects which can be put on the ‘Union list of projects of common interest under Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013[97] on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009. These projects can then enjoy certain benefits provided for in this regulation. The last type of projects is national projects, which are governed by Act No 458/2000, on the conditions for business and the performance of State administration in the energy sectors and amending certain acts (the Energy Act).

ii. Regional cooperation in this area[98]

Context of regional cooperation

The Czech Republic produces only 2 % of its natural gas consumption and is therefore dependent on imports from third countries. Sufficient diversification of transport routes (the Gazela pipeline and reverse gas flows at border transfer points) together with market liberalisation have led to the currently very good security of gas supply for domestic customers. The transmission system operator in the Czech Republic is at the same time an important natural gas transit operator for markets in Western, Central and Southern Europe. It is currently not possible to precisely determine the impact of decarbonisation in the European and Czech context on the Czech gas network and the concrete information on how this network will be used with a view to minimise the transmission system operator’s sunk costs. At present, technological solutions for the gas sector decarbonisation are not developed to a large extent in both the EU and the Czech Republic, and it is therefore appropriate to keep this infrastructure for future use for both natural gas and new types of gases. A combination of natural gas with CCS or CCU may be considered for the storage or utilisation of carbon produced from natural gas splitting. Another European trend is the future use of synthetic methane, biomethane and hydrogen as a partial substitute for natural gas. The specific decision on the use of the technologies for new types of gases can be expected in 2020 to 2030, largely depending on the research and development of these technologies and the economies of scale to be achieved after they are deployed.

Regional cooperation in the area of natural gas

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[97] Projects of Common Interest are updated as needed and the provision of these specific projects in the National Plan does not mean that these projects can be considered binding.

[98] Non-regional PCI groups established under Regulation (EU) No 347/2013.

In the area of natural gas, micro- and macro-regional cooperation takes place on several levels. Within the Gas Coordination Group, which meets regularly about once a year, the EU Member States discuss security, legislative and economic issues related to the EU gas sector.

Regional infrastructure cooperation is strengthened at the operational level through the implementation of PCI projects, which are regularly discussed in smaller groups set up on a geographic basis.

On the basis of the revised Security of Gas Supply Regulation (2017/1938), the so-called Risk Groups have been set up through which carry out regional risk management. States are discussing factors that could threaten the stability of gas supply in the future and look for ways to mitigate the risks. The Czech Republic is an active member of three regional groups, namely the Ukrainian, Baltic and Belarusian groups. Furthermore, the ‘Solidarity mechanism’ has been established, which obliges States to work more closely with their neighbours on crisis management and to codify the mechanism to provide cross-border assistance in case of threatened gas supply outages to protected customers.

The V4 Gas Forum is regularly held by the presiding country of the Visegrad Group. The focus of the meetings is always fully up to the presiding State, but typically the central theme is the debate on the possibilities for regional cooperation in the area of gas infrastructure development and the search for a common position on the legislative proposals being discussed by the EU Council. The V4 Gas Forum newly discusses the legal and operational aspects of Solidarity implementation.

The ‘Budapest Process’ is a platform for V4+B4+ meetings. This platform is relatively new, and it is currently difficult to predict how the initiative develops, or what its specific focus will be.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

For gas infrastructure projects, it is currently possible to obtain EU financial support through the Connecting Europe Facility (CEF). CEF is part of the EU Financial Framework 2014–2020. In the past, projects also received support from the EU Trans-European Energy Network (TEN-E) programme, which provided support to long-term energy investments.

In 2012, the BACI project received financial support from the TEN-E funds. The financial support was 50 % of the eligible costs incurred in updating the documentation for the land-use permit and the study of the future possibilities of interconnecting the Czech and Austrian gas transmission systems. The study was completed in 2013 and the land-use permit application was filed in May 2015. At the end of 2014, the project received a CEF grant covering 50 % of the eligible costs of the preparatory study on the preparation of documents for the investment application. These documents were completed in late 2015.

In 2014, the CPI project received financial support from the CEF programme covering 50 % of the eligible costs for the development of land-use permit documentation and documentation for contractor and material selection for the Stork II project. In the context of the CEF’s second call in the energy sector, a grant for construction work on the Stork II project was obtained, but it was cancelled because the project was postponed until the end of 2022 by the Polish partner. The Stork II project has been postponed to the end of 2023, according to information from the Ten-Year Plan for the Development of the Transmission System 2020–2029.

Neither the BACI project nor the CPI project were included in the 4th list of Projects of Common Interest (PCI). Therefore, it cannot be expected that these projects would draw funds from the CEF programme for the period 2014–2020.

In 2017 a CEF grant was obtained for design work as part of the project to modernise the Břeclav compressor station. Its aim is primarily to prepare a feasibility study and to create an introductory project and the Detail Design.

3.4.3 Market integration

i. Policies and measures related to the elements set out in point 2.4.3

3.4.3.1 Electricity sector

With regard to international aspects, the policies and measures of the Czech Republic in this area are primarily aimed at EU legislation, namely Commission Regulation (EU) 2015/1222 (CACM) and the conditions and methodologies that follow therefrom. This is especially the MCO plan, see Chapter 2.4.3, which is binding on all NEMOs within the EU.

In cooperation with all NEMOs in the EU, in June 2017 first a plan was created to jointly establish and perform the functions of a market coupling operator – the 'MCO plan'. It established rules for the management and cooperation between NEMOs, defines the relationship with third parties, and also describes the transition of existing initiatives of interconnected day-ahead and intraday markets into a single interconnected day-ahead and intraday market.

In relation to the CACM Regulation, the following methodologies were developed in 2017: (i) the methodology of products that NEMOs can incorporate into single day-ahead or single intraday coupling; (ii) back-up methodology; (iii) the methodology for harmonised maximum and minimum clearing prices.[99]

The single price coupling algorithm and the continuous trading matching algorithm is the last methodology which had to be prepared by the MCOs under CACM.

Electricity forward market

The Czech Republic will sign a contract through ČEPS to establish a single EU platform for the allocation of long-term capacity rights under harmonised rules. The requirements for the establishment of this platform are set out in Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation (the 'FCA Regulation')[100].

Integration of day-ahead electricity market

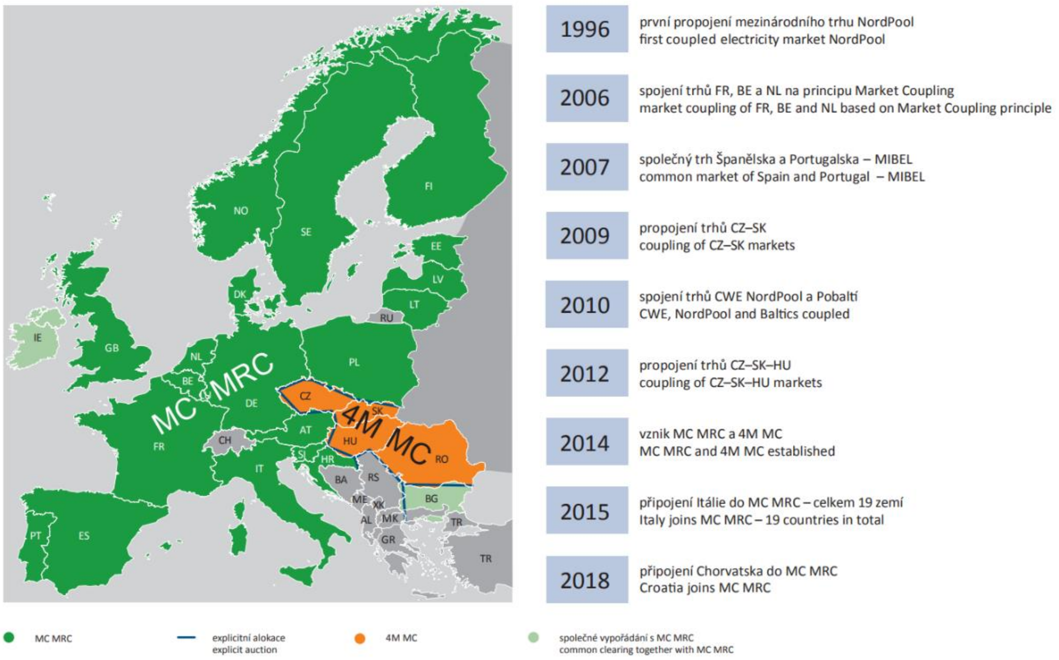
As part of the MCO Plan, the Price Coupling of Regions (PCR) project, based on the cooperation of energy exchanges, has been established as a technical solution to enable the integration of day-ahead markets. OTE, a.s. has been a full member of this project since 2013 and has been thus involved in the development of this solution. The PCR system provides a unified algorithm, known as EUPHEMIA, and unified operational procedures for effective electricity pricing and the use of cross-border transmission capacity. The PCR solution is already being used in price-coupled markets (see Figure 5.4) in Europe and its further use, as a basis for a future pan-European solution, can therefore be seen as a logical step. In 2018, a significant shift was made in the PCR project to initiate the steps necessary to modify the EUPHEMIA solution to meet the requirements of the price coupling algorithm in accordance

99 At the time of the finalisation of the National Plan of the Czech Republic, all pan-European methodologies are already approved, but they are still undergoing changes. The following information from ACER can be used for an overview of methodologies https://www.acer.europa.eu/en/Electricity/MARKET-CODES/CAPACITY-ALLOCATION-AND-CONGESTION-MANAGEMENT/Pub_Docs/CACM%20implementation%20table.pdf

100 For more information see: https://www.ceps.cz/cs/fca-gl and: https://www.emissions-euets.com/forward-capacity-allocation-platform.

with the CACM Regulation. Intensive research is planned in the coming years to ensure sufficient quality, robustness and stability of the algorithm for the single day-ahead market in Europe.

Figure 2: *Current state of day-ahead market coupling in electricity in Europe*



Source: OTE, a.s.

The Multi-Regional Coupling (MRC) includes the markets of Germany/Austria, France, Belgium, Netherlands, Luxembourg, Denmark, Finland, Croatia, Sweden, Norway, United Kingdom, Spain, Portugal, Latvia, Lithuania, Estonia, Slovenia, Italy and Poland. This coupling area accounts for approximately 2 800 TWh of annual electricity consumption. The Bulgarian day-ahead market is settled together with the MRC, but without the allocation of cross-border capacities.

Thanks to the long-term integration activities of the Market Operator, the Czech Republic is part of the day-ahead market coupling covering the Czech, Slovak, Hungarian and Romanian electricity market (4M MC). The 4M MC uses the PCR solution, which ensures the technical and procedural compatibility between 4M MC and the MRC and the target European solutions. Market participants in the Czech Republic are offered products and solutions also used in Western Europe.

Over the last few years, there were ongoing preparations for the coupling of this regional project to MRC on the basis of the implicit flow-based allocation of cross-border capacities within CORE established by the CACM Regulation and consisting of 13 EU Member States[101].

The Czech Republic's interest is to provide market participants with the possibility of implicit allocation of cross-border capacity at all border profiles of the Czech Republic through the above electricity markets integration projects.

Integration of intraday electricity market

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[101] France, Germany, Belgium, the Netherlands, Austria, Czech Republic, Slovakia, Poland, Hungary, Slovenia, Croatia, Luxembourg and Romania.

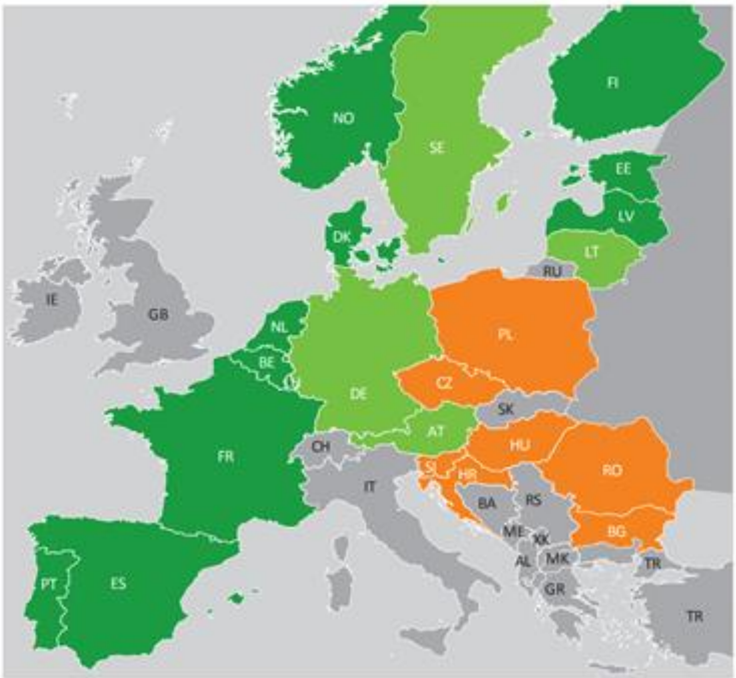
A logical step towards creating a single European market is also the individual coupling at regional / pan-European level in intraday trading. The integration of intraday trading is largely different from day-ahead coupling, because it is a continuous 24/7 trading, with significant demands not only on the harmonisation of procedures between marketplaces and providers of cross-border profiles but also on the technical solution used, which must achieve very high availability while maintaining stable performance.

2018 saw the conclusion of the implementation of a platform for the single intraday continuous trading with the implicit allocation of cross-border capacities within the Cross-Border Intraday Coupling (XBID) project, which was established as the technical solution for the single intraday coupling in Europe under the MCO Plan. The XBID project responds to market needs by creating a more transparent and efficient continuous trading environment that enables market participants to easily trade their intraday positions across EU markets without the need for explicit allocation of transmission capacity. On 19 November 2019, the project for the European Single Intraday Coupling of electricity markets was launched with trading for the 20 November 2019 supply day[102].

The solution is based on a single central IT system linking bids from local trading systems operated by nominated electricity market organisers, as well as available transmission capacities between trading zones provided by transmission system operators. As part of the central solution, orders placed by market participants in one country may be matched with orders placed by market participants in any other participating country if there is an available cross-border transmission capacity between the zones concerned.

[102] For more information see: https://www.ote-cr.cz/cs/o-spolecnosti/zpravy_ote/projekt-evropskeho-propojeni-vnitrodennich-trhu-s-elektrinou-sidc-v-ramci-tzv-druhe-vlny-lokalnich-implementacnich-projektu-potvrzuje-spusteni-provozu-dne-19-listopadu-2019-ke-ctrnacti-jiz-propojenym-zemim-evropske-unie-se-tak-prida-dalsich-sedm-zemi.

Figure 3: *Expected state of day-ahead coupling in electricity in Europe after 2019*

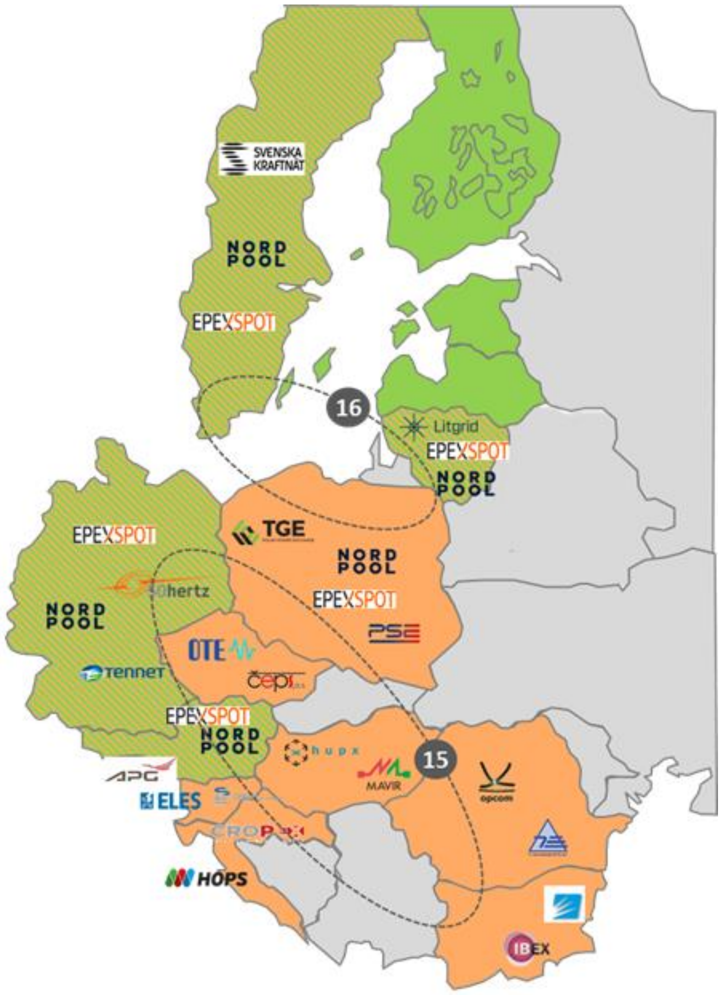


Source: OTE, a.s.

The national intraday coupling is realised through 'local implementation projects', which bring together nominated electricity market operators and transmission system operators in a given area or region. On 12 June 2018, the first wave of local implementation projects was successfully launched, covering the following countries: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Lithuania, Latvia, Norway, the Netherlands, Portugal, Spain and Sweden. Since the launch of the first wave in June 2018, more than 16 million trades have been successfully completed.

In May 2017, a local implementation project No 15 (the so-called LIP 15) was launched, through which the relevant nominated market operators and transmission system operators representing Austria, Czech Republic, Germany, Poland, Hungary, Romania, Croatia and Slovenia showed their interest in realising continuous cross-border trading and introducing an implicit allocation of intraday cross-border transmission capacities on relevant profiles. The parties to the LIP 15 project plan to start operations by the end of 2019.

Figure 4: *Cross-border profiles under LIP 15*



Source: OTE, a.s.

Balancing services market

Through ČEPS, the Czech Republic is represented in the TERRE[103], MARI[104] and PICASSO[105] platform projects implementing transnational platforms for sharing and activating balancing energy bids from standard products. The common objective of all platforms is the introduction of a single market with standardised balancing energy bids and thereby also the achievement of the key EBGL[106] objectives. ČEPS is also a member of other working groups which prepare or implement other EBGL requirements; together with the implementation of the platforms, these represent an instrument for the Czech Republic to achieve commitments in this area of the market.

3.4.3.2 Gas sector

The Czech Republic intends to help complete the internal energy market, in particular the internal gas market, by removing infrastructure bottlenecks between the Czech Republic and its neighbours, namely

[103] Trans European Replacement Reserves Exchange
[104] Manually Activated Reserves Initiative
[105] Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation
[106] Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing

Poland and Austria. This should be facilitated by the fact that the national gas market legislation has been adapted to two regulations designed to ensure uniform principles for the creation of a single internal gas market in the EU – Regulation (EU) No 2017/460 establishing a network code on harmonised transmission tariff structures for gas, Regulation (EU) No 2017/459 establishing a network code on capacity allocation mechanisms in gas transmission systems and repealing Regulation (EU) No 984/2013.

This should be further facilitated by the support for the implementation of PCI status projects (projects of common interest), enabling direct interconnection with the gas systems of neighbouring countries. These projects contribute to the integration of national markets in the region and the creation of a Central European gas market. The interconnection with Germany and Slovakia is already sufficiently robust. The Czech Republic is interconnected with Poland by the STORK gas pipeline. There is no physical interconnection between the Czech Republic and Austria.

For more information see also Chapter 2.4.3.2.

ii. Measures to increase the flexibility of the energy system with regard to renewable energy production such as smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, real-time price signals, including the roll-out of intraday market coupling and cross-border balancing markets

National Action Plan for Smart Grids

The key strategic and planning document containing measures to increase the flexibility of the energy system is the National Action Plan for Smart Grids, which is prepared by the Ministry of Industry and Trade on the basis of the task formulated in the State Energy Policy of the Czech Republic from 2015. The National Action Plan for Smart Grids (NAP SG) was approved by the Government of the Czech Republic in March 2015, by Government Resolution No 149 of 4 March 2015.

The period up to 2019 was characterised as preparatory within the framework of NAP SG; the aim in this period was to prepare the necessary analyses, to design and agree a target model for the smart grid implementation in the Czech Republic, to complete and evaluate the pilot projects and to prepare the implementation process for the Advanced Metering Management (AMM).

On 16 September 2019, the Government of the Czech Republic approved the NAP SG Update, more precisely the National Action Plan for Smart Grids 2019–2030 (NAP SG 2019–2030)[107]. At the same time, the NAP SG Evaluation Report as of 31 December 2018 was prepared, which provides detailed information on the fulfilment of individual cards, or policies and measures within the NAP SG.

The following areas have been identified as relevant areas that fall within the scope of the NAP SG Update:

- Legislation (EU legislation – network regulations, winter legislative package, new technologies);
- Use of aggregation, flexibility for electricity systems (decentralised energy sources, consumption);
- Electromobility (integration and use for the operation of the electricity system);
- Digitalising and its use (automation, communication);
- Decentralised energy sources (integration and use for the operation of the electricity system);
- Dispatching control (including operational measurement);

[107] The National Action Plan for Smart Grids 2019–2030 is available at the following link.

– Accumulation (integration and use for the operation of the electricity system);
– Advanced Metering Management (AMM).

Table 55 provides an overview of a total of 20 projects (measures / tasks) approved under NAP SG 2019–2030, divided into three main areas. The projects are further divided into three main groups: support, implementation and pilot. NAP SG 2019–2030 then contains detailed tender notes for each project, which includes a solution schedule, responsibility for performance, expected benefits and other information.

Table 55: *Overview of NAP SG 2019–2030 measures by individual areas*

Areas / Programmes	Projects (measures / tasks)
I – Legislation, tariff system, regulation	Legislative support (support project)
	Monitoring and implementation of EC regulations (network codes) (implementation project)
	Introduction of a 15-minute interval for evaluation of imbalances (implementation project)
II – Use of new technologies in the operation of the Czech electricity system	Installation of electricity quality metering (implementation project)
	Frequency relief (feasibility project)
	Flexibility of battery systems (0.5 MW and above) to provide balance and other support services (pilot project)
	DECE flexibility (0.5 MW and above) to provide balance and other support services (pilot project)
	Flexibility of large consumers (connected to 110 KV) to provide balance and other support services (pilot project)
	Aggregation of supply-side flexibility providers (including prosumers) connected to HV and LV to provide balance and other support services (pilot project)
	Accumulation, use of accumulation as a part of PVPP installations in LV networks (support project)
	Technical DataHUB – Digitalising of the operation of the Czech electricity system in future conditions (implementation project)
	Management Q (implementation project)
III – Integration of new technologies into the electricity system	Implementation of advanced metering management (implementation project)

	Implementation of smart stations at high voltage level (remote control, monitoring, signalling) (implementation project)
	Implementation of remote-controlled switching elements (RCSE) on MV overhead lines (implementation project)
	Low-voltage network automation (ASDC) (support project)
	Integration of electromobility into the transport system (pilot and support project)
	Development and construction of optical telecommunication infrastructure (implementation project)
	Energy DataHUB – trade part (implementation project)
	Utilisation of Power to X technology for accumulation of surplus electricity from RES (support project)

Source: Prepared by the MIT on the basis of the National Action Plan for Smart Grids 2019–2030

Measures following from European legislation

The change of market setting to increase its flexibility is implemented as part of the implementation of the Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation ('FCA Regulation'), Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management ('CACM Regulation') and finally Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing ('EB Regulation').

The FCA Regulation lays down detailed rules on cross-zonal capacity allocation in the forward markets, on the establishment of a common methodology to determine long-term cross-zonal capacity, on the establishment of a single allocation platform at European level offering long-term transmission rights, and on the possibility to return long-term transmission rights for subsequent forward capacity allocation or transfer long-term transmission rights between market participants.

The CACM Regulation lays down detailed guidelines on cross-zonal capacity allocation and congestion management in the day-ahead and intraday markets, including the requirements for the establishment of common methodologies for determining the volumes of capacity simultaneously available between bidding zones, criteria to assess efficiency and a review process for defining bidding zones.

The EB Regulation lays down a detailed guideline on electricity balancing including the establishment of common principles for the procurement and the settlement of frequency containment reserves, frequency restoration reserves and replacement reserves and a common methodology for the activation of frequency restoration reserves and replacement reserves.

iii. Where applicable, measures to ensure the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets

In accordance with Act No 165/2012, on supported energy sources, the transmission system operator or distribution system operator is obliged, in its licenced territory, to preferentially connect to the transmission system or to the distribution system a facility generating electricity from a supported source in order to transfer or distribute electricity, if the manufacturer so requests and meets the conditions of connection, except for the demonstrable lack of capacity of the transmission and distribution facility or in the case of the risk to safe and reliable operation of the electricity system. At the same time, the transmission system operator or distribution system operator shall, at the request of the producer whose facility generating electricity from a supported source is to be connected to the distribution system or the transmission system, provide the necessary information for the connection, information on estimated connection costs, the time limit for connection, handling the connection application and an estimate of the time needed to make the connection.

Integration of renewable energy sources, demand-side response and overall flexibility are dealt with in detail in the National Action Plan for Smart Grids, more precisely its updated version, i.e. the National Action Plan for Smart Grids 2019–2030. These measures are set out in more detail in part (ii) and they are specifically summarised in Table 55.

Partial measures with regard to demand-side flexibility are also included in the approved European legislation, in particular Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU. The measures required by this Directive will be gradually transposed into national legislation.

iii. Policies and measures to protect consumers, especially vulnerable and, where applicable, energy poor consumers, and to improve the competitiveness and contestability of the retail energy market

Policies and measures to protect the legitimate interests of customers and consumers in the energy sector to meet all reasonable energy supply requirements:

– ensuring the supply of energy to consumers at the most competitive prices;
– ensuring appropriate measures to promote a more efficient use of energy for consumers;
– increased level of customer protection in the position of the consumer, i.e. especially household customers;
– ensuring that consumers are informed about their energy consumption and energy costs in sufficient time intervals; non-discriminatory payment systems;
– ensuring that consumers are informed of their rights in the energy sector;
– ensuring the enforcement of consumer rights – establishing swift and effective complaints procedures and out-of-court settlement mechanisms;
– ensuring the availability of effective means of settling disputes for all customers;
– issuing binding decisions on the protection of consumers’ rights in disputes with energy companies;
– issuing binding decisions regarding energy companies; imposing effective, proportionate and dissuasive sanctions on energy companies;
– promoting fair competition, enabling consumers to make full use of the opportunities in energy markets.

Energy poverty is a multidimensional phenomenon, which can be characterised from many different perspectives. Still, the basic model criteria may reflect a situation where households have insufficient level of basic energy services as a result of a combination of high energy expenditure, low household income, low energy efficiency of buildings and facilities, possibly in combination with the specific energy needs of these households. Therefore, energy poverty itself can be seen as a problem at the interface between social, economic and environmental agendas. For this reason, the solution may be an integrated approach, which can include both social policy measures and measures to improve energy efficiency in households, as well as measures to increase consumer awareness of the ways to save energy (improving the position of consumers, especially of vulnerable consumers).

The terms ‘vulnerable customer’ or ‘energy poverty’ are commonly used in EU documents and EU legislation, without this term being defined in them. Rather than focusing on the definition of vulnerable customers, the EU places a strong emphasis on the existence of support systems and the definition of which categories of customers this support applies to. In connection with vulnerable customers, regardless of how this term is defined in individual Member States with regard to national conditions, Member States should ensure the enforcement of rights and obligations aimed at protecting and supporting this category of customers.

Therefore, criteria must be determined at national level to define the term ‘energy poverty’, thus allowing regular monitoring of the state of energy poverty in the Czech Republic. The term ‘vulnerable customer’ can be understood and defined in the Czech environment only once the priorities allowing to develop and implement interventions and assess their effectiveness are determined on the basis of research and market analysis.

Regardless of the fact that energy poverty or vulnerable customer is not currently defined in the Czech Republic, customer support systems are now in place that partially meet the requirements of the directives, because they allow economic support and protection against disconnection of poor customers. It is a combination of economic support within social systems, together with tools to protect customers in emergency situations (supplier of last resort, obligation going beyond the licence). However, the Czech Republic does not have a specific support system for the energy sector, which is not in direct contradiction with EU requirements, because the EU requires a high degree of caution when considering intervention in the internal electricity or gas market, even if the intention is to protect vulnerable customers.

Existing support systems:

– an economic support system specific to the energy sector (the Czech Republic does not have an economic support system specific to the energy sector). In most countries with an economic support system in the energy sector, the system covers customers with income below a defined level.);
– a system of economic support outside of the energy sector (a characteristic factor is that customers can get some financial support if needed) (part of social systems in the Czech Republic).
– a system of non-economic support specific to the energy sector (a non-financial support system, such as, in particular, disconnection protection, may work as a complement to the economic support system). In the Czech Republic, these measures include the institutes of supplier of last resort and obligations going beyond the licence regulated by the Energy Act).

A vulnerable customer, whose position may be derived from the state of ‘energy poverty’, must be appropriately defined in law to ensure his suitable protection. The underlying theoretical parameters of a vulnerable customer may in particular involve situations where:

– customers are significantly less capable of protecting or representing their interests in the energy market than typical consumers (for example, due to age or health);
– in the event of a negative energy supply situation, customers, due to their personal situation, will be more harmed by an event than other customers in the same situation.

The energy sector in the Czech Republic lacks systematic collection of information on the number of households suffering from energy poverty; therefore, there can be no binding parameters characterising a vulnerable customer. Ultimately, therefore, there can be no system of economic support for vulnerable customers personalised for the energy sector.

In this respect, there are the following principles on which new policies and measures should be based to protect vulnerable and energy poor consumers:

- in order to identify energy poverty among household customers in the Czech Republic, it will be necessary to publish the parameters and criteria used for its identification, measurement and monitoring – important factors in designing the indicators for measuring energy poverty are, inter alia, low income, high energy costs and low energy efficiency of homes;
- drawing up a national action plan or another appropriate framework to tackle this problem, which would aim to reduce the number of people facing the problem and ensure the necessary energy supplies to vulnerable customers and customers suffering from energy poverty;
- the application of an integrated approach, for example as part of energy and social policy – measures need to be adapted to the specific situation identified and may include social or energy policy measures relating to the payment of electricity bills, investment in energy efficiency of residential buildings or consumer protection, such as disconnection protection;
- in the fight against energy poverty, appropriate instruments may also include community energy principle, which may also bring about progress in energy efficiency of households and reduce consumption and lower supply rates – community energy may enable energy market participation to certain consumer groups in households which would otherwise not be able to do so;
- the protection of customers suffering from energy poverty or the protection of vulnerable customers should be ensured by means other than public interventions in the setting of electricity or gas supply prices, an exception being an intervention in the form of 'public service', but it must be consistent with transparent conditions and only in precisely defined cases.

For more information on energy poverty, see also Chapter 2.4.4 and 3.4.4.

iv. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing[108]

Measures developing demand-side flexibility are contained in the National Action Plan for Smart Grids, or more precisely in its updated version, the National Action Plan for Smart Grids 2019–2030. These measures are set out in more detail in part (ii) and they are specifically summarised in Table 55.

Partial measures with regard to demand-side flexibility are also included in the approved European legislation, in particular Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU. The measures required by this Directive will be gradually transposed into national legislation.

3.4.4 Energy poverty

i. Where applicable, policies and measures to achieve the objectives set out in point 2.4.4

The Czech Republic does not currently have policies or measures specifically aimed at reducing energy poverty. This issue is primarily addressed by social policies or, where applicable, partially by consumer protection policies. However, the Czech Republic addresses this issue also with regard to the approved European legislation. Currently, work is underway on the methodology to identify vulnerable customers and consumers suffering from energy poverty and tools to address this problem (for more information,

[108] In accordance with Article 15(8) of Directive 2012/27/EU.

see Chapter 2.4.4). It will likely be possible to propose specific measures and policies in this area only following the preparation of this methodology. The first call of the pilot programme of financial assistance to households and municipalities in the Karlovy Vary, Moravian-Silesian and Ústí nad Labem Regions is under way within the National Programme Environment. The programme aims to pre-finance the replacement of substandard solid fuel boilers in households in the form of a soft loan to individuals; part of the support is intended to provide the services of a boiler replacement specialist who will provide the households with comprehensive advisory services. Therefore, the programme is aimed at helping socially weak households to support the replacement of substandard heat sources in a residential building and it can thus be to some extent considered as an energy-poverty-related programme, which is at the same time energy-sector-specific. The Czech Republic will provide information about the developments in this area by periodic progress reports in accordance with Regulation (EU) 2018/1999.

3.5 Dimension 'Research, innovation and competitiveness'

i. Policies and measures related to the elements set out in point 2.5

3.5.1.1 The National Research, Development and Innovation Policy of the Czech Republic 2016–2020 and its update for 2019–2020[109]

The National Research, Development and Innovation Policy of the Czech Republic 2016–2020 is the key strategic document at national level, which sets out guidelines for research, development and innovation and forms the basis for other related strategic documents of the Czech Republic. The document puts more emphasis on supporting applied research for the needs of the economy and the State administration, and identifies the key areas and research topics on which applied research should focus. The National Policy also proposes changes in the management and funding of science so that more top-level scientific results are produced and companies become more engaged in R&D.

In 2018, the Report on the Evaluation of Fulfilment of Measures of National Priorities of Oriented Research, Experimental Development and Innovation 2016–2020 was prepared, which was approved by the Czech Government in February 2019. This report includes an update of the National Priorities of Oriented Research, Experimental Development and Innovation of the Czech Republic 2016–2020 for the period 2019–2020, prepared in the context of the proposed modifications to the measures described in that report.

3.5.1.2 National priorities for oriented research, experimental development and innovation[110]

National Priorities of Oriented Research, Experimental Development and Innovation were approved by the Government of the Czech Republic on 19 July 2012. National priorities for oriented research, experimental development and innovation are valid for the period up to 2030 with gradual fulfilment. Within the defined 6 priority areas, there are 24 sub-areas with a total of 170 specific targets. The document contains a description of each of the priority areas and sub-areas, indicating links between the areas and defining several system measures. The document also contains a statement regarding the expected division of expenditures on research, development and innovation from the state budget into individual areas.

[109] The document is available at: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=682145
[110] The document is available at: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=653383

Table 56: *Energy-related priority areas within the NPOR*

Area	Sub-area
Renewable energy sources	Developing economically efficient solar energy
	Developing economically efficient use of geothermal energy
	Developing economically efficient use of biomass
Nuclear sources	Efficient long-term use of existing nuclear power plants
	Supporting the safety of nuclear installations
	Research to support the construction and operation of new economically efficient and secure units
	Research and development of the fuel cycle
	Storage of radioactive waste and spent fuel
	Research and development of 4th generation reactors, especially efficient and safe fast reactors
Fossil energy sources	Economically efficient and environmentally-friendly fossil power and heating
Electric networks including energy storage	Capacity, reliability and safety of backbone transmission networks
	Modifying networks for 'demand-side management'
	Electricity storage, including the use of hydropower
	Security and resilience of distribution networks
Production and distribution of heat/cold, including cogeneration and trigeneration	Heat off-take from power plants in base load
	High-efficiency cogeneration (trigeneration) in district heating systems in partial load operations (system services)
	Distributed combined production of electricity, heat and cold from all types of sources
	Transmission and storage of heat
	Efficient management of treating indoor environment
	Alternative sources – waste recovery
Energy in transport	Increase the share of liquid and gas biofuels to replace fossil sources
	Increase the share of electricity use for drives to replace fossil sources
	In the future, introduce hydrogen as a source of energy in transport
Systemic development of the Czech energy sector in the context of EU energy sector development	System analyses to support a balanced State Energy Policies (SEP), other related strategy documents of the State and regional development policies with regard to the EU framework
	Integral strategy of municipal and regional development with verification by demonstration projects (link to SET Plan – Smart Cities and Smart Regions)

Source: National priorities for oriented research, experimental development and innovation

3.5.1.3 National Research and Innovation Strategy for Smart Specialisation of the Czech Republic

EU Member States were obliged to prepare their National Research and Innovation Strategies for Smart Specialisation (National RIS3 Strategies) in order to identify appropriate prospective economic areas, which should be subsequently supported by the European Structural and Investment Funds (ESIF). To this end, the Czech Republic has prepared its National RIS3 Strategy, which reflects the priorities of our economy, which should be targeted by ESIF programmes and selected research and development support programmes. The approval of the National RIS3 Strategy by the Czech government and the European Commission was a necessary condition to receive funds from the relevant ESIF. The document was modified by Government Resolution No 24 of 11 January 2019 'on the National Research and Innovation Strategy for the Smart Specialisation of the Czech Republic 2014–2020 – Update 2018'. Table 57 lists the priority areas of energy research based on the National Research and Innovation Strategy for Smart Specialisation in the Czech Republic. The approval of the National RIS3 Strategy by the Czech government and the European Commission was a necessary condition to receive funds from the relevant ESIF (within the 'preliminary conditions').

Table 57: *Priority areas of research based on the National Research and Innovation Strategy*

Regions	Description
Technologies for electricity and heat production in nuclear power plants	In the field of **technologies for electricity and heat production in nuclear power plants**, the main challenge of the research and development will be to ensure a high level of security, including the acquisition of knowledge and necessary tools and data in all areas needed to continuously ensure quality legislation, State Office for Nuclear Safety supervisory activities (including expert support of the regulator), and the needs of operators, all in a synergistic way to maintain and improve the quality of the necessary experts. It includes models for enhancing deterministic and probabilistic security analyses (including the role of the human factor), new technologies and approaches to preventing and managing severe accidents. The use of project reserves is an important area of research, be it in relation to performance (including optimisation of fuel cycles) or longevity (associated with the derivation of behaviour and aging of materials, components and equipment). There is potential in the preparation of improved methods of processing and treatment of radioactive waste, decontamination and dismantling of nuclear power plants after termination of operation (including the use of robots). The fourth-generation systems, nuclear fusion, particle sources and small modular reactors (SMR) are also an important research topic.
Fossil fuel based energy production	In the field of **fossil fuel based power production**, research and development must provide the necessary tools to enable greater flexibility of operation, including increasing the regulatory range of the resource (recognising the effects on the life of materials and equipment and their maintenance), technologies to continuously meet the decreasing limits for emissions from operated sources (mainly coal) and to increase their efficiency (technical solutions, advanced management models). The research should also include the use of energy by-products from the combustion processes of coal sources (ash, flue ashes, energy gypsum, etc.), especially for the production of building and construction materials, including the derivation of conditions for the use of new materials (evaluation of the impact of harmful substances, testing methods design, ecotoxicology, etc.). There is also the possibility of developing the utilisation of black and brown coal in a different way than by combustion.
Heat production and distribution (or cold)	In the area of **heat production and distribution** (or cold), the future challenge lies in making the systems more efficient by measures targeting specific conditions either at the source (boiler output ranges, optimum solution for deSOx / deNox / dust, reduction of the minimum enforcement of condensing production, solutions for multi-fuel use, etc.) or in the heating network (technical possibilities of loss reduction, modern system control systems). The main development themes are also the accumulation of energy (heat or surplus electricity in the electricity system) and the 'hybridisation' of the systems – effective partial decentralisation of systems (synergy of central and decentralised facilities). Attention must be paid to the development of innovative small cogeneration and micro-generation technologies (improved engines, fuel cells, ORC cycles, etc.), trigeneration, production and distribution of cold and their testing in real-life use.
Use of renewables	Cost-effective **use of renewables** requires development and testing of technologies that are suitable to the conditions in the Czech Republic. Biomass systems have considerable potential – future solutions are primarily in the provision of heat on a local (regional) scale. Research and development must focus on the sustainable extraction of biomass (residues and waste from forestry and agriculture), purposefully grown biomass and its transformation into a form that is suitable for transport and end use. The boilers must be available in all the necessary performance series that meet the future requirements (for small boilers, these are requirements arising from the ecodesign legislation). The subject of R&D must be a

	suitable transformation processes of biomass showing the most effective solutions in the future. Topics for biogas plants are the expansion of the fuel base and the efficient use of heat. The use of higher output hydropower will be tied to more efficient operation of the equipment (innovative machines and their control) and reduction of environmental impacts during construction and operation of the equipment. Complex systems management models that take energy, water and other functions into account are also important[111]. Some potential is represented by small hydropower plants for small gradients and flows requiring innovative technologies (low-component systems, new types of turbines, simple regulation, etc.). Development in the use of wind energy should be aimed at solutions to reduce losses (gearing, etc.) and trouble-free integration into the electricity grid. The use of solar energy should focus on the expansion of roof photovoltaic installations combined with appropriate storage to maximise domestic consumption (residential sector, services); innovative solutions for solar thermal systems (cost reduction, combination with unconventional heat storage solutions, etc.). Development must also focus on the use of heat pumps – increasing SOC, gas pumps, combination with other technologies at house or small-site level. Decentralised sources must be perceived not only as isolated technologies, but their synergic functioning must be explored at the same time – e.g. interconnecting them into virtual power plants (aggregators) and heat sources. Power-to-gas technology, i.e. converting energy into hydrogen or methane for energy storage, will also be a development focus.
Electricity networks	In the area of **electricity networks**, research and development will focus on ensuring reliable and safe (including security) operation of the electricity system in changing conditions on the source and consumer side. Management issues, new technical elements enhancing the robustness, efficiency and reliability of the system, developing the vision of network integration and managing the electricity balance in the European context are important topics for the area of transmission. Research and development and demonstration topics for reliable and secure operation are important in the area of distribution networks – new automation elements (remote control elements), advanced approaches in diagnostics and monitoring (predictive diagnostics, etc.), smart metering and integration of renewables, distributed generation and electromobility. The key theme is the optimisation of production and consumption – advanced load management (developing centralised control) and power management based on price and other motivational signals (demand-side management / demand response).
Energy storage.	**Energy storage** will be a key element between production and consumption in the future. Therefore, it is important to develop and test energy storage systems with different characteristics and with different carriers potentially suitable for the functionality (energy and performance; networking or island operation solutions, etc.), taking into account the potential for discounting.
Energy savings	In the field of energy **savings**, it is crucial to develop and demonstrate practically applicable solutions in the final consumption sectors – households, industry, services and agriculture. The preparation and demonstration of integral solutions for cities and agglomerations (smart cities and regions)

[111] Complex model management of power systems, in particular in the case of hydraulic structures not intended primarily for the production of electricity, will be based primarily on the purposes and priorities of the hydraulic structures for which they have been authorised. In practice, this control can only be applied in the free-handling zones in the storage volume of the tanks within the defined control lines.

	in relation to European initiatives, but taking into account the specificities of the Czech Republic is also a complex area. The essence lies in synergistically integrating the generation and transmission of energy, the use of energy in buildings and the energy intensity of transport, all while applying ICT technologies. In the residential sector, the concept of smart homes and housing is to be developed, which is the intersection between construction, local energy production, smart appliances, but also other elements for a safe and happy life. Energy savings must focus not only on technical solutions, but also on business and financing models. It is also important to improve the energy performance of buildings, for example by insulation. Passive houses lead to an increase in the quality of indoor and outdoor environments due to lower levels of harmful substances inside the building and lower emissions of local pollution into the surroundings.
Energy for transport	The **energy for transport** are should focus on the preparation and demonstration of solutions for wider use of electromobility (integration of charging stations into the network, control systems, integration with energy storage, hybrid solutions, inductive charging etc.), hybrid vehicles and the development of concepts and verification of key elements for fuel cell propulsion and transport. An important role is played by the development of new types of biofuels or the use of energy by-products to build road network and infrastructure.
Perspective energy technology	In the field of **perspective energy technologies**, which will be applied in the longer term, research and development will focus for example on small modular reactors working in the high temperature area with high safety, fourth-generation reactors, hydrogen technologies mainly for energy storage, nuclear fusion, advanced energy storage and transformation technologies and thermodynamic cycles.
Analytical supporting documents	Decision-making in the energy sector requires high-quality **analytical supporting documents** that can relate to the above areas individually or be common to several of them. Conventional and larger renewable sources and energy distribution share the development of risk-oriented decision-making models (operation, maintenance models) based on advanced mathematical solutions and data handling. Another topic is the analysis of possibilities and limits of energy sector development in the Czech Republic for various time horizons or models of ensuring energy security and increasing the energy and raw material efficiency of the economy.
Horizontal issues	**Horizontal issues** of research and development such as the application of ICT (digitisation, big data), new materials and production technologies (rapid prototyping, customised manufacturing, etc.) must also be taken into account.
Nanotechnology	In the field of **nanotechnologies** it is necessary to focus the research on the possibilities of application of graphene (graphene supercapacitor) and the use of nanomaterials in the construction of batteries (3D batteries).

Source: National Research and Innovation Strategy for Smart Specialisation of the Czech Republic

3.5.1.4 THÉTA

One of the main instruments of support of applied research specifically in the energy sector is the THÉTA programme, administered by the Technological Agency of the Czech Republic. The programme was created on the basis of measures from the State Energy Policy.

The focus of THÉTA is based on the updated State Energy Policy of the Czech Republic, approved by the Czech Government in May 2015. The programme is aimed at supporting projects whose results have a high potential for application in a number of areas of the public life of the Czech Republic. The programme period is 2018–2025 (i.e. 8 years in total). The first tender was announced in 2017, the second in 2018, and the third in October 2019. The maximum duration of projects is set at 8 years, but varies from one sub-programme to another.

In the medium and long term, the programme aims to contribute, through the outputs, results and impacts of the supported projects, to achieving the vision of transformation and modernisation of the energy sector in accordance with approved strategic documents. This will be achieved through the support for energy research, development and innovation with a focus on: (i) promoting public interest projects; (ii) new technologies and system elements with high potential for rapid deployment in practice; (iii) support for long-term technological perspectives; the division to individual sub-programmes is reflective of this.

The State budget expenditures for THÉTA for 2018–2025 total CZK 4 000 million. Non-public funds should then amount to CZK 1 715 million. Thus, total expenditure amounts to CZK 5 715 million. The programme allocation is divided into sub-programmes as follows: sub-programme 1 – 15 %, sub-programme 2 – 50 % and sub-programme 3 – 35 %. Table 58 shows the approved THÉTA budget for 2018–2025.

Table 58: *THÉTA budget (rounded to CZK million)*

Year	2018	2019	2020	2021	2022	2023	2024	2025
Total expenditure	272	509	818	917	917	917	867	498
State budget expenditure	200	360	580	640	640	640	600	340
Non-public funds	72	149	238	277	277	277	267	158

Source: THÉTA, a programme to support applied research, experimental development and innovation

3.5.1.5 Programme Environment for Life

The programme of applied research, experimental development and innovation in the environment field – Environment for Life was approved by the Resolution of the Government of the Czech Republic No 204 of 25 March 2019. The support for the programme is provided by the Technological Agency of the Czech Republic and the Ministry of the Environment is responsible for its content.

The focus of the Programme Environment for Life is set by the updated State Environmental Policy of the Czech Republic 2012–2020 (hereinafter 'SEP'), which was approved by the Government in November 2016. In order to improve the environmental protection in the Czech Republic and to fulfil the Czech Republic's obligations in this area set by the European Union and international conventions, the applied research, experimental development and innovation will focus on the priority thematic areas of SEP, i.e. sustainable use of natural resources, climate protection and air quality improvement, waste management and recovery, nature and landscape protection and a safe and resilient environment, including preventing and reducing the consequences of natural and anthropogenic hazards.

The Programme aims to bring new environmental solutions, stabilise and expand the knowledge base, which will make a significant contribution to ensuring a healthy and quality environment in the Czech Republic and sustainable use of its resources, minimising negative environmental impacts of human activities, including transnational impacts; it will thus contribute to improving the quality of life in Europe and in the global context.

These solutions will contribute to reducing the impacts of climate change on nature and society, in particular to mitigating the effects of drought and preventing drought, reducing the impact of other meteorological extremes (wind, floods, extreme temperatures), improving air and water quality, improving to the development of circular waste management and the efficient use of raw materials, improving the conservation of natural resources, water, soil and the rock environment, preserving biodiversity and improving the quality of nature and landscape protection, developing environmentally friendly and climate change resilient and safe society.

The specific objectives of the programme are as follows:

1. Contribute to adaptation to climate change and to the introduction of economically effective mitigation measures;
2. Contribute to the improvement of environmental components and support the implementation of the circular economy principles;
3. Promote resilient and safe society and nature.

The priority areas of the programme are as follows:

- climate – measures to protect the climate, adapt to and mitigate the increasingly extreme nature of precipitation and temperature, both in settlements and in the open countryside;
- air protection;
- waste and circulation management;
- protection of water, soil, rock environment and other natural resources;
- biodiversity, nature and landscape protection;
- environmentally friendly society, safe and resilient environment, specific instruments of environmental protection and sustainable development.

The first public tender for the Programme Environment for Life was announced on 12 June 2019.

3.5.1.6 Research infrastructure of the Czech Republic

In 2009, Act No 130/2002, on the promotion of research, experimental development and innovation from public funds and amending certain related acts (Promotion of Research, Experimental Development and Innovation Act), as amended, laid down a new specific legislative instrument to support research infrastructure of the Czech Republic. The Ministry of Education, Youth and Sports became the central State administration authority of the Czech Republic responsible for financing the so-called 'large infrastructures for research, experimental development and innovation' from the public funds of the Czech Republic, with large infrastructure being defined as 'unique research facilities, including their purchase, related investment and activities, which is necessary for a comprehensive research and development activity with high financial costs and technological complexity and which is approved by the government and established by one research organisation for use also by other research organisations.'

In 2010, the Roadmap of Large Infrastructures for Research, Experimental Development and Innovation of the Czech Republic was prepared for the first time, whose structure corresponds to the ESFRI

Roadmap and which was updated in 2011 and 2015, when a completely new Roadmap of Large Infrastructures for Research, Experimental Development and Innovation of the Czech Republic 2016–2022 was prepared[112]. Since 2010, the Roadmap of Large Infrastructures for Research, Experimental Development and Innovation of the Czech Republic thus represents a strategic document of the Czech Republic which establishes the policy of support and further investment development of large research infrastructures and represents the Czech Republic's contribution to the European efforts for strategic approach to research infrastructures on national and macro-regional EU level.

In the energy sector, the following are considered large infrastructure: (i) catalytic processes for the efficient use of carbonaceous energy raw materials; (ii) COMPASS – tokamak for thermonuclear fusion research; (iii) CVVOZE PowerLab; (iv) Jules Horowitz Reactor – participation of the Czech Republic; (v) experimental nuclear reactors LVR-15 and LR-0; (vi) research infrastructure for geothermal energy; (vii) SUSEN – sustainable energy; (viii) VR-1 – a school reactor for research activities.

3.5.1.7 Competence Centres / National Competence Centres

Competence Centres

The Competence Centres programme was approved by Government Resolution No 55 of 19 January 2011. The draft changes to the Competence Centre programme were approved by Government Resolution No 146 of 27 February 2013. The programme was aimed at supporting the establishment and activities of research, development and innovation centres in progressive fields with high application and innovative potential and perspective for a significant contribution to improving the Czech Republic's competitiveness.

As part of 'Competence Centres', a programme of the Technology Agency of the Czech Republic, the following centres focusing on energy were established: Competence Centre for Energy Recovery of Waste, Centre for Advanced Nuclear Technology (CANUT), Advanced Technologies for Heat and Power Generation, Centre for Research and Experimental Development of Reliable Energy, and Centre for the Development of Technologies for Nuclear and Radiation Safety: RANUS – TD.

National competence centres

A programme for the support of applied research, experimental development and innovation, the National Competence Centres (NCC), was approved by the Resolution of the Government of the Czech Republic No 291 of 29 April 2019. The aim of the programme is to synergistically interconnect the already existing successful centres, which were established with the support of TA CR (Competence Centres), GA CR (Excellence Centres) and operational programmes (especially the R&DI Centres) with other research centres and units into one integrated system. The programme will help to significantly strengthen the segment of research organisations focused on applied research and it will motivate relevant existing research institutes with the aim of concentrating their research and technological capacities in the NCCs, where quality applied research will be carried out according to the needs of the application sphere. As part of the National Competence Centre programme, the National Energy Centre is established.

[112] The document is available at: http://www.msmt.cz/vyzkum-a-vyvoj-2/cestovni-mapa-cr-velkych-infrastruktur-pro-vyzkum

It will be possible to use the programme for synergies and complementary effects with the Union programme Horizon 2020 and its successor Horizon Europe and other international programmes that are in line with the programme's focus.

ii. Where applicable, cooperation with other Member States in this area, including, where appropriate, information on how the SET Plan objectives and policies are being translated to a national context

In the area of science and research, the Czech Republic is relatively significantly involved in cooperation with other Member States, both at the level of the European Strategic Energy Technology Plan (SET Plan) and its other pillars (for example the European Energy Research Alliance[113]). The Czech Republic is also relatively significantly involved in the EU Framework Programme for Research and Innovation (Horizon 2020). The Czech Republic is also involved in European but also international research within important scientific centres (see, for example, the research infrastructures in the energy sector referred to in Chapter 3.5.1.6). The Czech Republic is also involved in research cooperation programmes of the International Energy Agency. Specifically, it is a Technology Collaborative Platform on Energy Saving in Buildings[114]; fluidised bed combustion[115] and clean energy and education[116].

In June 2019, the Czech Republic and Hungary also initiated the creation of a V4 platform for energy research. This platform should be officially introduced under the Czech V4 Presidency. The platform's priorities are yet to be defined, but it should focus on researching smart grids, energy storage, energy efficiency, etc. Emphasis will also be placed on nuclear research. At the same time, a special Czech–Hungarian Innovation Platform (CIP) should be established. The aim is coordination and possible joint action in the field of energy innovation and technological development with regard to the future, sustainable development and social responsibility.

The priorities of the European Strategic Energy Technology Plan (see Table 59) are already largely taken into account in the State Energy Strategy in areas defining the main R&D priorities. The priorities of the SET Plan have also been taken into account in detail in the preparation of the THÉTA programme, which is specifically focused on the energy sector. The specific reflection / use of the SET Plan priorities and their modifications for the Czech Republic are specifically referred to in the text of the approved THETA programme or in the underlying analyses of this programme.

[113] European Energy Research Alliance (EERA)
[114] Energy Conservation in Buildings and Community Systems Programme
[115] Fluidised Bed Conversion (FBC TCP)
[116] Clean Energy Education and Empowerment (C3E TCP)

Table 59: *Priorities under the Integrated Roadmap, Energy Union priorities, 10 SET Plan projects*

SET Plan Integrated Roadmap (13 themes)	ENERGY UNION R&I & Competitiveness priorities	SET Plan (10 key actions)
T10: Development of renewables T8: System flexibility	N°1 in Renewables	1. Performant renewable technologies integrated in the system 2. Reduce costs of technologies
T1: Engaging consumers T2: Smart technologies for consumers T6: Modernising the electricity grid T7: Energy storage T8: System flexibility T9: Smart cities & communities	Smart EU Energy System with consumers at the centre	3. New technologies & services for consumers 4. Resilience & security of energy system
T3: Energy efficiency in buildings T4: Energy efficiency in heating & cooling T5: Energy efficiency in industry & services	Efficient Energy Systems	5. New materials & technologies for buildings 6. Energy efficiency for industry
T7: Energy storage T13: Biofuels, fuel cells & hydrogen, alternative fuels	Sustainable Transport	7. Competitive in global battery sector (e-mobility) 8. Renewable fuels
T11: Carbon capture storage/use		9. CCS/U
T12: Nuclear energy		10. Nuclear Safety

Source: Information systems SETIS

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

For more detailed information on the level of public funding for energy research and innovation, see Chapter 4.6. In general, (i.e. not in relation to energy), financial measures, including the intended EU support, are described in detail in the National RIS3 Strategy, which aims, inter alia, to identify appropriate prospective areas of the economy, which should be subsequently supported by European Structural and Investment Funds (ESIF) or the EU funds. National RIS3 strategy then reflects the priorities of the Czech economy, on which the ESIF / EU fund programmes and selected national programmes of research and development support should focus (see Chapter 3.5.1.3).

Section B: Analytical basis[117]

[117] See part 2 for a detailed list of parameters and variables to be reported in Section B of National Plans.

4 CURRENT SITUATION AND PROJECTIONS WITH EXISTING POLICIES AND MEASURES[118,119]

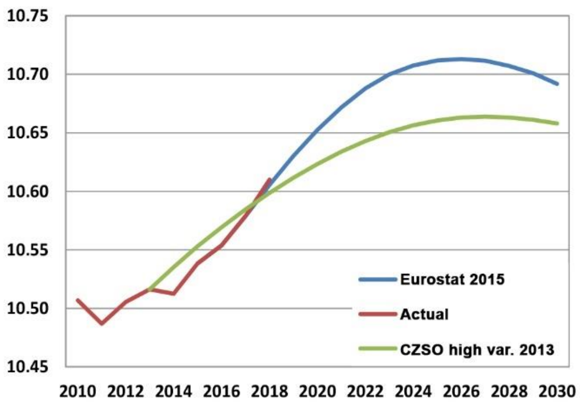
4.1 Projected evolution of main exogenous factors influencing energy system and GHG emission developments

i. Macroeconomic forecasts (GDP and population growth)

4.1.1.1 Expected population trends (demographic projections)

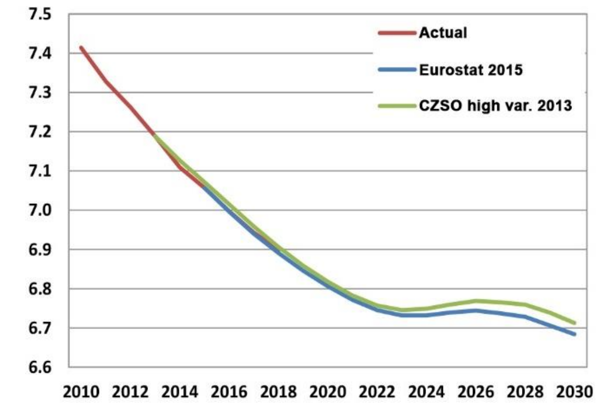
Demographic projection is one of the basic parameters for deriving long-term macroeconomic outlook. The future intensity of population ageing and the economic response to this process is a major factor affecting the long-term economic development.

Chart 19: *Population (millions of persons)*



Source: CZSO, Eurostat.

Chart 20: *Population aged 15–64 (millions of persons)*



Source: CZSO, Eurostat.

[118] The state of play must reflect the date of submission of the National Plan (or last available date). The existing policies and measures include those which have been implemented and adopted. The adopted policies and measures are those which have been adopted by a formal government decision before the date of submission of the National Plan and for which there is a clear commitment to carry them out. Implemented policies and measures are those that are covered by one or more of the following statements as at the date of submission of the National Plan: national legislation is in force, one or more voluntary agreements have been concluded, financial resources have been allocated, human resources have been mobilised.

[119] The choice of external factors may be based on the assumptions made in the 2016 EU baseline scenario or another later policy scenarios for the same variables. Another useful source of data in creating national estimates using existing policies and measures and in impact assessments is also the specific results of Member States in relation to the EU 2016 benchmark scenario or other future policy scenarios.

The 2013 projection of the Czech Statistical Office[120], valid at the time the document was prepared, was prepared using the 2012 data. It does not (and cannot) reflect the changes in demographic trends in recent years. This involves a relatively dramatic increase in birth rates, when total fertility increased from 1.46[121] in 2013 to 1.67 in 2017, which in turn led to an increase in the number of live births by 7.1 %. In other parameters, such as mortality and international migration balance, the actual development was roughly in line with the projection's expectations.

That is why a newer 2015 Eurostat demographic projection was used[122] (published in 2017). According to the projection, the current population growth should continue in the next few years. It should peak probably in 2025 at about 10.7 million people. After that, the population should gradually shrink.

Since 2009, demographic ageing has resulted in a shrinkage of the working-age population aged 15–64. However, its intensity is decreasing over time and this process should temporarily stop after 2024. This is due to the generation born in the first half of the 1960s, a period of low birth rates, which will reach the age of 65.

4.1.1.2 Expected economic growth

The prediction of economic development for 2018–2021 is based on the April Macroeconomic Forecast of the Czech Republic. In 2018–2021, economic growth should gradually slow down from 3.6 % in 2018 to 2.4 % in 2021. Domestic demand, both final consumption (households and general government sector) and investment, should be the main driver of growth over the entire period. In spite of the continued growth of exports, net exports should have more or less neutral effect on GDP growth due to the high import intensity of exports and domestic demand (especially investments).

The outlook for the years 2022–2030 is based on the following assumptions.

The labour productivity growth (relative to employment) should reach 2.4 % per year over the entire period. This growth corresponds to the long-term average of the period 1994–2017. Although productivity growth slowed down in this period, as in a number of other economies (in 1994–2007, labour productivity increased by an average of 3.4 % per year while in 2008–2017 the average growth was only 1.1 % per year), given the low level of productivity in the Czech Republic compared to the developed Western economies, we believe that there is still significant scope for further increase in labour productivity. The ratio of employment in the working age population (15–64 years) could reach 80 %. Given this assumption, the increase in labour productivity will be the dominant growth factor.

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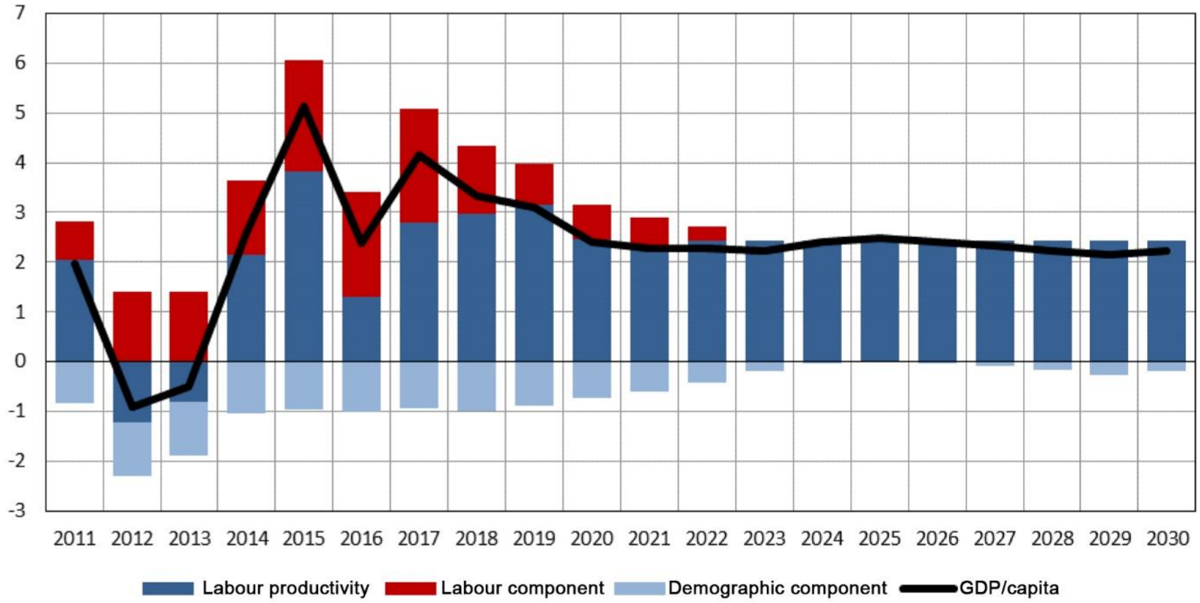
120 https://www.czso.cz/csu/czso/projekce-obyvatelstva-ceske-republiky-do-roku-2100-n-fu4s64b8h4. The new CZSO demographic projection was issued in November 2018.

121 It includes the number of live births per 1 woman if her fertility remained the same as in that year over her entire reproductive period.

122 http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-/database

Chart 21: *Decomposition of the growth of real GDP per capita (annual growth in %, contribution to growth in percentage points)*[123]



Source: CZSO, Eurostat. Calculations of the Ministry of Finance of the Czech Republic

Together with the expected development of the working-age population (a total decline of 1.2 % compared to 2021), these assumptions thus determine real GDP growth, which should fluctuate around 2.3 % in 2022–2030. At the end of the period, the projected decline in the working-age population will be more pronounced, which could slow economic growth from 2.5 % in 2024–25 to 2.1 % in 2029 and 2030.

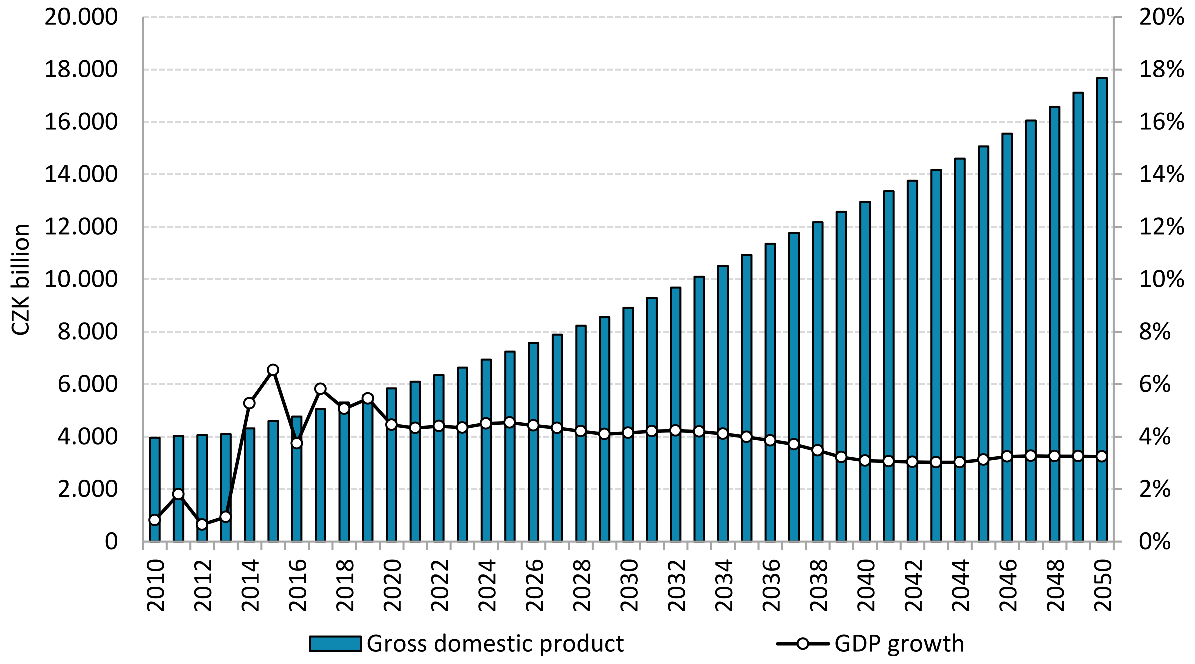
For the entire period of 2022–2030 we expect stable price developments. GDP deflators and gross added value should increase by 2 % per year. Nominal gross value added[124] could be 90 % of GDP in individual years of the 2018–2030 period. This corresponds to the mutual relationship between these aggregates, which were achieved in 2010–2017 on average.

For the development of the CZK/EUR exchange rate, the technical assumption of a gradual appreciation of 1 % per year was adopted. This is in line with the expected continued convergence of the economic level of the Czech Republic and the euro area.

[123] Note: Labour component is defined as the ratio of employment in the working age population (15–64), the demographic component is the share of the working-age population in the total population. Labour productivity is related to employment.

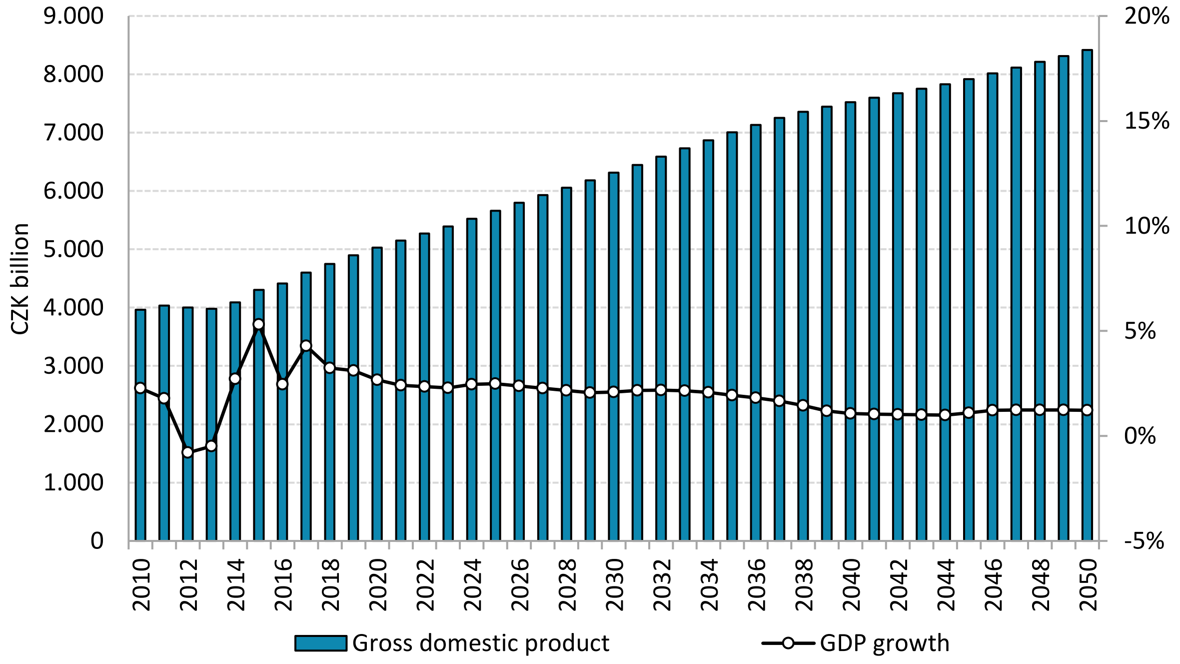
[124] The Ministry of Finance does not predict the development of the gross value added; therefore, the values for 2018–2021 are projected based on the assumptions in this document.

Chart 22: *GDP growth outlook*



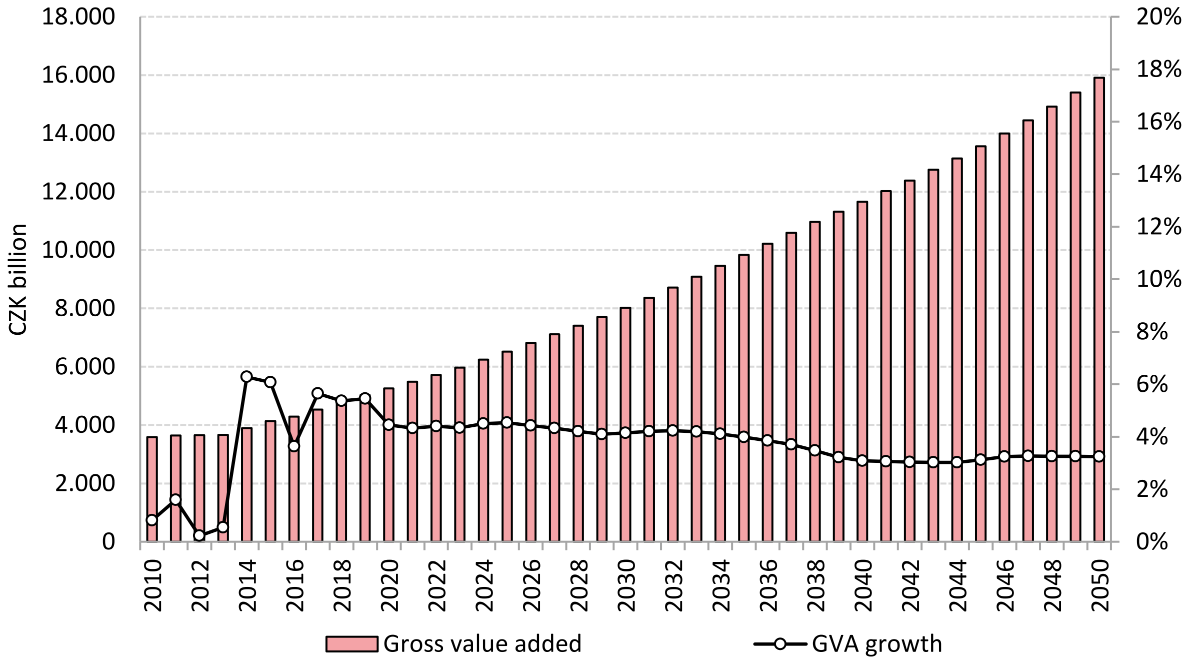
Source: Ministry of Finance of the Czech Republic (August 2018)

Chart 23: *GDP growth outlook (2010 prices)*



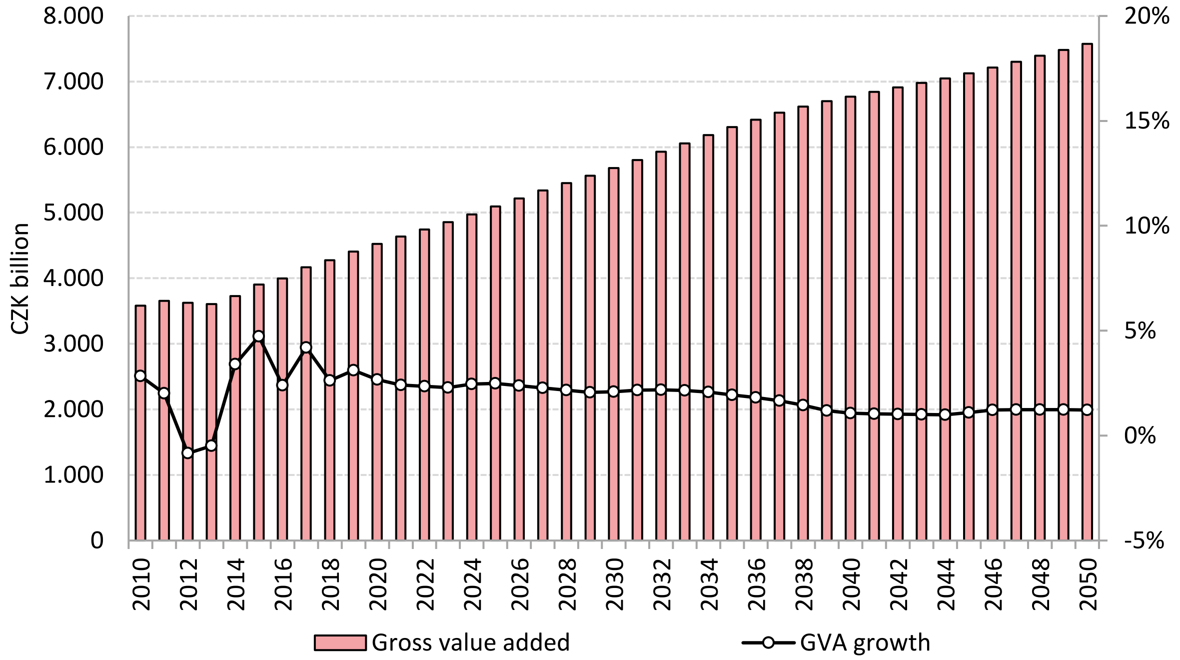
Source: Ministry of Finance of the Czech Republic (August 2018)

Chart 24: *GVA growth outlook*



Source: Ministry of Finance of the Czech Republic (August 2018)

Chart 25: *GVA growth outlook (2010 prices)*



Source: Ministry of Finance of the Czech Republic (August 2018)

Table 60: *Outlook of basic macroeconomic parameters (Part 1)*

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
										Prediction	*Prediction*	*Prediction*	*Prediction*	*Outlook*	*Outlook*	*Outlook*	*Outlook*
Gross domestic product	*CZK billion*	3 962	4 034	4 060	4 098	4 314	4 596	4 768	5 045	5 300	5 589	5 838	6 091	6 359	6 635	6 934	7 249
	Growth (%)	**0.8**	**1.8**	**0.6**	**0.9**	**5.3**	**6.5**	**3.7**	**5.8**	**5.1**	**5.5**	**4.5**	**4.3**	**4.4**	**4.3**	**4.5**	**4.5**
	CZK billion 2010	3 962	4 033	4 001	3 981	4 089	4 307	4 412	4 601	4 750	4 898	5 029	5 150	5 271	5 392	5 525	5 662
	Growth (%)	**2.3**	**1.8**	**-0.8**	**-0.5**	**2.7**	**5.3**	**2.5**	**4.3**	**3.2**	**3.1**	**2.7**	**2.4**	**2.4**	**2.3**	**2.5**	**2.5**
Gross value added	*CZK billion*	3 583	3 640	3 649	3 668	3 899	4 136	4 286	4 528	4 771	5 031	5 255	5 482	5 723	5 972	6 241	6 524
	Growth (%)	**0.8**	**1.6**	**0.2**	**0.5**	**6.3**	**6.1**	**3.6**	**5.6**	**5.4**	**5.5**	**4.5**	**4.3**	**4.4**	**4.3**	**4.5**	**4.5**
	CZK billion 2010	3 583	3 655	3 624	3 606	3 729	3 905	3 999	4 166	4 275	4 409	4 526	4 636	4 745	4 853	4 973	5 096
	Growth (%)	**2.8**	**2.0**	**-0.8**	**-0.5**	**3.4**	**4.7**	**2.4**	**4.2**	**2.6**	**3.1**	**2.7**	**2.4**	**2.4**	**2.3**	**2.5**	**2.5**
GDP deflator	*2010=100*	100.0	100.0	101.5	102.9	105.5	106.7	108.1	109.7	111.6	114.1	116.1	118.3	120.6	123.0	125.5	128.0
	Growth (%)	**-1.4**	**0.0**	**1.5**	**1.4**	**2.5**	**1.2**	**1.3**	**1.5**	**1.8**	**2.3**	**1.7**	**1.9**	**2.0**	**2.0**	**2.0**	**2.0**
GVA deflator	*2010=100*	100.0	99.6	100.7	101.7	104.5	105.9	107.2	108.7	111.6	114.1	116.1	118.3	120.6	123.0	125.5	128.0
	Growth (%)	**-2.0**	**-0.4**	**1.1**	**1.0**	**2.8**	**1.3**	**1.2**	**1.4**	**2.7**	**2.3**	**1.7**	**1.9**	**2.0**	**2.0**	**2.0**	**2.0**
CZK/EUR (ECU)		25.3	24.6	25.1	26.0	27.5	27.3	27.0	26.3	25.6	25.2	24.6	24.0	23.8	23.5	23.3	23.1
	appreciation (%)	**4.6**	**2.9**	**-2.2**	**-3.2**	**-5.7**	**0.9**	**0.9**	**2.7**	**2.8**	**1.4**	**2.5**	**2.5**	**1.0**	**1.0**	**1.0**	**1.0**
Employment	*thous. persons*	5 057	5 043	5 065	5 081	5 109	5 182	5 264	5 346	5 419	5 430	5 439	5 444	5 442	5 436	5 439	5 444
	Growth (%)	**-1.0**	**-0.3**	**0.4**	**0.3**	**0.6**	**1.4**	**1.6**	**1.6**	**1.4**	**0.2**	**0.2**	**0.1**	**0.0**	**-0.1**	**0.1**	**0.1**
Population as of 1 January	*thous. persons*	10 462	10 487	10 505	10 516	10 512	10 538	10 554	10 579	10 610	10 630	10 652	10 672	10 688	10 700	10 707	10 712
	Growth (%)		**-0.2**	**0.2**	**0.1**	**0.0**	**0.2**	**0.1**	**0.2**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.0**
Population (year average)	*thous. persons*	10 517	10 497	10 509	10 511	10 525	10 543	10 565	10 590	10 620	10 641	10 662	10 680	10 694	10 704	10 710	10 712
	Growth (%)		**-0.2**	**0.1**	**0.0**	**0.1**	**0.2**	**0.2**	**0.2**	**0.3**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.0**
Population 15–64	*thous. persons*	7 371	7 295	7 225	7 149	7 083	7 027	6 970	6 921	6 873	6 826	6 789	6 759	6 739	6 732	6 736	6 742
	Growth (%)		**-1.0**	**-1.0**	**-1.1**	**-0.9**	**-0.8**	**-0.8**	**-0.7**	**-0.7**	**-0.7**	**-0.5**	**-0.4**	**-0.3**	**-0.1**	**0.1**	**0.1**
Productivity	*CZK thousand 2010/empl.*	784	800	790	784	800	831	838	861	877	902	925	946	969	992	1 016	1 040
	Growth (%)	**3.3**	**2.1**	**-1.2**	**-0.8**	**2.2**	**3.8**	**0.8**	**2.7**	**1.9**	**2.9**	**2.5**	**2.3**	**2.4**	**2.4**	**2.4**	**2.4**
Average household size	*persons/household*	2.507	2.496	2.419	2.407	2.396	2.387	2.378	2.369	2.360	2.351	2.342	2.333	2.324	2.315	2.306	2.297
Number of households	*thousands*	4 195.3	4 205.5	4 344.3	4 367.2	4 391.9	4 416.3	4 442.7	4 469.7	4 499.7	4 525.9	4 552.1	4 577.2	4 600.9	4 623.0	4 643.6	4 662.9
Number of households, EU-SILC	*thousands*	4 149.7	4 180.6	4 254.9	4 282.5	4 304.5	4 324.7	4 347.8	4 372.3	4 401.6	4 427.2	4 452.8	4 477.4	4 500.6	4 522.2	4 542.3	4 561.3
Available household income	*CZK billion*	2 179	2 184	2 206	2 208	2 285	2 383	2 474	2 575	2 721.9	2 880.7	3 009.1	3 139.3	3 277.4	3 419.6	3 573.6	3 735.8
	Growth (%)	**0.8**	**0.2**	**1.0**	**0.1**	**3.5**	**4.3**	**3.8**	**4.1**	**5.7**	**5.8**	**4.5**	**4.3**	**4.4**	**4.3**	**4.5**	**4.5**
Available household income + NPISH	*CZK billion*	2 207	2 212	2 234	2 237	2 315	2 412	2 506	2 612	2 760.6	2 921.7	3 051.9	3 183.9	3 324.0	3 468.3	3 624.4	3 789.0
	Growth (%)	**0.8**	**0.2**	**1.0**	**0.1**	**3.5**	**4.2**	**3.9**	**4.2**	**5.7**	**5.8**	**4.5**	**4.3**	**4.4**	**4.3**	**4.5**	**4.5**

Table 61: *Outlook of basic macroeconomic parameters (Part 2)*

		2026 *Outlook*	2027 *Outlook*	2028 *Outlook*	2029 *Outlook*	2030 *Outlook*	2031 *Outlook*	2032 *Outlook*	2033 *Outlook*	2034 *Outlook*	2035 *Outlook*	2036 *Outlook*	2037 *Outlook*	2038 *Outlook*	2039 *Outlook*	2040 *Outlook*
Gross domestic product	*CZK billion*	7 570	7 897	8 229	8 566	8 921	9 296	9 689	10 095	10 510	10 929	11 351	11 771	12 180	12 572	12 960
	Growth (%)	**4.4**	**4.3**	**4.2**	**4.1**	**4.1**	**4.2**	**4.2**	**4.2**	**4.1**	**4.0**	**3.9**	**3.7**	**3.5**	**3.2**	**3.1**
	CZK billion 2010	5 797	5 929	6 057	6 182	6 312	6 448	6 589	6 731	6 870	7 004	7 131	7 250	7 355	7 443	7 522
	Growth (%)	**2.4**	**2.3**	**2.2**	**2.1**	**2.1**	**2.2**	**2.2**	**2.2**	**2.1**	**1.9**	**1.8**	**1.7**	**1.4**	**1.2**	**1.1**
Gross value added	*CZK billion*	6 813	7 108	7 407	7 710	8 029	8 367	8 720	9 086	9 460	9 837	10 216	10 594	10 962	11 315	11 665
	Growth (%)	**4.4**	**4.3**	**4.2**	**4.1**	**4.1**	**4.2**	**4.2**	**4.2**	**4.1**	**4.0**	**3.9**	**3.7**	**3.5**	**3.2**	**3.1**
	CZK billion 2010	5 218	5 337	5 452	5 564	5 681	5 804	5 930	6 058	6 183	6 304	6 418	6 526	6 620	6 699	6 770
	Growth (%)	**2.4**	**2.3**	**2.2**	**2.1**	**2.1**	**2.2**	**2.2**	**2.2**	**2.1**	**1.9**	**1.8**	**1.7**	**1.4**	**1.2**	**1.1**
GDP deflator	*2010=100*	130.6	133.2	135.8	138.6	141.3	144.2	147.0	150.0	153.0	156.0	159.2	162.4	165.6	168.9	172.3
	Growth (%)	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
GVA deflator	*2010=100*	130.6	133.2	135.8	138.6	141.3	144.2	147.0	150.0	153.0	156.0	159.2	162.4	165.6	168.9	172.3
	Growth (%)	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
CZK/EUR (ECU)		22.9	22.6	22.4	22.2	22.0	21.9	21.7	21.6	21.5	21.4	21.3	21.2	21.1	21.0	20.9
	appreciation (%)	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Employment	*thous. persons*	5 443	5 437	5 424	5 406	5 390	5 379	5 371	5 362	5 350	5 332	5 310	5 281	5 243	5 192	5 137
	Growth (%)	**0.0**	**-0.1**	**-0.2**	**-0.3**	**-0.3**	**-0.2**	**-0.2**	**-0.2**	**-0.2**	**-0.3**	**-0.4**	**-0.5**	**-0.7**	**-1.0**	**-1.1**
Population as of 1 January	*thous. persons*	10 713	10 712	10 707	10 701	10 692	10 680	10 665	10 649	10 632	10 616	10 600	10 585	10 572	10 561	10 552
	Growth (%)	**0.0**	**0.0**	**0.0**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.2**	**-0.2**	**-0.2**	**-0.2**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
Population (year average)	*thous. persons*	10 712	10 709	10 704	10 696	10 686	10 673	10 657	10 641	10 624	10 608	10 592	10 578	10 566	10 557	10 549
	Growth (%)	**0.0**	**0.0**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.2**	**-0.2**	**-0.2**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
Population 15–64	*thous. persons*	6 741	6 733	6 717	6 695	6 675	6 662	6 651	6 640	6 625	6 604	6 576	6 541	6 492	6 430	6 362
	Growth (%)	**0.0**	**-0.1**	**-0.2**	**-0.3**	**-0.3**	**-0.2**	**-0.2**	**-0.2**	**-0.2**	**-0.3**	**-0.4**	**-0.5**	**-0.7**	**-1.0**	**-1.1**
Productivity	*CZK thousand 2010/empl.*	1 065	1 091	1 117	1 144	1 171	1 199	1 227	1 255	1 284	1 313	1 343	1 373	1 403	1 433	1 464
	Growth (%)	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.3**	**2.3**	**2.3**	**2.3**	**2.2**	**2.2**	**2.2**	**2.2**	**2.1**
Average household size	*persons/household*	2.288	2.279	2.270	2.261	2.252	2.244	2.235	2.226	2.217	2.208	2.199	2.190	2.181	2.172	2.163
Number of households	*thousands*	4 681.2	4 698.3	4 714.5	4 729.9	4 744.1	4 757.1	4 769.4	4 781.2	4 793.0	4 805.2	4 817.7	4 831.0	4 845.4	4 861.0	4 877.4
Number of households, EU-SILC	*thousands*	4 579.1	4 595.9	4 611.7	4 626.7	4 640.6	4 653.4	4 665.4	4 677.0	4 688.5	4 700.4	4 712.7	4 725.7	4 739.8	4 755.0	4 771.1
Available household income	*CZK billion*	3 901.3	4 070.0	4 241.2	4 415.1	4 597.8	4 791.1	4 993.5	5 203.0	5 416.9	5 632.7	5 850.0	6 066.7	6 277.4	6 479.5	6 679.5
	Growth (%)	**4.4**	**4.3**	**4.2**	**4.1**	**4.1**	**4.2**	**4.2**	**4.2**	**4.1**	**4.0**	**3.9**	**3.7**	**3.5**	**3.2**	**3.1**
Available household income + NPISH	*CZK billion*	3 956.8	4 127.8	4 301.5	4 477.9	4 663.2	4 859.2	5 064.5	5 277.0	5 494.0	5 712.8	5 933.2	6 152.9	6 366.6	6 571.6	6 774.4
	Growth (%)	**4.4**	**4.3**	**4.2**	**4.1**	**4.1**	**4.2**	**4.2**	**4.2**	**4.1**	**4.0**	**3.9**	**3.7**	**3.5**	**3.2**	**3.1**

Table 62: *Outlook of basic macroeconomic parameters (Part 3)*

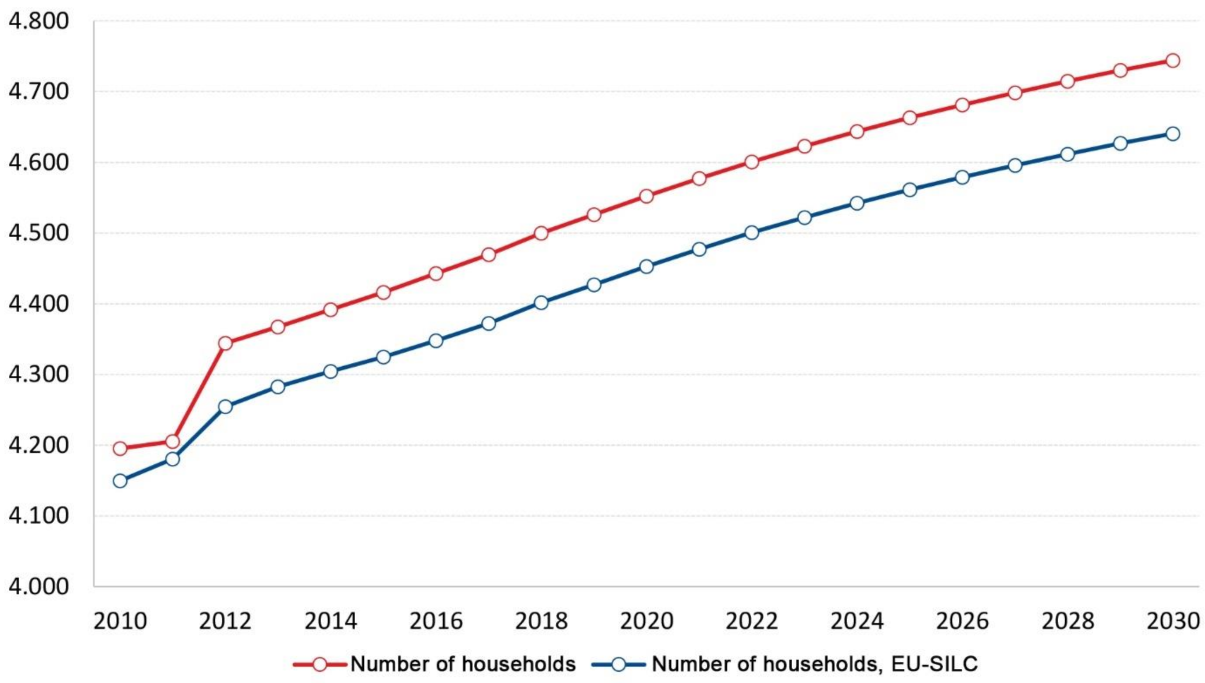
		2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
		Outlook	*Outlook*	*Outlook*	*Outlook*	*Outlook*	*Outlook*	*Outlook*	*Outlook*	*Outlook*	*Outlook*	*Outlook*
Gross domestic product	*CZK billion*	12 960	13 356	13 762	14 178	14 606	15 061	15 549	16 056	16 580	17 120	17 675
	Growth (%)	**3.1**	**3.1**	**3.0**	**3.0**	**3.0**	**3.1**	**3.2**	**3.3**	**3.3**	**3.3**	**3.2**
	CZK billion 2010	7 522	7 600	7 677	7 755	7 832	7 917	8 014	8 113	8 213	8 315	8 416
	Growth (%)	**1.1**	**1.0**	**1.0**	**1.0**	**1.0**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
Gross value added	*CZK billion*	11 665	12 021	12 386	12 761	13 146	13 555	13 995	14 452	14 923	15 409	15 908
	Growth (%)	**3.1**	**3.1**	**3.0**	**3.0**	**3.0**	**3.1**	**3.2**	**3.3**	**3.3**	**3.3**	**3.2**
	CZK billion 2010	6 770	6 840	6 910	6 979	7 049	7 126	7 213	7 302	7 392	7 484	7 575
	Growth (%)	**1.1**	**1.0**	**1.0**	**1.0**	**1.0**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
GDP deflator	*2010=100*	172.3	175.7	179.3	182.8	186.5	190.2	194.0	197.9	201.9	205.9	210.0
	Growth (%)	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
GVA deflator	*2010=100*	172.3	175.7	179.3	182.8	186.5	190.2	194.0	197.9	201.9	205.9	210.0
	Growth (%)	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
CZK/EUR (ECU)		20.9	20.8	20.8	20.7	20.7	20.6	20.6	20.5	20.5	20.4	20.4
	appreciation (%)	**0.5**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**
Employment	*thous. persons*	5 137	5 083	5 029	4 976	4 925	4 880	4 843	4 808	4 774	4 742	4 710
	Growth (%)	**-1.1**	**-1.1**	**-1.1**	**-1.0**	**-1.0**	**-0.9**	**-0.8**	**-0.7**	**-0.7**	**-0.7**	**-0.7**
Population as of 1 January	*thous. persons*	10 552	10 545	10 538	10 532	10 526	10 520	10 513	10 505	10 496	10 488	10 478
	Growth (%)	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
Population (year average)	*thous. persons*	10 549	10 541	10 535	10 529	10 523	10 516	10 509	10 500	10 492	10 483	10 473
	Growth (%)	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
Population 15–64	*thous. persons*	6 362	6 294	6 228	6 163	6 099	6 044	5 997	5 954	5 913	5 873	5 833
	Growth (%)	**-1.1**	**-1.1**	**-1.1**	**-1.0**	**-1.0**	**-0.9**	**-0.8**	**-0.7**	**-0.7**	**-0.7**	**-0.7**
Productivity	*CZK thousand 2010/empl.*	1 464	1 495	1 527	1 558	1 590	1 622	1 655	1 687	1 720	1 753	1 787
	Growth (%)	**2.1**	**2.1**	**2.1**	**2.1**	**2.0**	**2.0**	**2.0**	**2.0**	**1.9**	**1.9**	**1.9**
Average household size	*persons/household*	2.163	2.154	2.145	2.136	2.127	2.118	2.109	2.100	2.091	2.082	2.073
Number of households	*thousands*	4 877.4	4 894.4	4 911.9	4 929.7	4 947.7	4 965.5	4 983.1	5 000.5	5 017.9	5 035.2	5 052.3
Number of households, EU-SILC	*thousands*	4 771.1	4 787.7	4 804.8	4 822.2	4 839.8	4 857.3	4 874.4	4 891.5	4 908.5	4 925.4	4 942.1
Available household income	*CZK billion*	6 679.5	6 883.4	7 092.7	7 307.3	7 527.9	7 762.3	8 013.7	8 275.4	8 545.2	8 823.5	9 109.5
	Growth (%)	**3.1**	**3.1**	**3.0**	**3.0**	**3.0**	**3.1**	**3.2**	**3.3**	**3.3**	**3.3**	**3.2**
Available household income + NPISH	*CZK billion*	6 774.4	6 981.3	7 193.5	7 411.1	7 634.9	7 872.6	8 127.7	8 393.0	8 666.7	8 949.0	9 239.0
	Growth (%)	**3.1**	**3.1**	**3.0**	**3.0**	**3.0**	**3.1**	**3.2**	**3.3**	**3.3**	**3.3**	**3.2**

Source: Ministry of Finance of the Czech Republic (August 2018)

4.1.1.3 Outlook of the number of households

In the Czech Republic, as well as in other EU countries, the average household size has been slowly but consistently decreasing, largely due to demographic trends (population ageing, increasing maternal age). In the following years, we expect it to linearly decline at the 2017 annual rate. The average number of household members could thus fall from 2.37 in 2017 to 2.25 in 2030. The expected total number of households is derived from population projection and average household size. The number of (private) households according to the EU-SILC survey[125] in 2017 was about 97.8 % of the total number of households; this share is maintained for the entire outlook period.

Chart 26: *Outlook of the number of households (thousands)*



Source: Eurostat. Calculations of the Ministry of Finance of the Czech Republic

The available household income for 2018 and 2019 is based on the April Macroeconomic Forecast of the Czech Republic. Its year-on-year growth could reach 5.4 % and 5.3 % in these years, mainly due to the predicted strong rise in wages and salaries. In 2020–2030, the nominal available household income could be 51.6 % of GDP, which corresponds to the prediction for 2019. Its growth in this period should average 4.4 % in koruna and 5.5 % in euro. The available household income and non-profit institutions serving households in 2017 exceeded the available household income by about 1.5 %. We expect the same percentage over the entire period.

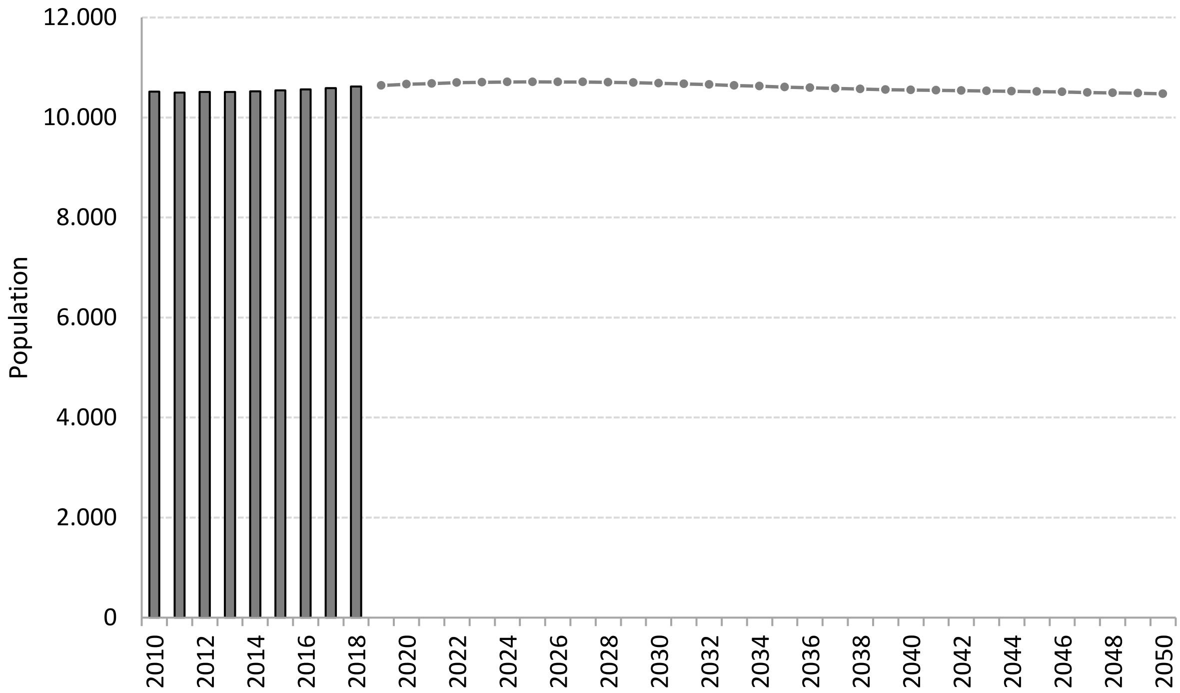
4.1.1.4 Population outlook

Below is the historical development of the population and population outlook. The historical development of the population is based on the data of the Czech Statistical Office. It is evident that the population of the Czech Republic is growing year-on-year, but relatively slowly at an average of around 18 thousand people, which corresponds to an average year-on-year growth of approximately 0.18 %.

[125] The EU-SILC survey is carried out only in permanently occupied private apartments and does not include collective and institutional households (prisons, elderly homes, hostels, etc.) and homeless people.

More detailed demographic analyses and evaluation of historical trends are available in this respect. The population outlook corresponds to the so-called baseline projection according to EUROSTAT. According to the projection, in the period up to 2050 it is possible to expect a relative stagnation or very slight decline of the population.

Chart 27: *Population outlook (average)*



Source: EUROSTAT

ii. Sectoral changes expected to impact the energy system and GHG emissions

Sectoral changes expected to impact the energy sector and greenhouse gas emissions are described in detail in the relevant chapters of this document and the analytical annexes.

iii. Global energy trends, international fossil fuel prices, EU ETS carbon price

4.1.1.5 Global energy trends

Current trends in the development of the global energy sector

Global energy demand grew by 2.1 % in 2017, according to IEA preliminary estimates[126], more than twice the growth rate in 2016. Global energy demand in 2017 reached an estimated 14 050 million tonnes of oil equivalent (Mtoe), compared with 10 035 Mtoe in 2000.

Fossil fuels met over 70 % of the growth in energy demand around the world. Natural gas demand increased the most, reaching a record share of 22 % in total energy demand. Renewables also grew strongly, making up around a quarter of global energy demand growth, while nuclear use accounted for the remainder of the growth. The overall share of fossil fuels in global energy demand in 2017 remained

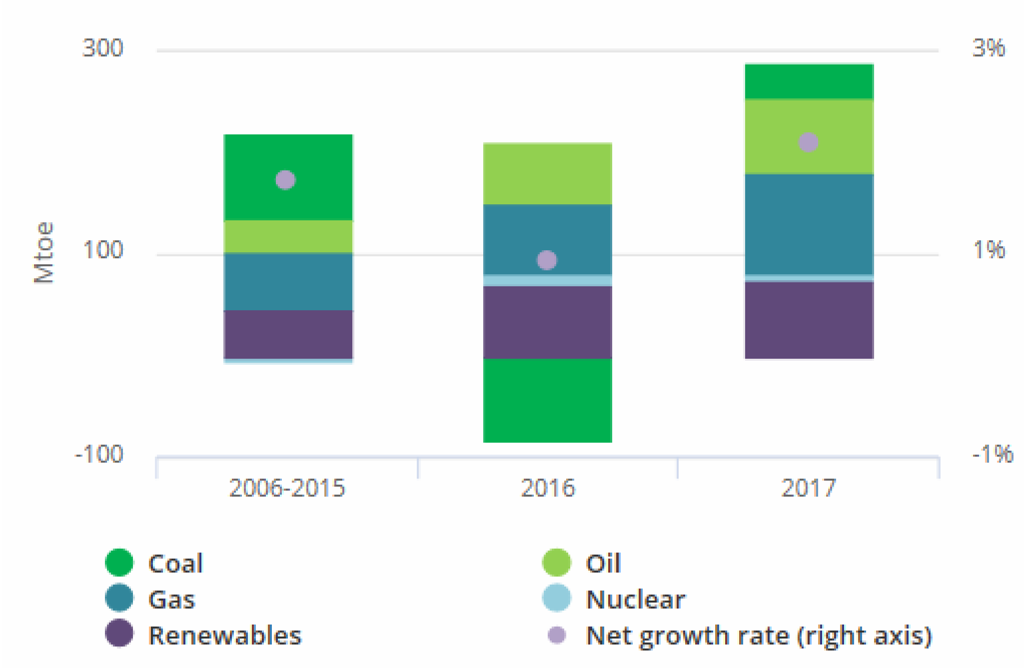
[126] Current trends in the development of the global energy sector are based on the information from the International Energy Agency (IEA), specifically from the Global Energy & CO2 Status Report, available online at https://www.iea.org/geco/.

at 81 %, a level that has remained stable for more than three decades despite strong growth in renewables.

Improvements in global energy efficiency slowed down. The rate of decline in global energy intensity, defined as the energy consumed per unit of economic output, slowed to only 1.7 % in 2017, much lower than the 2.0 % improvement seen in 2016.

The growth in global energy demand was concentrated especially in Asia, with China and India together accounting for more than 40 % of total demand growth. Energy demand in all developed economies contributed more than 20 % to global energy demand growth, although the share of these countries in total energy consumption continued to decline. Southeast Asian countries and Africa have seen remarkable growth (8 % and 6 % of global energy demand growth, respectively), although the per capita energy consumption in these regions is still below the global average.

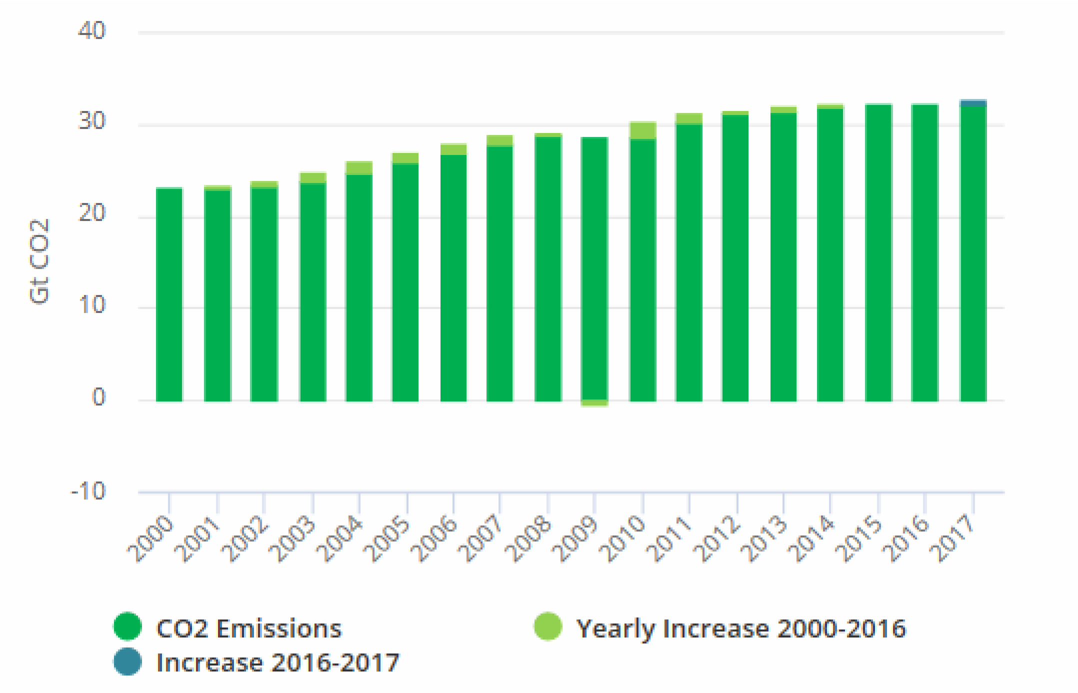
Chart 28: *Average annual growth in global energy demand by fuel*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

Global energy- related CO_2 emissions increased by 1.4 % in 2017 and reached a historic maximum of 32.5 billion tonnes, i.e. a renewed growth after three years of relative stagnation. However, the increase in CO_2 emissions was not universal. While most major economies saw an increase, some others declined, including the United States, the United Kingdom, Mexico and Japan. The United States saw the largest decline, mainly due to higher use of renewable sources.

Chart 29: *Global energy-related CO2 emissions*

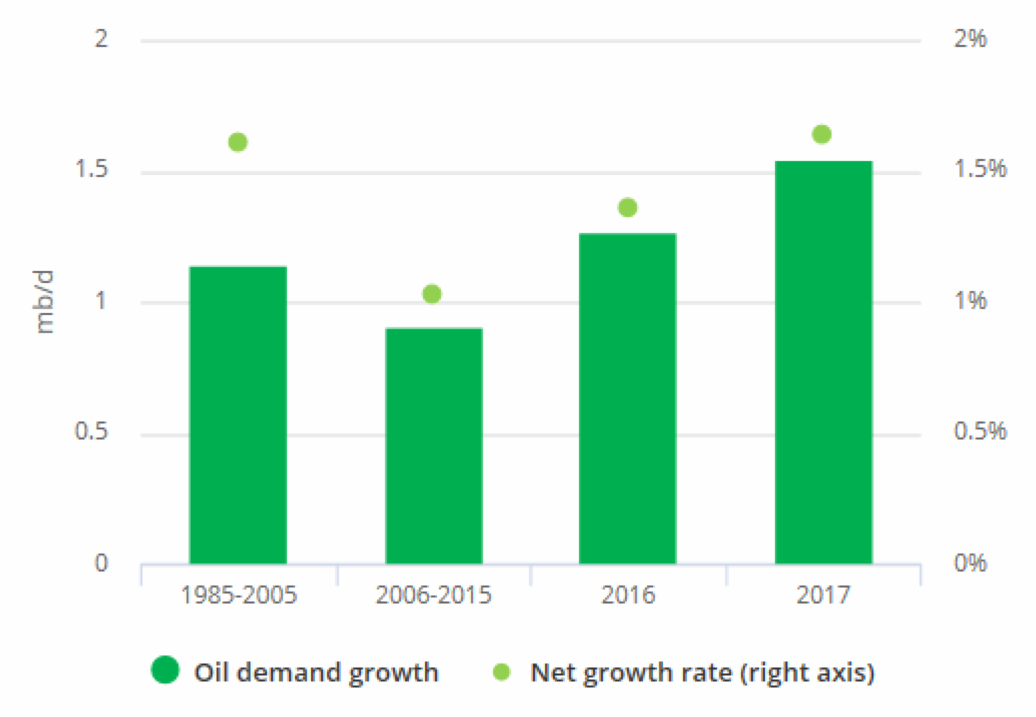


Source: International Energy Agency; Global Energy & CO2 Status Report (online)

The global demand for oil grew by 1.6 % (or 1.5 million barrels per day) in 2017, a much higher year-on-year growth than the average growth of 1 % over the last decade. An increasing share of SUVs and light trucks in large economies and the demand in the petrochemical sector were the main drivers of this growth.[127]

[127] In this respect, it is appropriate to mention the trend of a gradual move away from plastics, which is linked to better knowledge about global negative impacts on the environment, which may have a potential impact on oil consumption in the petrochemical sector.

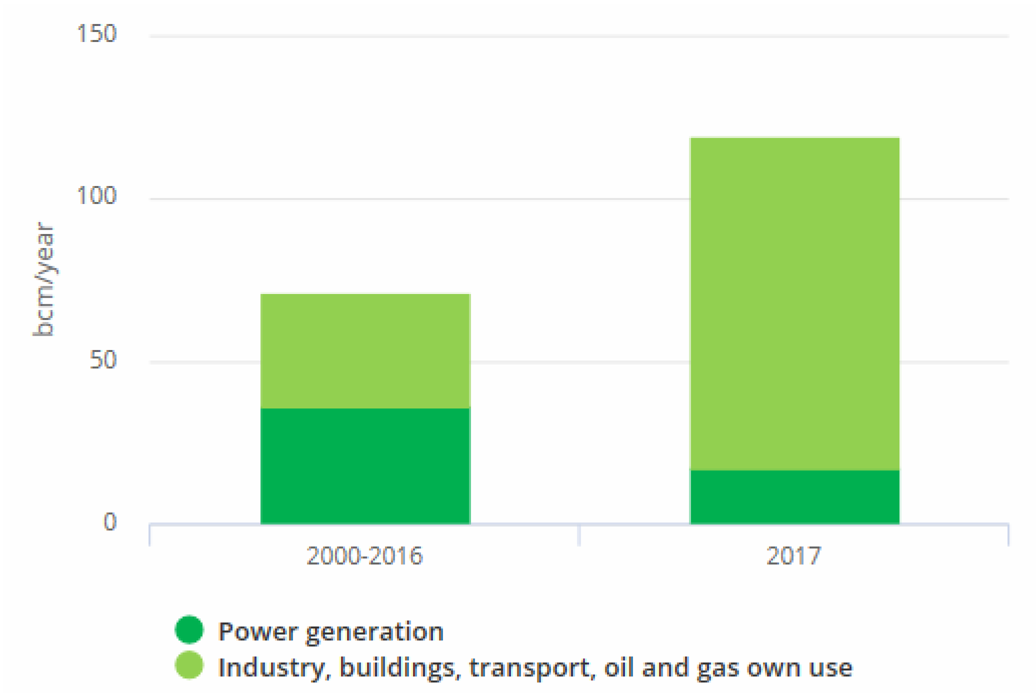
Chart 30: *Average year-on-year growth in oil demand*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

Global demand for natural gas grew by 3 %, largely due to a relatively large supply and relatively low costs. China alone accounted for nearly 30 % of global growth. Over the past decade, half of global demand for gas came from the energy sector; last year, however, more than 80 % of the growth came from the industry and the buildings sector.

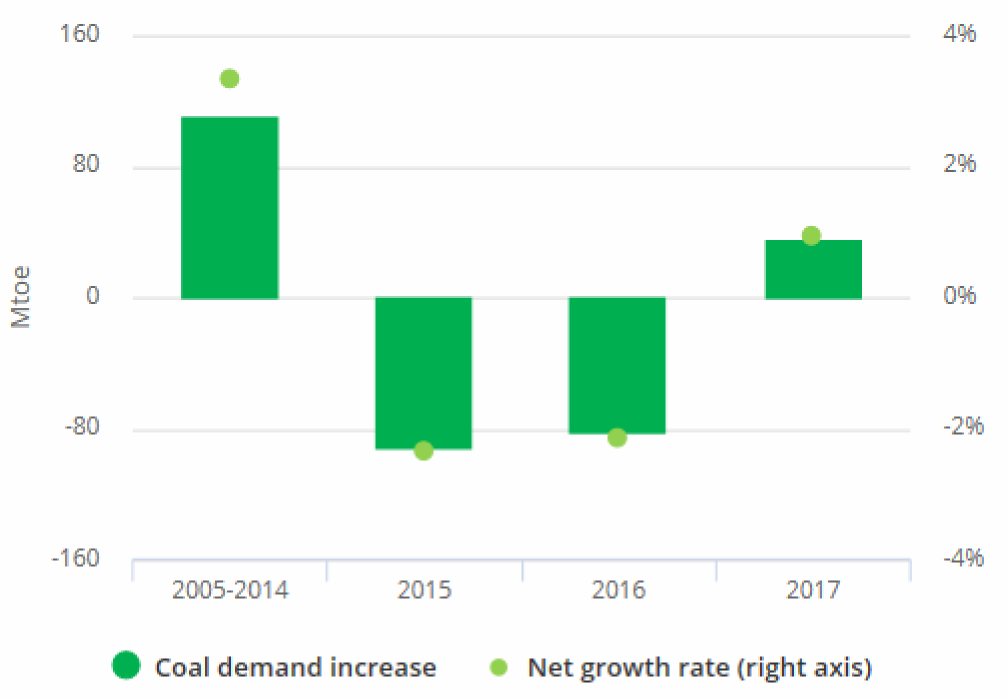
Chart 31: *Average year-on-year growth in natural gas demand*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

The global demand for coal rose by 1 % in 2017, a reverse in the declining trend of the last two years. This growth was mainly due to demand in Asia, which was almost entirely driven by an increase in the generation of electricity from coal.

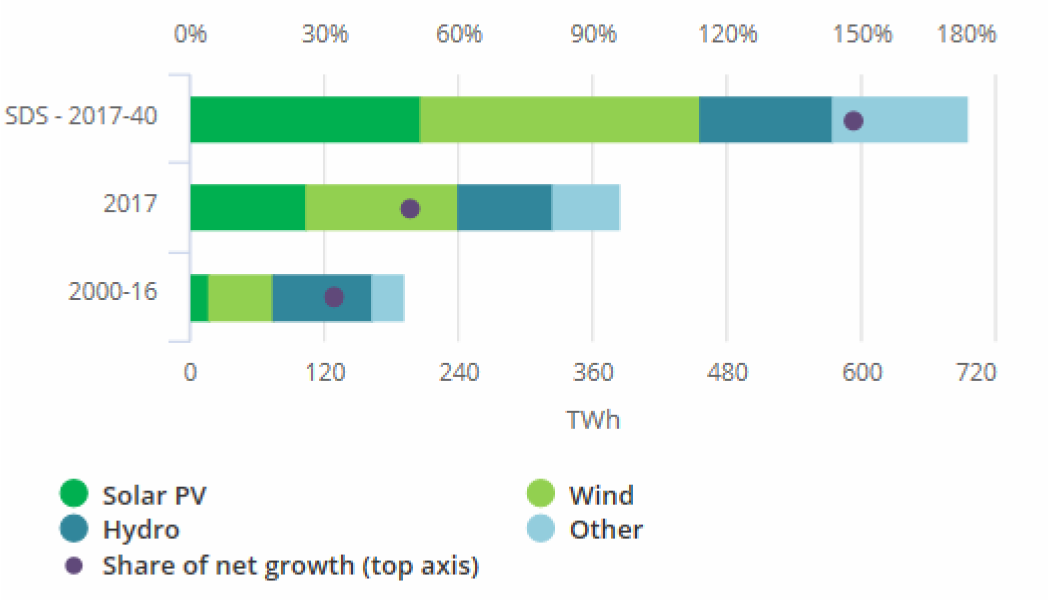
Chart 32: *Average year-on-year growth in coal demand*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

Renewable energy sources saw the highest growth of all energy sources in 2017, covering a quarter of the world's growth in energy demand. China and the United States were the leaders of this unprecedented growth and have contributed approximately 50 % of the increase in electricity production from renewable sources, followed by the European Union, India and Japan. Wind energy accounted for 36 % of the renewable energy growth.

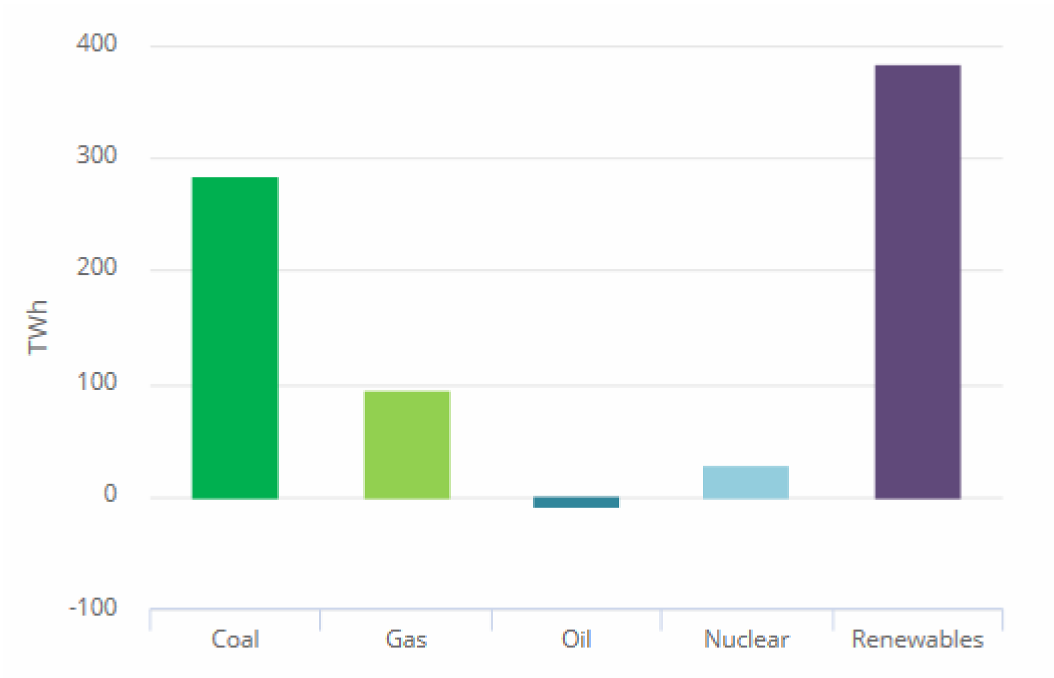
Chart 33: *Average year-on-year growth of global RES production (including a comparison with the sustainable development scenario)*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

The global demand for electricity grew by 3.1 % in 2017, which is significantly more than the overall increase in energy demand. China and India together accounted for around 70 % of this growth. Electricity generation from nuclear power plants increased by 26 TWh in 2017, as a relatively large volume of new nuclear capacity was commissioned.

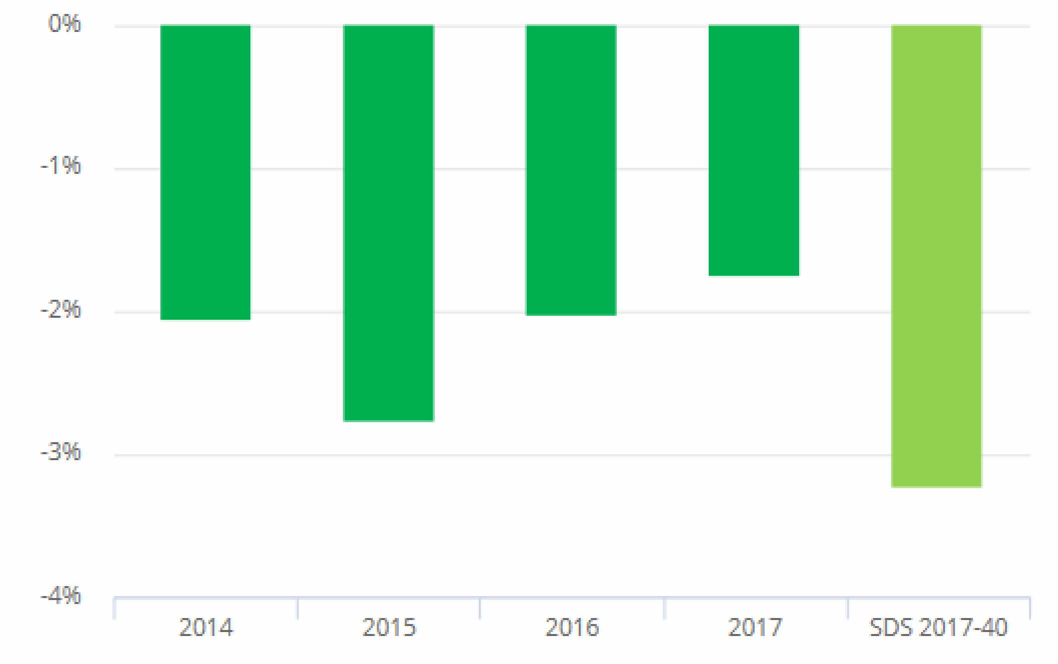
Chart 34: *Change in electricity mix by fuel in 2016–2017*



Source: International Energy Agency; Global Energy & CO2 Status Report (online)

The increase in global energy efficiency slowed dramatically in 2017, mainly due to the lack of policies and also the relatively low prices of basic energy commodities. Global energy intensity improved by only 1.7 % in 2017 and by an average of 2.3 % over the past three years.

Chart 35: *Average year-on-year change in energy intensity (including a comparison with a sustainable development scenario)*



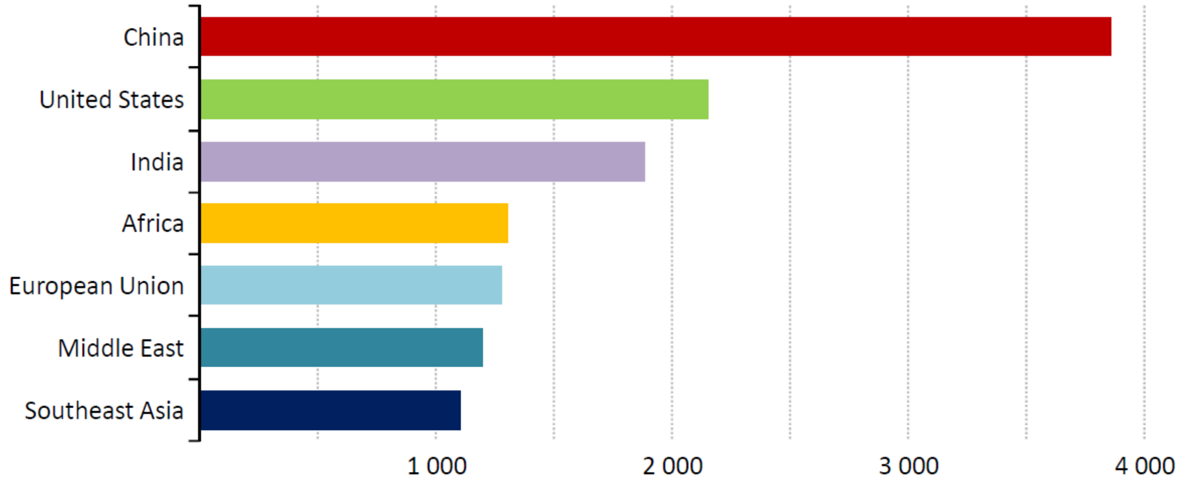
Source: International Energy Agency; Global Energy & CO2 Status Report (online)

World energy outlook

According to the New Policy Scenario of the International Energy Agency[128], rising incomes and a population increase of about 1.7 billion people, mostly in urban areas in emerging economies, will increase global energy demand by 2040 by more than a quarter. An increase in the global demand would then approximately double if there is no progressive improvement in energy efficiency, which is a strong policy tool to address concerns with regard to ensuring energy security and sustainability. In fact, almost all additional demand growth comes from emerging economies, primarily India. In 2000, Europe and North America accounted for more than 40 % of the world's energy demand and the emerging economies in Asia for about 20 %. By 2040, these shares will likely reverse.

[128] The world energy outlook is based on the information from the International Energy Agency (IEA), namely from the World Energy Outlook 2018. The basic scenario is a scenario referred to as 'New Policy Scenario'.

Chart 36: *World energy demand by country, WEO 2018 (IEA), in Mtoe*



Source: World Energy Outlook 2018

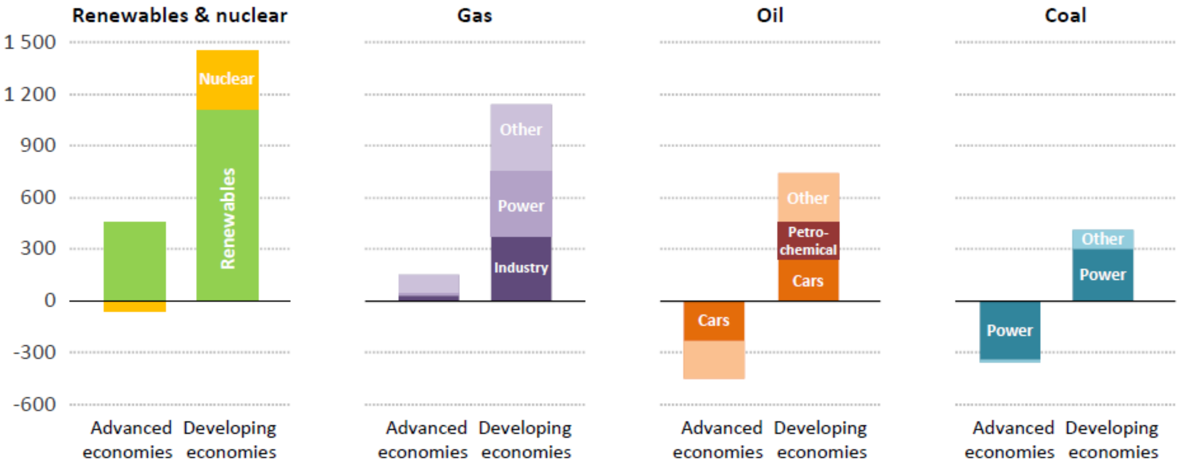
A significant shift in energy consumption to the Asian region is evident in all fuels and technologies as well as in energy investment. As expected, Asia will account for up to half of global natural gas growth, 60 % growth in wind and solar panels, more than 80 % increase in oil consumption, and more than 100 % increase in coal consumption and use of nuclear energy (due to declines in other regions).

The world energy sector is transforming in a variety of ways due to the shift in supply, demand and also due to technological trends. International energy trade flows from the Middle East, Russia, Canada, Brazil and the United States are increasingly directed to Asia. This is also evidenced by the fact that, according to assumptions, Asia's share of global oil and gas trade will rise from about half to more than two thirds by 2040. New ways of converting energy are also visible at the regional level, as digitisation and increasingly cost-effective renewable energy technologies make it possible to use distributed and community-based energy supply models.

Since its inception about one hundred years ago, the electricity sector is undergoing its most dramatic transformation. Electricity is increasingly preferred as a fuel in economies with the dominance of 'lighter' industries, services and digital technologies. The share of the electricity sector in global final consumption is currently close to 20 % and its further development can be expected. Policy support and the reduction of technology costs lead to a rapid growth of variable renewable production sources, making the energy sector a frontrunner in the efforts to reduce emissions. However, it is essential to ensure that the whole system works so that it can deliver a reliable supply in the future.

In 2017, the use of coal saw a year-on-year increase after two years of decline, but the final investment decisions for new coal-fired power plants were well below the level seen in recent years. Once the current wave of construction of coal-fired power stations is over, the flow of new coal-fired power stations which will be gradually commissioned will slow down after 2020. However, it is still too early to write off coal from the global energy mix: the average age of coal-fired power plants in Asia is less than 15 years, compared with about 40 years in developed economies. With industrial use of coal showing a moderate increase by 2040, relative stagnation in global consumption can be expected, with declines in China, Europe and North America being offset by growth in India and Southeast Asia.

Chart 37: *Change in world energy demand by fuel, WEO 2018 (IEA), in Mtoe*



Source: World Energy Outlook 2018

The use of oil in road transport is expected to peak around mid-2020. Oil use in the petrochemical, freight, air and maritime industries, however, will continue to contribute to overall demand for oil. Reducing consumption in cars due to higher drive efficiency will lead to a three times higher demand reduction compared to 3 million barrels per day (mb/d), which will be replaced by about 300 million electric cars in 2040. However, the pace of change and shift to other fuels in transport, which accounts for about a quarter of the total demand for oil, is not accompanied by equally rapid changes in other sectors. The industrial petrochemical sector is expected to be the largest source of oil growth. Assuming that the overall plastics recycling rate doubles, demand would decrease only by about 1.5 mb/d of the total projected increase by more than 5 mb/d by 2040. The overall growth in oil demand to 106 mb/d in 2040, according to the New Policies Scenario, comes almost exclusively from emerging economies.

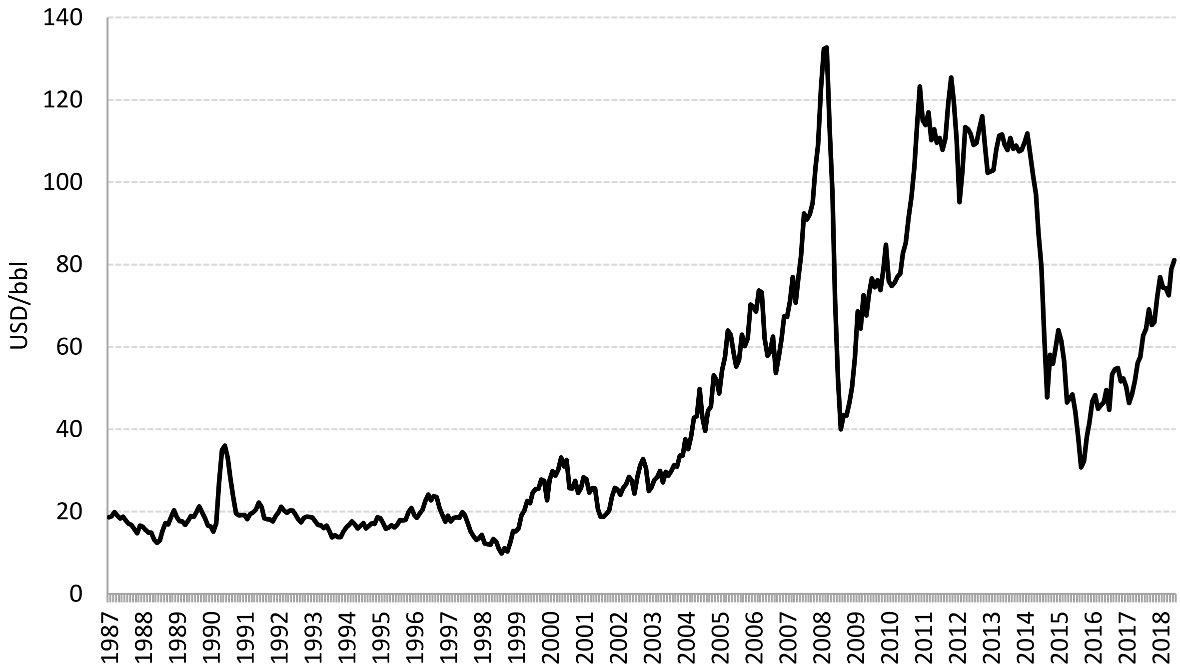
Around 2030, natural gas is expected to 'overtake' coal consumption and become the second largest fuel in the global energy mix. Industrial consumers will account for the largest part of the 40 % increase in natural gas consumption. LNG gas trade will more than double by 2040, in particular in response to the growing demand of emerging economies led by China. Russia remains the world's largest gas exporter, due to its expansion to Asian markets, but an increasingly integrated European energy market gives buyers more gas supply options. A higher share of wind and photovoltaic power plants reduces the use of gas capacity in Europe and the modernisation of existing buildings also helps to reduce gas consumption for heating. However, gas infrastructure still plays a crucial role, particularly in ensuring the demand for heat in the winter and ensuring an uninterrupted supply of electricity

4.1.1.6 Historical development of international prices of oil, coal and natural gas

Historical development of oil prices

The period from around mid-2015 almost until the end of 2017 saw relatively low oil prices at 40–50 USD per barrel, with prices in early 2016 dropping to only USD 30 per barrel. The low-price period was caused by a number of factors, but a significant factor in this respect is the significant increase in unconventional oil production in the United States. In Q4 2017, there was a gradual rise in prices due to a relatively high demand growth, but also due to other factors, such as a reduction in production due to the geopolitical situation (for example, a decrease in production in Venezuela). The future development of oil prices is very difficult to estimate and for example according to the International Energy Agency it is necessary to prepare for a period of increased volatility of international prices. Despite a significant increase in production in the United States, there is a relatively significant increase in demand, which is already at 100 million barrels per day (mb/d) and is mainly driven by the consumption of Asian countries (Q3 2018). Investments in oil exploration and extraction have been very low for several years and there is a risk of a shortage of production in the medium term (i.e. about 5 years), which can mean a period of relatively high oil prices. A more detailed analysis and description of historical oil prices goes beyond this document and is closely monitored by specialised bodies and organisations such as the International Energy Agency (the Czech Republic has been a member of the International Energy Agency since 2001). On the basis of the task resulting from the State Energy Policy adopted in 2015, the Ministry of Industry and Trade prepares annually the Report on the Energy Sector Development in the Area of Oil and Petroleum Products, which also deals with the issues of historical price development.

Chart 38: *Historical development of oil prices (spot price of North Sea Brent FOB)*

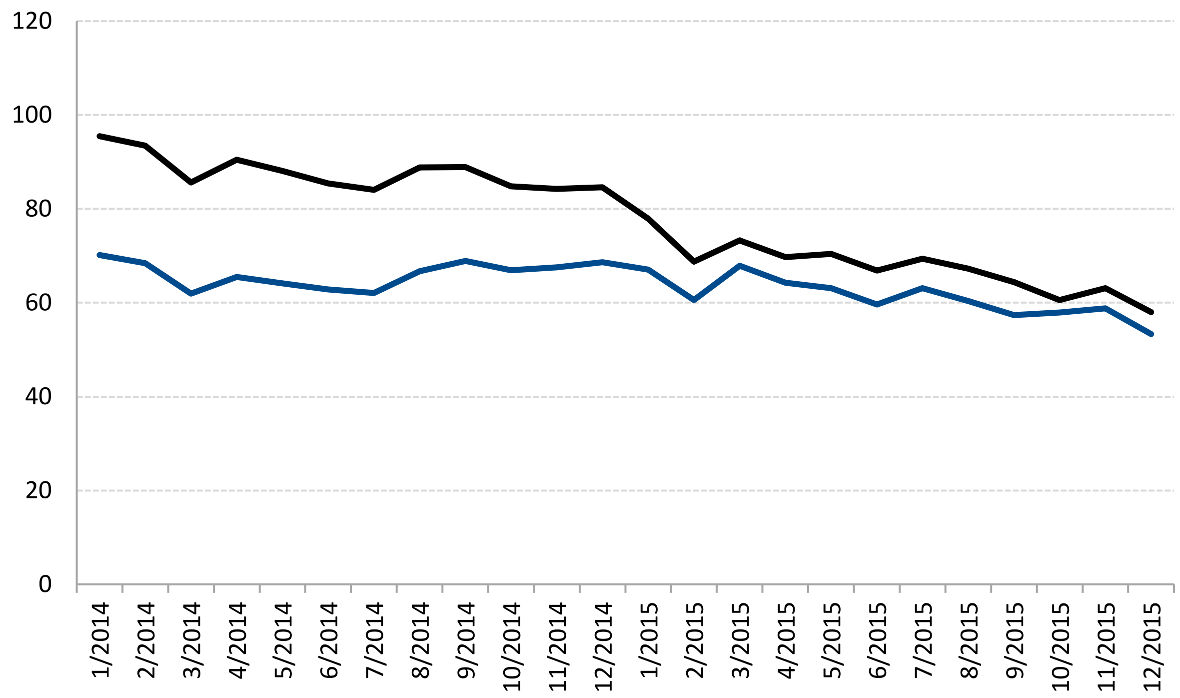


Source: U.S. Energy Information Administration (information available online)

Historical development of coal prices

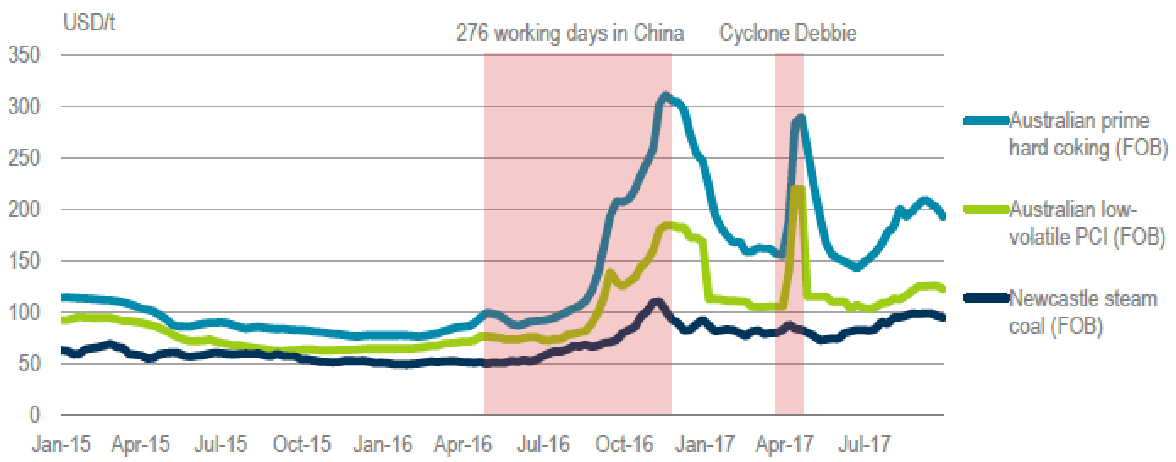
World black coal prices, both conventional and spot prices, are traditionally determined primarily by U.S. and Australian coal prices. In recent years, black coal prices in Northwest Europe's ports peaked in the summer of 2008, and then declined substantially due to the emerging global economic crisis. Prices start to gradually rise again in 2010 and in the middle of 2011, they are around a relatively high value of 120–130 USD per tonne. The absolute long-term peak was USD 139.05 per tonne in January 2011. However, already in the second half of the same year, prices fell to around USD 100 per tonne due to unusually mild start of the winter. From that time, coal inventories grew, mainly those of electricity coal. In 2013 and 2014, coal energy prices were volatile but with a downward trend. For example, in 2013 the price of 1 TCE of electricity coal (CIF) in Northwest Europe ports was highest in March, namely USD 105.11 (EUR 81.08) and the lowest in July – 85.26 USD (EUR 65.18). There was a remarkable decline of almost EUR 10 to EUR 71.50 per TCE in April. The year 2013 ended with an average December price of USD 97.07 per TCE (EUR 70.83 per TCE). The year 2014 started with an average January price of USD 95.48 per TCE (EUR 70.16 per TCE). In both cases, this was the year's maximum, as the price goes down afterwards and in March, for example, it reached USD 84.02 per TCE (EUR 67.92 EUR per TCE. The year 2014 ended with an average December price of USD 84.62 per TCE (EUR 68.63 per TCE). 2015 saw a further fall in the price of coal to USD 45 per TCE at the end of the year.

Chart 39: *Historical development of the price of black coal (USD per TCE)*



Source: Mineral resources in the Czech Republic (CGS); EURACOAL Market report (2016)

Chart 40: *Historical development of coal prices in 2015–2017 (USD per tonne)*

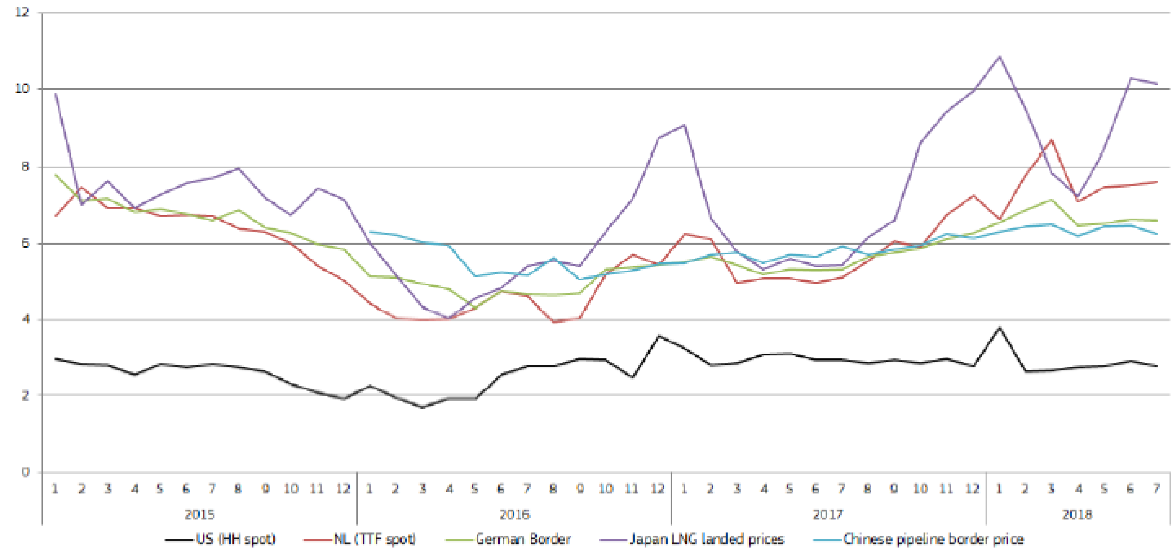


Source: Coal 2017 – Analysis and Forecast to 2022 (IEA); IHS Energy (2017)

Historical development of natural gas prices

Chart 41 shows an international comparison of wholesale gas prices. Over the past few years, international gas prices have been converging. However, this trend was interrupted in the last two winter seasons (2016–2017 and 2017–2018) when Asian prices increased sharply due to strong seasonal demand. European and US prices also increased, but less, which led to a widening gap between regional prices.

Chart 41: *International comparison of gas prices for individual regions (USD/mmbtu)*



Sources: Platts, Thomson-Reuters, BAFA, CEIC

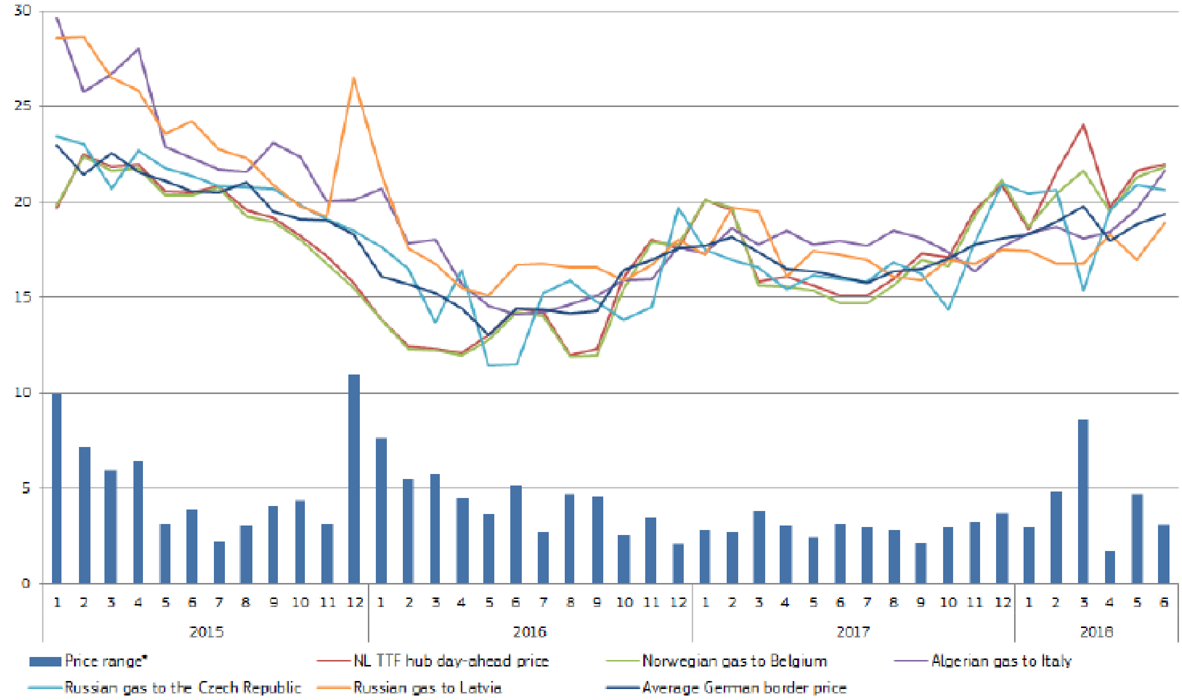
Source: Quarterly Report on European Gas Markets (volume 11, issue 2, second quarter of 2018)

Chart 42 compares the selection of estimated gas supply border prices from major exporters to the EU: Russia, Norway and Algeria. For comparison, the daily prices of the Dutch TTF gas hub are also presented.

Over the past three years, there has been a gradual price convergence, which has been caused by significantly declining oil prices in the second half of 2014 and in 2015 with a lagged impact on prices pegged to the price of oil. Greater emphasis on pricing based on demand and supply within the hub (as opposed to pricing based on oil price indexation) also contributed to partial price convergence.

In 2015–2016, the prices of Russian gas to Latvia and Algerian gas pegged to oil were typically higher than the hub prices, but in 2017 this gap virtually disappeared. In the second half of the year, demand and supply prices within the hub began to grow, while the pegged prices stabilised or even declined. As a result, in November/December 2017 the oil-pegged prices were lower than the hub prices. In Q1 2018, hub prices increased considerably, especially in March, due to low temperatures. The oil-pegged prices remained relatively stable, because the delayed impact of oil price growth on world markets was yet to occur.

Chart 42: *Comparison of EU wholesale price estimates (EUR/MWh)*



Source: Eurostat COMEXT and European Commission estimations, BAFA, Platts
*The difference between the highest and lowest price depicted on the graph
Note: Border prices are estimations of prices of piped gas imports paid at the border of the importing country, based on information collected by customs agencies, and are deemed to be representative of long-term contracts.

Source: Quarterly Report on European Gas Markets (volume 11, issue 2, second quarter of 2018)

4.1.1.7 Carbon price in the Emissions Trading Scheme

The EU Emissions Trading Scheme (EU ETS) is a key instrument of EU climate policy because it covers almost half of all EU emissions. Emissions trading is therefore one of the means to meet the current target of reducing GHG emissions in the EU by at least 40 % compared to 1990, which means that the EU ETS sectors must reduce emissions by 43 % compared to 2005. The system includes emissions of carbon dioxide (CO_2), nitrous oxide (N2O) and perfluorocarbons (PFCs).

The original system set-up foresaw such emission allowance (EUA) prices that would encourage emissions reduction, but their prices have been consistently too low and did not motivate producers to reduce emissions. Low prices were caused by a high surplus of allowances in the market from previous periods. The reason was bad estimate of the necessary allocation in the first period, the fall in industrial production as a result of the economic recession, the stagnation or drop in electricity as a result of austerity measures and massive support of especially renewable sources at the expense of fossils.

In December 2017, agreement was reached on European legislation dealing with emissions trading. The main agreed changes include: (i) a faster decrease in allowances (LRF 2.2 %); (ii) stricter market stability reserve (24 % deductions, cancellation from 2024); (iii) tightening of benchmarks; (iv) more carbon leakage measures; (v) new financial mechanisms (funds, derogations). On 27 September 2018, the European legislation on the Emissions Trading Scheme in 2021–2030 was officially approved.

Chart 43 indicates the historical development of the emission allowance price. It is evident from early 2018 there is a relative increase in the allowance price, inter alia due to changes in the relevant European legislation, which will lead to a partial reduction of the quantity of the allowances traded. Table 63 then indicates the expected development of the emission allowance. This outlook is based on the recommended parameters for reporting greenhouse gas emissions for 2019. However, it should be noted in this respect that the development of the emission allowance price is subject to a wide range of uncertainties, for example with regard to the expected development of the European economy or the further development of climate-energy policy at EU level.

Chart 43: *Development of the emission allowance price (EUR per tonne of CO2) in the spot market*

Source: European Energy Exchange (EEX)

Table 63: *Expected development of emission allowance price (in EUR per tonne of CO_2)*

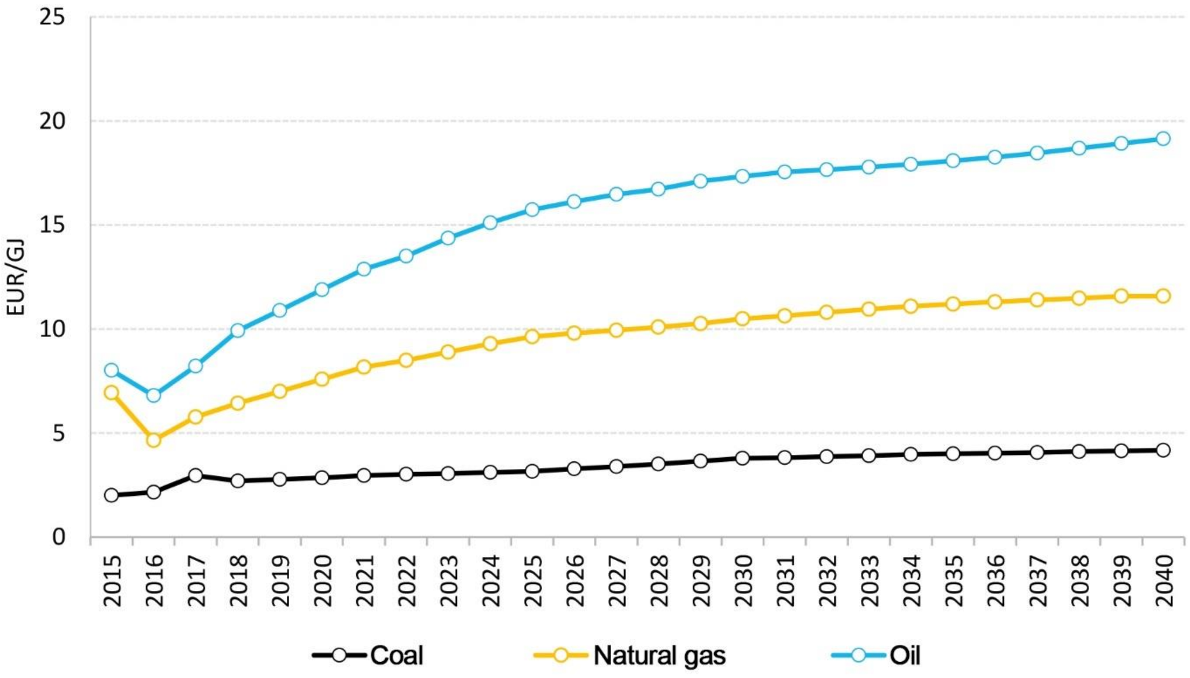
	2015	2020	2025	2030	2035	2040
2010 prices	7.2	14.4	21.6	32.1	40.3	48.0
2013 prices	7.5	15.0	22.5	33.5	42.0	50.0
2016 prices	7.8	15.5	23.3	34.7	43.5	51.7

Source: Recommended parameters for reporting greenhouse gas emissions for 2019 (15 June 2018)

4.1.1.8 Prices of internationally traded fuels

Chart 44 provides the prices of internationally traded fuels (coal, gas and oil), which are based on the parameters for the preparation of the National Plan recommended by the European Commission. Comparable assumptions should ensure in this respect better comparability of national plans across Member States. The tables in Annex 3 to this document contain more detailed information about the forecasts shown in the chart. As these are fuel forecasts that were compiled some time ago, they were corrected by the European Commission. Still, it should be noted that the forecast prices of internationally traded fuels are subject to considerable uncertainty, primarily due to the period of this prediction.

Chart 44: *Forecast prices of international fuels with correction in 2015–2024*

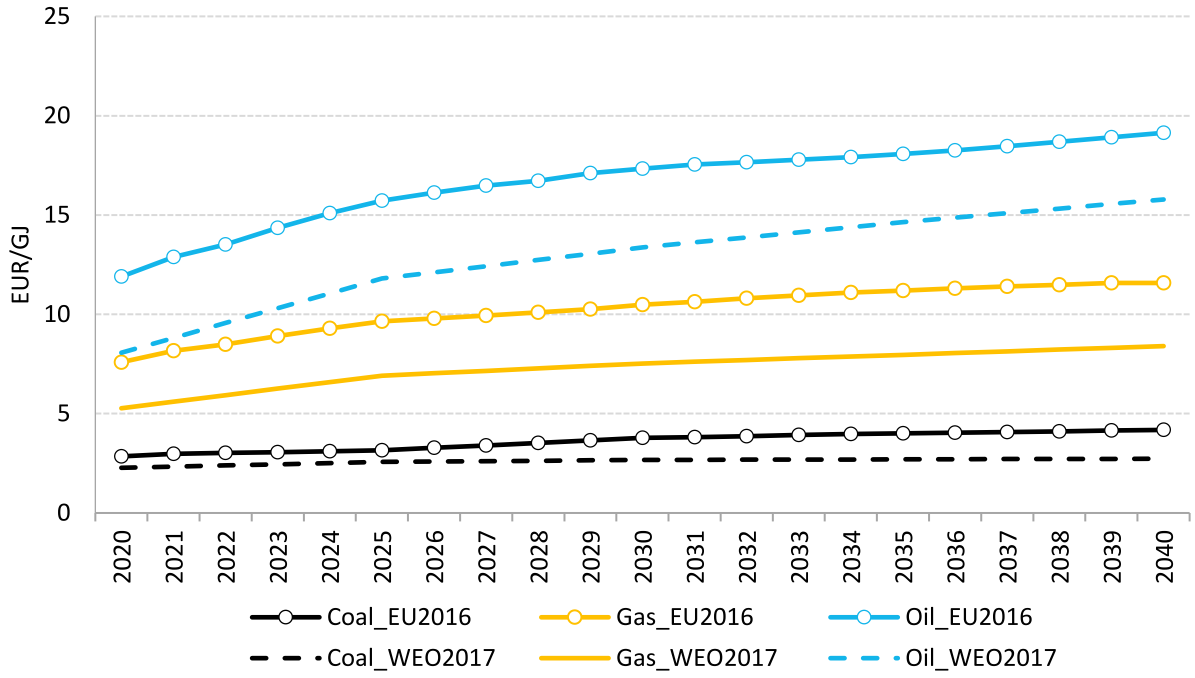


Source: Recommended parameters for the preparation of the National Plan (August 2018)

4.1.1.9 Development of prices of non-regulated electricity depending on input assumptions

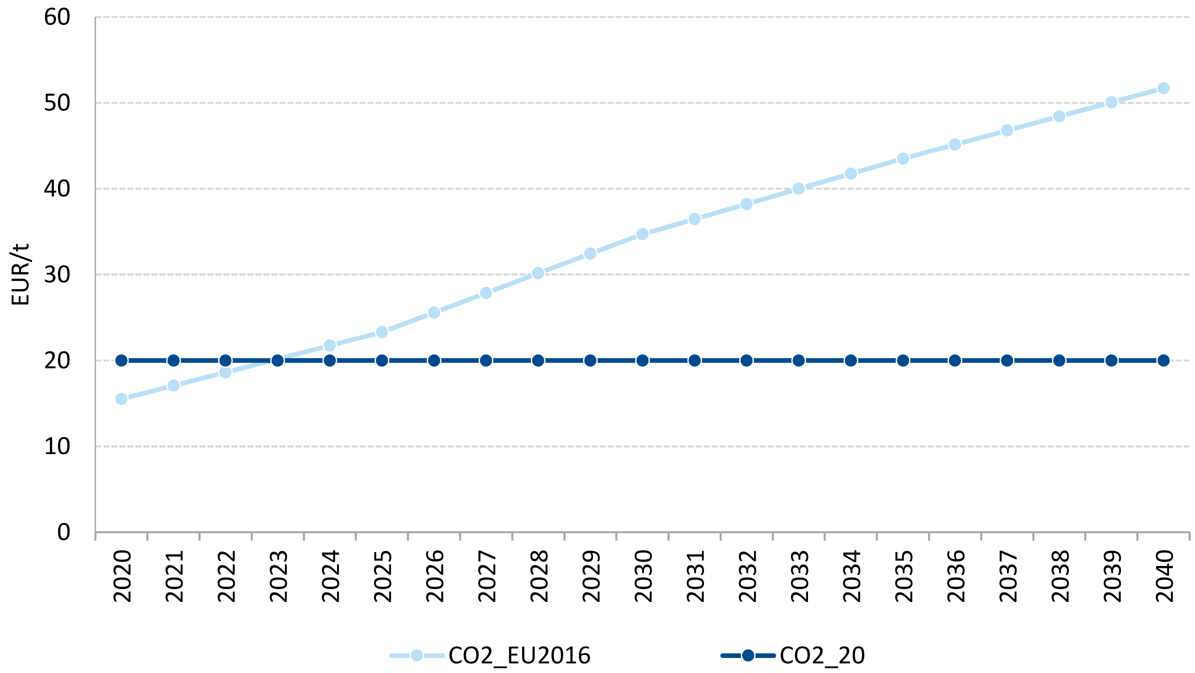
On the basis of input assumptions about basic fundamentals (i.e. in particular prices of internationally traded energy commodities), the pan-European model was used to create an outlook of the price of non-regulated electricity, which is then used in energy modelling and forms the basis for the costs of future support for renewable sources, for example. The outlook is then prepared in different scenarios, which takes into account the possible uncertainty of future developments. For comparison, data from the International Energy Agency (in particular from the World Energy Outlook 2017) is used as an alternative source of prices for internationally traded energy commodities (coal, natural gas, oil).

Chart 45: *Outlook for the price of basic fuels*



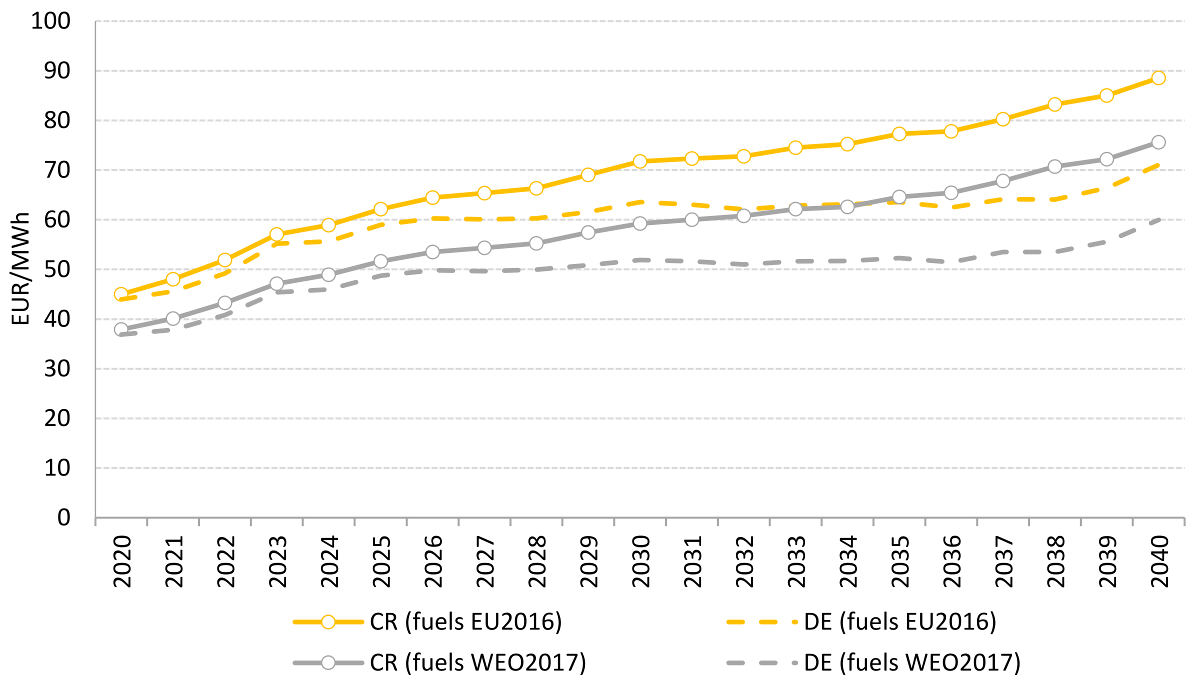
Source: Analysis based on the PLEXOS model

Chart 46: *Development scenarios of the emission allowance price*



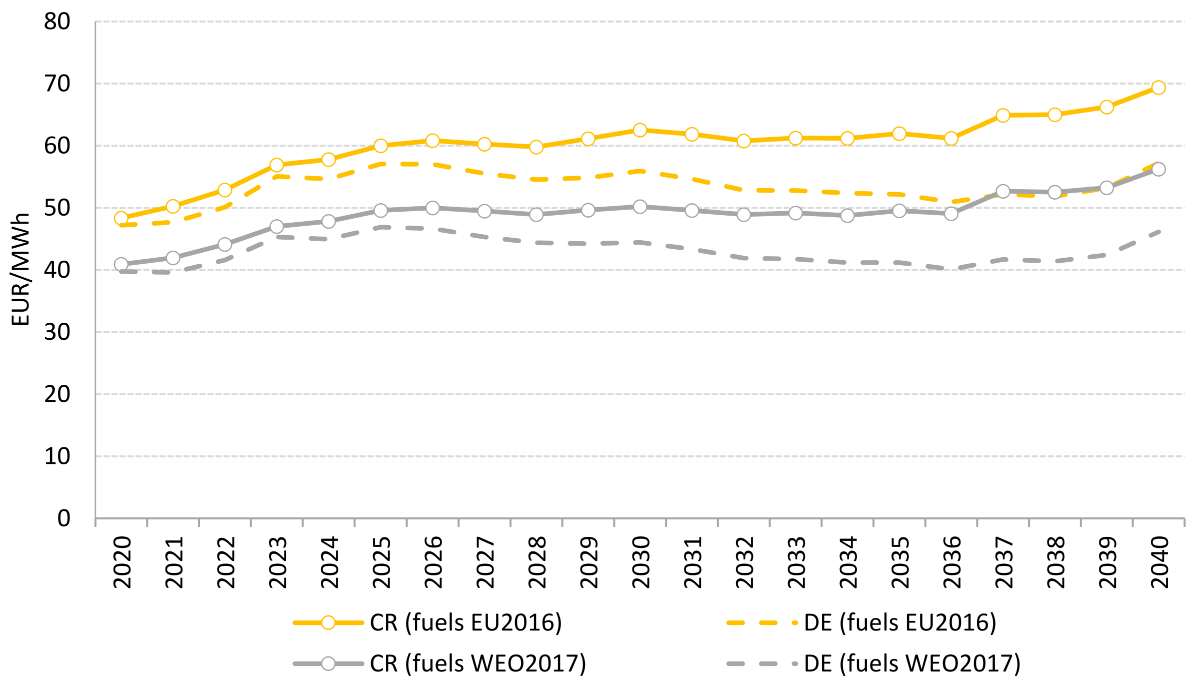
Source: Analysis based on assumptions for the purpose of preparing the National Plan

Chart 47: *Development of the price of non-regulated electricity with allowance price on the basis of the EU2016 assumptions*



Source: Analysis based on the PLEXOS model

Chart 48: *Development of the price of non-regulated electricity with allowance price at EUR 20 per tonne*



Source: Analysis based on the PLEXOS model

iv. Technology cost developments

With regard to the technology cost developments, information based on the 'EU Reference Scenario 2016' provided by the European Commission for the purposes of preparing this document was used as much as possible. These assumptions are not provided here neither in spreadsheet nor graphical form because of the scope of this material. In the case of missing data and for verification purposes, national analyses were used, primarily the Expected long-term Balance Between Gas Supply and Demand, which is prepared annually by the operator of the electricity and gas market, OTE, a.s.

4.2 Dimension 'Decarbonisation'

4.2.1 GHG emissions and removals

i. Trends in current GHG emissions and removals in the EU ETS, effort sharing and LULUCF sectors and different energy sectors

As one of the parties to the UN Framework Convention on Climate Change, the Czech Republic is obliged to prepare and regularly update national inventory and reporting of greenhouse gas emissions and removals. In addition, membership in the European Union includes additional requirements for the Czech Republic, such as fulfilling the obligations specified in Article 7 of EU Regulation No 525/2013. The National Inventory Report below outlines greenhouse gas emissions for the period 1990–2016. The inventory of greenhouse gas emissions and removals was prepared in accordance with the methodological guidelines of the Intergovernmental Panel on Climate Change: IPCC 2006 Guidelines (IPCC 2006).

According to the latest available inventory of greenhouse gas emissions and removals, the Czech Republic's greenhouse gas emissions in 1990–2016 decreased by 34.69 %, including the LULUCF sectors[129] and 35.24 % excluding the LULUCF sectors. The energy sector accounts for the largest share (81 %) of total emissions, of which 96 % is related to the combustion of fuels. Table 64, Table 65 and Chart 49 show the development of greenhouse gas emissions and removals in this period, broken down by individual greenhouse gases and IPCC sectors[130].

Table 64: *GHG emissions in 1990–2016 [kt CO_2 eq.]*

	CO_2[1]	CH_4[3]	N_2O[3]	HFCs	PFCs	NF_3	SF_6	Total[4]	
								Including LULUCF	Excluding LULUCF
1990	164 227.40	23 657.59	9 590.58				84.24	19 9597.37	19 3034.57
1991	148 512.48	22 073.04	8 170.22				84.08	18 0785.92	17 1226.71
1992	144 074.22	20 711.08	7 385.39		NO		85.41	17 4157.46	16 3780.20
1993	137 962.67	19 791.45	6 561.71				86.56	16 6245.21	15 6228.97
1994	131 532.51	18 658.51	6 509.15				87.66	15 8452.93	15 0676.84
1995	131 972.06	18 234.11	6 864.66	36.00	0.01	NO	88.68	15 8867.50	15 0666.46
1996	134 648.71	18 095.43	6 684.49	84.20	0.68	NO	98.31	16 1229.60	15 2905.84

129 Land use, land use change and forestry
130 Intergovernmental Panel on Climate Change

	CO_2[1]	CH_4[3]	N_2O[3]	HFCs	PFCs	NF_3	SF_6	Total[4]	
								Including LULUCF	Excluding LULUCF
1997	130 849.71	17 693.76	6 641.18	168.67	1.73	NO	96.10	15 7040.36	14 9393.44
1998	125 125.66	16 987.94	6 527.85	214.74	1.66	NO	94.98	15 0411.78	14 2779.92
1999	116 441.58	16 253.40	6 392.91	246.48	1.10	NO	95.94	14 0750.99	13 2754.69
2000	126 896.91	15 424.80	6 312.25	330.65	4.69	NO	108.40	15 0160.25	14 1411.56
2001	126 666.37	15 184.14	6 414.66	423.60	9.75	NO	98.82	14 9837.35	14 0769.80
2002	123 598.03	14 762.71	6 161.33	523.03	16.39	NO	121.28	14 6163.49	13 7469.17
2003	127 048.37	14 786.56	5 822.50	630.49	8.55	NO	144.69	14 9381.45	14 2156.45
2004	127 759.33	14 359.25	6 312.60	707.04	12.81	NO	120.61	15 0184.08	14 2553.80
2005	125 294.53	14 731.87	6 135.33	793.11	14.89	NO	111.84	14 8044.88	14 0506.82
2006	126 380.29	14 980.43	5 949.39	1 053.00	31.09	NO	105.12	14 9486.88	14 4052.97
2007	128 180.73	14 565.38	5 965.84	1 429.78	29.00	NO	93.79	15 1173.61	14 7907.74
2008	122 933.87	14 672.60	6 107.07	1 678.77	39.76	NO	88.67	14 6435.34	14 0064.37
2009	115 255.28	14 317.54	5 713.19	1 753.01	45.44	NO	89.05	13 8034.77	13 0249.41
2010	117 495.55	14 535.65	5 500.82	2 008.84	48.01	0.15	82.76	14 0535.27	13 4533.25
2011	115 023.30	14 538.52	5 686.72	2 241.77	8.24	0.59	88.64	13 8480.32	13 1242.07
2012	110 914.08	14 528.99	5 603.45	2 380.17	6.19	0.89	92.44	13 4371.95	12 7306.27
2013	106 401.19	13 948.17	5 587.53	2 505.38	4.08	1.41	83.04	12 9285.77	12 2926.96
2014	104 060.31	13 954.58	5 825.53	2 695.69	3.02	2.37	79.90	12 7367.58	12 1060.88
2015	104 784.56	14 024.75	5 861.81	2 925.69	1.96	2.15	78.27	12 8419.12	12 1887.10
2016	106 543.30	13 804.46	6 092.07	3 121.50	1.44	2.15	78.63	13 0348.69	12 5011.55
%[2)]	-35.12	-41.65	-36.48	8 569.74	16 214.85	NA	-6.66	-34.69	-35.24

[1] GHG emissions excluding emissions/removals from LULUCF

[2] compared to the baseline year

[3] including LULUCF

[4] including indirect emissions

Source: CHMI

Table 65: *GHG emissions and removals in the period 1990–2016 by IPCC sectors [kt CO_2 eq.]*

	1. Energy	2. Industrial processes and product use	3. Agriculture	4. LULUCF	5. Waste
1990	161 339.98	17 113.01	15 898.12	-6 562.80	3 124.51
1991	147 957.10	13 847.99	13 702.88	-9 559.21	3 266.79

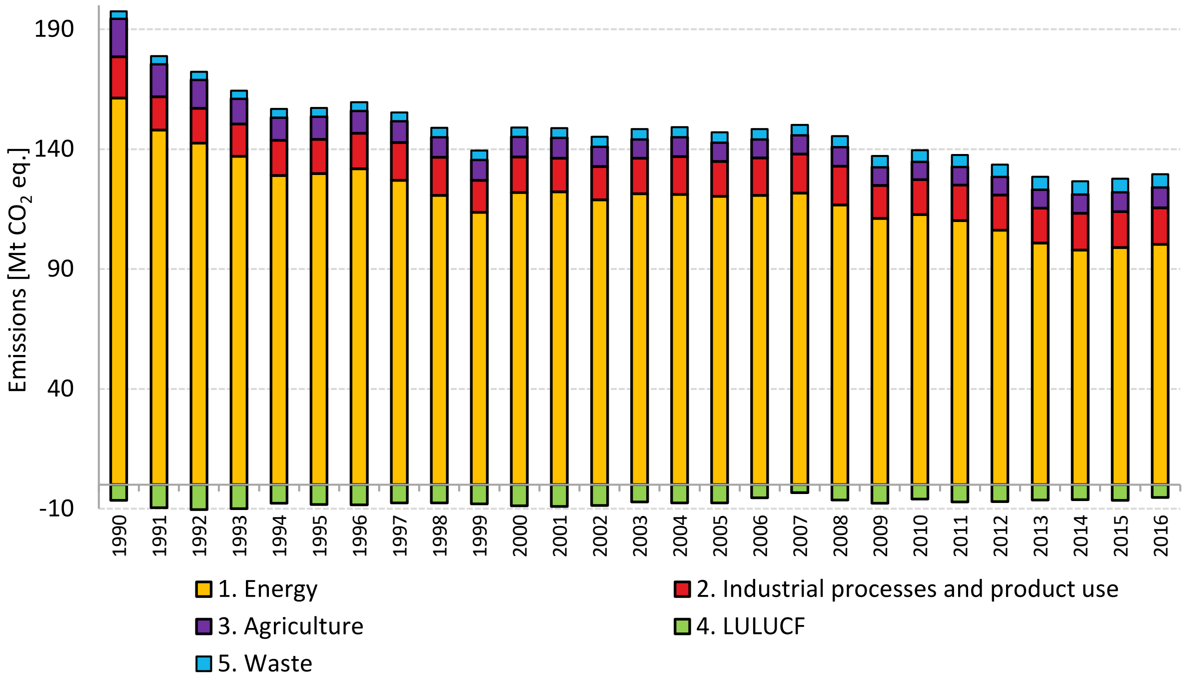
1992	142 438.58	14 609.67	11 859.32	-10 377.26	3 275.76
1993	137 047.96	13 451.41	10 465.88	-10 016.24	3 356.73
1994	128 983.49	14 690.24	95 30.55	-77 76.09	3 503.45
1995	129 812.10	14 211.15	95 88.19	-8 201.04	3 510.88
1996	131 766.17	14 899.73	92 96.98	-8 323.76	3 549.21
1997	126 985.97	15 797.67	88 89.20	-7 646.93	3 665.98
1998	120 645.43	15 899.75	85 24.23	-7 631.86	3 792.03
1999	113 594.51	13 354.90	85 95.05	-7 996.29	3 806.09
2000	121 973.32	14 804.42	83 71.40	-8 748.69	3 853.46
2001	122 217.03	14 017.60	84 93.33	-9 067.55	3 993.32
2002	118 898.93	13 782.21	82 93.06	-8 694.32	4 126.98
2003	121 382.55	14 801.58	78 66.08	-7 225.01	4 285.11
2004	121 141.48	15 712.44	80 89.63	-7 630.27	4 234.83
2005	120 346.04	14 549.02	7 803.15	-7 538.05	4 294.58
2006	120 773.00	15 575.84	7 670.18	-5 433.92	4 371.05
2007	121 647.69	16 320.09	7 843.31	-3 265.87	4 314.32
2008	116 670.55	16 236.68	7 991.66	-6 370.97	4 511.55
2009	111 154.39	13 719.72	7 583.63	-7 785.37	4 621.05
2010	112 645.46	14 653.08	7 411.91	-6 002.02	4 861.48
2011	110 177.11	14 858.85	7 585.63	-7 238.25	4 917.13
2012	106 159.49	14 654.13	7 581.34	-7 065.68	5 077.39
2013	100 847.75	14 497.67	7 764.78	-6 358.82	5 373.05
2014	97 861.37	15 345.08	7 958.76	-6 306.71	5 401.69
2015	98 957.27	14 993.33	8 158.20	-6 532.02	5 511.73
2016	100 280.60	15 221.74	8 519.68	-5 337.14	5 561.26
[1]%	1.35 %	1.49 %	4.54 %	-18.95 %	0.92 %
[2]%	-37.85 %	-11.05 %	-46.41 %	-18.68 %	77.99 %

[1] *Difference from the previous year*

[2] *Difference from the baseline year*

Source: CHMI

Chart 49: *GHG emissions and removals in the period 1990–2016 by IPCC sectors [Mt CO_2 eq.]*



Source: CHMI

Table 66 shows in more detail the trend of greenhouse gas emissions by IPCC categories for selected years.

Table 66: *GHG emissions and removals for selected years by IPCC categories [kt CO_2 eq.] (part 1)*

Category	1990	1995	2000	2005	2010	2015	2016
Total emissions	190 912.83	14 8921.27	140 253.91	139 454.73	133 569.91	121 088.50	124 246.14
January Energy	**161 339.98**	**12 9812.10**	**121 973.32**	**120 346.04**	**112 645.46**	**98 957.27**	**100 280.60**
A. Fuel combustion (sectoral approach)	149 478.48	12 0507.09	114 847.26	113 936.92	106 853.95	94 569.51	96 249.72
1. Energy sector	56 915.91	6 1850.19	62 061.93	63 165.64	62 123.38	53 678.15	54 449.09
2. Manufacturing and construction	51 234.04	2 6192.98	23 425.60	18 844.61	12 089.43	9 700.31	9 396.92
3. Transport	7 284.03	9 354.55	11 932.42	17 106.65	17 007.86	17 744.33	18 449.82
4. Other sectors	34 044.50	23 109.37	17 247.37	14 546.55	15 304.13	13 065.91	13 546.23
5. Other	NO	NO	179.95	273.47	329.14	380.81	407.66
B. Fugitive emissions	11 861.51	9 305.01	7 126.06	6 409.12	5 791.51	4 387.76	4 030.88
1. Solid fuels	10 779.39	8 468.06	6 249.66	5 513.41	4 894.36	3 774.33	3 420.64
2. Oil and natural gas and other emissions from energy production	1 082.12	836.95	876.40	895.71	897.15	613.43	610.25
2. Industrial processes	**17 113.01**	**14 211.15**	**14 804.42**	**14 549.02**	**14 653.08**	**14 993.33**	**15 221.74**
A. Mineral industry	4 082.45	3 019.09	3 633.37	3 345.75	3 048.42	2 575.79	2 816.07
Chemical industry	2 944.23	2 808.20	2 937.08	2 837.88	2 371.07	2 070.59	1 527.23
C. Metal industry	9 670.32	7 949.20	7 435.43	7 103.10	6 752.62	6 975.84	7 311.48
D. Non-energy products and solvent use	125.56	103.75	148.60	136.23	117.72	139.55	139.73
E. Electronics industry	NO,NE	NO,NE	11.17	6.64	41.93	5.32	6.39
F. Use of ODS	NO	36.01	332.75	802.49	2 016.65	2 927.20	3 122.53
G. Other product manufacture and use	290.46	294.90	306.04	316.93	304.69	299.04	298.31
3. Agriculture	**15 898.12**	**9 588.19**	**8 371.40**	**7 803.15**	**7 411.91**	**8 158.20**	**8 519.68**
A. Enteric fermentation	5 754.89	3 588.22	3 048.32	2 848.43	2 720.02	2 895.96	2 957.46
B. Manure management	3 315.36	2 304.97	2 041.56	1 836.06	1 581.17	1 554.11	1 580.18
D. Agricultural land	5 531.71	3 474.46	3 120.69	2 979.97	2 937.48	3 356.62	3 603.26
G. Lime application on soils	1 187.63	111.26	113.21	64.51	61.97	164.41	168.01
H. Urea application	108.53	109.27	47.61	74.17	111.27	187.10	210.76

Source: CHMI

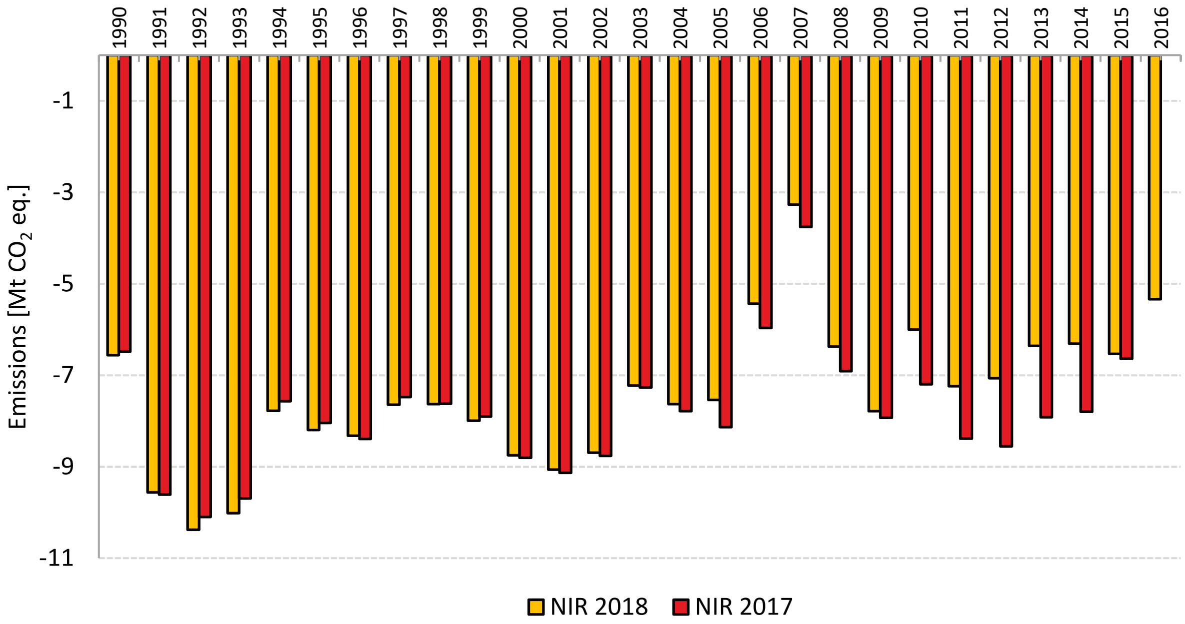
Table 67: *GHG emissions and removals for selected years by IPCC categories [kt CO_2 eq.] (part 2)*

Category	1990	1995	2000	2005	2010	2015	2016
4. Land use, land use change and forestry	**-6 562.80**	**-8 201.04**	**-8 748.69**	**-7 538.05**	**-6 002.02**	**-6 532.02**	**-5 337.14**
A. Forest land	-5 076.02	-7 359.82	-7 451.99	-6 130.21	-4 237.45	-5 967.69	-4 519.32
B. Cropland	213.22	234.25	224.98	244.82	172.20	131.92	124.36
C. Grassland	-96.83	-344.25	-404.90	-404.50	-460.66	-358.28	-661.65
D. Wetlands	21.48	9.08	26.34	21.17	34.11	25.09	25.03
E. Settlements	86.31	91.80	133.42	175.75	136.24	95.81	124.06
F. Other	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
G. Harvested wood products	-1 712.97	-833.55	-1 277.74	-1446.16	-1 647.58	-460.00	-430.67
5. Waste	**3 124.51**	**3 510.88**	**3 853.46**	**4 294.58**	**4 861.48**	**5 511.73**	**5 561.26**
A. Solid waste disposal	1 979.27	2 404.98	2 798.38	3 058.11	3 462.42	3 653.77	3 671.11
B. Biological treatment of solid waste	NE,IE	NE,IE	NE,IE	60.90	202.65	678.57	711.36
C. Incineration and open burning of waste	21.25	64.92	57.88	124.12	127.29	121.59	115.99
D. Wastewater treatment	1 123.99	1 040.98	997.20	1051.44	1 069.12	1 057.79	1 062.80
Memo items:							
International bunkers	528.22	562.83	593.83	978.94	965.41	895.14	964.06
Aviation	528.22	562.83	593.83	978.94	965.41	895.14	964.06
CO_2 emissions from biomass	6 445.39	5 787.22	6 652.88	8 667.39	12 342.53	16 193.69	16 461.81
Indirect N_2O emissions	2 111.77	728.70	554.23	526.19	427.33	344.49	366.48
Indirect CO_2 emissions	2 121.74	1745.19	1 157.65	1052.09	963.33	798.60	765.41
Total emissions excluding LULUCF	**197 475.63**	**157 122.31**	**149 002.60**	**146 992.78**	**139 571.94**	**127 620.52**	**129 583.28**
Total emissions including LULUCF	**190 912.83**	**148 921.27**	**140 253.91**	**139 454.73**	**133 569.91**	**121 088.50**	**124 246.14**
Total emissions including indirect CO_2, excluding LULUCF	**199 597.37**	**158 867.50**	**150 160.25**	**148 044.88**	**140 535.27**	**128 419.12**	**130 348.69**
Total emissions including indirect CO_2, including LULUCF	**193 034.57**	**150 666.46**	**141 411.56**	**140 506.82**	**134 533.25**	**121 887.10**	**125 011.55**

Source: CHMI

Table 68 shows that the LULUCF sectors show net emission removals throughout the 1990–2016 period. The removals fluctuate year-on-year, but overall, they show a slightly declining trend (see Chart 50). The table shows preliminary data for counting LULUCF activities in the Kyoto Protocol 2nd commitment period (the final amount will be counted for the whole period).

Chart 50: *LULUCF removals in 1990–2016 [Mt CO_2 eq.]*



Source: CHMI

Table 68: *Values for counting LULUCF emissions and removals under the Kyoto Protocol in 2013–2020 [kt CO_2 eq.]*

Kyoto Protocol activities	Net emissions / removals (kt CO_2 eq.)			
	2013	2014	2015	2016
A. Activities under Article 3.3				
A.1. Afforestation/reforestation	-498.47	-553.76	-593.74	-635.53
A.2. Deforestation	233.81	230.85	179.56	218.64
B. Activities under Article 3.4				
B.1. Forest management[131]	-5 932.14	-5 836.23	-5 970.69	-4 490.22

Source: CHMI

Verified emissions from stationary sources included in the EU ETS decreased by 18.11 % between 2005 and 2016. Emissions in non-ETS sectors show a rather fluctuating trend over the same period. In particular, emissions from the waste and transport sectors are increasing. However, the Czech Republic should, with a large margin, meet its target for non-ETS sectors by 2020, which allows for a maximum emission increase from these sectors of 9 % compared to 2005.

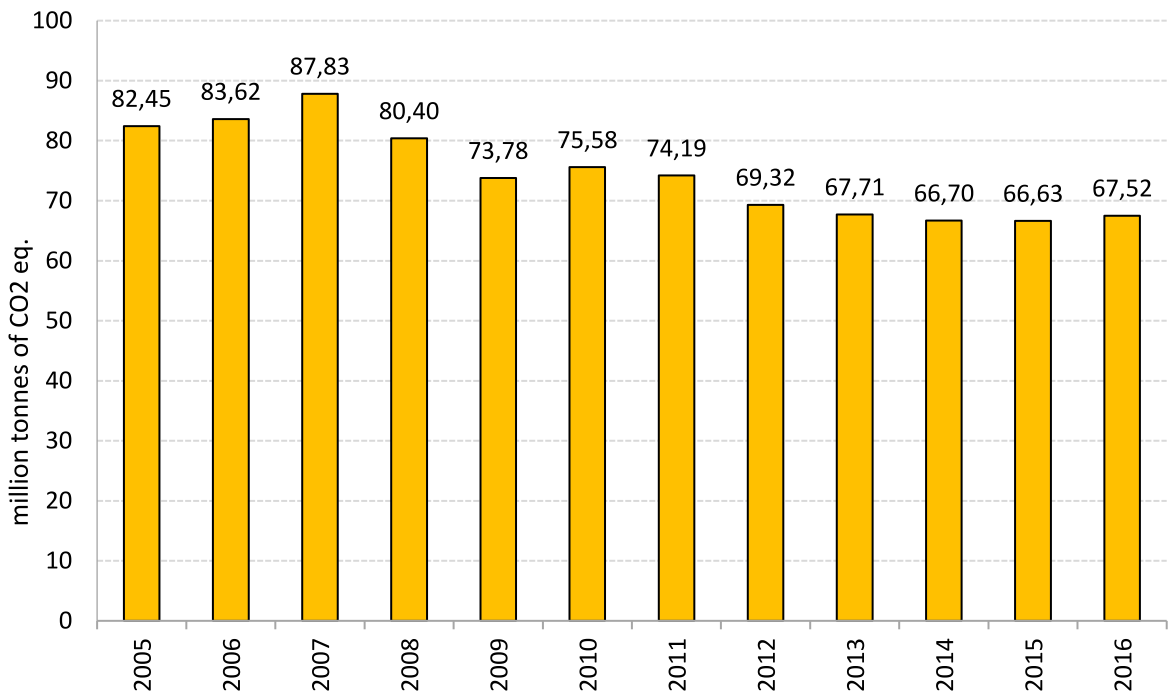
131 Only removals above the benchmark level of -4 868 kt CO_2 eq. can be accounted

Table 69: *Verified emissions from stationary installations in the EU ETS (million tonnes of CO2 eq.)*

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Emissions (EU ETS)	82.45	83.62	87.83	80.40	73.78	75.58	74.19	69.32	67.71	66.70	66.63	67.52

Source: EUTL

Chart 51: *Verified emissions from stationary installations in the EU ETS*



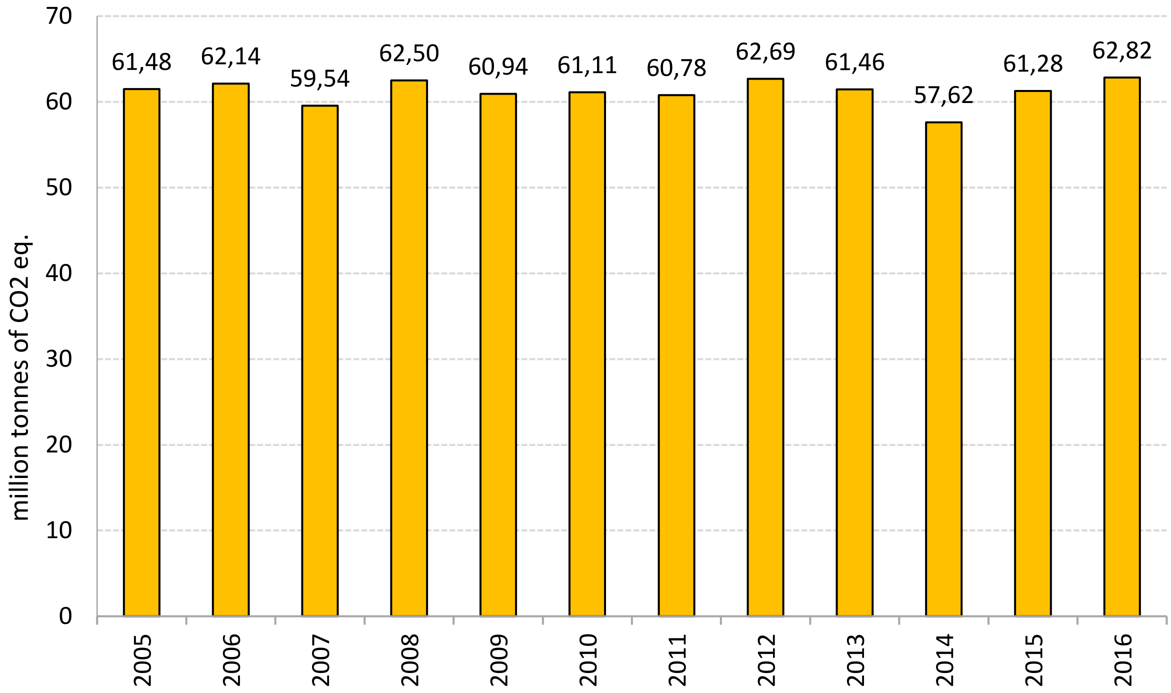
Source: EUTL

Table 70: *Emissions in non-ETS sectors in 2005–2016 (million tonnes of CO2 eq.)*

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Emissions (non-ETS)	61.48	62.14	59.54	62.5	60.94	61.11	60.78	62.69	61.46	57.62	61.28	62.82

Source: EUROSTAT, CHMI

Chart 52: *Emissions in non-ETS sectors in 2005–2016*



Source: EUROSTAT, CHMI

ii. Projections of sectoral developments with existing national and Union policies and measures at least until 2040 (including for the year 2030)

The projections of greenhouse gas emissions are based on the latest available inventory of greenhouse gas emissions and removals as described in Chapter 4.2.1 (i). Emission projections contain two scenarios (WEM – assumes the effects of current policies and measures on the development of greenhouse gas emissions, WAM – assumes the effect of planned policies and measures on the development of greenhouse gas emissions). Emission projections are created separately for each of the sectors (1. Energy, 2. Industrial processes and product use, 3. Agriculture, 4. LULUCF, 5. Waste) with a specific emphasis on key emission sources (sources that have a significant impact on total emissions of the country with respect to absolute emission values, taking into account the observed emission trend and taking into account the level of uncertainty for the given source).

Projection of greenhouse gas emissions from sector 1. Energy is based on data provided by the MIT. In particular, this data includes energy and heat production outlooks and final consumption outlooks by sector (industry, transport, services, households, agriculture and others) are particularly high. The MESSAGE model was used to create greenhouse gas projections[132], which is used for medium-term to long-term energy planning, for climate change policy analysis and developing national or regional scenarios.

Projection of greenhouse gas emissions from sector 2. Industrial processes and product use are based on the outlooks for production of selected products such as cement, lime, iron, steel, etc., provided by the MIT, and on the outlooks prepared by industry experts (especially for fluorinated greenhouse gases). The actual projections of greenhouse gas emissions are based on the methodology used in the inventory of emissions and greenhouse gas removals, which is in line with the IPCC Guideline 2006. For

[132] Model for Energy Supply Strategy Alternatives and their General Environmental Impacts

projections of fluorinated greenhouse gas emissions used in refrigeration and air conditioning technology, the country-specific Phoenix model was used.

Projection of greenhouse gas emissions from sector 3. Agriculture is based on the Strategy of the Ministry of Agriculture of the Czech Republic with a view to 2030 updated by the Minister of Agriculture's statement on this Strategy and on consultations with experts on policies and measures in agriculture and rural development. Significant inputs into the projections are data on livestock population trends, volume of nitrogen from fertilisers applied to agricultural land and the annual harvest of agricultural crops. The projections of greenhouse gas emissions are based on the methodology used in the inventory of emissions and greenhouse gas removals, which is in line with the IPCC Guideline 2006.

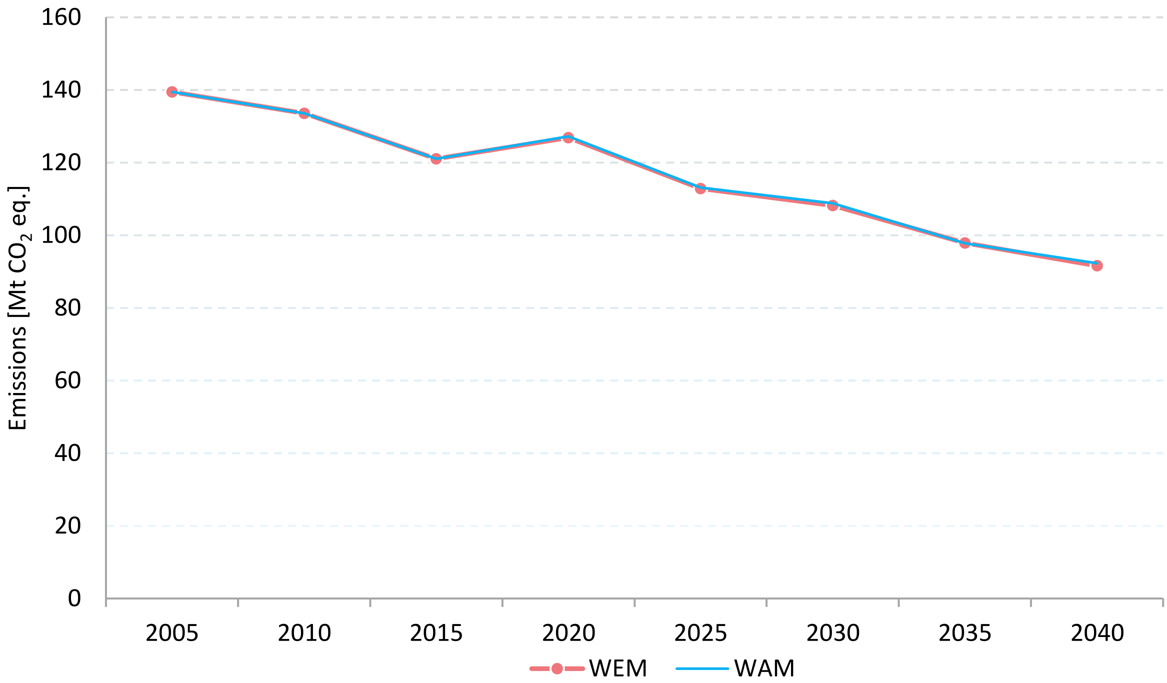
When making projections of greenhouse gas emissions from sector 4. LULUCF, there is a specific focus on forest land category, which is a key category in the LULUCF sector, but also in the whole national inventory of greenhouse gas emissions and removals. In relation to the LULUCF sector and carbon neutrality, it should be emphasised that in the coming years the role of forestry in the Czech Republic will change in terms of CO_2 sinks due to extraordinary logging related to the elimination of bark beetle calamity. For these reasons, it is likely that the category of the managed forest land will temporarily show CO_2 emissions. For this reason, forestry-related projections are prepared using the EFISCEN model[133]. The EFISCEN model is one of the most frequently used models for various tasks associated with the projections of forest resource developments in Europe. The projections of greenhouse gas emissions for the other LULUCF categories are based on the correlation of the estimated 2016 emissions with the corresponding areas for the predicted years.

Projection of greenhouse gas emissions from sector 5. Waste is based on the data provided in the Waste Management Plan of the Czech Republic, which contains waste management outlooks by 2024. The projections after 2024 were extrapolated based on trend and expert estimates. The actual projections of greenhouse gas emissions are based on the methodology used in the inventory of emissions and greenhouse gas removals, which is in line with the IPCC Guideline 2006.

Chart 53 and Table 71 show the results of projections of total greenhouse gas emissions for the WEM and WAM scenarios. In the short term until 2020, greenhouse gas emissions are projected to increase compared to the current state, and from 2025 global emissions will start to decrease gradually for both scenarios. In both scenarios, there is an approximately 24 % decrease in total greenhouse gas emissions by 2040 compared to the current state. The greenhouse gas emission projections under the WAM scenario are only slightly more unfavourable (see Table 71) than under the WEM scenario. The difference is due to emission projections from the LULUCF sector, where the WAM scenario envisages changes in the age structure and species composition of the forest (for more detailed description, see below).

[133] European Forest Information Scenario Model

Chart 53: *The results of the projections of total greenhouse gas emissions for WEM and WAM scenarios (including LULUCF)*



Source: CHMI

Table 71*: The results of the projections of total greenhouse gas emissions for WEM and WAM scenarios (including LULUCF) [Mt CO_2 eq.]*

	Historical emissions			GHG emission projection				
	2005	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
WEM	139.45	133.57	121.09	126.83	112.85	108.22	97.84	91.59
WAM	139.45	133.57	121.09	127.18	113.12	108.71	97.78	92.29

Source: CHMI

Table 72: *Outcomes of GHG emission projections outside EU-ETS for WEM and WAM scenario [Mt CO2 eq.]*

	Historical emissions			GHG emission projection				
	2005	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
WEM	64.54	57.99	54.44	63.20	58.34	53.96	49.70	45.72
WAM	64.54	57.99	54.44	64.10	56.87	52.83	47.91	44.61

Source: CHMI

Table 73 presents the results of projections of total greenhouse gas emissions by type of gas. The most significant decrease in emissions compared to the current situation is expected for hydrogen fluoride hydrocarbons (HFCs). The use of HFCs is strictly limited by European legislation as well as globally

(HFCs are on the list of controlled substances of the Montreal Protocol). Decrease in emissions is also expected for CO_2 and CH_4, while N_2O emissions are expected to grow slightly, which is linked to the increase in emissions from agriculture.

Table 73: *The results of the projections of total greenhouse gas emissions for WEM and WAM scenarios for individual gases (including LULUCF) [Mt CO_2 eq.]*

	Historical emissions			GHG emission projection				
	2005	2010	2015	2020	2025	2030	2035	2040
	WEM							
CO_2	117.67	111.39	98.19	103.81	90.79	87.93	78.80	73.90
CH_4	14.73	14.54	14.02	13.61	13.09	12.07	11.39	10.23
N_2O	6.14	5.50	5.86	5.89	6.08	6.21	6.24	6.24
F – gases	0.92	2.14	3.01	3.51	2.88	2.00	1.41	1.21
	WAM							
CO_2	117.67	111.39	98.19	104.17	91.08	88.70	79.58	75.32
CH_4	14.73	14.54	14.02	13.61	13.08	11.80	10.55	9.51
N_2O	6.14	5.50	5.86	5.89	6.07	6.21	6.23	6.24
F – gases	0.92	2.14	3.01	Only WEM scenario				

Source: CHMI

Chart 54 and Table 74shows the results of projections of total greenhouse gas emissions by sector. The most significant decrease in total greenhouse gas emissions compared to the current situation (approximately 32 %) is foreseen for sector 1. Energy. The projections are based on the data provided by the MIT. For sector 1. Energy, projections WEM and WAM scenarios were prepared. Unlike the WEM scenario, the WAM scenario envisages additional measures in transport. However, given the share of transport in total emissions from the energy sector, the differences between the WEM and the WAM scenarios are not significant.

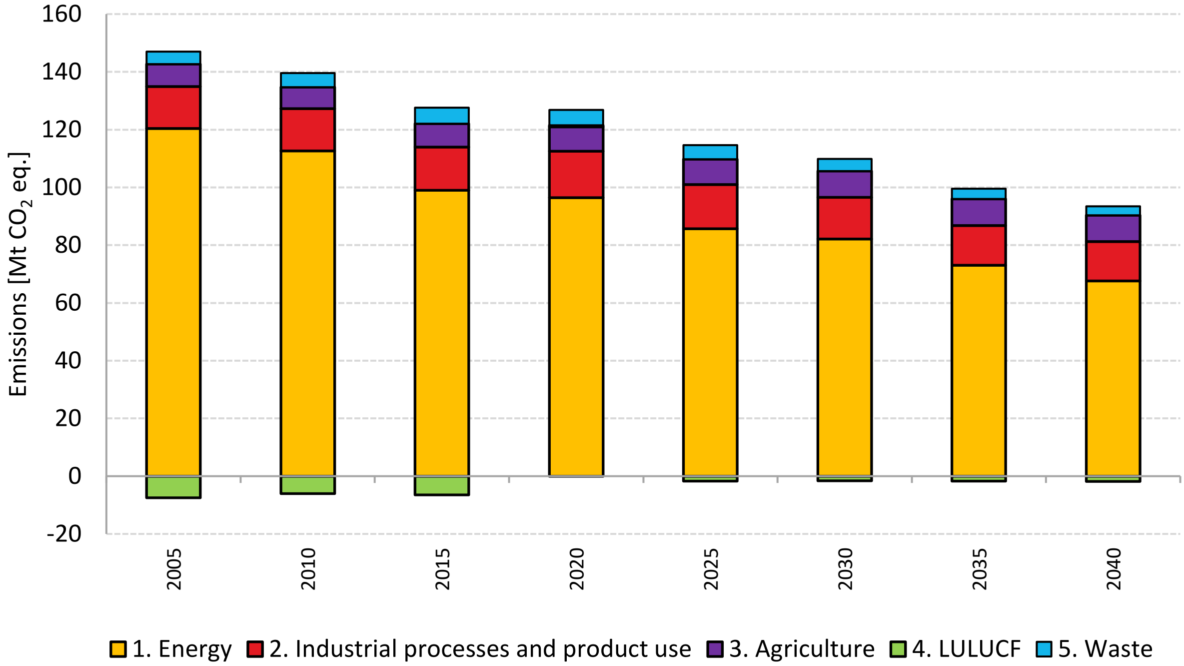
Given that the MIT prediction until 2040 of the production of selected products does not anticipate a downward trend in industrial production, greenhouse gas emissions from sector 2. Industrial processes and product use are decreasing slowly. The reduction in emissions is mainly due to the legislation on the use of fluorinated greenhouse gases, which requires manufacturers/importers/exporters to gradually shift to alternative refrigerants.

For sector 3. According to the projections, agriculture can be expected to see an increasing trend in greenhouse gas emissions, especially for the manure management category and for the enteric fermentation category. The increase in emissions is due to the expected increase in livestock population, which is based on the data from the Ministry of Agriculture.

The projections prepared for sector 4. LULUCF show the expected gradual loss of CO_2 removal capacity until 2040. The emission projections for sector 4. LULUCF include changes in age structure (WEM) and age structure and species composition (WAM – more diverse Czech forests with a significantly higher share of deciduous trees). Although until 2040, the WAM scenario appears to be slightly more negative in terms of emission sinks (removals), it should lead to more stable and resilient forests better adapted to changing environmental conditions – improving safety and sustainability of forest production.

For sector 5. According to the projections for waste, a reduction in greenhouse gas emissions can be expected in both scenarios. The reduction of emissions is more pronounced for the WAM scenario, which is based on stricter coefficients for the recovery of landfill gas.

Chart 54: *Results of projections of total greenhouse gas emissions for the WEM scenario by sector*



Source: CHMI

Table 74: *Results of projections of total greenhouse gas emissions for the WEM and WAM scenarios by sector*

	Historical emissions			GHG emission projection				
	2005	2010	2015	2020	2025	2030	2035	2040
[Mt CO_2 eq.]	WEM							
1. Energy	120.35	112.65	98.96	96.49	85.66	82.15	73.03	67.59
2. Industrial processes and product use	14.55	14.65	14.99	16.05	15.35	14.43	13.78	13.60
3. Agriculture	7.80	7.41	8.16	8.36	8.77	9.05	9.15	9.17
4. LULUCF	-7.54	-6.00	-6.53	0.55	-1.74	-1.63	-1.73	-1.81
5. Waste	4.29	4.86	5.51	5.38	4.81	4.22	3.61	3.03
	WAM							
1. Energy	120.35	112.65	98.96	96.15	85.28	81.78	72.69	67.29

	Historical emissions			GHG emission projection				
	2005	2010	2015	2020	2025	2030	2035	2040
[Mt CO_2 eq.]	WEM							
2. Industrial processes and product use	14.55	14.65	14.99	Only WEM scenario				
3. Agriculture	7.80	7.41	8.16	Only WEM scenario				
4. LULUCF	-7.54	-6.00	-6.53	1.25	-1.09	-0.49	-0.61	-0.10
5. Waste	4.29	4.86	5.51	5.38	4.80	3.95	2.77	2.32

Source: CHMI

Table 75 shows a more detailed overview of the projections of greenhouse gas emissions from sector 1. Energy, which accounted for up to 80 % of total Czech emissions (including LULUCF and indirect emissions) in 2016. The Energy sector is expected to see a gradual decrease in total greenhouse gas emissions until 2040.

Table 75: *Projection of total greenhouse gas emissions from the Energy sector for WEM and WAM scenarios*

	Historical emissions			GHG emission projection				
	2005	2010	2015	2020	2025	2030	2035	2040
[Mt CO_2 eq.]	WEM							
A. Fuel combustion (sectoral approach)	113.94	106.85	94.57	92.46	81.80	78.84	69.79	64.89
1. Energy sector	63.17	62.12	53.68	51.49	42.54	42.24	36.26	34.02
2. Manufacturing and construction	18.84	12.09	9.70	9.86	9.83	9.68	9.61	9.52
3. Transport	17.11	17.01	17.74	17.94	17.39	16.10	14.27	12.22
4. Other sectors	14.55	15.30	13.07	12.94	11.82	10.59	9.43	8.90
5. Other	0.27	0.33	0.38	0.23	0.23	0.23	0.23	0.23
B. Fugitive emissions	6.41	5.79	4.39	4.03	3.86	3.31	3.24	2.70
1. Solid fuels	5.51	4.89	3.77	3.38	3.07	2.68	2.58	2.02
2. Oil and natural gas and other emissions from energy production	0.90	0.90	0.61	0.65	0.79	0.63	0.65	0.69
	WAM							

	Historical emissions			GHG emission projection				
	2005	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
[Mt CO_2 eq.]	**WEM**							
A. Fuel combustion (sectoral approach)	113.94	106.85	94.57	92.12	81.43	78.47	69.45	64.59
1. Energy sector	63.17	62.12	53.68	Only WEM scenario				
2. Manufacturing and construction	18.84	12.09	9.70	Only WEM scenario				
3. Transport	17.11	17.01	17.74	17.60	17.01	15.73	13.93	11.92
4. Other sectors	14.55	15.30	13.07	Only WEM scenario				
5. Other	0.27	0.33	0.38	Only WEM scenario				
B. Fugitive emissions	6.41	5.79	4.39	Only WEM scenario				
1. Solid fuels	5.51	4.89	3.77	Only WEM scenario				
2. Oil and natural gas and other emissions from energy production	0.90	0.90	0.61	Only WEM scenario				

Source: CHMI

(iii) Interaction with air quality and air emissions policy

The link of the National Plan to the issue of air protection was realised in connection with the preparation of the Update of the National Emission Reduction Programme. This central strategy document on air protection meets the requirements for the elaboration of national air pollution control programmes imposed on Member States by Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC. This Directive also sets national emission reduction commitments, the ‘emission ceilings’, for 2020, 2025 and 2030.

The update of the National Emission Reduction Programme was prepared in parallel with the National Energy and Climate Plan of the Czech Republic. The update of the National Emission Reduction Programme of the Czech Republic adopted the Draft National Plan, its structure and parameters as an input assumption for the calculation of emission projections of selected air pollutants. The calculated projections indicated that by 2020 the Czech Republic would meet all set national emission reduction commitments, and that by 2025 it would not fulfil its national ammonia reduction commitment without additional measures. In 2030, given the current situation, the Czech Republic will have difficulty meeting its national emission reduction commitments for all specified air pollutants except sulphur dioxide.

In view of the emission projections, additional emission reduction measures have been identified in the National Emission Reduction Programme Update in order to meet the national emission reduction commitments set out in the above Directive by the specified dates. One of the new measures, measure BB12 ‘Additional emission reductions for 2030 from the public energy and heat production sector’, requires an additional savings of at least 5 kt of NOx emissions in 2030 compared to the NERP-WM emission scenario, a scenario that already included the original Draft National Plan of the Czech Republic as amended by the Government of the Czech Republic in January 2019. Among the ways of fulfilling this commitment, measure BB12 envisages, in particular, greater use of non-combustible renewable energy sources or heat recover from industry, fuel change or increased energy efficiency.

The public energy sector is particularly important in relation to air in terms of NOx emissions, in which it accounts for about 26 %. Overall, in terms of secondary particulate matter precursors, it accounts for 22 % of emissions, making it the second largest emitter of these emissions in the Czech Republic, just behind the local household heating sector (41 %).

The NERP Update also assessed the contribution of foreign sources to air pollution in the Czech Republic. According to the results of modelling by advanced chemical model, the contribution of foreign sources in the Czech Republic may range from 30 to 50 % of the annual average for PM10 suspended particulate concentrations and 40 to 60 % of the annual average PM2.5 particle concentration (evaluated collectively for both primary and secondary particles)

In particular, increasing the share of non-combustible renewable energy sources, increasing energy efficiency, reducing energy intensity and increasing heat recovery can be considered favourable interventions in this area with a positive impact on air quality. Furthermore, from the point of view of SO2 emissions, there is a positive substitution of fossil fuels (primarily coal) by other energy sources, however, the prepared emission projection shows compliance with emission reduction targets for SO_2 with significant margin for all analysed years (2020, 2025, 2030). The issue of maintaining and improving air quality is problematic in the sector of heat production in sources with a rated thermal input of up to 300 kW, i.e. the local heating sector of households, where the national plan assumes a significant contribution to meeting the set target of heat production from renewable sources. Increased use of biomass is associated with emissions of air pollutants, which must be compensated by technological replacement of sources and improvement of the quality of service of sources, which are ensured by the requirement for the operation of boilers of at least 3rd and higher class (according to EN 303-5) and from 2022 by subsidies to support the exchange of sources (currently focused on boilers, after 2022 in accordance with measure DA1 of the NERP Update also on heaters) and measures to raise the awareness of the operators of sources about the correct way of heating (measure DB11).

The road transport sector accounts for about 32 % of total nitrogen oxide emissions and is the most important source of these emissions to air. With regard to national emission reduction commitments, it is necessary to achieve an additional savings of at least 5 kt of NOx emissions in 2030 compared to the scenario with measures (the WM scenario includes existing legislation and other already established measures). This can be achieved by a higher fleet renewal rate and a wider deployment of alternative fuel vehicles, both for cars and trucks and for public transport (electromobility and hydrogen mobility), but it is necessary to look for an emission-free way to produce these fuels instead of producing them from fossil sources. There is also significant potential for shifting transport from road to rail, targeted by measure AB23 of NERP Update. The different options for meeting the set share of renewable sources in transport do not differ significantly from the point of view of the total amount of transport emissions; a higher proportion of electricity leads to a positive effect of displacement of emissions from traffic-burdened localities and thus to a reduction of the impact on air quality. Increasing the share of natural gas / biogas at the expense of conventional fuels (petrol and diesel) also has some positive impact on reducing emissions.

Overall, the National Emission Reduction Programme update defines 6 new priority measures to reduce emissions of selected air pollutants and 14 support measures. The measures are focused on the sectors: public energy; heat generation; residential combustion in households, transport and agriculture. Together, these measures represent the NERP–WaM 2019 scenario. Its effect is expressed in the table below, which offers a comparison with the evolution of emissions under the NERP–WM scenario, i.e. a scenario that has taken into account all existing effective or valid measures and which corresponds to the original draft National Plan.

Table 76: *National emission projections for the period up to 2030 in kt/year*

		NERP–WM 2019			NERP–WaM 2019		
	2005	2020	2025	2030	2020	2025	2030
NO_x	276	152	129	107	152	124	97
VOC	252	173	148	141	173	144	126
SO_2	208	82	65	60	82	60	54
NH_3	77	66	68	72	66	53	57
$PM_{2.5}$	43	28	20	17	28	18	13

Source: CHMI, MOTRAN, IFER, VÚZT

4.2.2 Renewable energy

i. Current share of renewable energy in gross final energy consumption and in different sectors (heating and cooling, electricity and transport) as well as per technology in each of these sectors

The total share of renewable energy sources in gross final energy consumption according to EUROSTAT methodology stood at 14.89 % in 2016. Table 77 Table 64 shows the development of the share of renewable energy sources in gross final consumption in 2004–2016. Chart 55 shows the same in graphical form.[134]

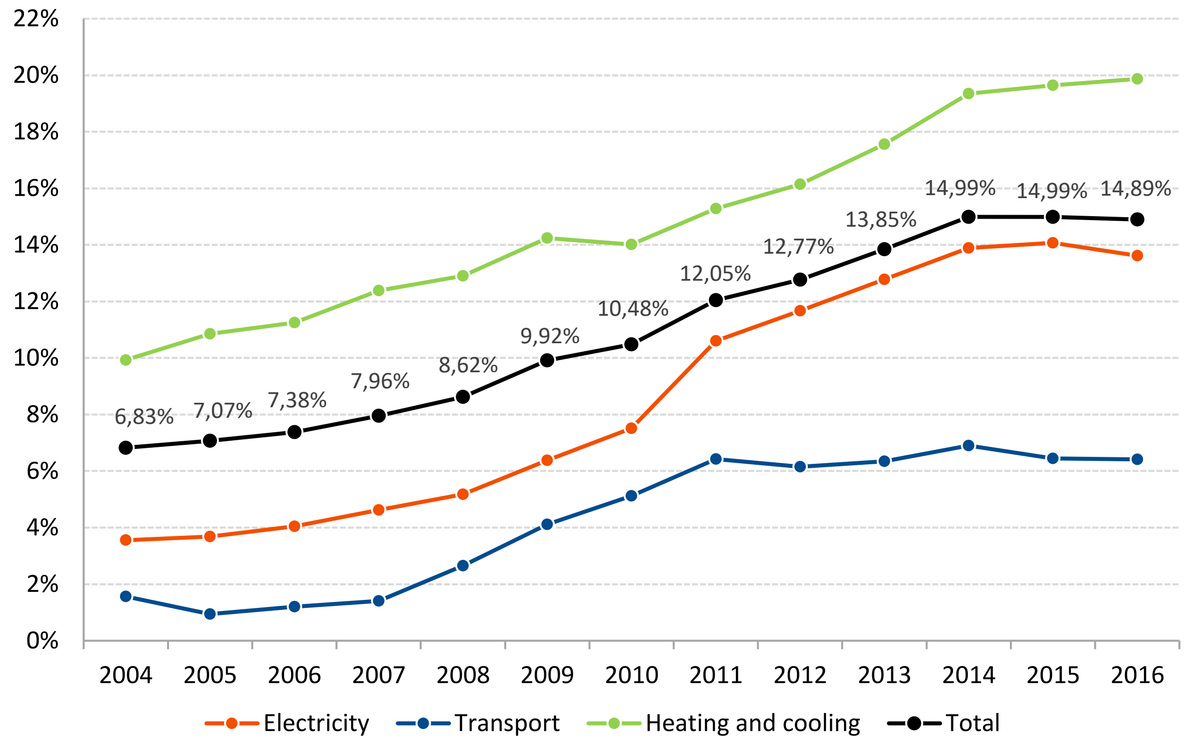
Table 77: *RES share in gross final consumption in 2004–2016 (%)*

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Electricity	3.55	3.69	4.04	4.62	5.18	6.38	7.52	10.61	11.67	12.78	13.89	14.07	13.61
Transport	1.57	0.94	1.20	1.40	2.66	4.11	5.12	6.43	6.15	6.34	6.90	6.45	6.42
Heating	9.93	10.85	11.25	12.38	12.91	14.24	14.01	15.29	16.14	17.56	19.35	19.64	19.87
Total	6.83	7.07	7.38	7.96	8.62	9.92	10.48	12.05	12.77	13.85	14.99	14.99	14.89

Source: RES share based on EUROSTAT methodology (MIT, CZSO)

[134] At the time of finalising the National Plan, preliminary values for 2017 were already available (these data are reported periodically). However, the reference year is 2016, so the data were presented consistently until 2016.

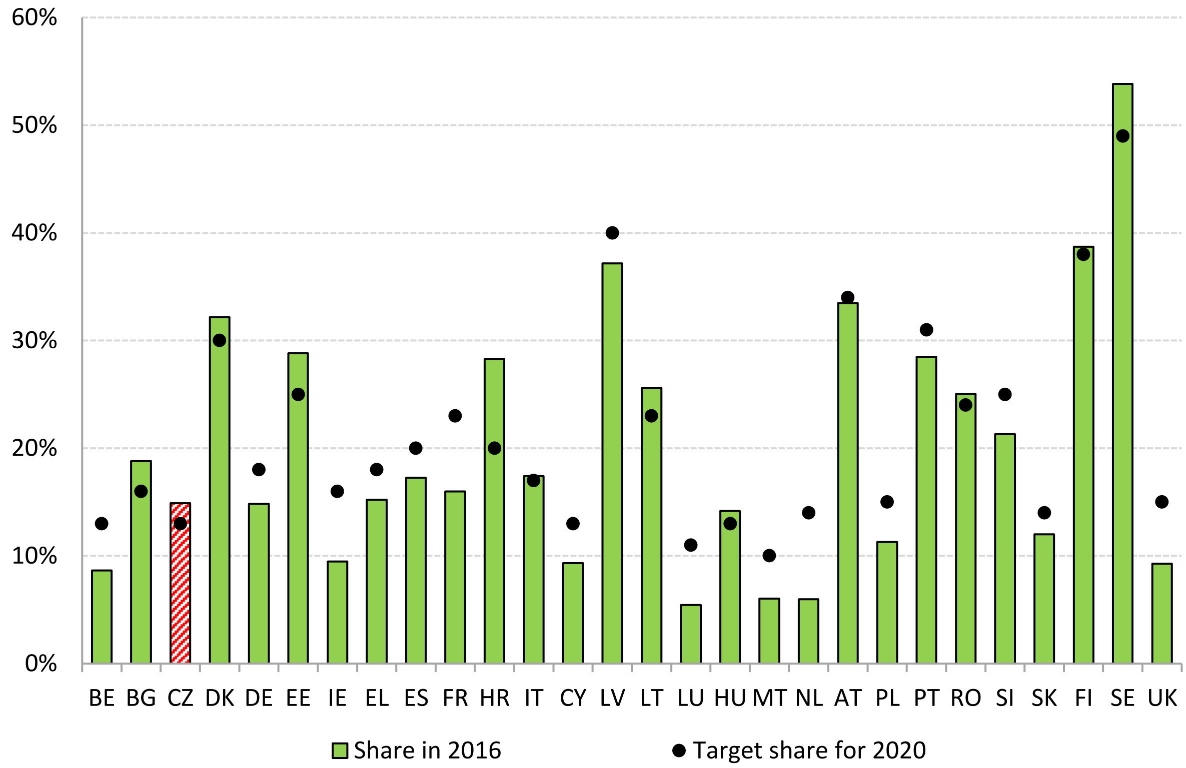
Chart 55: *RES share in total gross final consumption*



Source: RES share based on EUROSTAT methodology (MIT, CZSO)

The following chart shows the comparison of the share of renewable energy sources in each Member State in 2016 in the EUROSTAT methodology, including the RES share targets for each Member State by 2020. The Czech Republic was one of the 11 countries that already reached their 2020 target by 2016 (the Czech Republic reached its target in 2013).

Chart 56: *Comparison of the RES share in the EU (2016)*

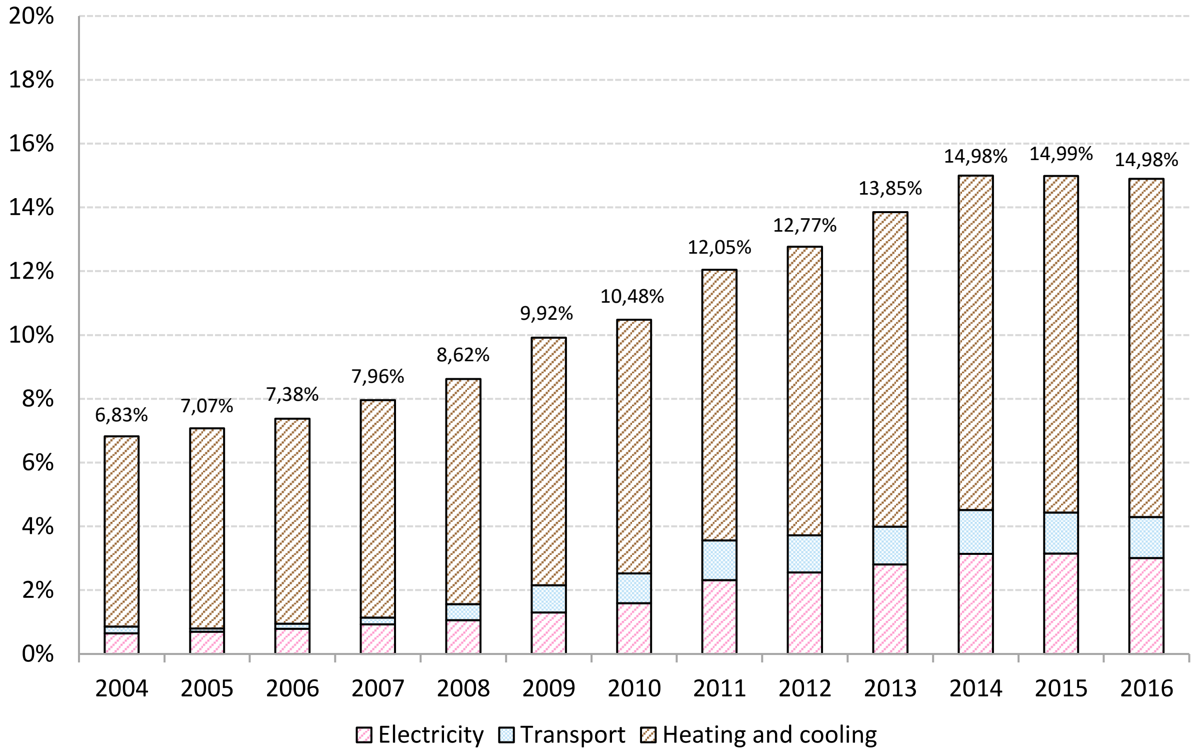


Source: RES share based on EUROSTAT methodology

Under Directive 2009/28/EC, the Czech Republic aims to achieve a 13 % share of renewable energy sources in final consumption by 2020. For 2015–2016, the Directive set the interim target of 9.1 %. The 2020 target was already achieved by the Czech Republic in 2013.

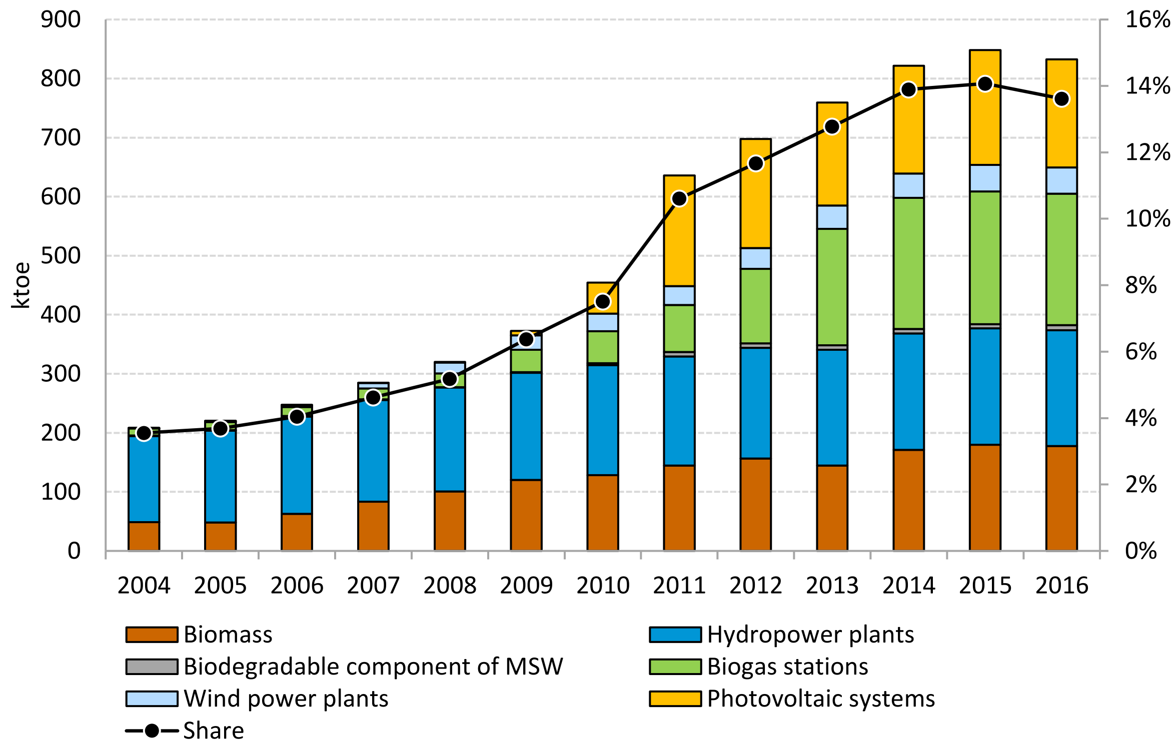
Chart 58 shows the evolution of the share of renewable energy sources in gross final consumption in the electricity sector since 2004 by fuels. In 2016, the share of renewable energy in the energy sector was 13.61 %. Renewable sources used in the production of electricity relative to the total share constitute approximately 3 %. Chart 59 shows the evolution of the share of renewable energy sources in gross final consumption in the transport sector in 2004–2016 by fuels. Renewable energy consumption in 2016 accounted for 6.42 % of total gross final consumption in the transport sector. The share of renewable energy sources in transport accounts for only about 1.3 % in the overall share. Chart 60 then shows the evolution of the share of renewable energy sources in the heating and cooling sector by fuels, which accounts for the largest share of approximately 10 % in the total share. The share of renewable sources in the heating and cooling sector is also the highest in comparison to other sectors; in 2016 it accounted for 19.87 %.

Chart 57: *RES share in gross final consumption (contributions of individual 'sectors')*



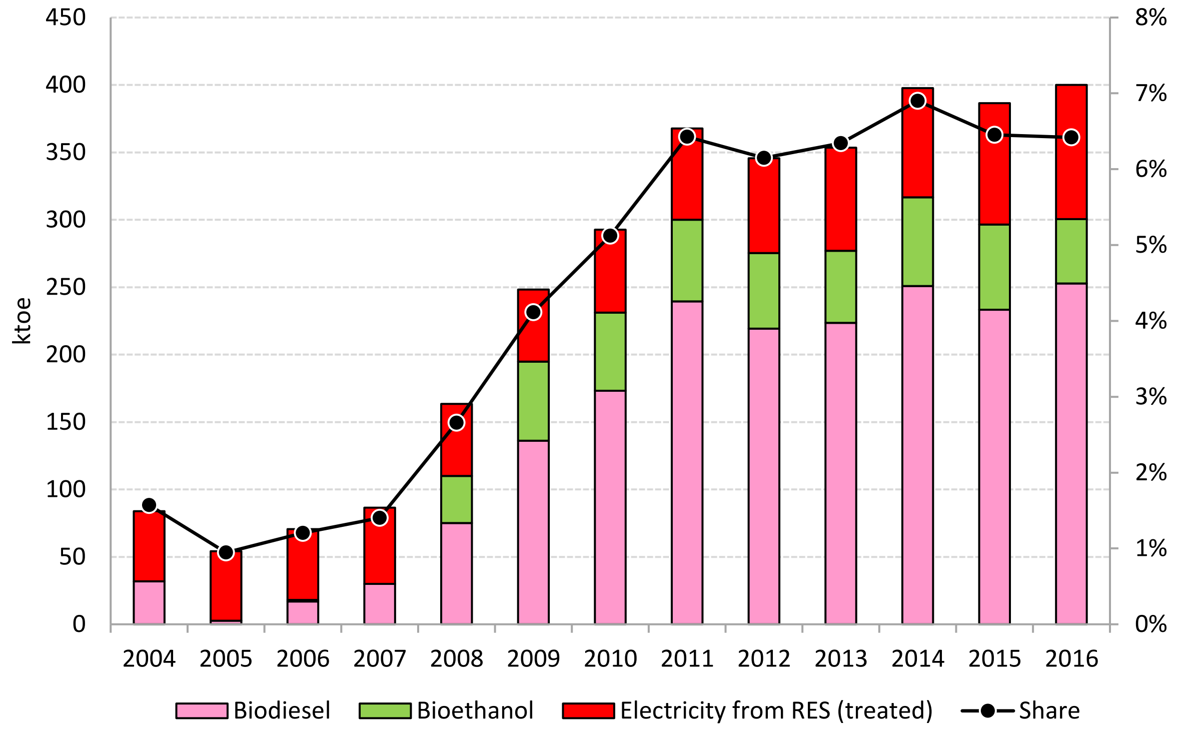
Source: RES share based on EUROSTAT methodology (MIT, CZSO)

Chart 58: *RES share in gross final consumption in the electricity sector*



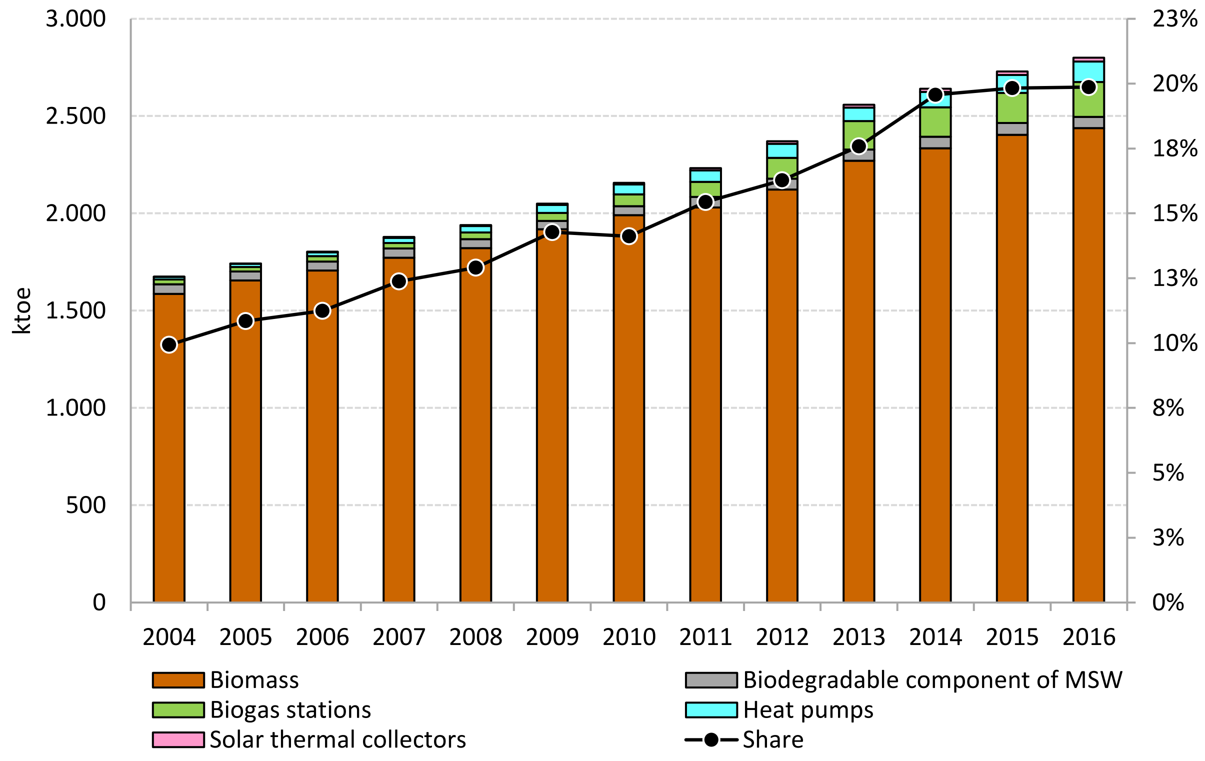
Source: RES share based on EUROSTAT methodology (MIT, CZSO)

Chart 59: *RES share in gross final consumption in the transport sector*



Source: RES share based on EUROSTAT methodology (MIT, CZSO)

Chart 60: *RES share in gross final consumption in the heating and cooling sector*



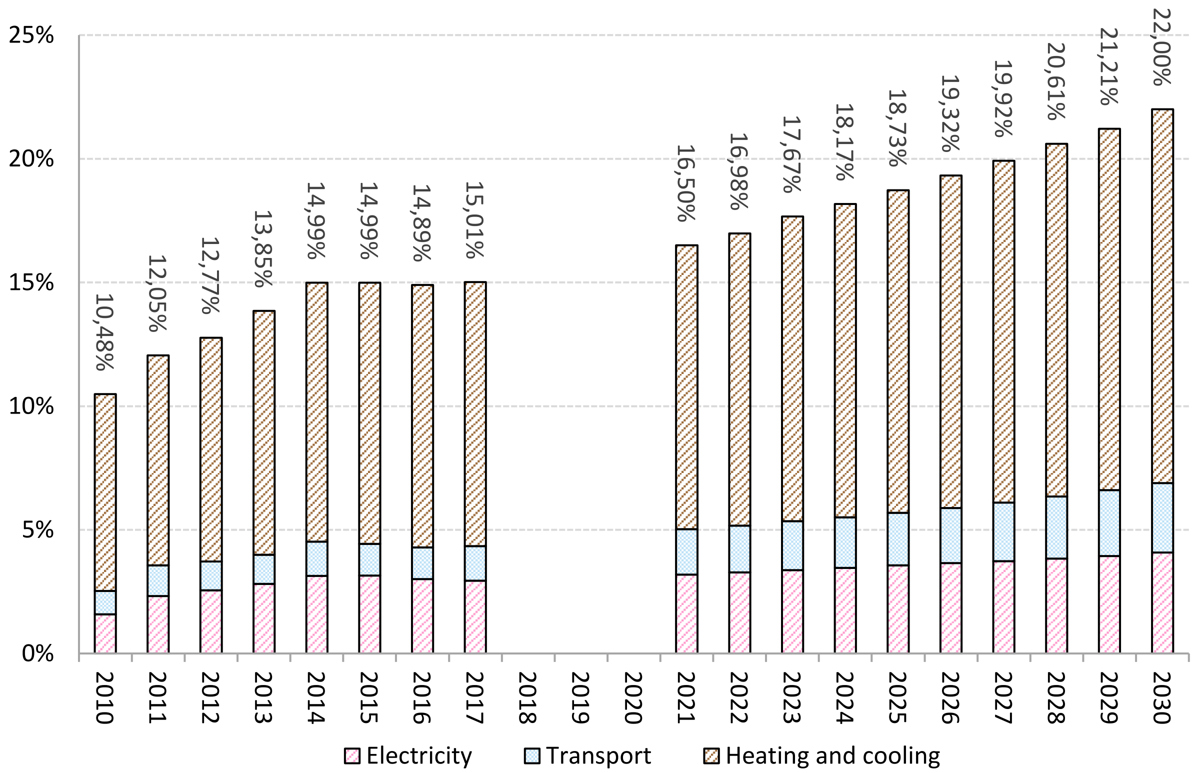
Source: RES share based on EUROSTAT methodology (MIT, CZSO)

ii. Indicative projections of development with existing policies for the year 2030 (with an outlook to the year 2040)

Estimated RES considering the implementation of existing policies

The estimated developments in the implementation of the policies and measures outlined in Chapter 3.1.2 is shown in Chapter 2.1.2. The proposed policies are designed to meet the target, so the estimated development considering the implementation of existing and forthcoming policies is the same as the one in Chapter 2.1.2. Chart 61 shows the expected development of the RES share by sector, based on the policies outlined in the relevant section of this document. In this respect, there is a relatively extensive supporting documentation called 'Supported Energy Sources Development by 2030', which provides a detailed estimate of the development of individual renewable energy sources by 2030 (this material is only available in Czech). By 2040, according to the approved State Energy Policy, renewable sources should account for 17-22 % of primary energy sources and 18–25 % of gross electricity production.

Chart 61: *Estimation of RES share by 2030 by individual sectors*



Source: Prepared by MIT for the purposes of the National Plan

Estimated development of gas from renewables

Given the intermittent nature of solar and wind power plants, gaseous fuels can play an important role, partly because of their technological possibilities for countering imbalances in the electricity system and because of the possibility of converting electricity into gaseous fuels. This creates the potential to significantly enhance the stability of the whole system, for example thanks to the fact that gaseous fuels can be stored and transported more easily and cheaper, and they can help make the use of renewables more efficient. In this way, it is possible to maximise the benefits of the existing energy infrastructure for the most efficient transition to a low-emission economy combining natural gas with decarbonised and renewable gases. Given a higher share of electricity production from intermittent renewable sources, gases from renewables can play an important role.

The development of gases from renewables depends on several factors. The key issue will be a certain degree of public support for the production of renewable gases. The operation of some of the existing biogas plants (from which biomethane can subsequently be produced) could be discontinued by 2030. Therefore, the future setting of financial and institutional support for the development of gas production from renewables will be crucial (see Chapter 3.1.2.2). This includes, inter alia, both the transformation of existing biogas stations to biomethane production, and construction of new biomethane stations including their connection to the gas system. In addition to biogas and biomethane plants, there are hydrogen production technologies as well as bioLPG production technologies. These technologies are already known, but the operation of these plants is currently unprofitable due to high operating costs.

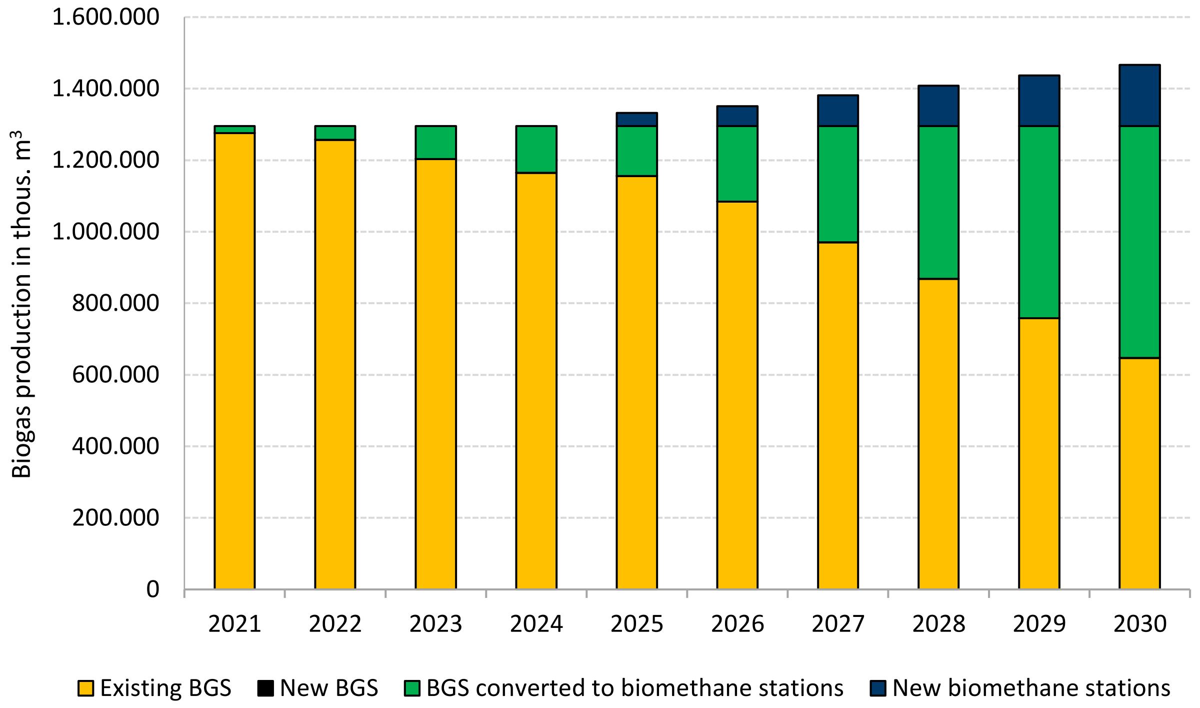
Gas from RES can play an important role as early as 2021–2030 and beyond, not only in electricity generation but also in the transport, heating and cooling sectors. Currently, there are approximately 400 biogas stations in the Czech Republic, more than 100 municipal and industrial wastewater treatment plants with sludge gas production and almost 70 landfill gas production plants. Biogas stations[135] account for approximately 1.5 % of the current approximately 15 % RES share in final energy consumption (see section 2.1.2). The overwhelming majority of biogas stations produce heat and electricity in cogeneration. In the Czech Republic, biomethane is currently being produced and injected into the gas network in a single facility (Rapotín biogas station).

In connection with, inter alia, the objective of the RES share in the transport sector, measures are prepared (see section 3.1.2), which should partially motivate the transformation of part of existing biogas stations to biomethane stations or the creation of new biomethane stations in 2021–2030. This conversion should take place primarily at biogas stations with lower useful heat utilisation and near high-pressure gas pipelines, which should also have a positive impact on increasing the use of primary energy sources. The following chart shows the expected biogas production by existing, converted and new biogas production.

Chart 62: *Expected biogas production by existing, converted and new biogas production*[136]

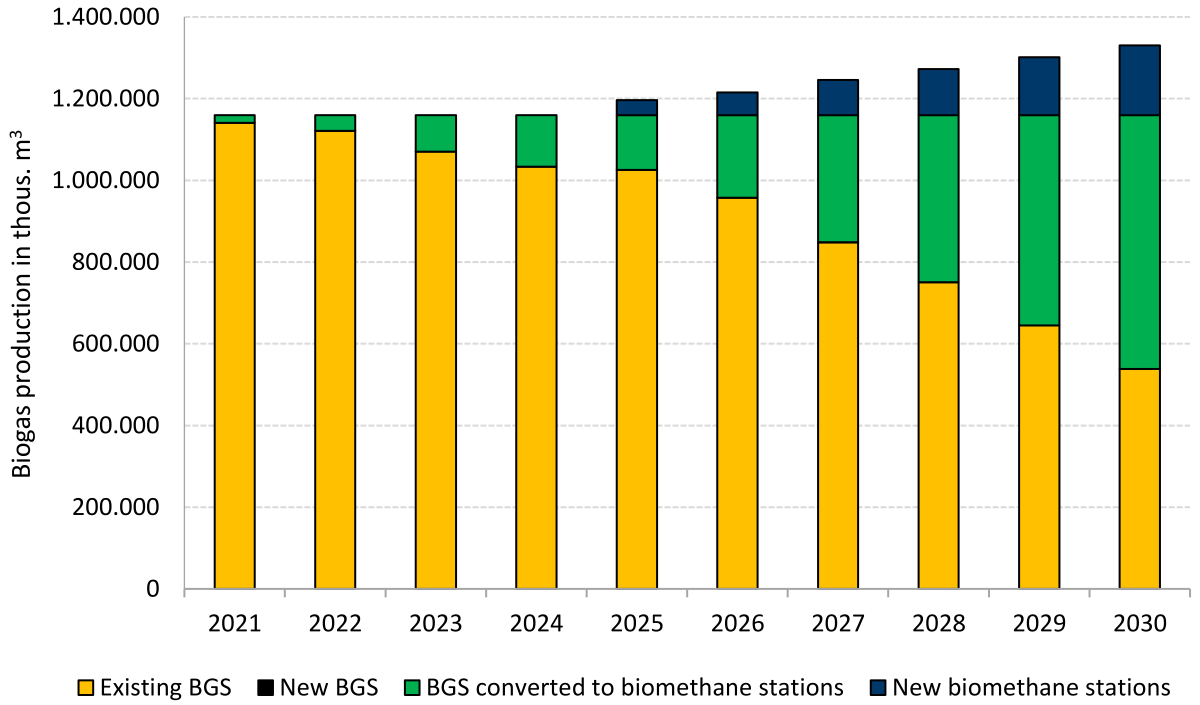
[135] Biogas stations including sewage treatment plants producing sludge gas and landfill gas production plants. Unless otherwise stated, the term ‘biogas stations’ includes wastewater treatment plants and landfill gas production plants.

[136] Several new biogas stations are expected to be built, but their overall biogas production is relatively low compared to other categories.



Source: Prepared by MIT for the purposes of the National Plan

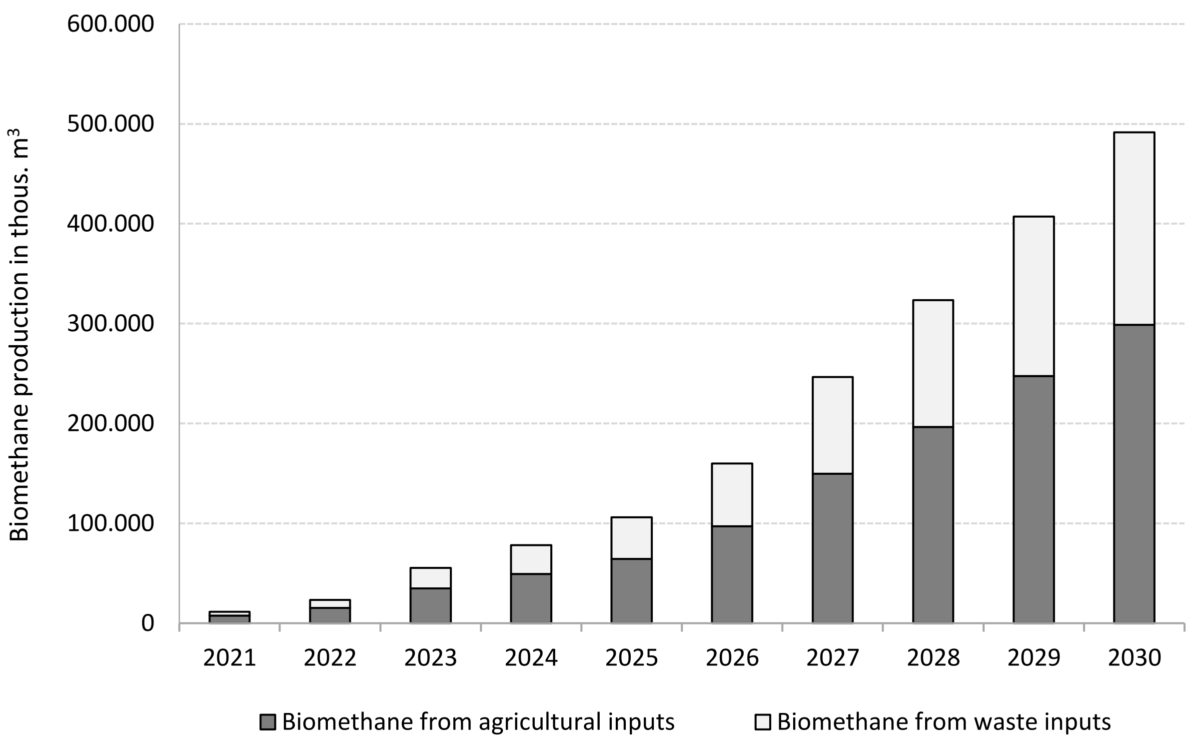
Chart 63: *Expected biogas production (agricultural biogas stations)*



Source: Prepared by MIT for the purposes of the National Plan

Chart 64 shows the expected distribution of biomethane by raw materials. The existing gas system is expected to be used for the transport of biomethane to the place of consumption, taking into account the distance of existing biogas stations from the gas system, as to be realistically connectable. The Czech Republic would like to report the allocation of the entire volume of 'advanced' biomethane to the transport sector and will try to find an acceptable reporting mechanism for this purpose. The 'advanced' biomethane from agricultural raw materials is expected to be consumed mainly in the heating and cooling sectors.

Chart 64: *Expected biomethane production by source*



Source: Prepared by MIT for the purposes of the National Plan

The table below shows the expected final biogas consumption by sector. The reason for the decline in final consumption in the electricity sector, which is due to the projected conversion of part of the plants, is described in more detail above. It is expected that only 'advanced' biomethane from waste materials will be consumed in the transport sector (the table shows consumption without considering the multipliers).

Table 78: *Final biogas consumption by sectors in TJ*

Final biogas consumption	2016	2020	2025	2030
Electricity sector	9 320.5	9 469.5	8 970.0	5 683.0
Transport	0	0	1 416.1	6 554
Heating and cooling	7 489.0	7 595.0	8 926.5	13 582.8
Total	16 809.5	17 064.5	19 312.6	25 819.8

Source: Prepared by MIT for the purposes of the National Plan

In this respect, all biomethane from waste materials (i.e. advanced biomethane) injected into the gas network is expected to be consumed within the transport sector (respecting the mass balance approach), while non-advanced biomethane injected into the gas network will be consumed in same proportion as the natural gas. Chapter 2.1.2 part (v) provides information on the expected consumption of biogas, or biomethane, as part of the sold heat.

The above is only a summary of a fairly comprehensive analysis that is published in the supporting document called entitled ‘Supported Energy Sources Development by 2030’.

Another gas that can be described as renewable when produced from renewable energy sources is hydrogen, which is currently mainly used in industrial production. Hydrogen produced from natural gas by pyrolysis or steam reformation in combination with carbon capture technologies is considered decarbonised gas and can also contribute to the Czech Republic’s climate and energy goals (see below). However, the potential for using hydrogen in the context of a low-carbon economy is much broader. In particular in the gas sector, the possible injection of hydrogen into the gas infrastructure is being discussed in order to create a mixture that will be further transported to end consumers. However, hydrogen and natural gas have different chemical and physical properties, which results in some parts of the gas infrastructure not being fully prepared for transporting a gas with higher than current hydrogen content. Therefore, the expansion of hydrogen (and other gases from renewables) is subject to research into the behaviour of hydrogen in the infrastructure and the adaptation of the infrastructure needed for storage, transport, distribution and final consumption; this includes potential analysis of the extent to which this infrastructure will need to be modified. The regulatory and legislative frameworks will need to be adapted to further develop hydrogen.

4.3 ‘Energy efficiency’ dimension

i. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

Table 79: *Current primary and final energy consumption in the economy and by sector*

	unit	2014	2015	2016	2017
Consumption of primary energy sources	TJ	1 745 793	1 747 487	1 727 226	1 800 928
Total final energy consumption	TJ	945 381	973 653	997 600	1 028 132
Final energy consumption by sector:					
industry	TJ	265 386	271 593	268 028	280 135
transport	TJ	249 068	259 388	268 680	277 019
households	TJ	279 392	289 143	302 338	307 418
services	TJ	122 651	124 981	129 849	133 690
Final energy consumption according to Europe 2020–2030 methodology	TJ	987 275	1 013 075	1 039 286	1 067 029
Gross value added by sector – 2005 prices:					
Industry	CZK million	1 393 856	1 451 040	1 467 826	1 577 095
Services	CZK million	2 033 796	2 142 527	2 210 852	2 273 216
Gross value added by sector – current prices:					
Industry	CZK million	1 477 294	1 562 192	1 600 393	1 676 537
Services	CZK million	2 314 585	2 470 997	2 586 987	2 748 756

Available household income	CZK million	2 284 609	2 383 321	2 474 370	2 575 885
Gross domestic product (GDP) – 2005 prices	CZK million	3 801 154	4 002 966	4 101 060	4 279 563
Gross domestic product (GDP) – current prices	CZK million	4 313 789	4 595 783	4 767 990	5 047 267
Production of electricity from heat power plants	GWh	80 587	77 984	77 479	81 226
Production of electricity from cogeneration	GWh	42 680	42 424	42 904	43 849
Production of heat from heat energy sources	TJ	119 666	121 233	127 519	122 851
Production of heat from cogeneration incl. waste heat from industrial processes	TJ	94 380	95 794	99 906	95 618
Consumption of fuel for the energy production from heat energy sources	TJ	940 368	904 638	889 375	924 494
Passenger-kilometres	pkm million	110 114	113 814	118 957	124 165
Tonne-kilometres	tkm million	71 421	76 613	68 172	62 936
Population (mean)	person	10 524 783	10 542 942	10 565 284	10 589 526

Source: 7. Progress report on meeting national energy efficiency targets in the Czech Republic

ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling[137]

Cogeneration

A) Current state – produced electricity, produced heat and installed capacities:

Development and current state of use of CHP:

Table 80: *State of electricity production and supply of useful heat from CHP in 2017*

	CHP up to 1 MWe (inclusive)		**CHP above 1 MWe up to 5MWe (inclusive)**		**CHP above 5 MWe (inclusive)**		**CHP Total**	
	Gross electricity production	Useful heal supply	Gross electricity production	Useful heal supply	Gross electricity production	Useful heal supply	Gross electricity production	Useful heal supply
	(GWh)	(TJ)	(GWh)	(TJ)	(GWh)	(TJ)	(GWh)	(TJ)
CHP	**1 622.2**	**4 865.9**	**1 387.3**	**7 557.9**	**7 221.3**	**91 196.5**	**10 230.8**	**103 620.3**
Biomass	17.4	466.0	97.8	918.5	1 011.8	9 143.5	1 126.9	10 527.9
Biogas	1 219.2	1 328.4	584.7	546.5	27.3	128.7	1 831.2	2 003.7
Black coal	0.2	8.0	31.2	1 062.6	1 178.6	13 654.3	1 210.0	14 725.0
Lignite	10.3	1 034.7	30.7	1 173.3	4 048.8	55 037.4	4 089.8	57 245.4
Coke	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waste heat	0.0	0.0	18.2	561.5	1.5	68.6	19.7	630.1
Other liquid fuels	0.0	0.0	15.4	276.7	2.5	76.5	17.8	353.2
Other solid fuels	0.8	0.9	20.2	663.4	98.6	1 828.3	119.6	2 492.6
Other gases	9.7	167.3	127.1	220.5	243.1	4 168.5	379.9	4 556.3
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel oils	6.5	31.4	1.3	0.6	9.8	131.7	17.6	163.7
Natural gas	358.0	1 829.3	460.8	2 134.2	599.4	6 958.9	1 418.2	10 922.3
Total installed el. capacity (MWe)	**396.4**		**389.1**		**10 392.1**		**11 177.6**	
Total installed heat capacity (MWt)		**906.0**		**1 436.4**		**22 208.4**		**24 550.9**

Source: ERO, Annual Report on the Operation of the ES CR in 2017

[137] In accordance with Article 14(1) of Directive 2012/27/EU.

Table 81: *Development of installed MWe capacity in 2013–2018 (in MWe)*

	CHP up to 1 MWe (inclusive)	CHP above 1 MWe up to 5MWe (inclusive)	CHP above 5 MWe (inclusive)	CHP total
2014	309.6	321.8	9 915.6	10 547.0
2015	320.2	347.3	10 032.0	10 699.5
2016	339.3	356.6	10 019.9	10 715.8
2017	396.4	389.1	10 392.1	11 177.6
2018	411.9	390.7	10 806.7	11 609.4
difference 2014–2018	102.3	68.9	891.1	1 062.4

Source: ERO, Annual Report on the Operation of the ES CR in 2014–2018

(B) Expected development – possibilities of new CHP installation

The forecast for the period after 2020 is based primarily on the need for heat supply and its gradually declining trend. The prediction was mainly based on the results of the study 'The evaluation of the potential of high-efficiency cogeneration and efficient district heating and cooling for the Czech Republic' prepared by the Ministry of Industry and Trade in 2015 defining the expected development in CHP development in 2015–2025, the outputs of which are provided below; current values and information from the ERO, MIT and OTE databases and information and development assumptions from the relevant associations were also used. 'The evaluation of the potential of high-efficiency cogeneration and efficient district heating and cooling for the Czech Republic' used statistical data and facts from 2013. The results are briefly summarised as follows:

- The potential for the development of high-efficiency CHP has been identified especially with smaller sources with power output of up to 10 MW_e. The potential will probably lie in increasing the number of micro-cogeneration units (capacity less than 50 kWe), small (capacity less than 1 MWe) and medium-sized CHP-based natural gas sources. Growth of sources with high-efficiency cogeneration can also be expected in the area of biomass utilisation, biogas stations (including heat transfer from existing sources) and the development of energy recovery of waste. However, the development of these high-efficiency CHP areas is conditional on maintaining stable economic incentives for investors and resource providers.
- In relation to large sources, only limited potential for the development of high-efficiency CHP was identified. Heat from large sources such as CHP plants, company power plants and most power plants is currently being used at the place of production, or transferred to the consumer through a heat supply system (HSS). In HSS with large sources, it will rather involve a change in the fuel base (co-firing of renewable energy sources (RES)) or alternative fuels, or improvement (increase) of CHP parameters (achieving higher efficiency or primary energy savings) as a result of resource reconstruction. However, concerning large sources, the risk of a possible reduction of electricity production from high-efficiency CHP cannot be overlooked. Current developments in the energy markets (and their consequences in the form of a reduction in wholesale electricity prices) can cause a downturn in electricity generation from high-efficiency CHP at large sources and a switch to a partially heat-plant operating regime. Most of the major heating sources in the Czech Republic use solid fossil fuels. Maintaining the current level of electricity generation from high-efficiency CHP is therefore also threatened by the tightening of environmental requirements and the expected increase in CO_2 allowance costs.

- The study identified a technical potential for the growth of micro, small and medium gas CHP plants (up to 5 MW) of 830 MW; in a subsequent cost-benefit analysis (CBA), it identified an optimal scenario, i.e. the scenario with the highest NPV, as a 'CHP' scenario with the following parameters:

  a) a growth of 33 MWe for newly installed sources of micro-cogeneration up to 50 kW;
  b) a growth of 227 MWe for newly installed sources of small and medium-sized gas cogeneration fuels with an output of 50 kW to 5 MW;
  c) a growth of 62 MWe for newly installed sources of cogeneration from RES and other alternative fuels.

<u>We divide the entire forecast into four parts:</u>

1. **CHP used in the replacement of existing mainly coal sources**
2. **CHP within the framework of sold heat, biogas and waste recovery**
3. **CHP that will replace or supplement heat plants using natural gas**
4. **Micro-cogeneration**

C) Summary of expected development in new cogeneration in the period 2020–2030:

Table 82: *Expected overall development in cogeneration*

Year	Installed electrical capacity (year-on-year increases) (MWe)			
	CHP used in the replacement of existing mainly coal sources	CHP within the framework of sold heat, biogas and waste recovery	CHP that will replace or supplement heat plants using natural gas	Micro-cogeneration
2020	10	14	25	2
2021	30	55	25	2
2022	30	15.5	25	2
2023	30	17.5	25	3
2024	25	13.5	25	3
2025	25	4	25	3
2026	25	4	25	3
2027	25	3	25	3
2028	10	12.5	25	3
2029	10	12.5	25	3
2030	10	2	25	3
Total	230	153.5	275	30

D) Reconstruction and modernisation of CHP plants that are currently in operation

For the sources currently in operation, we expect that most of these will continue to be operated between 2021 and 2030 and many will also be reconstructed and modernised in that period.

Electricity-generating facilities that are eligible for current support and are energy efficient will be able to apply for new operating aid schemes aimed to keep these generating facilities operational (electricity support to keep the electricity-generating facilities in operation or support for electricity production in a modernised electricity-generating facility) if they do not receive any other operating aid (e.g. support for RES or SES) – as overlapping of operating aid is compliant with the rules for State Aid set by the EU Environmental and Energy (EEAG) rules.

Therefore, based on the information in the previous paragraph, it is assumed that after the end of the current support for electricity from CHP, the support for CHP will only be used by electricity-generating facilities using fuels other than RES (such as support for the maintenance of an electricity-generating facility or support for electricity produced in a modernised electricity-generating facility).

Secondary energy sources

A) Current situation – produced energy and distribution

Table 83 shows gross electricity production from different types of secondary sources in 2016–2018.

Table 83: *Gross electricity production from secondary sources in 2006–2018*

Gross electricity production (GWh)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fuel gas (colliery)	97	85	52	42	40	27	31	35	48	36	43	41	53
Converter gas	20	21	23	23	26	27	23	27	30	26	24	25	23
Tail gas from carbon black production	0	0	0	0	0	0	0	0	16	14	16	12	16
Weak expansion gas	3	11	10	8	7	9	7	7	6	5	6	4	9
Tail gas from hydrogen refining	0	0	0	0	0	0	0	0	0	0	1	0	0
Residual gas (LPG)	14	13	14	10	13	16	14	12	17	15	16	19	20
Industrial waste	0	1	3	2	3	7	7	9	10	20	15	16	14
MSW (non-renewable component)	8	8	8	7	24	60	58	55	59	58	65	76	67
Heat from chemical process	0	0	0	0	0	0	0	0	9	1	18	18	18
Waste heat	9	39	36	28	25	28	22	25	27	27	25	25	25
Fuel refinery gas (other)	34	26	36	32	27	12	10	8	11	13	12	20	20
Ammonia-air mixture	45	42	37	41	33	44	42	42	41	39	41	40	40
Firedamp gas	29	56	161	216	233	250	267	288	289	284	276	278	257

Sources supported via operating aid

Currently, from the point of view of operating aid, secondary energy sources are actually divided into three categories

- mine gases (from closed and open / active mines);
- waste incinerators (waste recovery facilities);
- waste heat, including the use of the ‘rotary reduction’, which uses the steam energy consumed in the reduction stations for electricity production.

Development and current state of use of secondary resources[138]**:**

In 2018, a total of 61 sources using secondary sources were registered in the OTE system, which were operated in 41 electricity-generating facilities. Most power-generating facilities are registered in electricity-generating facilities using mine gas from open / active mines, which have a total of 22 sources with a total output of 304 MW (most sources are with an output of 1.56 MW or 25 MW). This is followed

[138] Information from the system of the electricity and gas market operator, OTE, a.s.

by power-generating facilities using mine gas from closed mines, of which there are a total of 18 sources with a total output of 21.4 MW (most sources with an output of 1.56 MW). There are also 4 municipal waste incineration plants registered in the OTE system. The rest of the sources and facilities generating electricity secondary sources are other secondary sources, which mostly involve heat or energy recovery.

B) Expected development – possibilities of new installations and reconstruction and modernisation of current facilities

New electricity-generating facilities; taking into account Guidelines on State aid for environmental protection and energy in EU (EEAG) and the requirements of the revised Directive on the promotion of the use of energy from renewable sources from the approved ‘Clean Energy for All Europeans’ package, the support will have to aimed at electricity and heat generating facilities utilising heat recovery. For heat recovery, the support will have the form of specific and non-unified (atypical) projects, which cannot be unified under one reference project used for setting the amount of operating aid – it is appropriate to focus on investment support. It will also include electricity-generating facilities using mine gases, where the form of operating aid is appropriate. For electricity-generating facilities using mine gases, it is necessary to focus primarily on keeping current electricity-generating facilities in operation until the dangerous gas generated by mining activities is exhausted (support for electricity to maintain electricity-generating facilities in operation or support for electricity production in a modernised electricity-generating facility); completely new electricity-generating facilities will be supported only in isolated cases.

Given the nature of sites where mine methane is mined and incinerated, it is appropriate to maintain the operating aid for electricity from mine gases as electricity support, not heat support. There is not much room and capacity to create new electricity-generating facilities that use mine gases. Areas around Most or Ústí nad Labem are unlikely to be eligible, as lignite does not produce methane spontaneously. Although hard coal mining in the Moravian-Silesian Region is expected to end in 2024, mine gas sources for new electricity-generating facilities are almost exhausted and the capacity of existing sources is already trending downwards. In 2019–2020, it is expected that 3 new electricity-generating facilities mine gases will be put into operation (based on available information). Each of these facilities should have a capacity up to 1 MW. In many cases, electricity-generating facilities will only change the technology of consumption of existing resources using mine gas (the transition from the use of mine gas from open / active mines to the use of mine gas from closed mines).

For the prediction of operating aid from secondary sources in 2021–2030, we assume that the modernisation of current mine gas electricity-generating facilities will be realised in the given period. Regarding new mine gas electricity-generating facilities, we assume that if there were any new electricity-generating facilities after 2021, it would be ‘compensated’ by reducing any prospective modernisation of electricity-generating facilities that are already in operation, as the amount of available mine gas will continue to decline in the future. For currently operational electricity-generating facilities powered by secondary sources, we assume that after the end of their eligibility for support they are currently using, a number of these or most of these electricity-generating facilities will continue to operate after 2021 through operating aid for electricity to maintain the a facility in operation or through support for electricity in a modernised mine gas facility until the available mine gas is exhausted.

Heat supply systems

In this respect, it is also desirable to maintain central heat supply systems where their operation is more efficient and more environmentally friendly than individual heating technology. In order to ensure a sufficient level of energy security in the heating sector, maximum use of domestic primary energy sources is needed. In relation to central heat sources, it mainly involves the most efficient use of domestic coal within high-efficiency CHP, in line with best available techniques (BAT). At the same time, it is desirable to increase the share of biomass in final heat consumption, whether in the form of co-firing with coal on central heat sources or in the form of domestic biomass boilers. Within central heat supply, it is necessary to create suitable conditions for the use of waste heat.

In accordance with Act No 165/2012, on supported energy sources, as amended, an efficient system of heat energy supply is a system to which one the following amounts of heat were supplied in the last calendar year: at least 50 % of heat from renewable sources, 50 % of waste heat, 75 % of heat from cogeneration or 50 % of heat from a combination of the above. The Energy Regulatory Office is legally obliged to keep a record of efficient heat supply systems and to publish an overview of them by 30 April[139]. As of 1 January 2016, the amendment to the Supported Energy Sources Act does not allow subsidies for heat pumps or solar systems that would impair the overall average annual efficiency of existing efficient heat supply system.

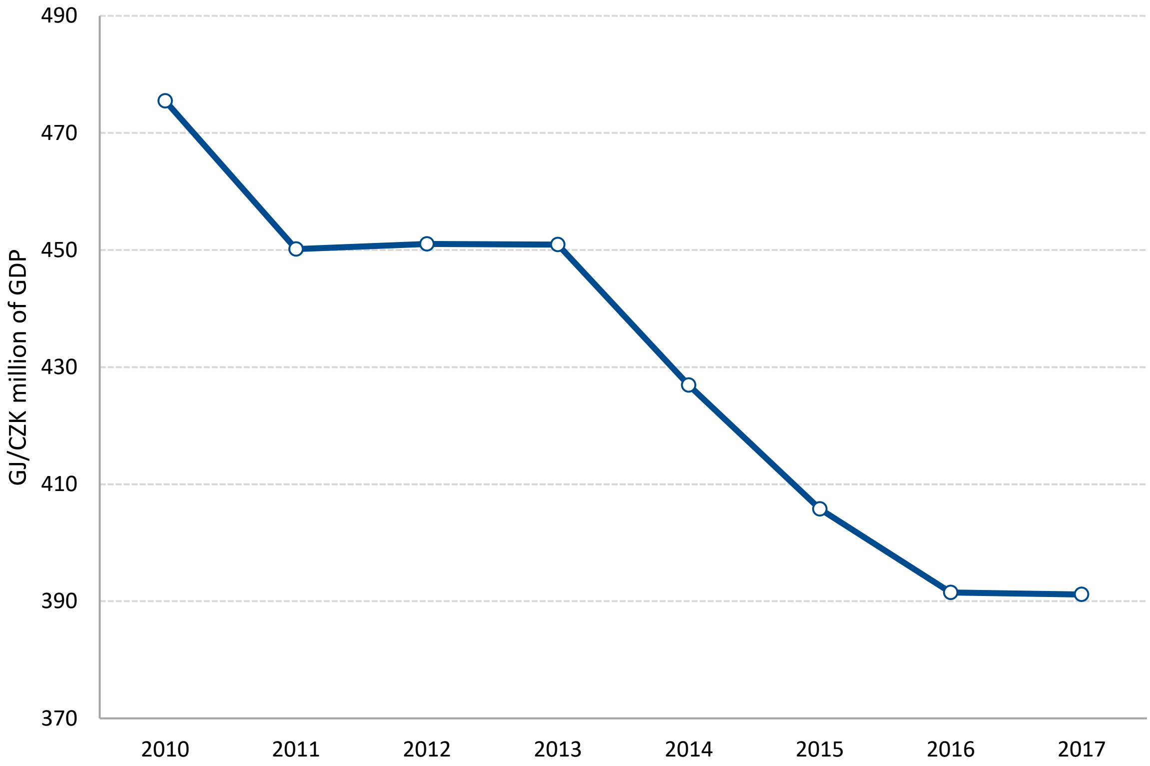
iii. Projections considering existing energy efficiency policies, measures and programmes as described in point 1.2.(ii) for primary and final energy consumption for each sector at least until 2040 (including for the year 2030)[140]

4.3.1.1 National energy efficiency target by 2020

The analysis of the trend in energy consumption has shown a year-on-year increase in final energy consumption since 2014. Consumption grew by 3.1 % year-on-year in 2017, which in absolute terms represents 31 PJ. According to the updated aggregate energy balance of the Czech Republic prepared according to the revised Eurostat methodology, the final energy consumption in 2017 was 1 028 PJ[141]. The year-on-year increase in final energy consumption caused an increase in consumption in all sectors of the economy. The fundamental fact is that, despite the increasing final energy consumption, the energy intensity of the economy has been decreasing for a long time. However, the level of energy **intensity stagnated in 2017, reaching 391 GJ/CZK million of GDP[142].**

[139] Overview of efficient heat supply systems as of 29 April 2019 is available at the following link.
[140] This reference business as usual projection shall be the basis for the 2030 final and primary energy consumption target which is described in 2.3 and conversion factors.
[141] The level of final energy consumption corresponds to the overall energy balance of the Ministry of Industry and Trade, which was prepared on the basis of the new Eurostat methodology.
[142] Gross domestic product at 2010 market prices (source: Eurostat).

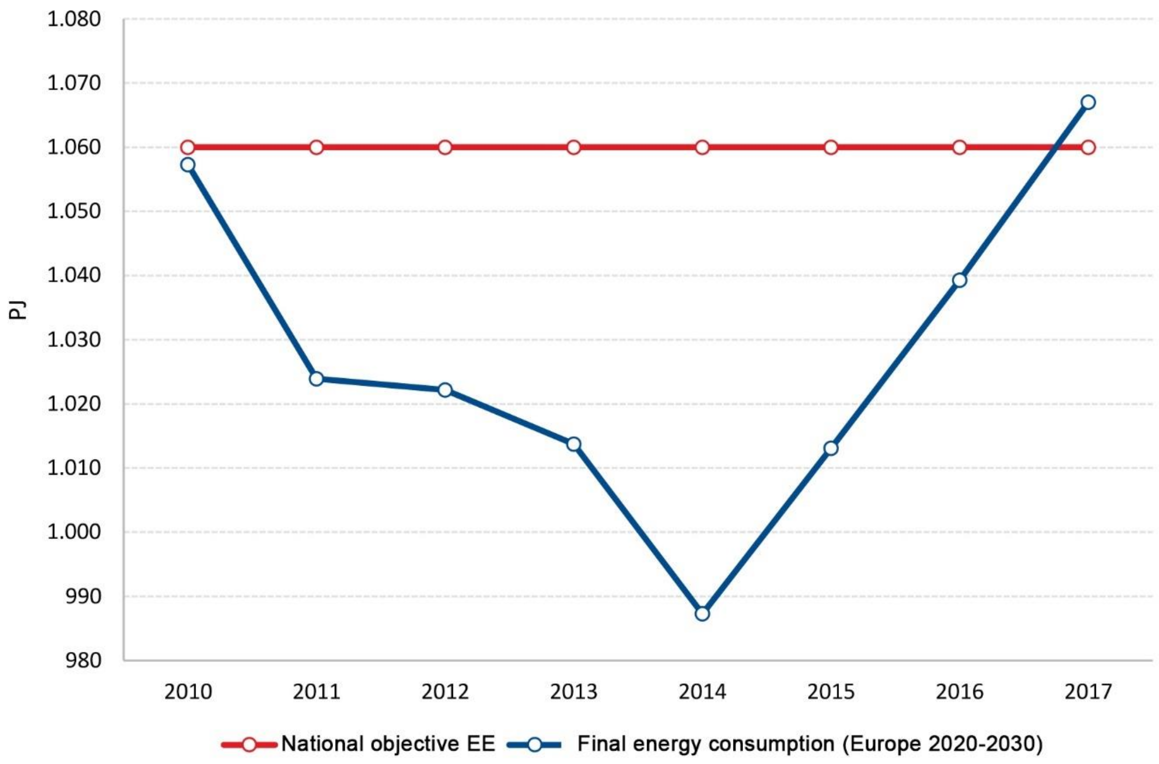
Chart 65: *Development of energy intensity of the Czech Republic, 2010–2017*



Source: Ministry of Industry and Trade, Eurostat

If we look at the final energy consumption in the light of the original Eurostat methodology, Europe 2020–2030, which is decisive for the Czech Republic in demonstrating the fulfilment of the national energy efficiency target by 2020, it must be stated that the final energy consumption of the Czech Republic exceeds the target value for 2020, i.e. 1060 PJ. It is clear that according to the original Eurostat methodology, final energy consumption values are higher compared to the official revised Eurostat methodology used to prepare the overall energy balance of the Ministry of Industry and Trade.

Chart 66: *Fulfilment of the national energy efficiency target (Europe 2020–2030), 2010–2017*



Source: Eurostat

Energy consumption in the household sector increased by 1.7 % year-on-year in 2017, reaching around 307 PJ. The energy intensity of households expressed per housing unit has also been increasing in the long term. In 2017 it grew by 1 % year-on-year and reached 73 GJ/apartment. In the previous period, household energy consumption was also influenced by the increase in the number of new apartment units, increase in the average floor area of apartment units[143] and a decrease in the number of people living in one apartment unit[144]. In terms of demography, consumption is influenced by an increase in population and in disposable household incomes[145], which leads to the increasing standard of living and influences consumer behaviour with an impact on energy consumption.

Taking into account the climate-adjusted final energy consumption for heating in the household sector, it can be stated that this energy consumption is growing at a slower rate that is less than 1 %. In 2017, climate-adjusted energy consumption for heating per apartment unit reached 51.37 GJ, which represents a 0.3 % deterioration in energy efficiency in households compared to 2016.

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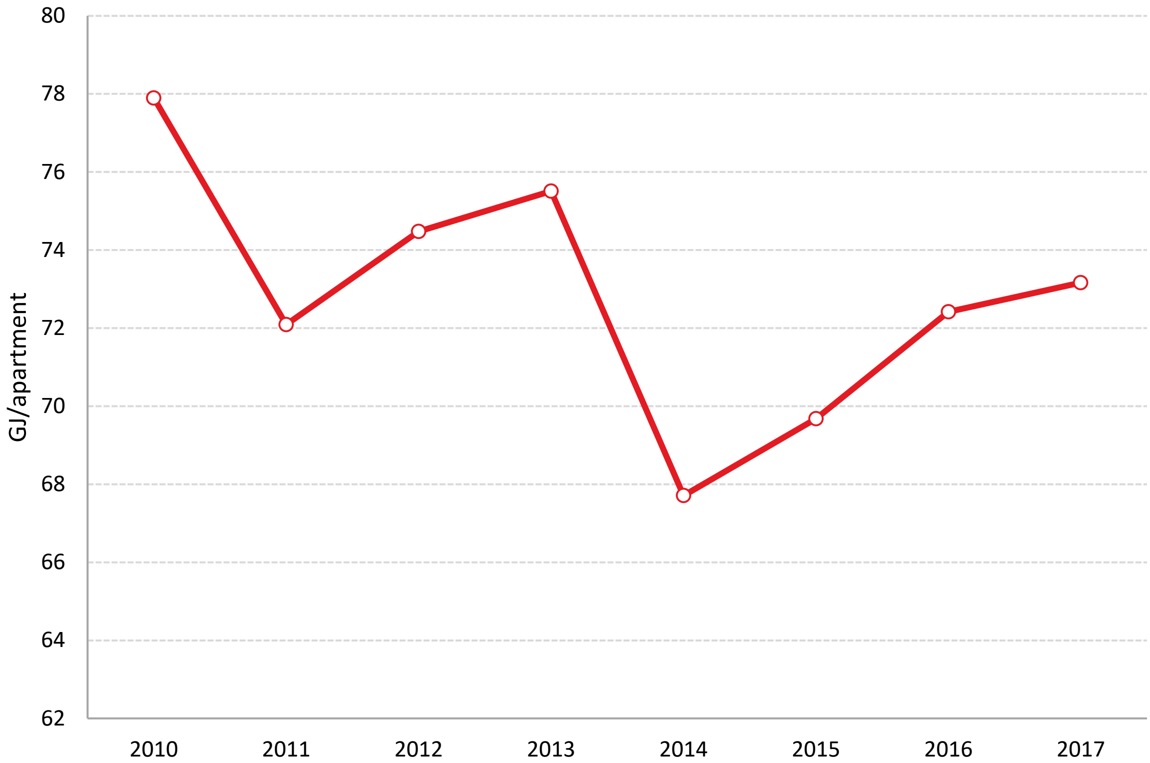
143 In 2004–2015 the average floor area of apartments increased by 5 % (Source: CZSO – ENERGO 2015).

144 The decrease in the number of persons living in one apartment unit is due to the trend of independent living. The average number of persons in a flat decreased by 11 % between 2004 and 2015 (Source: CZSO – ENERGO 2015).

145 Gross disposable income grew by 4 % year-on-year in 2017 and by 3.4 % year-on-year in 2016 (Source: Eurostat).

Chart 67: *Final energy consumption per household, 2010–2017*

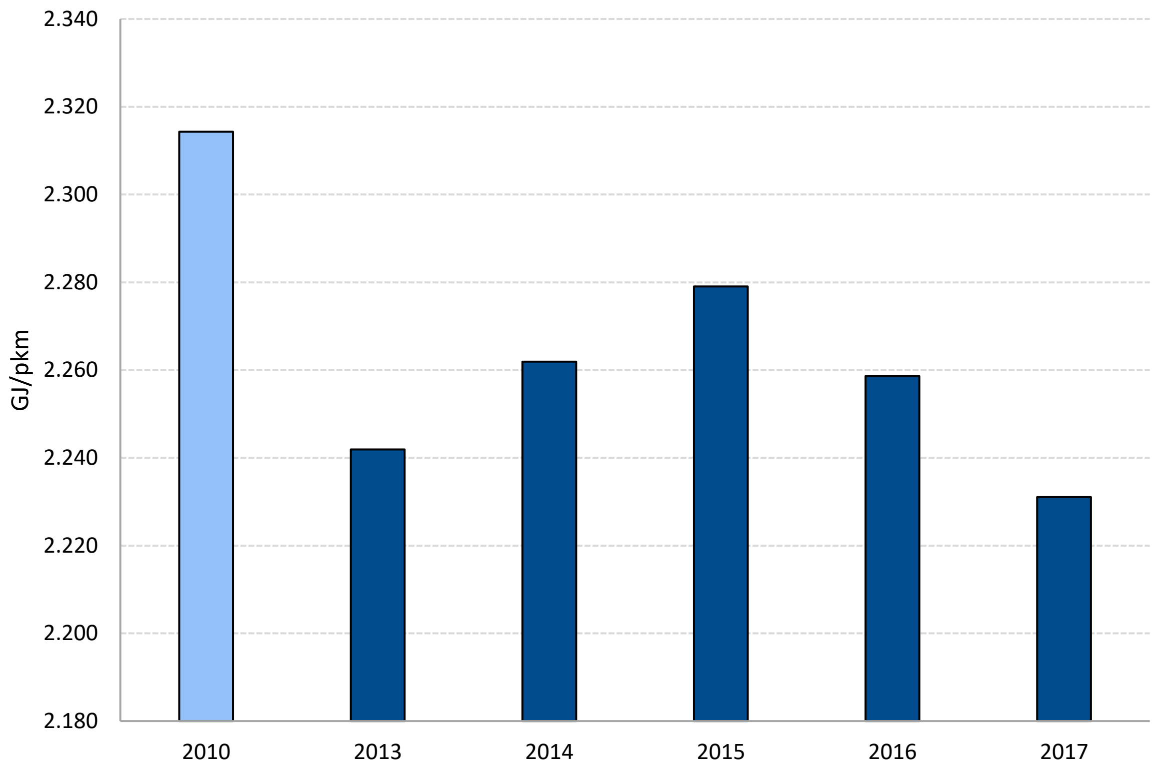


Source Ministry of Industry and Trade

In the transport sector, there has been a consistent increase in energy consumption. Energy consumption in the transport sector rose by more than 3 % year-on-year in 2017, totalling around 8 PJ. The increase in consumption was due mainly to an increase in the number of passenger-kilometres, which grew by almost 4.5 % year-on-year. Despite the year-on-year increase in passenger-kilometres, energy consumption per person-km was reduced year-on-year in 2017 (including individual car and public transport[146]) as well as energy consumption per car (includes only individual car transport). Based on the development of these indicators, it is possible to assume that efficiency in passenger transport has increased.

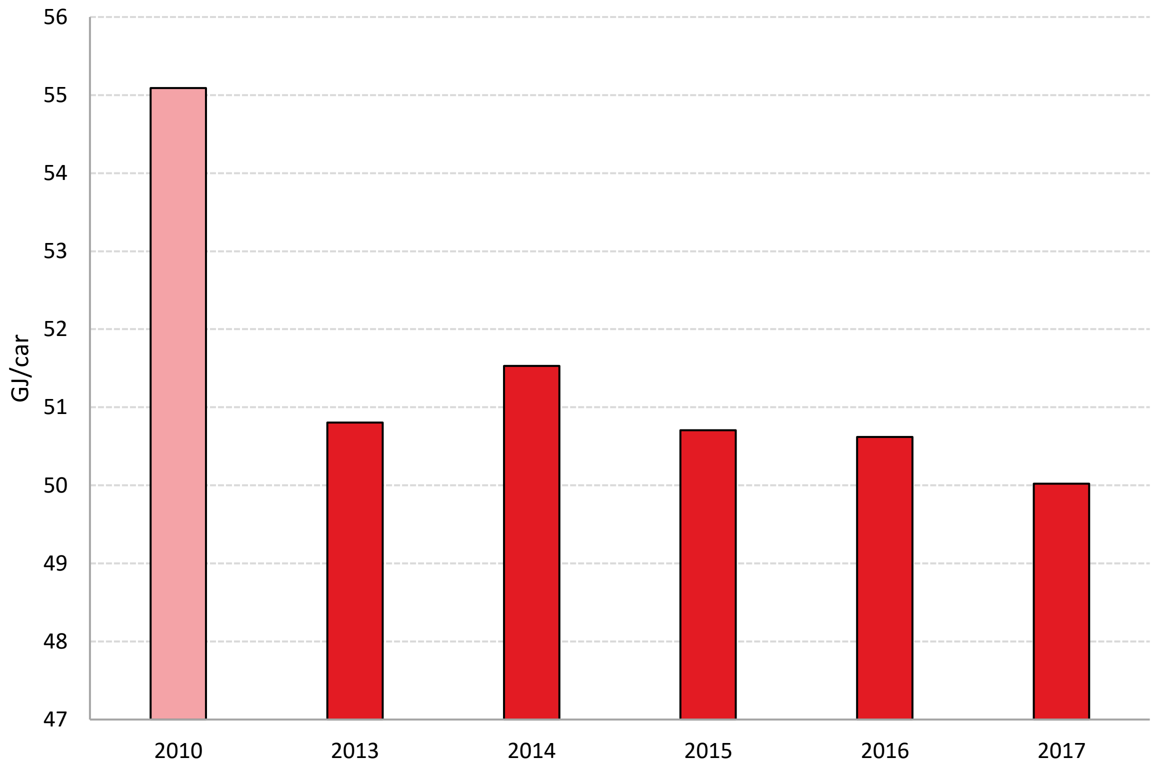
146 Public transport includes rail, bus, air, inland waterways and urban public transport.

Chart 68: *Energy consumption in the transport sector per passenger kilometre, 2010–2017*



Source: Ministry of Transport; Ministry of Finance

Chart 69: *Energy consumption in the transport sector per car, 2010–2017*

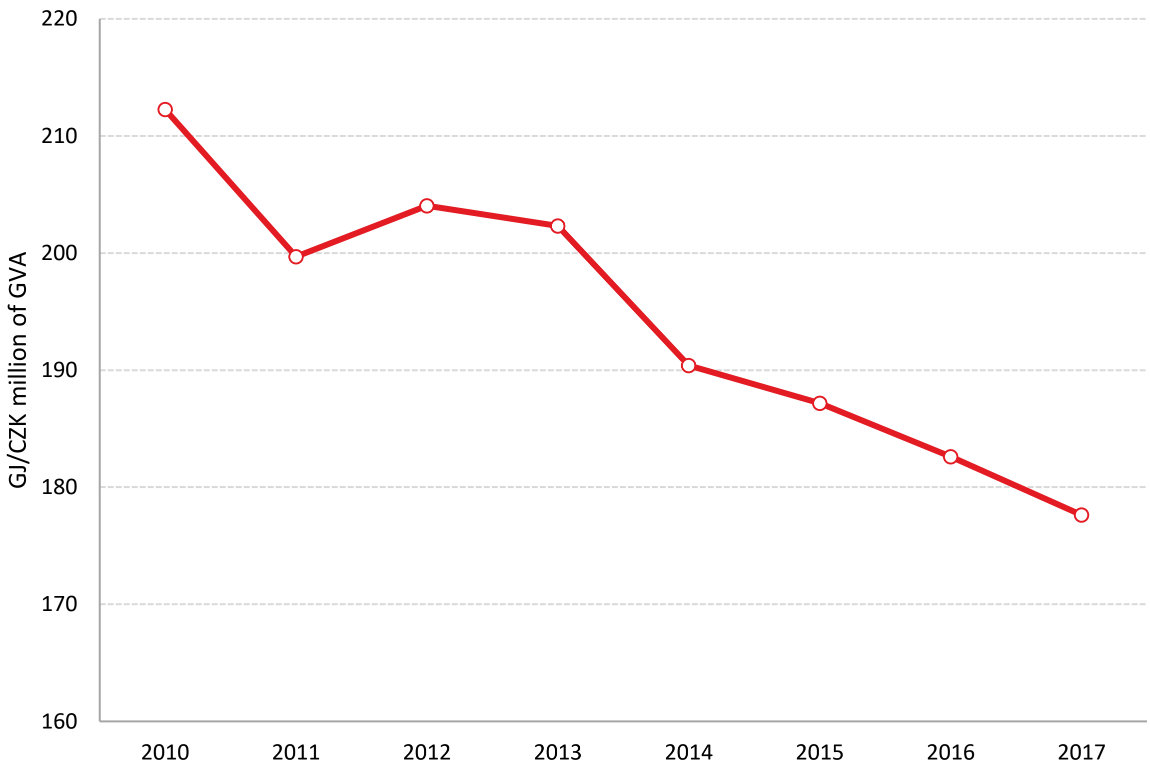


Source: Ministry of Transport; Ministry of Finance

Compared to the previous long-term decline in consumption, the industrial sector recorded a year-on-year increase of 4.5 % in 2017. This increase was not caused by a physical increase in energy consumption, but by a change in the statistical budgeting of consumption in the petrochemical industry.

Based on the long-term trend, the industry's energy intensity of gross added value (GVA) has been steadily decreasing since 2012. Compared to 2016, the industry's energy intensity declined by 2.7 % year-on-year. There has also been a consistent decline in the ratio of energy consumption to industrial production, which is measured against the Industrial Production Index (IPI)[147]. In 2017, this ratio declined by 1.8 % year-on-year, confirming the trend of increasing technical efficiency in the industry sector.

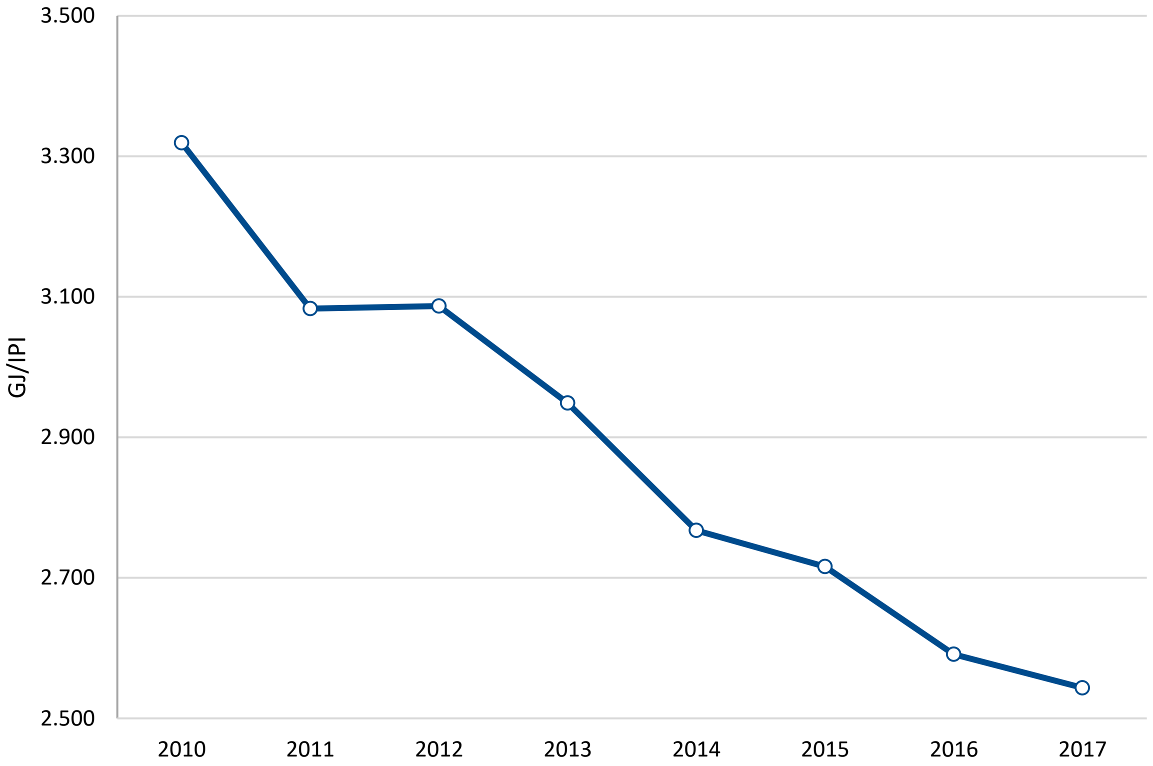
Chart 70: *Development of energy intensity of industry of the Czech Republic, 2010–2017*



Source: Eurostat, Ministry of Industry and Trade

[147] The Industrial Production Index (IPI) measures the output of industrial sectors adjusted for price effects. The index is primarily calculated as the monthly base index, currently in relation to the average month of 2015.

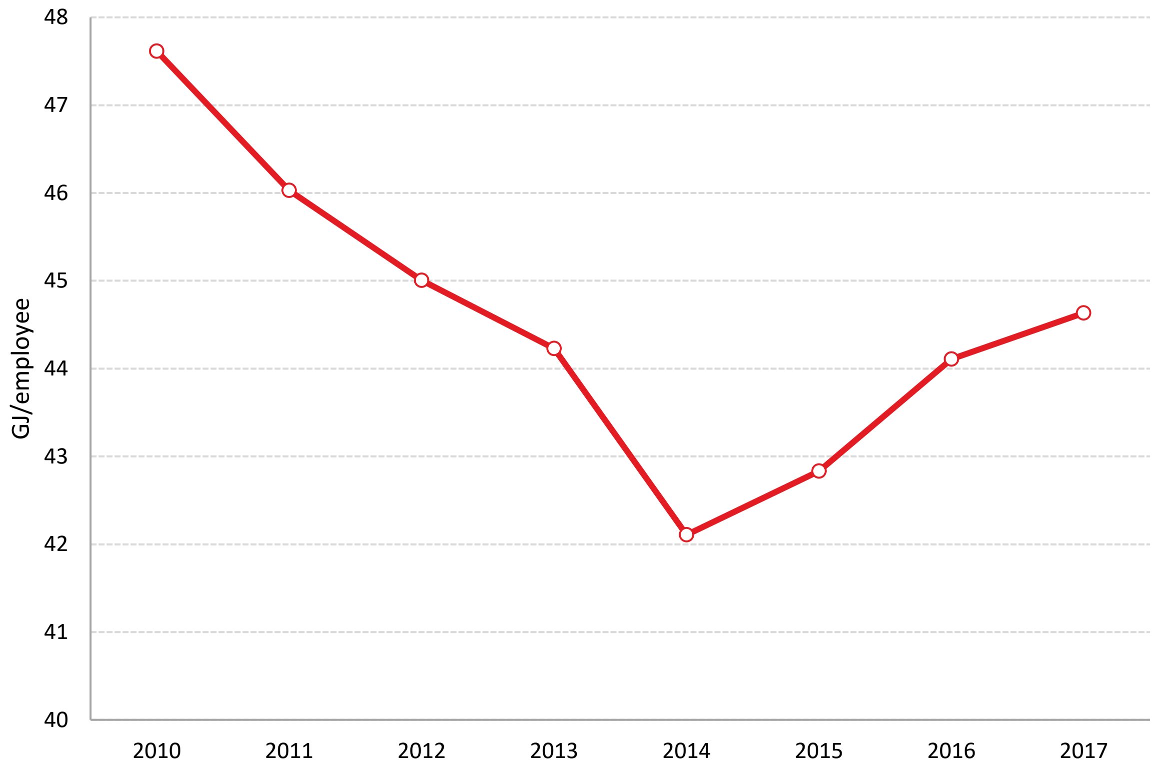
Chart 71: *Energy consumption in relation to industrial production, 2010–2017*



Source: Czech Statistical Office, Ministry of Industry and Trade

In the services sector, final energy consumption grew year-on-year by around 3 %, which is almost 4 PJ. The increase in consumption in the services sector was mainly due to the increase in the economic performance of the sector and the increase in the number of employees. On average, energy consumption per employee in the services sector has increased on average since 2014, reaching approximately the 2013 level in 2017.

Chart 72: *Energy intensity per employee of the service sector, 2010–2016*



Source: Czech Statistical Office, Eurostat

4.3.1.2 Contribution of the Czech Republic to the non-binding EU target by 2030

The national target will be determined as the maximum potential for reducing energy consumption in individual sectors of the economy, i.e. at the limit of final energy consumption that the Czech Republic can realistically achieve. This potential reflects the effect of planned strategies, policies and measures to be implemented in the period up to 2030, under the following assumptions:

- considering the climatic conditions, an increase in the number of tropical days in the summer and significant changes and intensities of the heating season compared to 2016 are not envisaged;
- GDP growth in line with the assumptions in Chapter 4.1.1.2;
- annual increase in residential area, taking into account the demographic developments in the Czech Republic in accordance with the assumptions in Chapter 4.1.1.1;
- growth in transport performance in the transport sector;
- a change in the structure of the economy (growth of the services sector and a decrease of heavy industry);
- increase/decrease of production in industry.

Strategies and policies affecting the level of final energy consumption include, without limitation:

- Long-term strategy for the renovation of buildings pursuant to Article 2a of the Energy Performance of Buildings Directive;
- obligation under Article 5 of the Energy Efficiency Directive;
- obligation under Article 7 of the Energy Efficiency Directive;

– legislative and regulatory measures resulting from the transposition and implementation of national and EU legislation;
– planned strategies and policies in other areas including, inter alia, the transport sector and specified in the following strategic materials:
    - State Energy Policy of the Czech Republic;
    - National Reform Programme (NRP);
    - State Environmental Policy;
    - Climate Policy in Czech Republic;
    - Strategic Framework for Sustainable Development of the Czech Republic;
    - Transport Policy of the Czech Republic for 2014–2020 with the Prospect of 2050.

Table 84: *Development of primary energy sources by 2030 (PJ)*

Primary energy sources	2015	2016	2020	2025	2030
Coal and coal products	687.8	694.1	663.9	542.1	530.4
Oil and petroleum products	360.5	334.6	369.7	370.9	367.2
Natural gas	271.4	293.8	287.6	283.2	261.5
Renewable sources	179.1	180.4	196.3	215.5	234.8
Industrial and municipal waste	11.6	12.7	12.9	15.7	15.9
Nuclear power plants	292.6	263.0	339.3	339.5	339.8
Heat	-0.1	-0.1	-0.1	-0.1	-0.1
Electricity	-45.1	-39.5	-56.4	-27.9	-22.9
Total	1 758.0	1 739.0	1 813.2	1 739.0	1 726.6

Source: Prepared by MIT for the purposes of the National Plan

Table 85: *Development of final consumption by 2030 (PJ)*

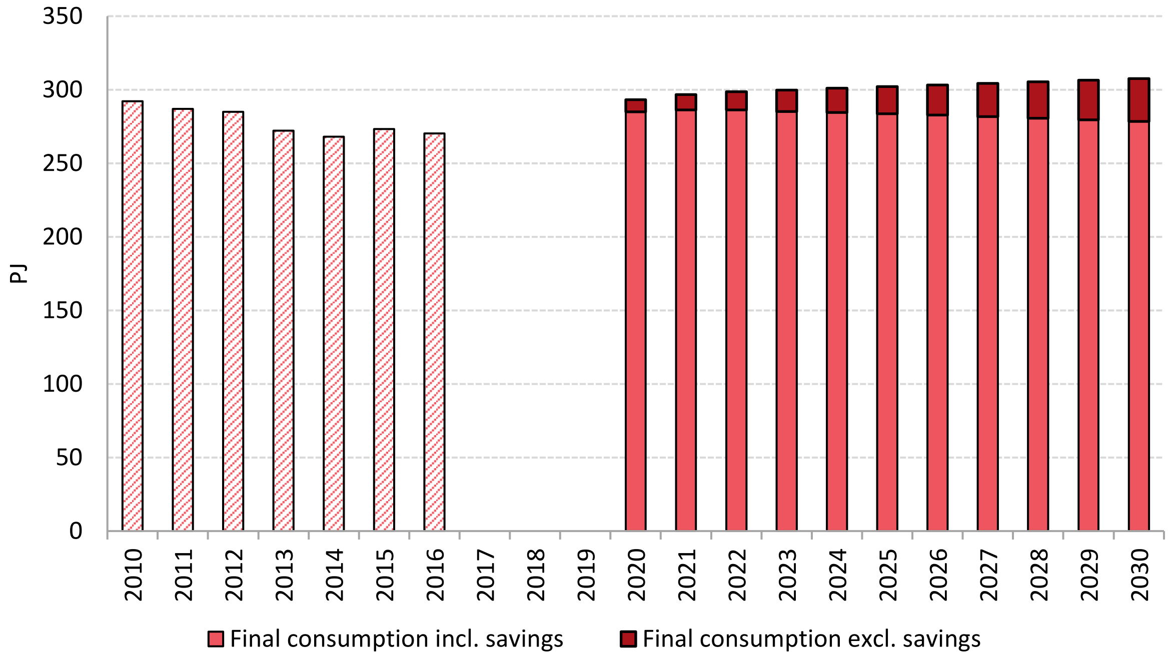
Final consumption	2015	2016	2020	2025	2030
Industry	273.3	270.3	285.0	283.6	278.5
Transport	259.4	268.6	275.5	285.4	293.6
Households	285.0	296.8	288.5	281.6	273.8
Services	123.2	127.7	126.4	121.4	115.6
Agriculture	25.4	26.8	24.8	25.3	25.4
Other	5.5	3.1	3.1	3.1	3.1
Total	971.8	993.4	1 003.4	1000.3	990.1

Source: Prepared by MIT for the purposes of the National Plan

The outlook for the development of final consumption in the industry was determined on the basis of the prediction of the development of the naturally expressed output in basic industrial sectors (iron and steel, non-ferrous metals, chemical industry, etc.), in total 13 sectors and assumptions with regard to the expected change in energy intensity. In each of these sectors, the most energy-intensive products, accounting for a significant part of the sector’s energy consumption, were selected. These are productions that are statistically monitored by the Czech Statistical Office and it is therefore possible to evaluate historical trends and at the same time to continuously evaluate the differences between the anticipated and the real development. Energy consumption is also monitored for these products and it is therefore possible to determine the energy intensity of their production. In this respect, assumptions have been made on the expected reduction in energy intensity individually for each product, taking into account existing technologies and measures in the sector and the remaining potential for the use of technologies that meet the best available technology criterion. The monitored products form a significant part of the energy consumption of the industry sector; the energy consumption not directly related to the technological process was then quantified separately. Final consumption without energy savings then corresponds to developments in the industry sector, provided that there is no change in the energy intensity of individual products, which would remain constant at 2016 levels.

The main boundary conditions are the development of the production of individual products related to the overall assumptions about the economic development and the development of the energy intensity of the individual monitored products. This procedure allows the development of the quantities influencing the boundary conditions to be statistically monitored and the possible deviations to be evaluated.

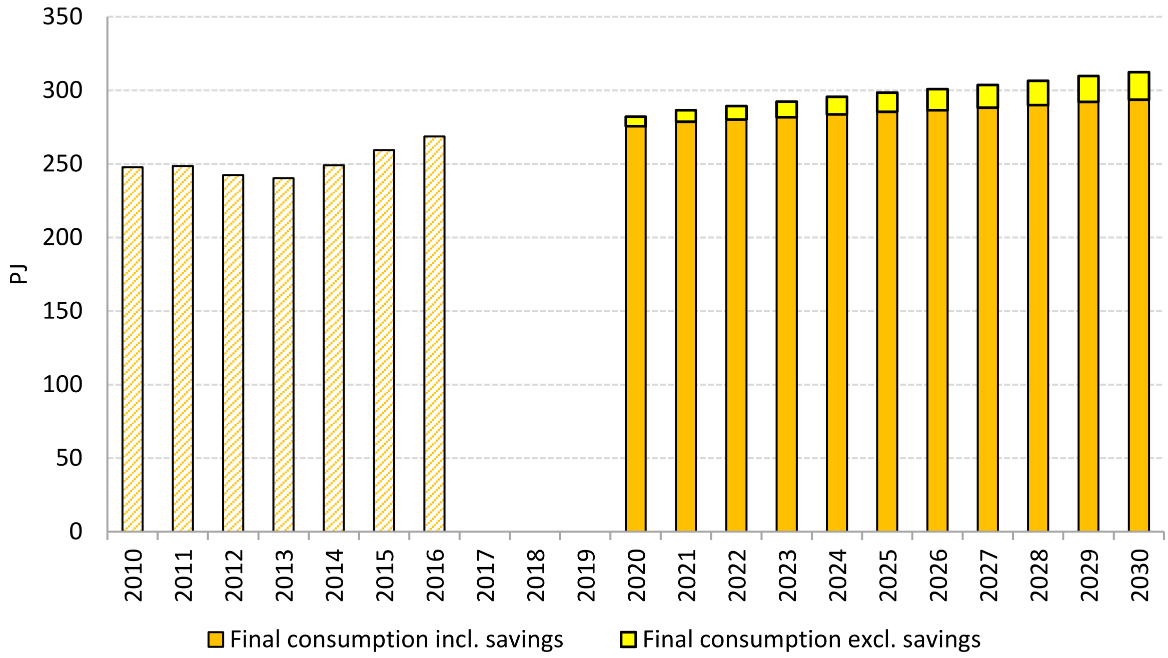
Chart 73: *Development of final consumption in the industry sector*



Source: Prepared by MIT for the purposes of the National Plan

The expected development of final consumption in the transport sector is based in particular on the expected development of passenger and freight transport performances, which are also based on assumptions about the development of economic growth and other socio-economic variables. Detailed assumptions about the development of transport performance are part of this document. Final consumption without saving shown in the graph below shows a situation where there would be no decrease in energy intensity relative to the unit of transport performance. Final consumption, including savings, then assumes decreased intensity in relation to the expected development and the relevant policies in transport.

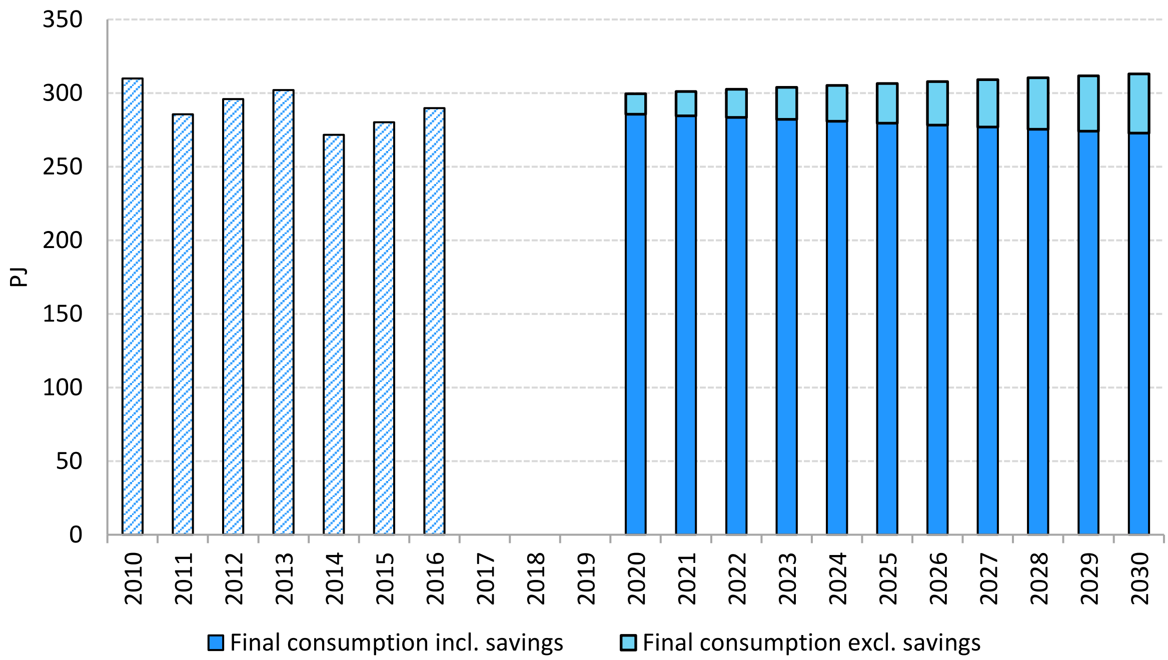
Chart 74: *Development of final consumption in the transport sector*



Source: Prepared by MIT for the purposes of the National Plan

Energy consumption in the household sector reflects the rate and depth of renovation of existing buildings corresponding to the likely scenario of a long-term renovation strategy for buildings and, in case of new construction, requirements for the energy performance of new buildings. At the same time, however, continued construction is envisaged, in line with the assumptions of demographic change and the development of households.

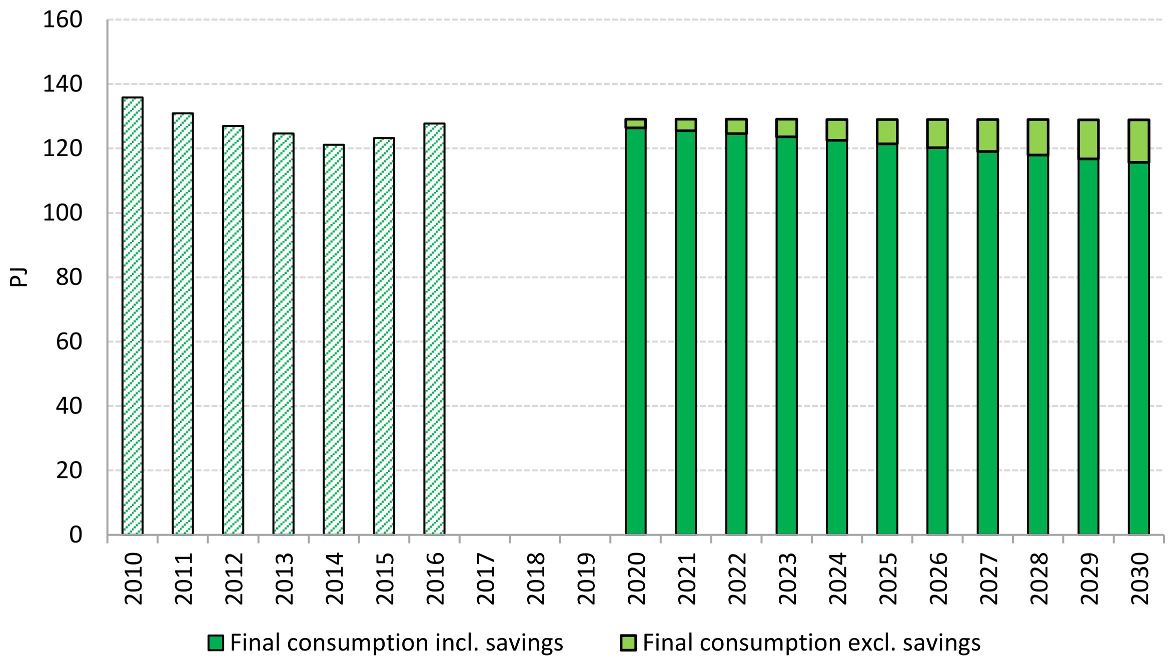
Chart 75: *Development of final consumption in the household sector*



Source: Prepared by MIT for the purposes of the National Plan

The evolution of final consumption in the services sector reflects the expected development of economic growth in this sector. At the same time, the assumptions of ongoing renovation of buildings in this sector in accordance with the renovation strategy are reflected.

Chart 76: *Development of final consumption in the services sector*



Source: Prepared by MIT for the purposes of the National Plan

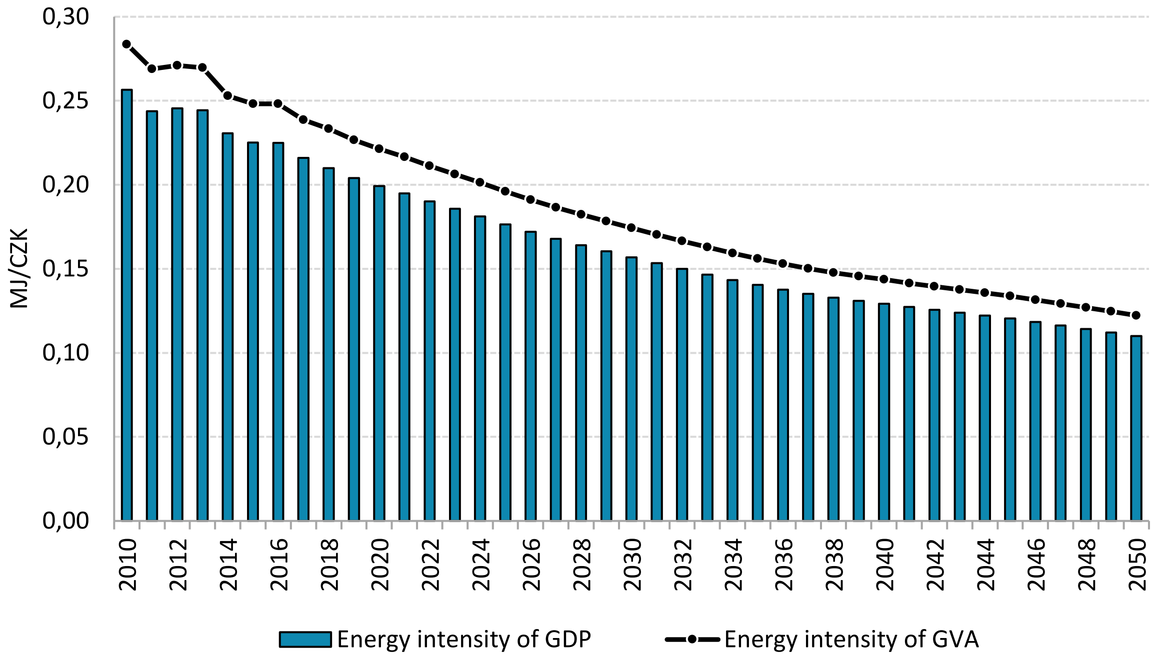
The following table and chart show the projected reduction in energy intensity of GDP and GVA production relative to the projected development of final consumption by 2030. In the event of economic growth based on the assumptions made about future developments, the energy intensity of GDP should increase by 30.23 % by 2030 compared to 2016 and that of GVA by 29.75 %.

Table 86: *Energy intensity of GDP and GVA in relation to final consumption (MJ/CZK)*

Energy intensity	2010	2016	2020	2025	2030
Gross domestic product	0.256	0.225	0.199	0.176	0.157
Gross value added	0.284	0.248	0.221	0.196	0.174

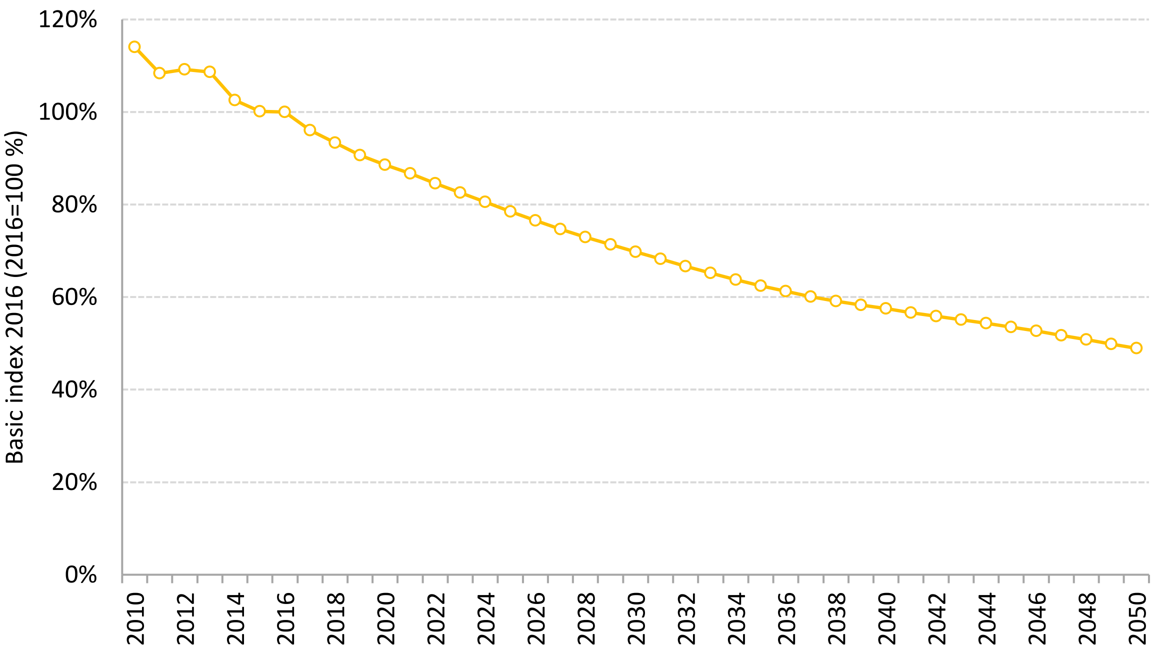
Source: Prepared by MIT for the purposes of the National Plan

Chart 77: *Energy intensity of GDP and GVA in relation to final consumption*



Source: Prepared by MIT for the purposes of the National Plan

Chart 78: *Basic index of energy intensity of GDP*



Source: Prepared by MIT for the purposes of the National Plan

iv. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, in accordance with Article 5 of Directive 2010/31/EU

In 2010, the European Parliament adopted Directive 2010/31/EU on energy performance of buildings (EPBD II). Member States were required to introduce legislation by in 2012 to increase the energy performance of new and refurbished buildings in accordance with this Directive. The specification of the energy performance improvement in buildings must be carried out by individual Member States on a cost-optimal level so that the measures required by legislation are cost-effective. The EU requests that input data for cost-optimal level calculations be updated by 2017.

For the required optimisation, in June 2011 the European Commission issued methodological guidelines which partly specified the general methodological framework set out in the Directive.

Article 5 of Directive 2010/31/EU

Calculation of cost-optimal levels of minimum energy performance requirements

1. The Commission has established by means of delegated acts in accordance with Articles 23, 24 and 25 a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements.

The comparative methodology framework has been established in accordance with Annex III and differentiates between new and existing buildings and between different categories of buildings.

2. Member States have calculated cost-optimal levels of minimum energy performance requirements using the comparative methodology framework established in accordance with paragraph 1 and relevant parameters, such as climatic conditions and the practical accessibility of energy infrastructure, and compare the results of this calculation with the minimum energy performance requirements in force.

Member States shall report to the Commission all input data and assumptions used for those calculations and the results of those calculations. The report may be included in the Energy Efficiency Action Plans referred to in Article 14(2) of Directive 2006/32/EC. Member States shall submit those reports to the Commission at regular intervals, which shall not be longer than five years. The first report shall be submitted by 30 June 2012.

3. If the result of the comparison performed in accordance with paragraph 2 shows that the minimum energy performance requirements in force are significantly less energy efficient than cost-optimal levels of minimum energy performance requirements, the Member State concerned shall justify this difference in writing to the Commission in the report referred to in paragraph 2, accompanied, to the extent that the gap cannot be justified, by a plan outlining appropriate steps to significantly reduce the gap by the next review of the energy performance requirements as referred to in Article 4(1).

In this respect, it is also necessary to note that the Czech Republic has sent an update to the cost-optimal levels of minimum energy performance requirements in 2018.[148]

4.4 Dimension 'Energy security'

i. Current energy mix, domestic energy sources, import dependency, including relevant risks

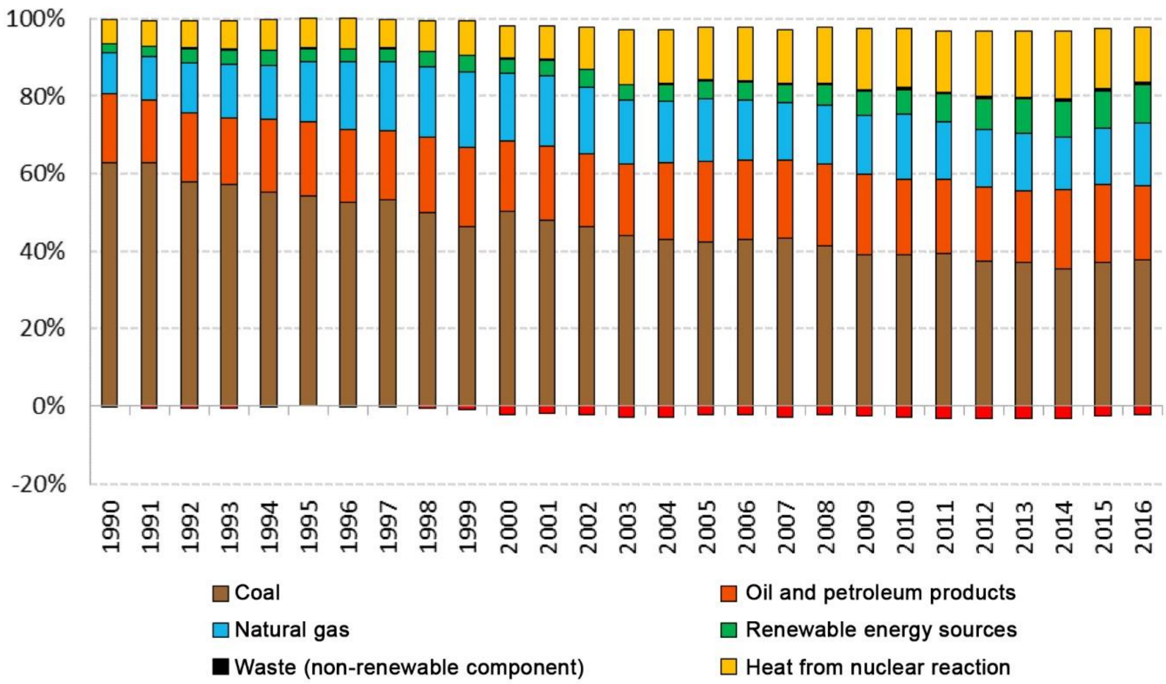
[148] The update is in the form of a document entitled: Update of inputs for the cost-optimal levels of buildings in the Czech Republic pursuant to Article 5 of the EPBD recast that is available here: link.

4.4.1.1 Current and expected energy mix

Current energy mix

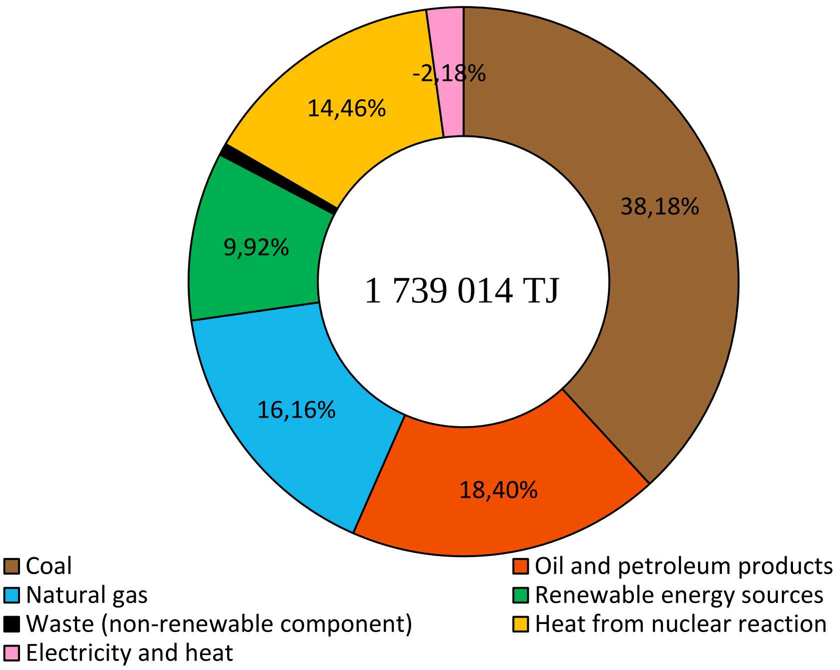
Chart 79 shows the evolution of the energy mix at the primary energy source level. In 2016 total primary energy sources amounted to 1 790.6 TJ. Solid fuels, especially brown and black coal, accounted for the largest share – 38.69 % (excluding electricity, which was negative). The second biggest source of energy is crude oil (and derived petroleum products), which accounted for 19.42 % in 2016. Natural gas accounted for 16.41 %. Nuclear reaction heat contributed 14.69 %. Renewables accounted for 10.08 %, and waste (its non-renewable component) accounted for around 1 % of the total energy mix.

Chart 79: *Evolution of the energy mix at the primary energy source level*



Source: Energy balance according to EUROSTAT methodology (1 December 2017)

Chart 80: *Relative representation of fuels in primary energy sources in 2016*

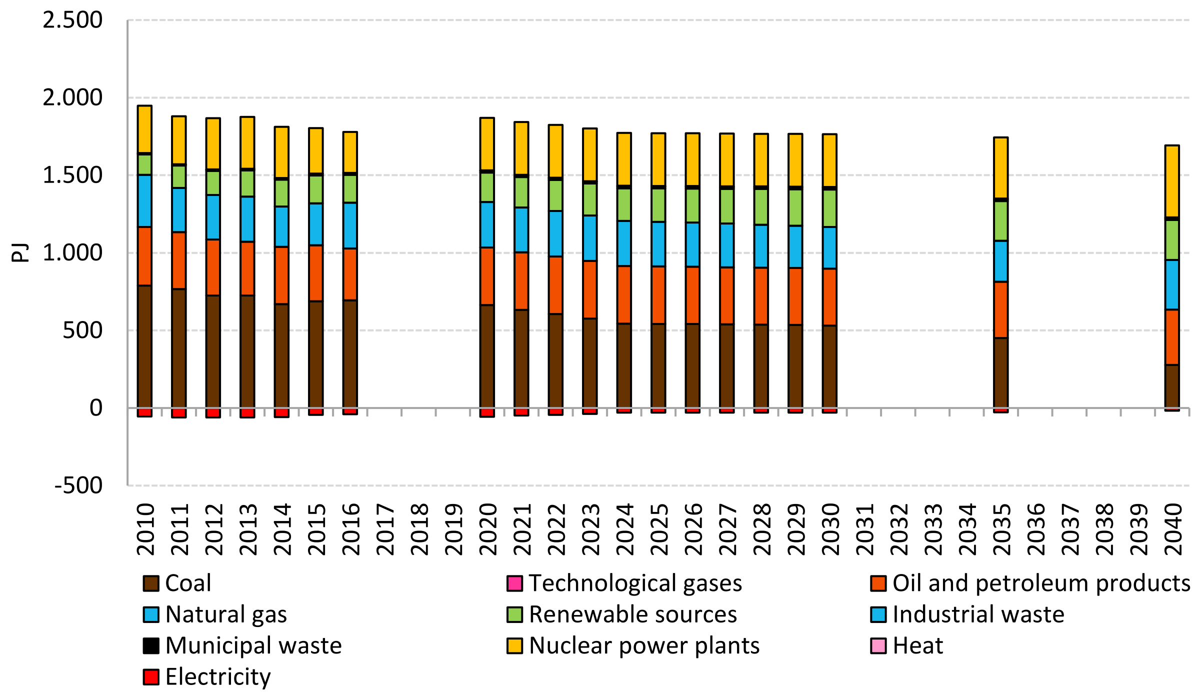


Source: Energy balance according to EUROSTAT methodology (1 December 2017)

Expected energy mix

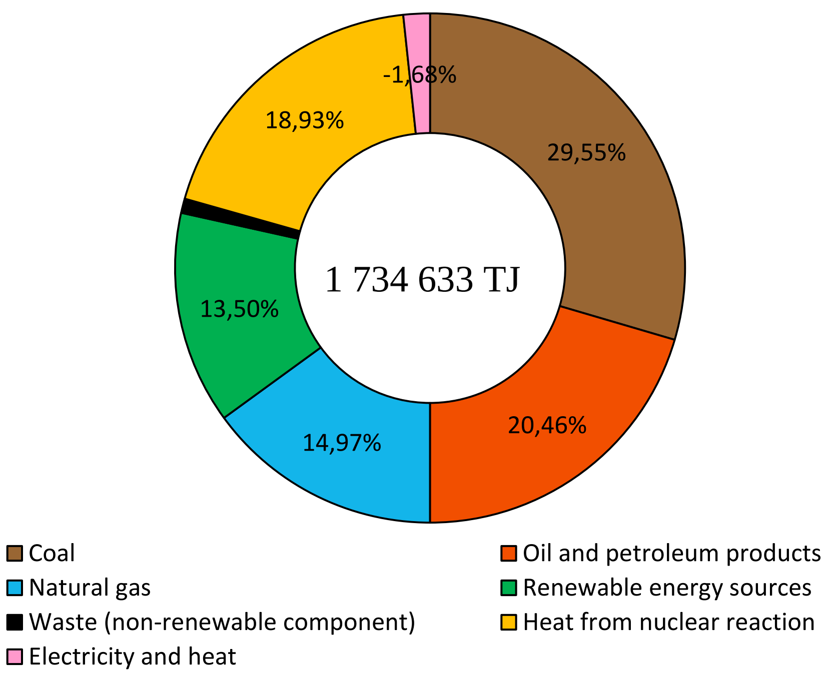
Chart 81 shows the expected evolution of the energy mix at the primary energy source level. Chart 82 then indicates the relative proportions of individual fuels within primary energy sources. Detailed information is provided in Annex 1, which provides a simplified energy balance for 2016, 2020, 2025 and 2030. For more information on the estimated development of the energy system, see Chapter 5.1, specifically part (i).

Chart 81: *Expected evolution of the energy mix at the primary energy source level*



Source: Ministry of Industry and Trade

Chart 82: *Relative representation of fuels in primary energy sources in 2030*

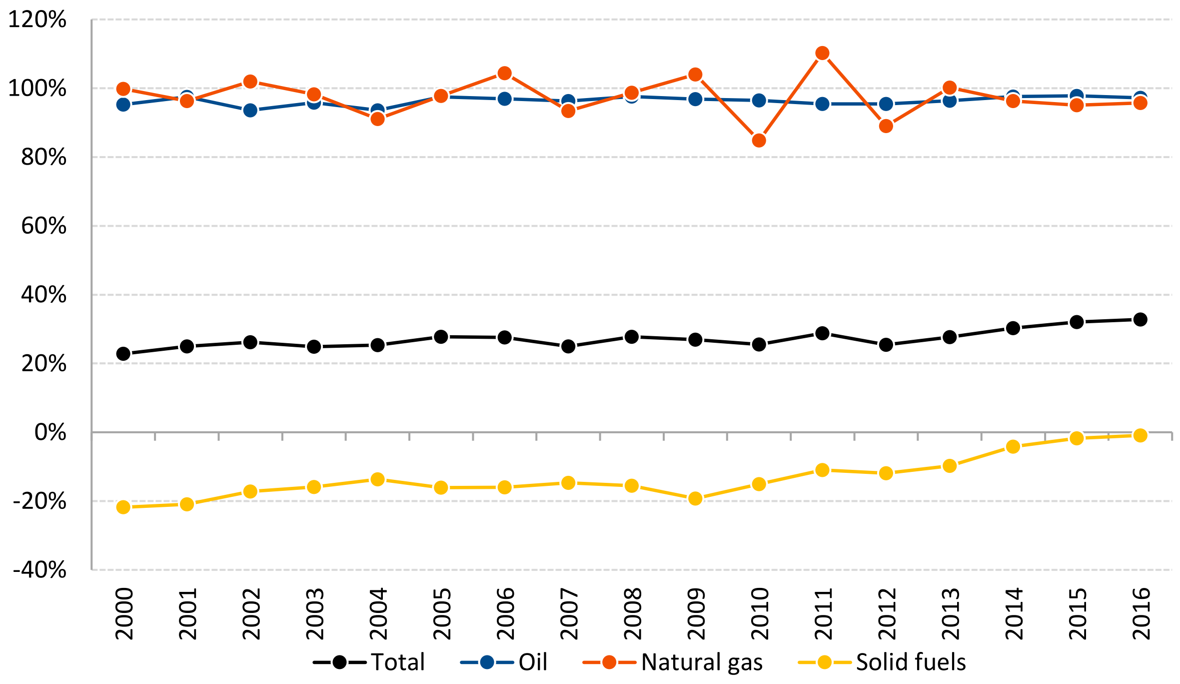


Source: Ministry of Industry and Trade

4.4.1.2 Import dependence

According to the Eurostat database, the total import dependence of the Czech Republic is about 30 % (in 2016 it was 32.8 %). The Czech Republic is, in essence, fully dependent on imports from third countries in the field of oil and natural gas. The Czech Republic extracts oil and natural gas, but the quantities are marginal given the overall need. The development of local production of biomethane, synthetic methane and hydrogen can in the future contribute to reducing import dependency for natural gas, as well as for oil with higher use of biofuels. In the case of consumption of solid fuels, especially brown and black coal, the Czech Republic is currently self-sufficient. Nuclear fuel for both domestic nuclear power plants is also imported; after the cessation of uranium mining in 2017, the Czech Republic is also fully dependent on imports of feedstock for the enrichment and manufacture of nuclear fuel. The Czech Republic is also an electricity exporter (about 11 TWh in 2016).

Chart 83: *Import dependence by major fuels*

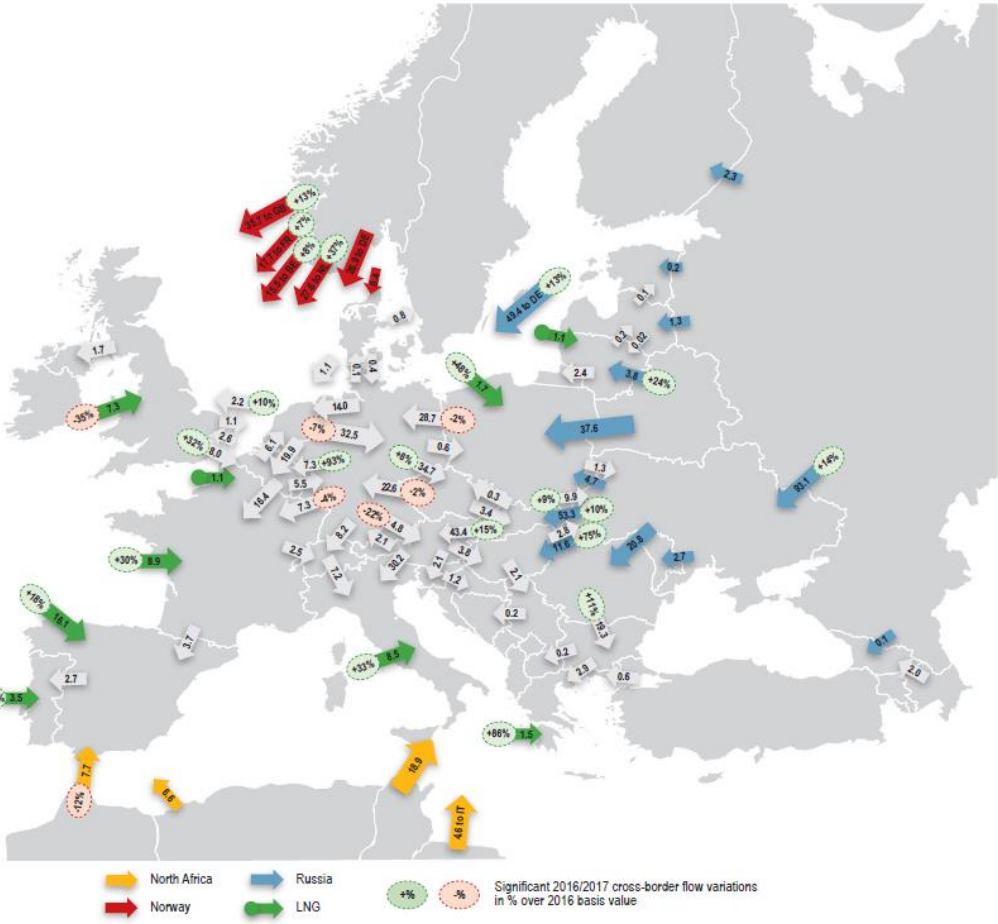


Source: EUROSTAT

4.4.1.3 Natural gas diversification

Developed infrastructure of cross-border interconnections as well as domestic transport enables the sufficient gas supply to the Czech Republic from abroad. Gas supplies to the Czech Republic have been coming almost exclusively through the Federal Republic of Germany for several years (see Figure 5). The Czech Republic's is almost completely dependent on natural gas imports and it would not significantly change even in the case of increased use of unconventional gas sources in the Czech Republic.

Figure 5: *Physical gas flows within the EU in 2017 and their changes compared to 2016*



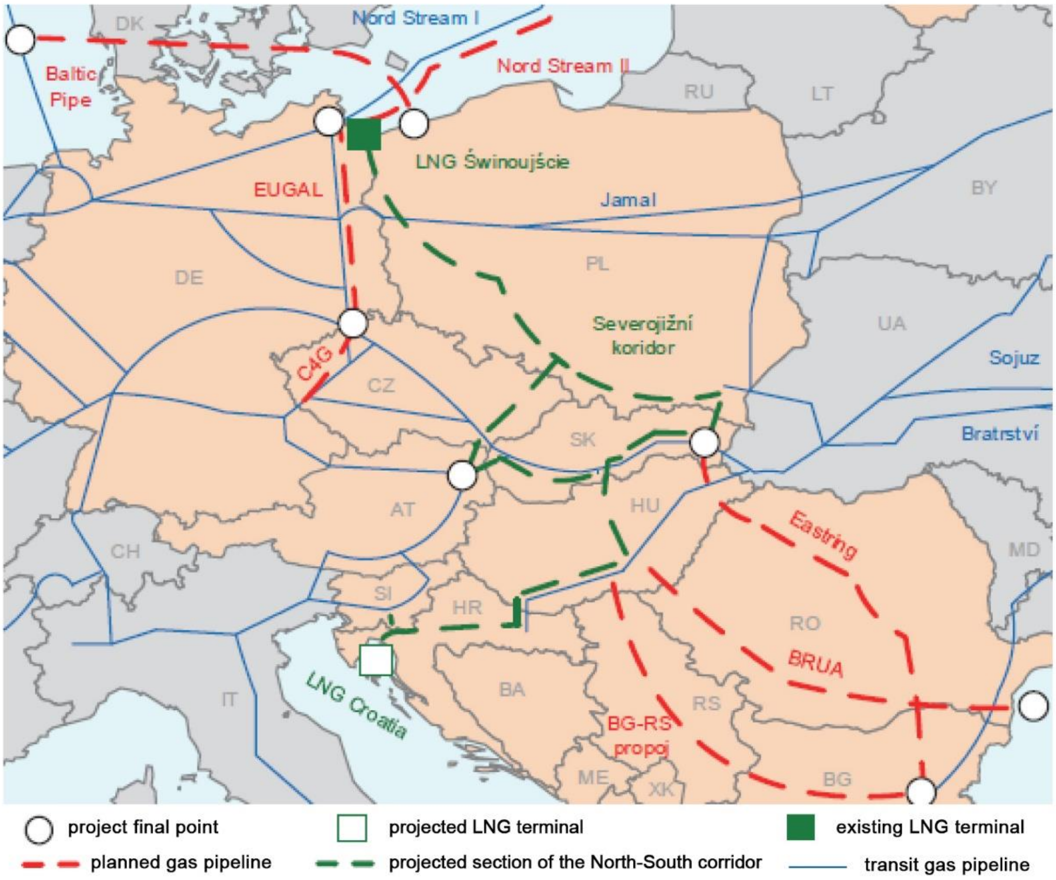
Source: ACER based on IEA (2017).

Note: The domestic production of MSs is not included. The reported Norwegian flows into Denmark originate from offshore fields that are only connected to the Danish system.

Source: Monitoring the Internal Electricity and Natural Gas Markets in 2017 (ACER/CEER)

The main measures in the field of natural gas diversification are the development of infrastructure with neighbouring countries, measures to integrate the natural gas market and measures aimed at increasing the production of gas from RES. Figure 6 shows development projects of transnational character and LNG terminals relevant for the Czech Republic. It is obvious that the increase of physical diversification (i.e. diversification of natural gas sources) is difficult to ensure from the Czech Republic's point of view, even in the case of continued development of cross-border infrastructure. The contribution of the continuing development of the infrastructure enabling the access of a new supplier to the EU countries (especially TANAP, SAF, or LNG projects) to the Czech Republic's source diversification can be described as relatively limited.

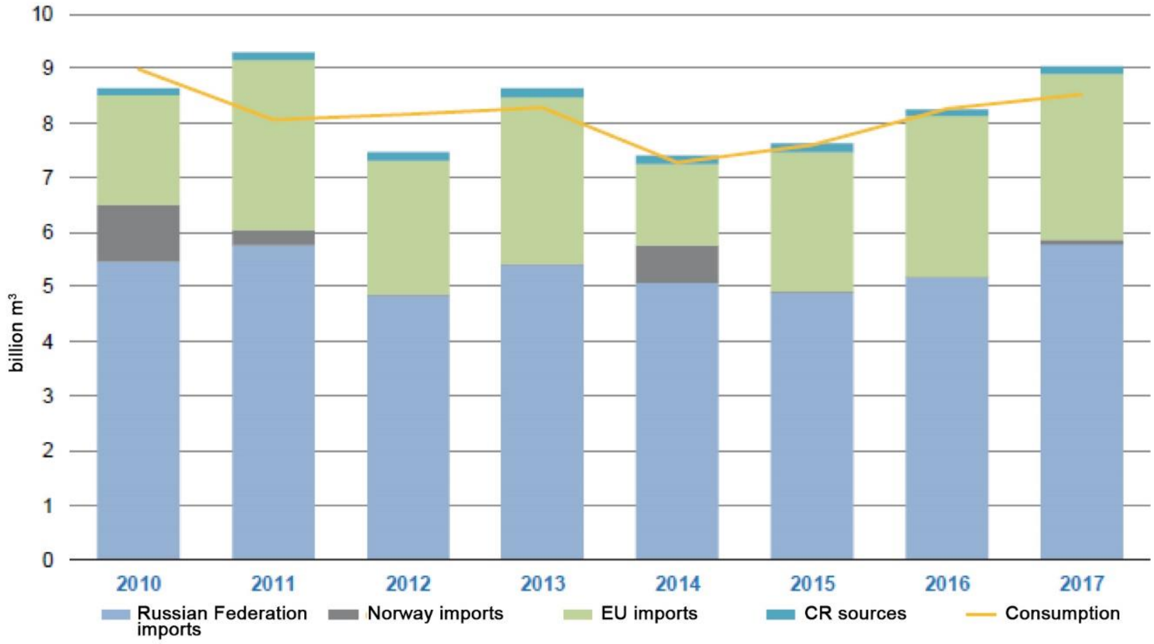
Figure 6: *Development projects of transnational character and LNG terminals*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2018)

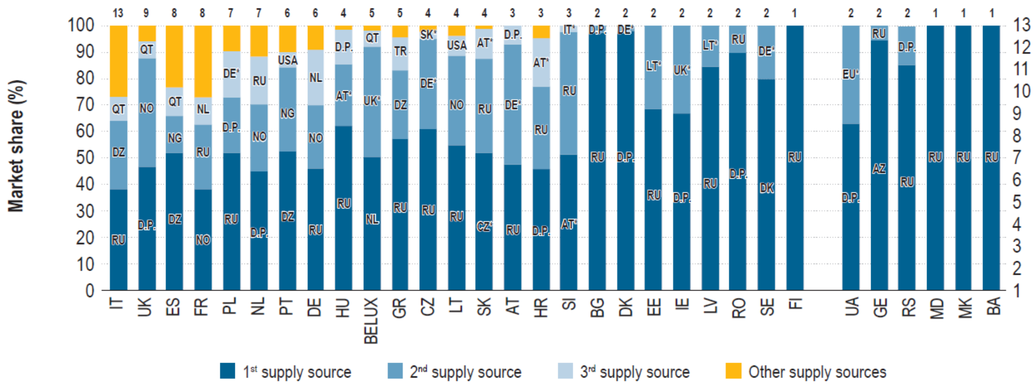
With regard to diversification of natural gas supply, the continued integration of the natural gas market contributing to business diversification is beneficial from the Czech Republic's point of view. Chart 84 shows the natural gas balance, which shows that approximately a third of imported gas is sourced through the EU market, even though it is molecularly gas from the Russian Federation (see also Chart 74). The development of local production of biomethane or synthetic methane and hydrogen is also an important measure which contributes to reducing the import dependence of natural gas or to increasing its diversification. Estimated development of gas from renewables is given in 4.2.2.

Chart 84: *Natural gas balance in the Czech Republic*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2018)

Chart 85: *Expected diversification of natural gas sources (2017)*



Source: ACER based on Eurostat, IEA, British Petroleum and EnC Secretariat data.

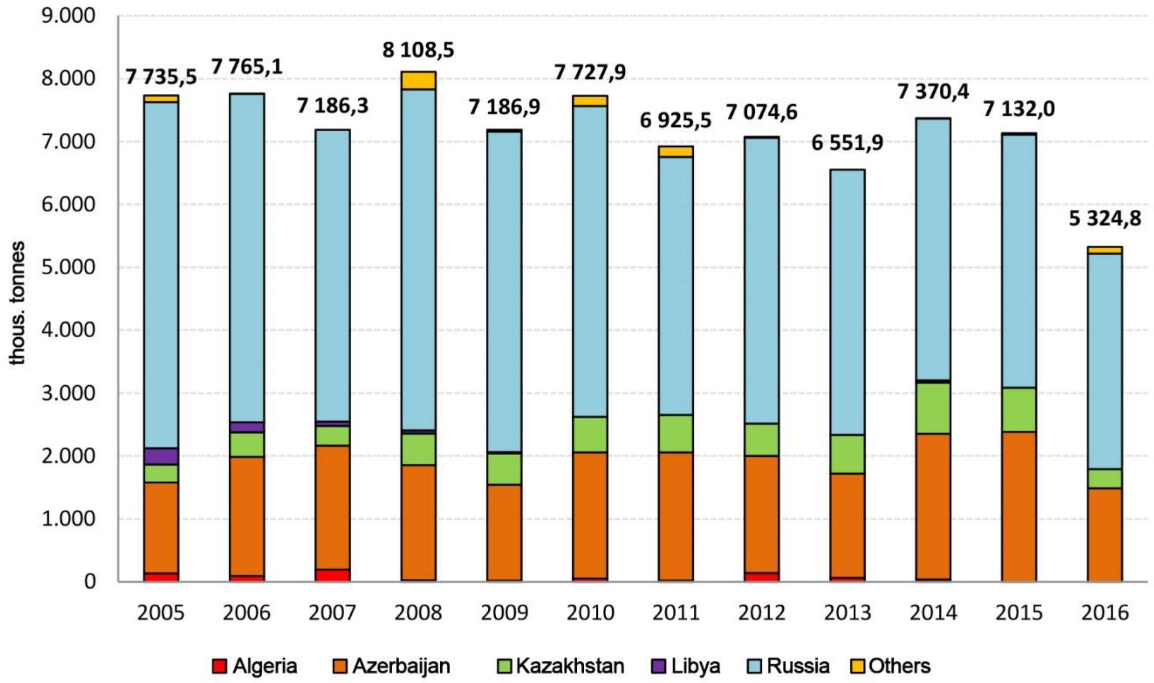
Note: D.P stands for domestic production. The asterisk refers to MSs with liquid hubs where gas is thought to have been purchased. For Denmark, the share of domestic production also includes the Norwegian offshore fields that are part of the Danish upstream network.

Source: Monitoring the Internal Electricity and Natural Gas Markets in 2017 (ACER/CEER)

4.4.1.4 Diversification in oil and petroleum products

In 2017 the Czech Republic imported 7 813.6 thousand tonnes of crude oil (average imports over the last 10 years total 7 127.5 thousand tonnes). The largest part was imported from the Russian Federation (52.47 %), Azerbaijan (31.04 %) and Kazakhstan (12.62 %); other countries accounted for 3.86 %. Domestic mining in 2016 was only 117 thousand tonnes. The Czech Republic uses two crude oil pipelines: the Druzhba pipeline (transport capacity available to the Czech Republic is 9 million tonnes of oil per year), which mainly transports oil from Russia, and the IKL pipeline (transport capacity of 10 million tonnes of oil per year), which transports oil from the Caspian Sea. The Czech Republic thus enjoys diversification of both sources and transport routes. In 2017, oil import costs totalled CZK 72 396 million (the average over the last 10 years is CZK 84 947 million). The Czech Republic also imports some petroleum products as well as exports a part of its own petroleum products. The total negative balance of foreign trade in oil and petroleum products is therefore approximately CZK 80 billion. million. In 2017, the negative balance was CZK 91.7 billion; in 2014, however, it was CZK 136.3 billion. The Czech Republic processes oil in two refineries in Litvínov and Kralupy. The aggregate processing capacity of both refineries is approximately 8.7 million tonnes of oil per year. The domestic refinery output covers approximately 80 % of national gasoline and diesel consumption. The refinery in Litvínov – Záluží processes in particular the Russian Export Blend, which is transported to the Czech Republic by the Druzhba pipeline (and a relatively small quantity also by the IKL pipeline). The refinery in Kralupy processes 'sweet crude oil', i.e. low-sulphur crude oil imported into the Czech Republic by the IKL oil pipeline, namely oil from the Caspian Sea, i.e. the Azeri, CPC and Turkmen blends, as well as crude oil from North Africa.[149]

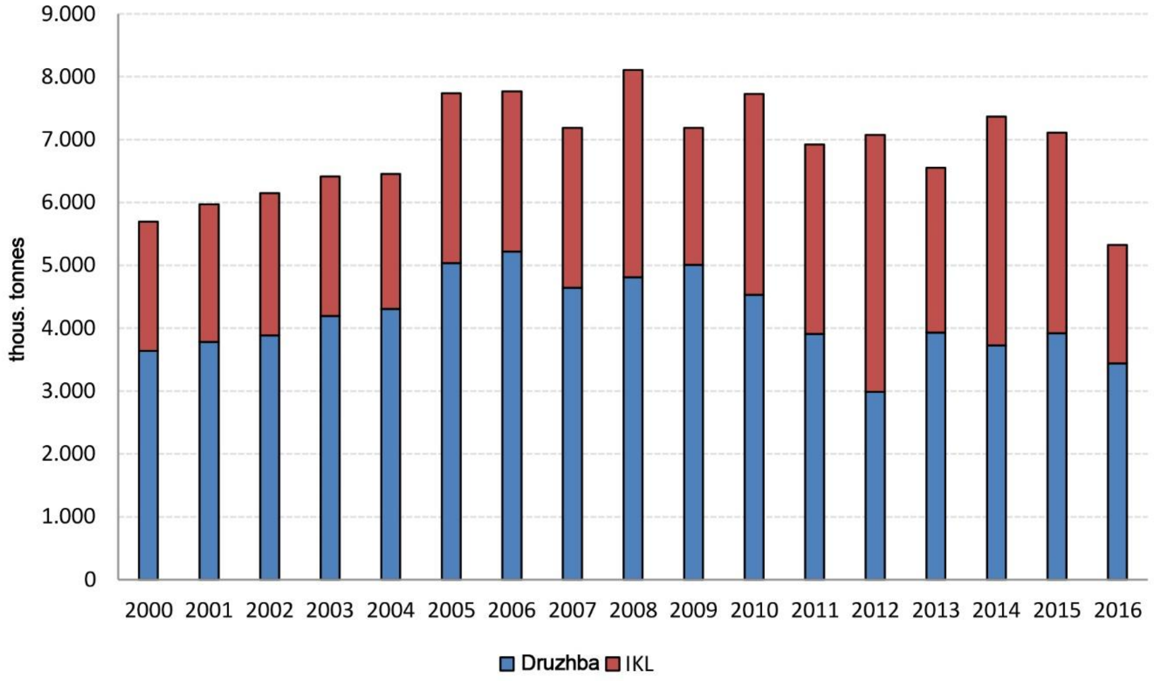
Chart 86: *Imports of petroleum into the Czech Republic by country of origin in 2005–2016*



Source: Czech Statistical Office

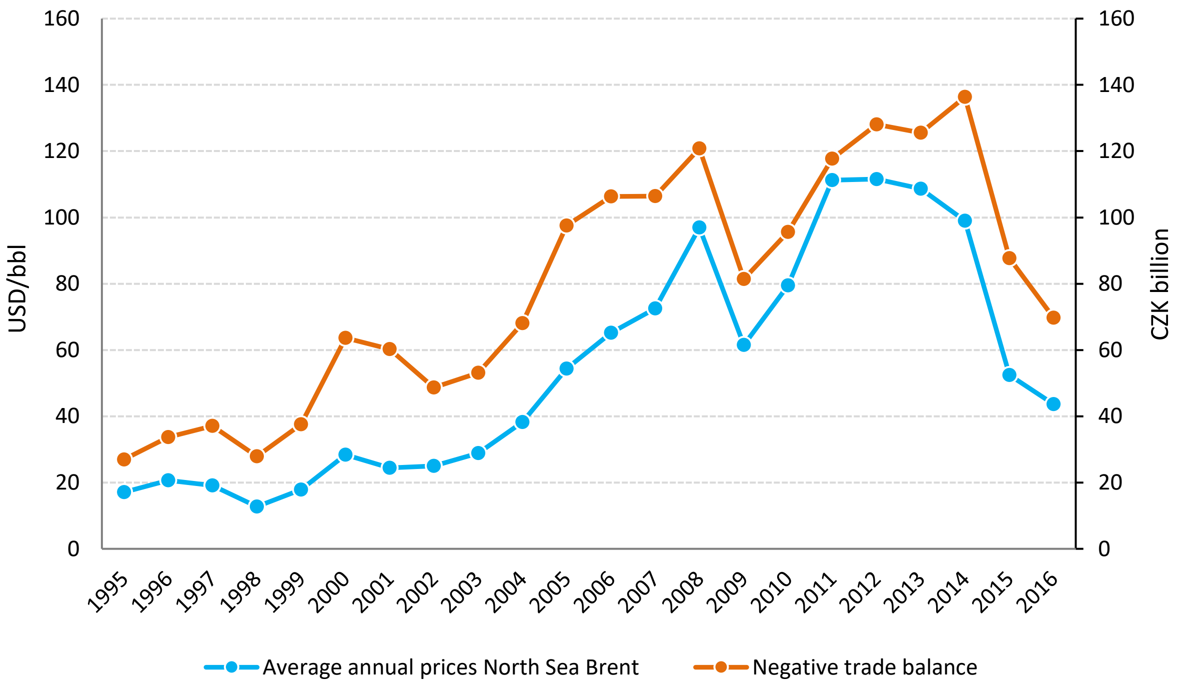
[149] For more information, see the Report on the Development of the Energy Sector in Oil and Petroleum Products 2016, available at: https://www.mpo.cz/cz/energetika/statni-energeticka-politika/zprava-o-vyvoji-energetickeho-sektoru-v-oblasti-ropy-a-ropnych-produktu-za-rok-2016--235988/

Chart 87: *Development of crude oil imports into the Czech Republic by Druzhba and IKL pipelines, 2000–2016*



Source: MERO, a.s.

Chart 88: *Price development of crude oil Brent and negative foreign trade balance in the oil sector*



Source: Oil and petroleum products – 2016 balance (MIT)

4.4.1.5 Production capacity development and ensuring electricity balance in the long term

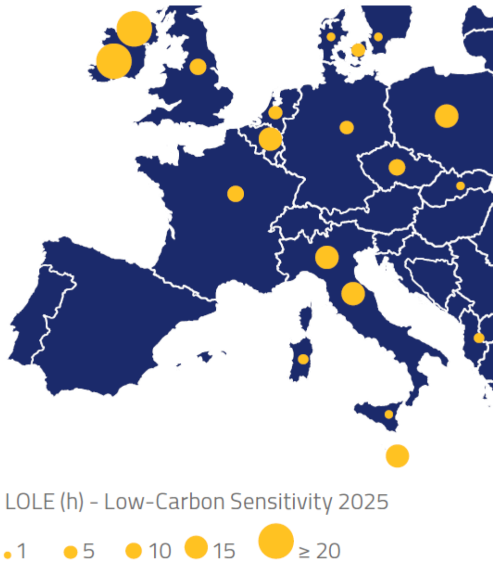
The transmission system operator, ČEPS, a.s., thoroughly analyses the current risks associated with the development of production capacities in the EU. To this end, and in accordance with Regulation (EC) No 2019/943, it prepares and publishes on a yearly basis the Assessment of the Czech Electricity System Source Adequacy. The current assessment covers the period until 2040 and its full version is available on the ČEPS, a.s. (Czech version: https://www.ceps.cz/cs/priprava-provozu English version: https://www.ceps.cz/en/generation-adequacy) and MIT websites.

Assessment of the Czech Electricity System Source Adequacy for 2019 was prepared in accordance with the methodological recommendations of ENTSO-E. In addition to the established medium-term resource adequacy outlook, it also includes a longer-term strategic outlook until 2040.

In terms of methodology, attention was paid to further development of computational methods. The report was first compiled on the basis of production resource data collected in a digitised way via a web interface.

The evaluation builds on the European ENTSO-E Adequacy Assessment and elaborates on the issue of adequacy for the Czech Republic in more detail (considering more scenarios). In particular, the results of the low carbon sensitivity scenario can be recalled from the European assessment. This sensitivity scenario for the impacts of environmental policies is up to date with regard to the price of allowances, the price of which is usually above 25 EUR/EUA in the second quarter of 2019. This scenario indicates reliability difficulties in traditional coal countries such as Poland, the Czech Republic and Germany, but also in Italy, France, Belgium, the Netherlands, the United Kingdom and Ireland.

Figure 7*: MAF 2018 results – Low-Carbon Sensitivity scenario, LOLE values in 2025*



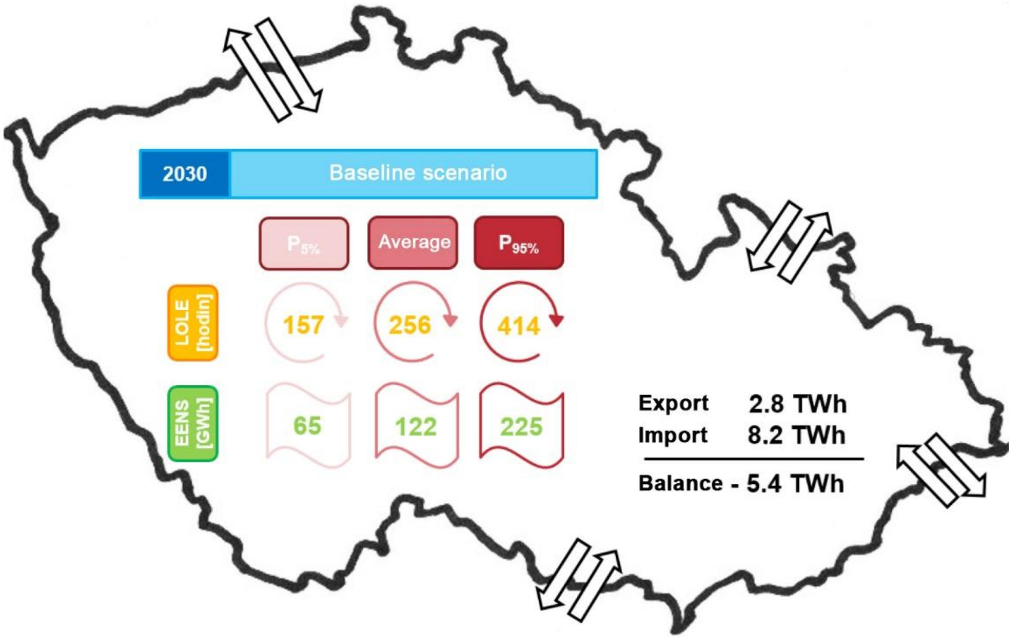
Source ENTSO-E Power Facts

Calculations were performed in the scenarios as part of the Assessments, which show that the reliability standards are not met.

If full availability of control power is required, which at all times corresponds to the fulfilment of the N-1 coverage requirement, a high LOLE value is calculated for the Baseline Scenario: (i) 42 hours for 2025; (ii) 256 hours for 2030.

In order to achieve the maximum recommended LOLE values (3 to 6 hours/year), it is necessary to implement measures to ensure performance balance (including the possible introduction of capacity mechanisms, for example in the form of strategic reserves).

Figure 8: *LOLE and EENS probability indicators for the Baseline Scenario for 2030, including export and import*



Source: Evaluation of the source adequacy of the Czech Republic by 2040 (MAF CZ)

The analyses show that the level of installed capacity will decrease due to the gradual decommissioning of coal sources and the end of the service life of nuclear sources. The planned development of RES and decentralised production according to the above calculations contribute to the security of electricity supply only to a limited extent. With regard to the development of power balances of neighbouring countries in our region, we cannot rely solely on import to ensure a safe and reliable supply.

At present, there is no new source in the Czech Republic in preparation or implementation with an installed capacity of hundreds of MW which could be put into operation in the outlook until 2030. In the medium term, additional investment in fossil fuel sources is limited. This is mainly because of the environmental measures for fossil sources and the subsequent need for higher investments connected with their implementation.

For 2040, high trade exchanges from countries with high electricity surpluses to countries with major deficiencies can be expected based on the simulations. For the Czech Republic, the operation of Dukovany NPP is no longer considered in 2040 and the resulting balance is thus significantly deficient. According to the resulting analyses, the Czech Republic becomes dependent on the import of electricity from abroad in 2040.

The LOLE reliability indicators for 2040 are as follows: (i) 678 hours per year for scenario A; (ii) 3 622 hours per year for scenario B.

In such an environment, the reliability of the supply must be ensured by sufficient performance and timely preparation of legislative, regulatory and technical measures to ensure such performance. One of the permissible options under Regulation (EU) 2019/943 of the European Parliament and of the Council is the introduction of a capacity mechanism following the appropriate steps.

The related steps in implementing the measures under consideration include the estimation of VoLL and LOLE and EENS reliability standards, which is the responsibility of the Member State under Regulation (EU) 2019/943 of the European Parliament and of the Council.

In addition to the Evaluation, the necessary more detailed regional evaluation was carried out for the Czech Republic, Slovakia, Hungary and Romania (Trilateral Regional Adequacy Platform 'TRAP'), which does not expect an energy shortage in the given group of countries by 2025.

4.4.1.6 Securing long-term supplies of nuclear materials and fuel

Nuclear fuel for the Dukovany Nuclear Power Plant is purchased on the basis of a long-term contract valid until 2028 (including an option) from the Russian company TVEL, which provides not only its production (fabrication), but also the conversion and enrichment services and part of the raw uranium. Fuel is currently being used at an increased output of 105 % in a full five-year fuel cycle, thanks to the latest fuel innovation (Gd-2M +) that is being introduced since 2014.

The Temelín Nuclear Power Plant also continued to operate on TVEL's fuel in both units on the basis of a long-term fuel contract. TVSA-T fuel supported the shift to the 104 % increased power over a four-year fuel cycle and it provides the potential for safe unit operation over a partially five-year duty cycle. In 2018, an advanced type of fuel with increased uranium content and increased structural rigidity (TVSA-T mod2) was introduced in Unit 2, allowing further increase in fuel efficiency.

For the production of nuclear fuel, the raw uranium and the related processing (conversion and enrichment) were provided on the basis of long-term contracts, both by purchasing from foreign suppliers and within direct fuel supplies from its producer (mainly for Dukovany Nuclear Power Plant).

Due to the termination of commercial uranium mining in the Czech Republic by DIAMO, domestic uranium is no longer purchased, but the processing of its reserves held by CEZ will continues to cover approximately half of the total uranium needs of the Dukovany Nuclear Power Plant in 2019. A contract with a foreign uranium producer signed in 2018 covered approximately 50 % of the uranium needs for the Dukovany Nuclear Power Plant until 2025. The total needs for uranium as well as conversion and enrichment services for CEZ-operated nuclear power plants are contractually fully met until at least 2020, and some contractual commitments continue until 2025.

The desirable diversification of the supply base is maintained in line with the EURATOM Supply Agency's supply policy recommendations. In order to reduce the risk of interruption or endangerment of nuclear fuel supplies within the required deadlines, CEZ has already taken the decision to increase the proportion of manufactured fuel at the power plant site at the expense of reducing strategic uranium reserves at various stages of processing held by its suppliers. During 2015 and 2016, two complete nuclear fuel charges were delivered to the Temelín Nuclear Power Plant. In 2017, three charges were delivered and in 2018 a fourth one was delivered for the Dukovany Nuclear Power Plant. Additional transhipments for the Dukovany Nuclear Power Plant will be delivered in the coming years. At the same time, the project of developing and licencing the Lead Test Assemblies of an alternative fuel supplier, Westinghouse Electric Sweden, is ongoing. In 2019, these six units were delivered and put into Unit 1 of the Temelín Nuclear Power Plant.

Among other things, the Czech Republic presents this information continuously within the framework of Uranium Resources, Production and Demand (Nuclear Energy Agency).

Table 87: *Nuclear fuel reserves at Dukovany site (NPD) and their expected development*

Horizon	Level of inventories [years of operation]	Level of inventories [number of transhipments]	Form of contract	Fulfilment of the standard
Until 2018	Approximately 2 years of operation of the power plant is ensured (including the fuel already loaded into the core of each reactor).	4	Long-term contract with JSC TVEL until 2028 (including option for delivery after 2024).	NO
From 2018	Approximately 3 years of operation of the power plant is ensured (including the fuel already loaded into the core of each reactor).	8	Long-term contract with JSC TVEL until 2028. + Annex 19 to the contract with JSC TVEL for delivery of 4 transhipments for the purpose of increasing supplies, deliveries 2017–2018.	NO
From 2021	Approximately 4 years of operation of the power plant is ensured (including the fuel already loaded into the core of each reactor).	12	Long-term contract with JSC TVEL until 2028. + Annex 20 to the contract with JSC TVEL for an additional 4 transhipments.	YES

As the NPD operator, CEZ monitors the development and steps taken by the EURATOM initiative within the ESSANUF project in relation to the possibility of qualifying the VVER-440 alternative fuel design by Westinghouse. However, there is currently no real alternative fuel supplier for NPD that could deliver an alternative for Gd-2M + fuel from the Russian supplier JSC TVEL, and therefore the goal of security of supply is met by creating inventories for 4 years of operation.

Table 88: *Nuclear fuel reserves at Temelín site (TNPP) and their expected development*

Horizon	Level of inventories [years of operation]	Level of inventories [number of transhipments]	Method of securing	Fulfilment of the standard
From 2016	Approximately 2 years of operation of the power plant is ensured (including the fuel	2	Long-term contract with TVEL until 2023.	NO

	already loaded into the core of each reactor).			
From 2024	Approximately 2 years of operation of the power plant is ensured (including the fuel already loaded into the core of each reactor).	2	A contract signed with the contractor(s) selected on the basis of a tender in combination with other development and validation projects allowing the operation of mixed zones, including the operational transition to an alternative supplier of the qualified fuel VVER 1000.	YES

The implementation of the Leading Test Assemblies (LTA) programme for the Westinghouse fuel at TNPP and the announcement of a tender for a new fuel supplier are, together, a prerequisite for meeting the target of qualifying (de-licencing) the fuel of two alternative suppliers, and thus obtaining the possibility of deploying mixed zones in TNPP and, last but not least, gaining real experience with the design and operation of the mixed zone of two alternative suppliers. Consequently, the level of achievement of this objective will be one of the criteria for the amount of established and maintained strategic fuel reserves after 2024, as defined by the safety standard. Based on the current risk assessment, it is clear that maintaining one fuel transhipments per year is sufficient to cover most of the known threats to the security of nuclear fuel supply.

Table 89: *Fresh nuclear fuel (FNF) storage capacities at the Dukovany (NPD) and Temelín (TNPP) sites*

Site	FNF storage, capacity description	Maximum number of years of operation	Maximum number of transhipments	The need to modify the storage
NPD	Limit capacity using all storage capacities at the level of 12 transhipments, which (considering transhipments already loaded in AZ reactors) will allow up to 4 years of operation of all 4 NPD units. The utilisation of the transhipment stock at NPD is simplified by the fact that the fuel assemblies are standardised and, depending on the required cycle length, the charge is modified by adapting the number of fuel assemblies loaded.	4	12	NO It is not necessary to increase the existing capacity of FNF storage

TNPP	The limit capacity of the FNF storage including the necessary handling positions is at the level of six transhipments. These will, considering transhipments already loaded in AZ reactors, allow for 3[1)] years for both units assuming the transition to a more efficient fuel cycle (36 loaded fuel assemblies in a transhipment instead of the current 42).	3[)150] (for both units)	6[2)151] (i.e. 12 containers for FNF)	YES Modifying at least two containers for hermetic cases[152]

For the new nuclear units under consideration, it is envisaged that the possibility of switching to an alternative fuel supplier after the end of the base period covered by the fuel contract will be retained with the supplier.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

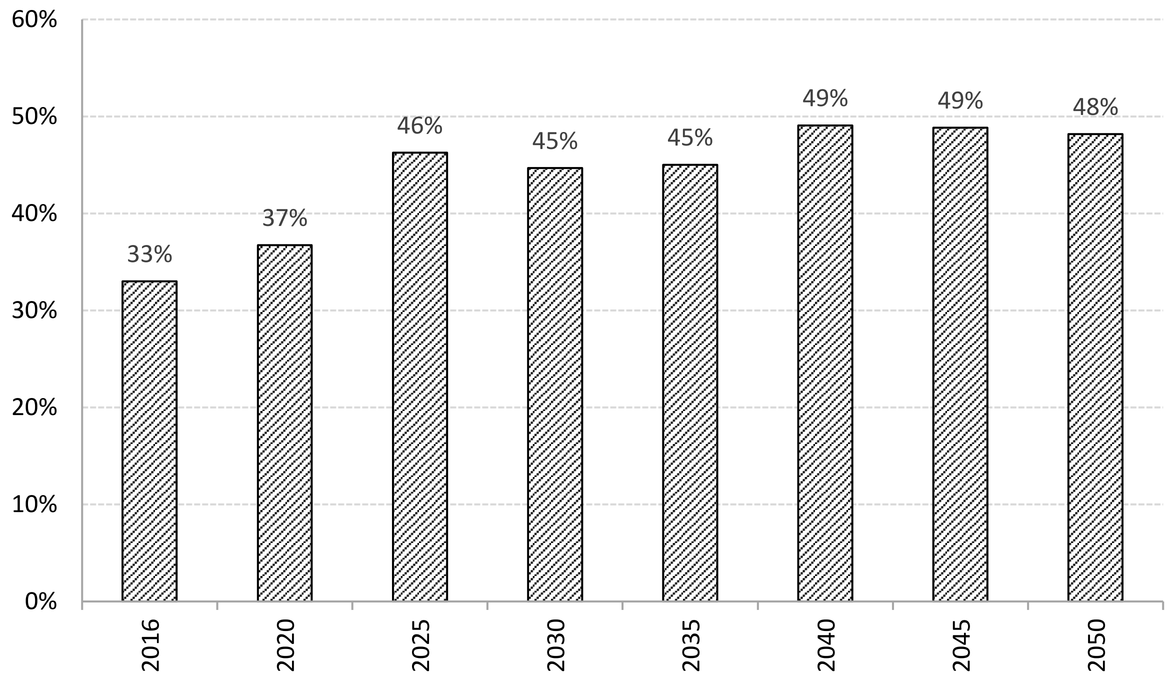
The development of energy security is relatively difficult to be described quantitatively. Annex 2, which provides a detailed list of parameters and variables, includes an indicator of import dependence. This indicator is currently at around 33 %. The Czech Republic is almost fully dependent on imports of natural gas and oil, which make up a significant part of domestic energy consumption. Even in the future it can be assumed that the Czech Republic will be almost exclusively dependent on these fuels. An increase in import dependence may also be facilitated by an increase in the use of these fuels, particularly natural gas, which will be important as a partial replacement of domestic coal. In the future, import dependence can be expected to increase, especially due to the decreasing domestic coal consumption at the expense of imported fuels. Also, the Czech Republic is currently a relatively large net electricity exporter, but in the future a relative reduction of the exported quantity can be expected. Chart 89 shows the expected development of import dependence. Energy security does not only depend on import dependence but also on a number of other circumstances, such as diversification rate, country of origin, etc. This information should be available or derivable from analytical data in Annex 2.

150 For a unit that is approaching outage (end of the campaign), 2 tanks (2x18 PS = 36 PS) are filled and prepared for the transport of FNF from storage to the unit and after their emptying it is only possible to refill them by a delivery from a fuel supplier, i.e. usually several weeks before the outage starts.

151 A total of 13 containers are available for the FNF, but at least 1 container must remain free for continuous handling and preparation of charges.

152 Containers (for hermetic cases) would have to be adapted for the storage of FNF.

Chart 89: *Expected development of import dependence*



Source: Prepared by MIT for the purposes of the National Plan

4.5 Dimension 'Internal energy market'

4.5.1 Electricity interconnectivity[153]

i. Current interconnection level and main interconnectors[154]

The methods of determining the degree of electricity interconnectivity may vary according to what the total available transmission capacity of all the profiles of the given system is related to. The 10 % interconnection target under the Barcelona Agreement is measured as the ratio of net transmission capacity to installed production capacity – with an emphasis on the integration of the internal electricity market. The current State Energy Policy of the Czech Republic determines the degree of integration into international networks (the degree of Czech Republic's interconnectivity) as the total available transmission capacity in relation to the maximum load determined by the share of the total export/import capacity of the transmission system in the given year and the outlook for the maximum net load of the transmission system for the given year.

For the purpose of comparing the two above methods of determining the degree of electricity interconnectivity, the outlooks of interconnectivity rates (export/import) for the years 2019, 2024 and 2030 on the basis of data from ČEPS, a.s. are provided. It should be reiterated that the determination of the 'maximum' transmission capacity of the system depends on several variable assumptions, so in order to ensure complete comparability of outputs, the calculation would have to take place under fixed and identical conditions, especially for security reserves, which mainly take into account the circular flows,

[153] The National Plan of the Czech Republic is not the basis for the preparation of spatial planning documentation.
[154] With reference to the overviews of the existing transmission infrastructure compiled by the Transmission System Operators (TSOs).

which develop over time. Due to uncertainties in the energy environment, especially in the energy mix, these values can be considered as indicative.

Table 90: *Expected interconnectivity level in 2019, 2024 and 2030*

Year / method of determining interconnectivity / transmission capacity	According to the Barcelona Agreement [related to installed capacity]		According to the State Energy Policy of the Czech Republic [related to maximum load]	
	Export capacity [%]	Import capacity [%]	Export capacity [%]	Import capacity [%]
2019	29.6	28.0	55.6	52.6
2024	38.7	35.4	57.9	53.0
2030 (Scenario A)	44.1	38.0	58.0	50.0
2030 (Scenario B)	44.1	38.0	60.2	51.8

Source: Data from ČEPS, a.s., the transmission system operator

The values in the table above (under the Barcelona Agreement) differ from the EU 2017 communication[155], because the new calculations of ČEPS, a.s. include tools for the effective management of circular flows on the basis of implemented investment measures in 2017. In particular, these include the reflection of the impact of PST on the determination of the security reserve in the calculation.

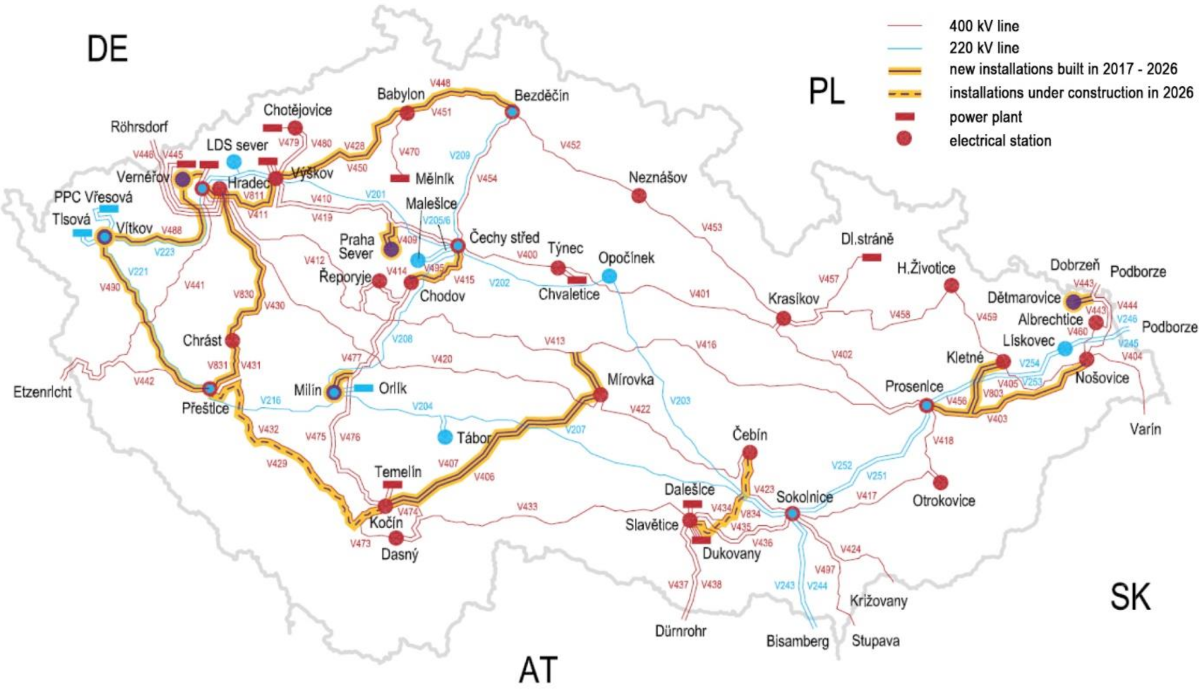
ii. Projections of interconnector expansion requirements (including for the year 2030)[156]

Projections of interconnector expansion requirements are provided primarily in the Plan for the Development of the Czech Transmission System 2017–2026 (in its updated version 2019–2028), which is undergoing the approval process at the time of preparation of this document. Estimates of further extension of the transmission system are detailed in subchapter 4.5.2.3.

155 Communication on strengthening Europe's energy networks COM(2017) 718, 23.11.2017

156 With reference to the national network development plans and TSO regional investment plans.

Figure 9: *Czech transmission network development scheme (as of 2026)*



Source: Czech transmission network development scheme under the Plan for the Development of the Czech Transmission System 2017–2026

4.5.2 Energy transmission infrastructure[157]

i. Key characteristics of the existing transmission infrastructure for electricity and gas[158]

4.5.2.1 Key characteristics of the existing electricity infrastructure

Key features of the existing infrastructure and estimates of network expansion requirements are part of the published Plan for the Development of the Czech Transmission System 2019–2028, which is subject to bi-annual updates.

The transmission system in the Czech Republic is operated by ČEPS, a.s. ČEPS, a.s. provides electricity transmission in the required volume and with high reliability. The continuous renewal and development of the transmission system by its operator leads to the increased transfer capacity of the elements during the reconstruction and replacement of the equipment, and thus the transmission system provides with high reliability the connection and output of the capacity of large sources, distribution supply and the required cross-border transmission of electricity.

Table 91: *Length of the transmission system lines in the Czech Republic*

Facility description	Line length (km)
400 kV line	3 735
of which double and multiple	1 338

[157] The National Plan of the Czech Republic is not the basis for the preparation of spatial planning documentation.
[158] With reference to the overviews of the existing transmission infrastructure compiled by the TSOs.

220 kV line	1 909
of which double and multiple	1 038
110 kV line	84
of which double and multiple	78

Source: Plan for the Development of the Czech Transmission System 2017–2026

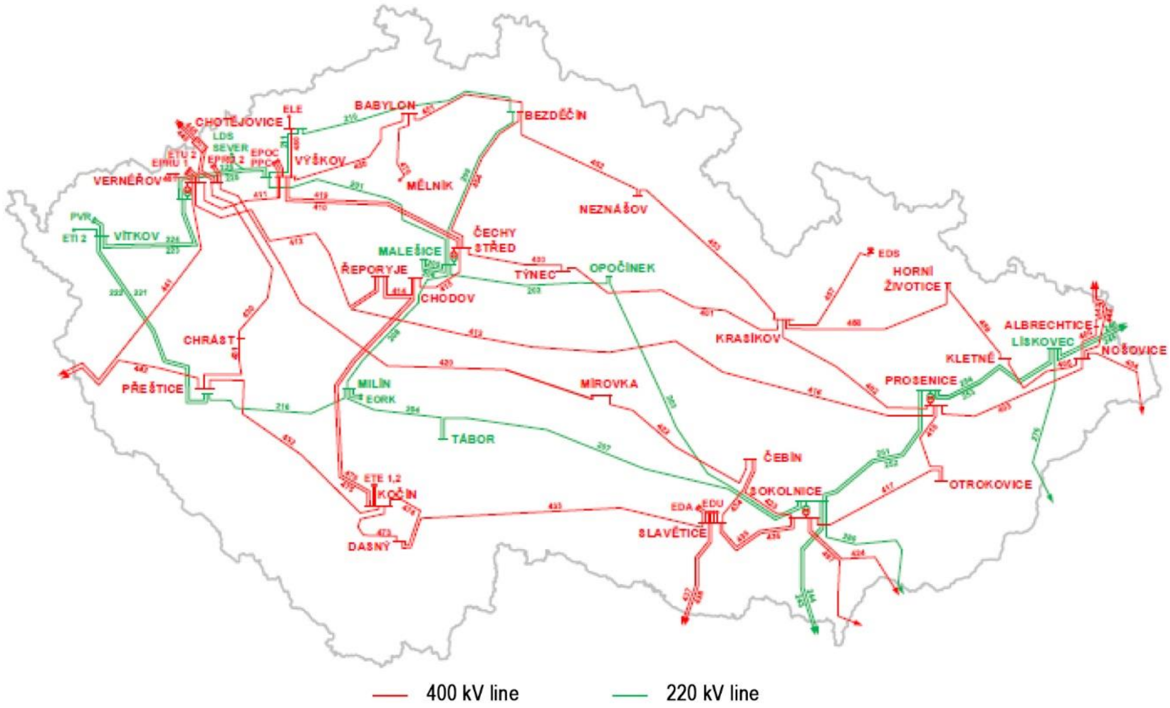
Table 92: *Number of cross-border lines, substations and transformers within the transmission system*

Facility description	Number of facilities
Cross-border 400 kV line	11
Cross-border 220 kV line	6
400 kV substations	26
220 kV substations	14
110 kV substations	1
400/220 kV transformers	4
400/110 kV transformers	49
220/110 kV transformers	21
Phase-shifting transformers, 400 kV (PST)	4

Source: Plan for the Development of the Czech Transmission System 2017–2026

Since 2017, phase-shifting transformers (PST) located on the cross-border Hradec-Röhrsdorf lines in the 420 kV substation in Hradec u Kadaně have been in operation. Their task is to avoid negative effects on the Czech transmission system by effectively limiting the large fluctuations of power across the cross-border profile between the Czech Republic and Germany. In 2017, a new 400/110 kV transformer station was commissioned in Vernéřov in order to allow an increase in the reserved power input (capacity) in the area, which is related, among other things, to the loss of capacity supplied to the 110 kV grid by the shutdown of Prunéřov I power plant.

Figure 10: *Transmission system – current state*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

4.5.2.2 Key characteristics of the existing gas infrastructure

General characteristics of the gas system

The gas system is a set of all facilities used for the production, consumption, storage and transport of natural gas. The gas system consists mainly of: (i) pipeline infrastructure with different operating parameters; (ii) control actuators – border transfer stations, compressor stations, distribution nodes, closures, measuring fittings etc.; (iii) gas storage facilities for the storage of natural gas; (iv) generating facilities of conventional and non-conventional gas which can be injected into the gas system; (v) off-take and transfer points.

In terms of the operational role, it is possible to divide the system into two hierarchical units:

- Transmission system – high-pressure gas pipeline system (VHP, HP), actuators and related objects connected with foreign gas systems. The transmission system is further subdivided into the transit system and national transmission system.
- Regional and local distribution systems – system of high-pressure, medium-pressure and low-pressure gas pipelines (HP, MP, LP), actuators and related technological objects used for the distribution of gas to final customers.

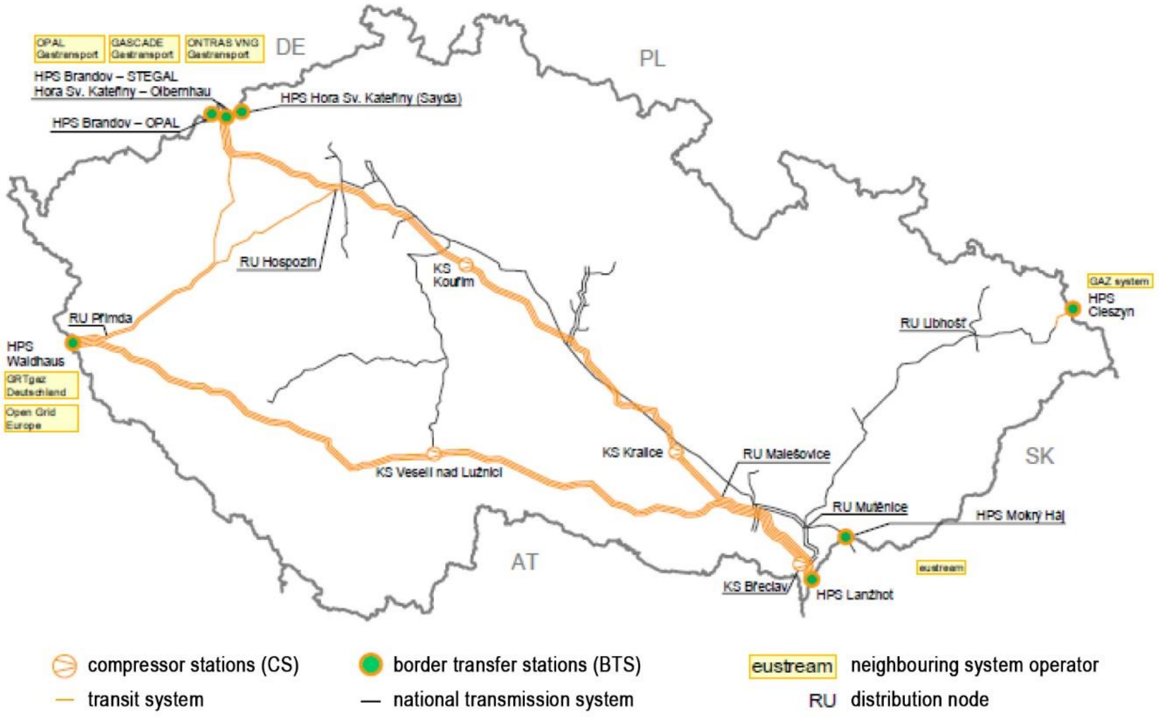
Within the Czech Republic gas is further transferred from the transmission system to distribution systems and directly connected customers. In addition, there are 8 gas storage facilities connected to the transmission system. Supply is ensured through 968 transfer stations where a commercial gas quantity meter is installed. Gas quality is measured at 27 nodes in the system.

Transmission system

Gas pipelines for international transit and domestic transmission with the length of about 3 820 km in total, with nominal diameters from DN 80 to DN 1400 and with nominal pressures from 4 to 8.4 MPa, i.e. the 'transmission system', are operated in the Czech Republic by NET4GAS. The transmission system provides especially for the following functions: (i) transmission of natural gas from long-distance international gas pipelines to transfer stations or to adjacent transmission systems; (ii) supply to selected customers[159]; (iii) transmission of gas to the storage facilities in the gas injection mode and transmission of gas from the storage facilities to consumption points in the gas use mode.

The transport system can be divided into four main branches. The North branch leads from Lanžhot to Brandov / Hora Sv. Kateřiny; the South branch leads from Lanžhot to Rozvadov and the West branch connects the North and South branches. In the Southeastern part of the country, the Moravian branch provides gas supplies to the Moravian regions and connects to the Polish transmission network. The North, South and West branches are connected in key distribution nodes of Jirkov, Rozvadov, Malešovice, Hospozín and Přimda.

Figure 11: *Transmission system of the Czech Republic*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Individual transfer points are connected to transit and domestic transmission systems, in total there are 96 transfer points to distribution networks and storage facilities. The transmission system is interconnected by seven border transfer stations with neighbouring transmission systems. Eight clients are connected directly to the transmission system. The following table shows the transmission system pipelines.

159 In order for a customer to be able to directly receive supplies from the transit system, it must meet the technical criteria given by the transmission operator and must off-take at least 100 GWh of gas energy from the VHP system or at least 10 GWh from the HP system annually.

Table 93: *Pipeline routes of the transmission system*

Specification	Operating overpressure (MPa)	Pipeline width (mm)	Pipeline lengths (km)
Transit system	4.0 to 8.4	800 to 1 400	2 471
Gazela gas pipeline	4.9 to 8.4	1 400	166
National transmission system	2.5 to 6.4	150 to 700	1 181

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Reverse gas flows in the transmission system

During the Gas Crisis in January 2009, a provisional reverse flow was made in the West-East direction, which allowed not only to supply customers in the Czech Republic but also in Slovakia. The gas was supplied via the transfer station Hora Svaté Kateřiny to the Czech Republic. As a result, gas supplies to customers in the Czech Republic were not reduced.

The implementation of the reverse flow within the European Energy Programme for Recovery (EEPR) involves the following structures / modifications:

1. Modification at the border transfer station (BTS) Hora Svaté Kateřiny allowed an increase in the amount of gas transmitted from Germany to the Czech Republic from 18 m^3 per day to 25 m^3 per day.
2. Modification of the pipeline at the interconnection point Hospozín allowed an increase in the amount of gas transmitted between Olbernhau and Waidhaus up to 15 million m^3 per day.
3. Modification of the pipeline at the Kralice nad Oslavou compressor station allowed the use of compression work for gas transmission in the west-east direction.
4. Modification of the pipeline at the Malešovice interconnection point allowed an increase in the gas transmission from the BTS Hora Svaté Kateřiny to the Rozvadov distribution node.
5. Modification of the pipeline system at the Břeclav compressor station enabled the use of compression work for the transmission to Slovakia.
6. Modification in BTS Lanžhot allowed the measurement of gas transmitted from the Czech Republic to Slovakia.
7. Modification of the compression station Kouřim pipeline system allowing the reverse flow was completed in 2011.

Transit system

The task of the transit system is to ensure the transmission of natural gas by very high pressure pipelines (VHP) to other countries and to ensure gas supplies to domestic customers. Thanks to the liberalisation of the gas sector, the use of the transmission system is determined by the market where the system users who want to transmit gas through the system compete for the transmission capacity. The exception is the Gazela gas pipeline, which is exempt from third party access (rTPA) to transmission capacity until the end of 2034. This exception is only granted for the transmission capacities in the direction Brandov-Waidhaus. This means that system users cannot compete for the capacity of this gas pipeline in auctions, as all of the capacity has already been allocated through an alternative allocation mechanism.

Between 2015 and 2016, projects increasing the capacity by 12 million m^3 a day were successfully completed on the transmission system in the direction to Lanžhot, also along the south branch in the direction Rozvadov – Veselí nad Lužnicí – Břeclav – Lanžhot, which previously served for the transmission of gas from Lanžhot to Bavaria. In addition to the gas storage facility in Tvrdonice, a single direct buyer is currently connected to the transit system: the Počerady gas-fired power plant.

National transmission system

The task of the national transmission system (NTS) is to transmit gas from the transit system to the distribution transfer stations. The NTS consists of gas pipelines with lower widths (150 to 700 mm) with operating pressures of 2.5 to 6.4 MPa. The total length of the national transmission system routes is 1 181 km. The connection to the transit system is at six transfer nodes. Due to the existing pressure conditions, compressor stations are not installed on the national transmission system, but all gas storage facilities operated within the Czech gas system are connected to the system. There is also a connection to the Slovak gas system on the NTS (Mokrý Háj). This connection is currently not being used.

Border transfer stations

In places at the border of the Czech Republic, where NET4GAS's transmission system is connected to the transmission systems of TSOs of the neighbouring countries, gas volume and quality are measured at border transfer stations (BTS). These places are, on the Czech-Slovak border, Lanžhot and Mokrý Háj (BTS on the Slovak side), on the Czech-Saxon border, Brandov and Hora Sv. Kateřiny, on the Czech-Bavarian border, Waidhaus (BTS on the German side) and, on the Czech-Polish border, Cieszyn (BTS on the Polish side).

Table 94: *Capacities of border transfer stations (billion m^3 per year)*

Profile and border transfer station	Input capacity to the Czech Republic	Output capacity from the Czech Republic
SK-CZ	56	31
Lanžhot	56	31
Mokrý Háj	0	0
PL-CZ (Cieszyn)	0	1
AT-CZ	0	0
DE-CZ	73	54
Waidhaus	15	37
Hora Svaté Kateřiny – Sayda	5	7
Hora Svaté Kateřiny – Olbernhau/Brandov STEGAL	13	10
Brandov OPAL (for the Gazela pipeline)	40	0
Total capacity	129	86

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Virtualisation of border points

On the basis of Article 19 of Commission Regulation (EU) 2017/459 establishing a network code on capacity allocation mechanisms in gas transmission systems (NC CAM), transmission system operators are obliged to set up a virtual interconnection point (VIP) where two or more interconnection points connect the same two adjacent entry-exit systems.

In the case of the Czech Republic, two virtual interconnection points are planned:

- VIP Brandov – GASPOOL with German Gaspool trade zone as of 1 November 2018;
- VIP Waidhaus with the German NCG trade zone as of 1 March 2019.

All available fixed and interruptible capacity will be offered at the VIP. No capacity beyond the existing contractual relationships will be offered on physical interconnection points that will become part of the VIP.

Compressor stations

The required pressure in gas pipelines is generated by four compressor stations, which are located in Kralice nad Oslavou and in Kouřim on the North branch and in Veselí nad Lužnicí and Břeclav on the South branch. All compressor stations are capable of bidirectional operation. Total installed capacity of the compressors is 243 MW.

Table 95: *Total installed capacity of compressor stations (MW)*

Compressor station name	Number of combustion turbines and their output	Installed capacity
Kouřim (north branch)	5x 6 MW + 2x 13 MW	56 MW
Kralice nad Oslavou (north branch)	5x 6 MW + 2x 13 MW	56 MW
Břeclav (south branch)	9x 6 MW + 1x 23 MW	77 MW
Veselí nad Lužnicí (south branch)	9x 6 MW	54 MW

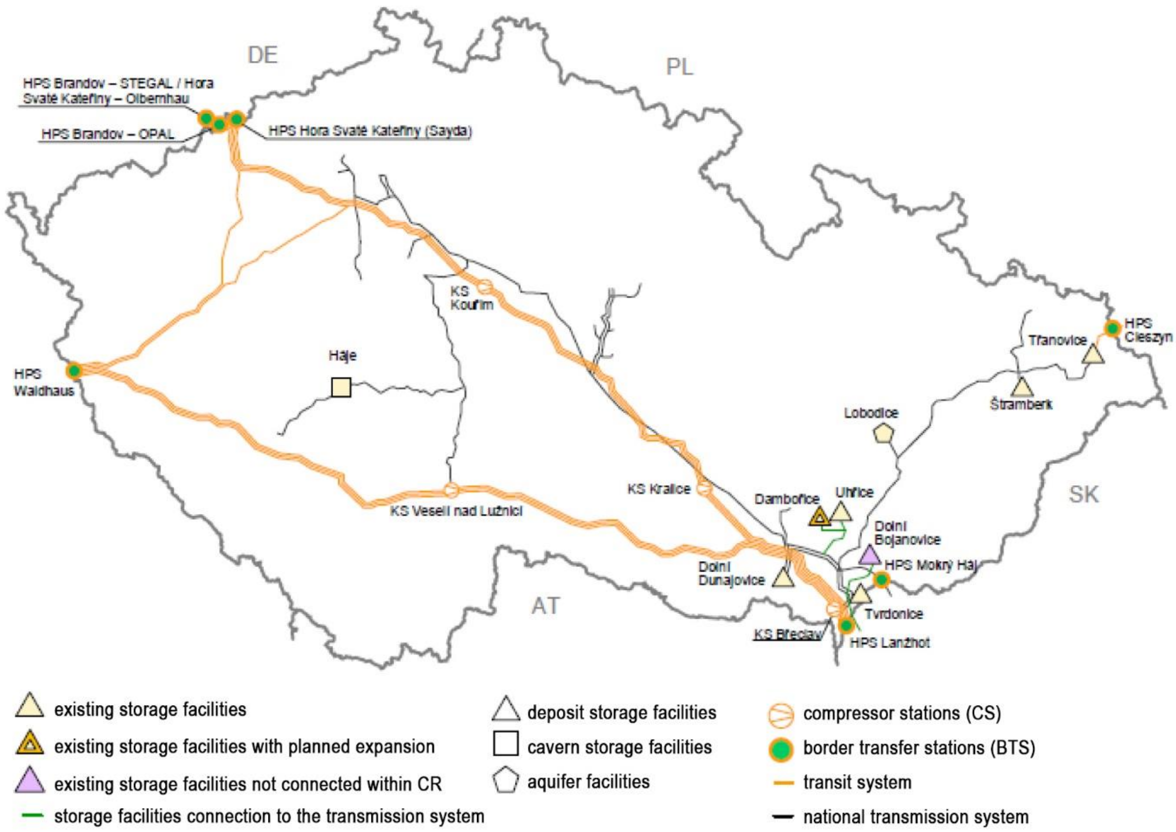
Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Gas storage facilities

A total of 9 storage facilities are currently in operation in the Czech Republic, of which 7 reservoirs being of the deposit type, 1 of the aquifer type (Lobodice) and 1 of the cavern type (Háje). The main role of storage facilities in the system is to cover peak demand in the heating season, which could not be covered by gas imports. Traders use them for economic reasons, because in the heating season, gas prices are usually higher than in low season. Finally, the storage facilities are an important element of the system in terms of security of gas supply in crisis situations.

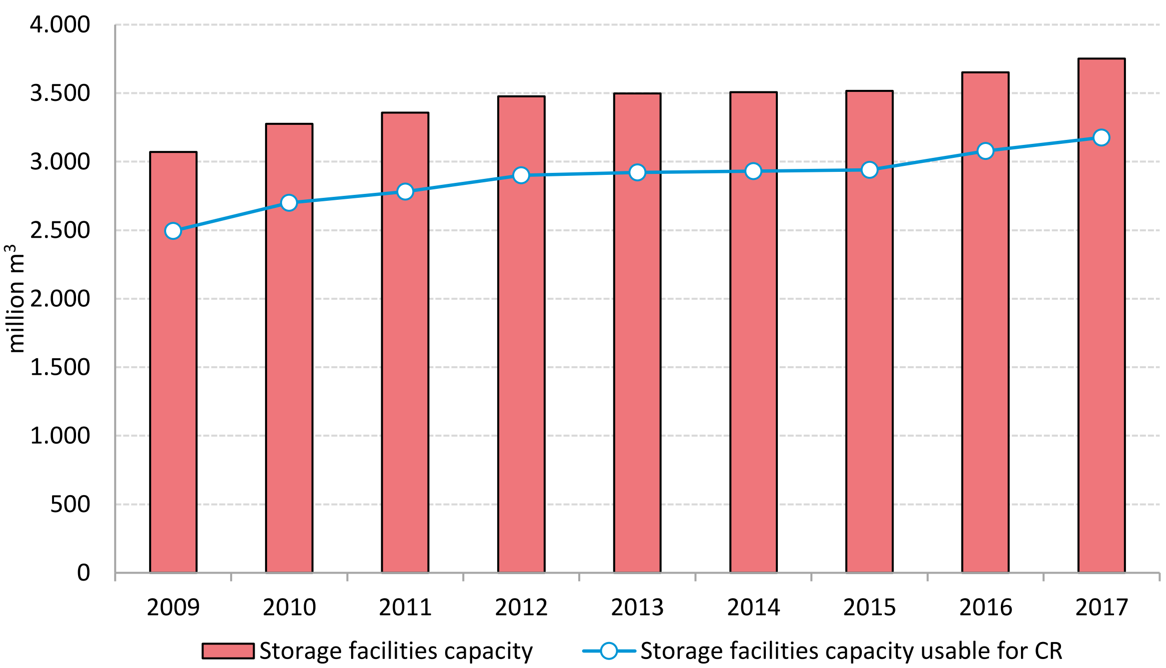
In recent years, the dynamic properties of storage facilities in the Czech Republic have been improved by an increase in their deliverability. The available capacity of the storage facilities connected to the Czech system totals 3 177 million m^3, and their maximum deliverability is 70 million m^3 per day. The capacity of the storage facilities located in the Czech Republic totals 3 753 million m^3, and their maximum deliverability is almost 79 million m^3 per day.

Figure 12: *Gas storage facilities – current state and plans for expansion*



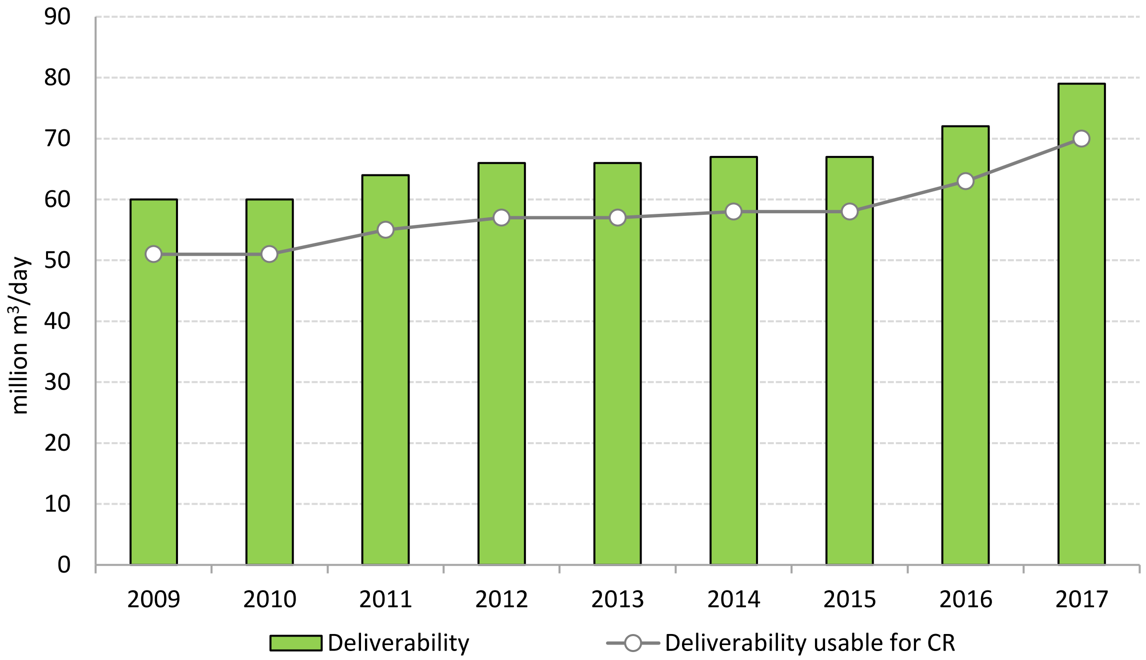
Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Chart 90: *Development of the capacity of natural gas storage facilities in the Czech Republic*



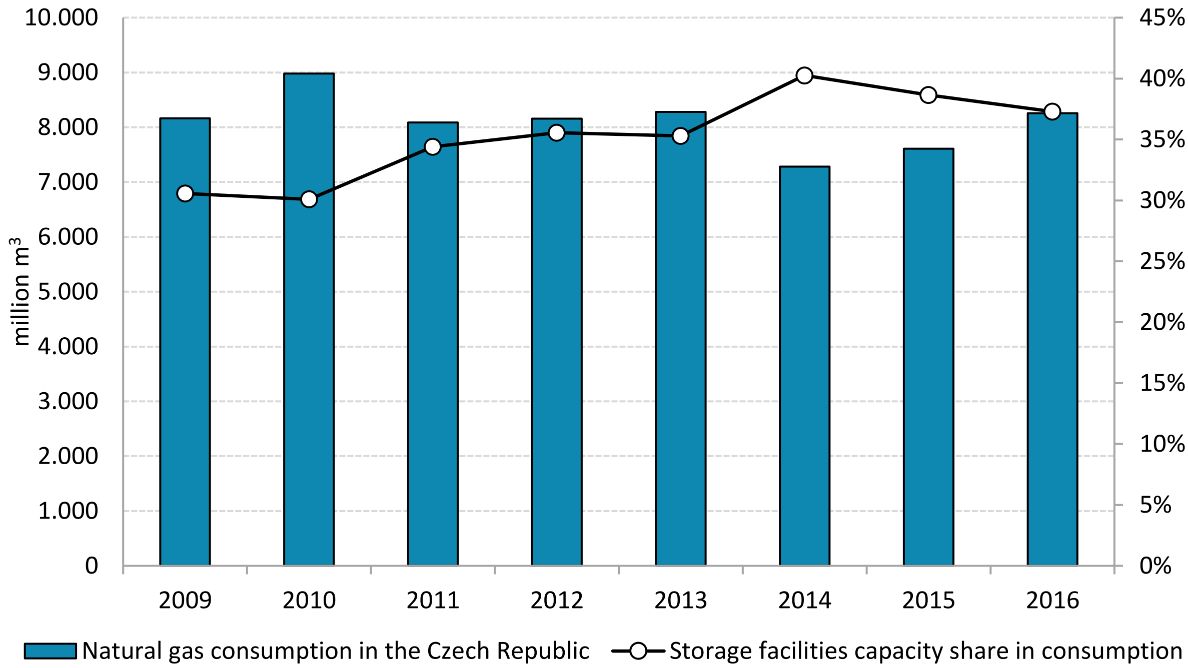
Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Chart 91: *Development of the deliverability of natural gas storage facilities in the Czech Republic*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Chart 92: *Share of the capacity of natural gas storage facilities in domestic consumption*



Source: Annual Report on the Operation of the Gas System of the Czech Republic 2016 (ERO)

Distribution systems

The task of the distribution system is to transport gas to end customers. Gas is mostly transmitted to the distribution systems from the transmission system through transfer stations; a small part of the gas supply comes from domestic extraction. Pipeline systems of distribution networks are the most extensive part of the entire gas system. They are operated at different pressure levels, as high pressure (from 0.4 to 4 MPa), medium pressure (from 5 kPa to 0.4 MPa) and low pressure (up to 5 kPa) pipelines. For reasons of supply reliability, individual regional distribution systems (over 90 000 customers) are operated in a grid configuration and can be mutually interconnected with back-up connections. No compressor stations are operated, and no gas tanks are connected within distribution. In a few cases, distribution networks are connected to foreign systems – this concerns the supply of island areas or, where relevant, back-up cross-border supply facilities.

Currently, regional distribution networks are operated by three entities:

- **GasNet** provides distribution in the North, Central, West and East Bohemia and also in South and North Moravia. It is further divided into 4 sub-regional networks.
- **E.ON Distribuce** provides distribution in South Bohemia.
- **Pražská plynárenská Distribution** provides distribution on the territory of the capital city of Prague.

In addition to regional distribution networks, there are local distribution systems, often operated within major industrial plants. Recently, there has been a growing number of cases where operators of these local systems take over local distribution from municipalities, which previously invested in their construction but do not want to operate them. At present, 65 local distribution systems are operated.

ii. Projections of network expansion requirements at least until 2040 (including for the year 2030)[160]

4.5.2.3 Projections of infrastructure expansion requirements in the electricity sector

Transmission system development

In order to ensure the safety and reliability of operation, the transmission system operator prepares every two years the Ten-Year Plan for the Development of the Transmission System of the Czech Republic. The plan presents two types of measures, which are briefly summarised in the following list and are described in detail further below:

- strategic solution: strategic investments in the medium and long term leading to the strategic development of the electricity system (maintenance, new lines, gradual phase-out of the 220 kV network);
- dynamic measures: partial investment technical measures allowing the connection of customers (often limited or conditional) within a shorter period than is possible with the strategic solution. In particular, this concerns connecting new sources to the transmission system or developing TS/DS transformation links.

Strategic solution

Renewal of station equipment and lines

The TSO renews the TS station equipment and lines to the extent ensuring the required security and reliability of TS operation. The typical lifetime of power equipment – especially lines – is 40 years and is affected by the method of maintenance and the conditions of the environment in which the equipment

[160] With reference to the national network development plans and TSO regional investment plans.

is operated. Replaceable parts of the equipment are replaced after the end of their lifetime; correct maintenance can extend the lifetime of pole structures up to twice the lifetime. After each replacement of lines and insulators, the line failure rate decreases.

Strengthening transmission capability

TSOs prepare and implement systemic measures to strengthen the TS transmission capability, to modernise and duplicate existing lines and to build new lines, and to expand and modernise substations. The construction of new 400 kV lines aims to supplement and reinforce the 400 kV system and to replace the 220 kV network. The 220kV network tasks will be gradually assumed by the reinforced 400kV network by 2040. The possibilities of building new lines in the new corridors are limited and the preparation is lengthy (10 years or more). Therefore, when renewing the 400 kV line, TSOs build double lines within the routes of the existing lines. The following table summarises the construction of new lines.

Table No 96: *Length of new lines in the TS until 2050 (km)*

Construction of TS lines	Length of new 400kV lines in 2017–2025	Length of new 400kV lines in 2026–2050
Construction of TS lines within a new route	189	70
Construction of double TS line within the original line route	572	629
Total length of new TS lines	761	699

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

International co-operation

Within the interconnected ENTSO-E, coordination is important in the planning of future forms of electricity networks and their further cooperation. The list of projects of common interest specified in Commission Delegated Regulation (EU) 2016/89 also contains five projects being prepared by ČEPS[161]. These projects meet not only the requirements for ensuring the safety and reliability of the transmission system operation, but also contribute towards the European targets with regard to the security of the operation of the entire interconnected system.

Reactive power compensation in the TS

Decentralised production and higher cabling rate lead, in particular at a time of lower load, to an increase in the generated reactive power in the DS and the associated increase in voltage at the given transfer station TS/110 kV. The duplication of transmission lines will increase the transmission capacities, but will also increase the reactive power generated by TS lines. In order to maintain voltage within the appropriate limits, TS uses available reactive power compensation tools and plans to build more than 1 000 MVAr of compensation facilities.

Dynamic measures

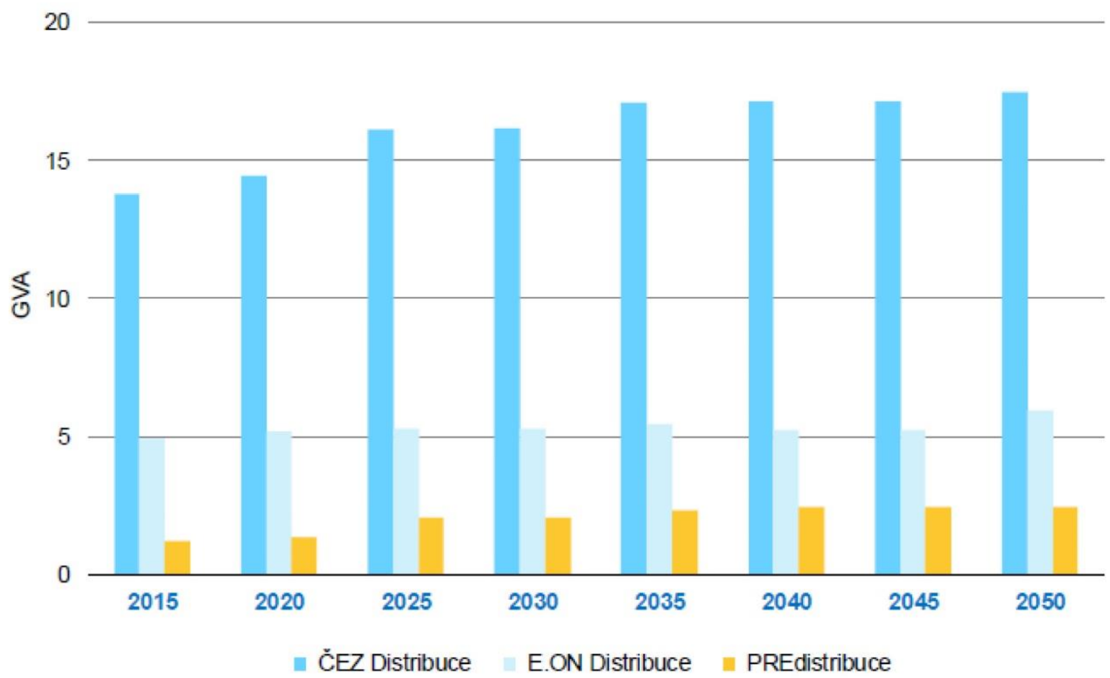
[161] Projects of Common Interest are updated as needed and the provision of these specific projects in the National Plan does not mean that these projects can be considered binding.

At the same time as the above, often time-consuming, measures, short- and medium-term solutions are also sought, which are acceptable for a transitional period. These include, in particular, TS line modernisation with an increase in the permissible line temperature to 80°C, dynamic line loading, automatic power reduction of sources and deeper coordination of transmission and distribution network operation.

New TS substations and transformer power

The TS/110 kV transformation link will be strengthened only for 400/110 kV transformation, with the transformation power to increase by 9 550 MVA by 2050. With respect to the phasing out of the 220/110 kV (4 200 MVA) transformation, the overall increase in TS/110 kV transformer power will be 5 350 MVA by 2050, with the projected increase in peak consumption by 2050 being between 600 and 3 400 MW (depending on the scenario) compared to the values measured in winter 2017. The development of installed TS/110 kV transformer power is shown in the following figure. The construction of new substations in the TS responds to the long-term trends in the given area, such as the decommissioning of large sources in 110 kV networks, the development of consumption and also the phasing out of the 220 kV system. By 2025, this involves the construction of a new 400/110 kV transformation in 4 locations (new 400 kV substations in Vítkov, Dětmarovice, Prague North and Milín). In the period 2026–2050 the construction of 400 kV substations is planned in the Opočínek, Lískovec, Malešice, Tábor and Rohatec, which will gradually replace the 220 kV substations. The following figures show the anticipated development of the TS according to ČEPS for 2025 and 2050.

Chart 93: *Installed power of TS/110 kV transformers (GVA)*



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

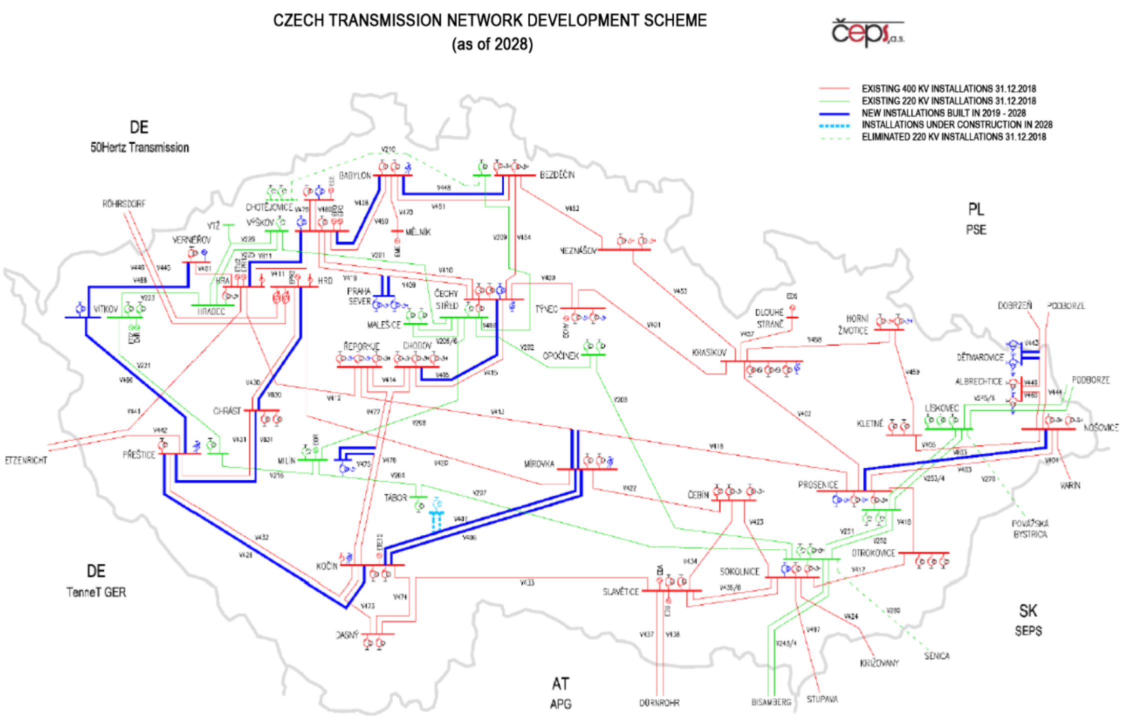
New technologies in the transmission system

The implementation of new elements is motivated by efforts to maintain the reliability of operation under new conditions. Specifically, this involves increased demands on interstate electricity transmission and increasing representation of decentralised sources and their expected future development. With limited possibilities to construct line structures, new technologies are already introduced in the Czech transmission system to increase the transmission capabilities of the lines and to increase the reliability and efficiency of TS operation. These include in particular:

- the construction of compact equipment in the TS;
- dynamic loading of the TS elements to increase network transmission capabilities;
- higher dispatcher control functions (prediction models, operation optimisation, protection against defects,
- business models);
- remote control of TS substations;
- automatic power reduction on sources to prevent the occurrence and spread of network failures.

Other potentially useful technologies not yet used in the Czech transmission system include the use of high-temperature conductors or superconductors and the flexible alternating current transmission system (FACTS). If unsuitable operating parameters are indicated, the above new technologies can be used to eliminate the unsuitable states. The development of the transmission network is shown in the following figures.

Figure 13: *Czech transmission network development scheme (as of 2028)*



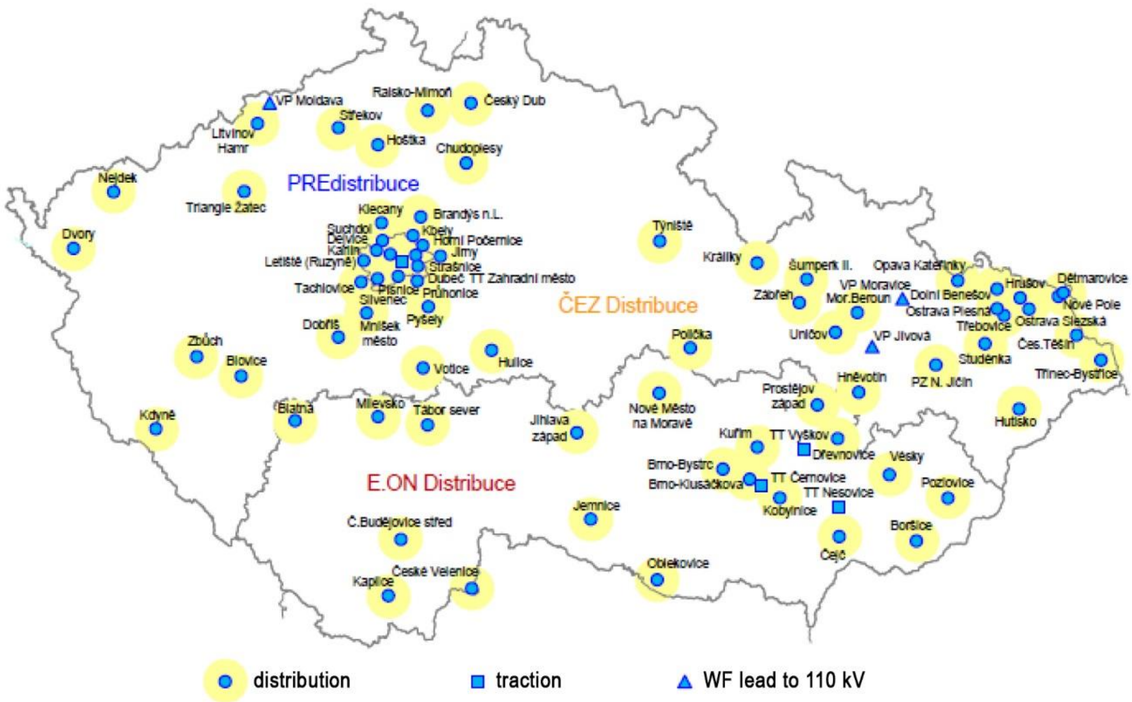
Source: ČEPS, a.s.

Distribution networks

Development of 110 kV networks

The development of 110 kV networks is prepared for a shorter period of time, so the operation of these networks is analysed in detail only for 2025. The development of 110 kV networks is based on the current needs of regions and the economic potential of distributors. The individual distribution companies must prepare the development so as to permanently meet the requirements of customers for the supply of electricity and the requirements of producers for power output. The development of distribution networks is influenced by changes in the TS, especially in the TS/110 kV transformation link, which affect both the development of the 110 kV networks in the respective node areas and their operational connection. The development is mainly focused on strengthening and reconstruction of the existing 110 kV lines. The new 110 kV substations are planned according to the expected load according to the requirements of customer in the respective regions. The construction of 81 new 110 kV stations is being prepared. Their location is shown in the following figure and their distribution and number in the following table. The following table gives an overview of the lengths of new and reconstructed 110 kV lines.

Figure 14: *Planned 110 kV substations*[162]



Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Table 97: *Planned 110 kV substations (number)*

110 kV substations	ČEZ Distribuce	E.ON Distribuce	PREdistribuce	Total
Distribution transformer station 110 kV/HV	44	20	10	74
Traction transformer station	0	3	1	4
Power output from WPP and PVPP	3	0	0	3
Total number of 110 kV stations	47	23	11	81

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

162 This is a long-term outlook aimed to illustrate possible developments. The implementation of the projects will be further specified.

Table 98: *Length of new and renovated 110 kV lines (km)*

Construction of 110 kV lines	ČEZ Distribuce	E.ON Distribuce	PREdistribuce	Total
Construction of 110 kV lines within a new route	616	201	73	890
Renovation of 110 kV lines within orig. route	523	474	19	1 016
Total length of new and renov. lines	1 139	675	92	1 906

Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Development of HV and LV networks

The development of HV and LV distribution networks and their further construction is administratively and economically complex. In addition to the construction of new lines and renovation of existing lines, HV and LV networks will make increasing use of new technologies, which should keep the currently relatively comfortable operation and increase operational reliability. In addition to strengthening and expanding existing distribution networks, the following elements will be used in the development of the TS:

- increasing share of cabling of distribution networks;
- development and implementation of automation elements on HV voltage level and also LV enabling central and autonomous control of these networks;
- development of automated voltage control systems even at lower voltage levels;
- control of the production of active and reactive power of decentralised sources according to the needs of network operation;
- control of selected parts of distribution networks according to network operation needs and preparation for implementation of needs and requirements of new entities on the electricity market (prosumers, aggregator, smart home);
- network-driven electricity storage, including storage by DSO;
- development of data and telecommunication infrastructure at high voltage level for network management options;
- Implementation of smart metering – AMM;
- use of non-frequency support services to optimise the operation of distribution networks.

Increase in the installed capacity of new decentralised sources will greatly influence the development of high-voltage and low-voltage networks. The operational needs of the distribution networks, particularly in the field of stress profile support, will require greater integration of new decentralised sources into the DS control system. Also, in accordance with the DS Operating Rules, this aspect determines the size of the decentralised source power supply to the particular HV or LV network. Networks will be gradually fitted with devices allowing bidirectional communication between the DSO and the consumers / network nodes. At the same time, a number of autonomous devices will be used, which, on the basis of data exchange, will be able to evaluate the state of the network and take appropriate steps to make the system more efficient without the intervention of the dispatcher. These include, for example, automatic reconfiguration of connection in the case of a failure, re-connection to the electricity system after a failure, etc. In this context, the use of reclosers, intelligent section breakers, HV/LV transformers with an on-load tap changer and other similar devices. These measures, together with the regulatory capabilities of decentralised sources, will make it easier to integrate more of these sources into the DS.

Distribution companies implement pilot projects to verify the security, operational reliability and clarity of distribution network management with new technologies. The use of and, primarily, the manner to manage new technological elements in distribution networks should allow:

- power balance closure of the production – consumption chain, including maximum storage at the distribution network level;
- efficient utilisation and coordination of production, consumption and storage in the DS to reduce transmission losses in networks and to minimise the reserved power at TS/110 kV transformations;
- more efficient operation and management of networks with maximum automation.

4.5.2.4 Projections of infrastructure expansion requirements in the gas sector

Role of the gas industry in general

Reducing greenhouse gas emissions in the Czech and European economy will lead to new system solutions. Therefore, in the future it is possible to anticipate the use of conversion potential of the gas sector, which would allow the storage of currently unnecessary gaseous energy. This would help reduce overload of the transmission network, strengthen energy security and reduce emissions. Typically, this would enable the production of hydrogen by electrolysis (Power2Gas technology) and possibly its methanisation into the form of synthetic methane.

The decarbonisation process and the development of new technological solutions will have an impact on the use of the gas system in the Czech Republic. It is currently not possible to precisely determine the impact of decarbonisation in the European and Czech context on the Czech gas network and the concrete information on how this network will be used with a view to minimise the transmission system operator’s sunk costs. At present, technological solutions for the gas sector decarbonisation are not developed to a large extent in both the EU and the Czech Republic, and it is therefore appropriate to keep developing this infrastructure for future use for both natural gas and new types of gases. A combination of natural gas with CCS or CCU may be considered for the storage or utilisation of carbon produced from natural gas splitting. The possible future use of gas infrastructure can therefore be crucial to meeting the energy needs of end customers.

Transmission system

The planned changes in the transmission system are updated every year in the form of the NET4GAS Ten-Year Development Plan. The plan is subject to approval by the ERO; the last proposal is from 2018 for the period 2019–2028. The investment projects of the development plan are divided into four areas: (i) connection of gas-fired power plants; (ii) output to the domestic zone; (iii) connection of new storage capacities; (iv) increase of cross-border capacities.

As part of the system development plan, the development of maximum daily consumption and output capacity in individual regional networks and regions is also analysed. The results show that the output capacities into the regional distribution systems are several times higher than the maximum daily consumption in the given regions. The exception is Northern Moravia, which is supplied with only a single line of the national transmission system. The current situation is only partly satisfactory, but the requested capacity for gas injection into the local storage facilities exceeds the technical capacity of the system and in the heating season the system would not be able to cover the demand in the region without storage facilities. Such a situation greatly complicates the possibility of connecting new large gas customers in the area. NET4GAS's response to these complications is the preparation of the Moravia pipeline project (Moravia Capacity Extension).

Table 99: *Projects whose implementation ensures appropriate transmission system capacity to meet the requirements necessary to ensure gas supply the security*[163]

Project category	Project code	Project name	State	Interconnection point of the transmission system	Approximate capacity increase (GWh/d)	Expected commissioning	PCI Status
Increasing output capacity to domestic zone	DZ-3-002	Moravia project	non-FID	X domestic	134-157[a)]	2022	NO
	DZ-3-005	Moravia Capacity Extension	non-FID	X domestic	158[a)]	2022	NO

Source: Ten-Year Plan for the Development of the Transmission System in the Czech Republic 2019–2028

Table 100: *Other projects that ensure the adequacy of the transmission system and/or affect the security of gas supply for the Czech Republic according to the N-1 formula under Regulation (EU) 2017/1938*[164]

Project category	Project code	Project name	State	Interconnection point of the transmission system	Approximate capacity increase (GWh/d)	Expected commissioning	PCI Status
Connection of power plants and heating plants	E-2-001	Connection of a power plant	non-FID	X domestic	4.93	2021	NO
Increasing output capacity to domestic zone	DZ-3-003	Connection of a directly connected customer	FID	X domestic	0.3	2019	NO
	DZ-3-004	Connection of a directly connected customer	non-FID	X domestic	0.7	2022	NO
Connection of new storage capacities	UGS-4-003	Connection of a gas storage facility	non-FID	E,X NG	extraction: 94 injection: 73	SSO: N/A[)] TSO: 2021 provided that connection agreement is	NO

[163] These projects are updated as needed in line with the update of the Ten-Year Development Plans. Their list below is therefore illustrative and in this context, it cannot be seen as binding.

[164] These projects are updated as needed in line with the update of the Ten-Year Development Plans. Their list below is therefore illustrative and in this context, it cannot be seen as binding.

						signed by 3Q/2018	
Projects increasing cross-border capacity	TRA-N-133	Bidirectional Austrian-Czech Interconnection (BACI)	non-FID	E,X CZ/AT (Reintal)	at least 201	2024	YES
	TRA-N-136	Czech-Polish Interconnection Gas Pipeline (CPI)	non-FID	E,X CZ/PL (Hať)	PL>CZ: 153 CZ>PL: 219	2022	YES
	TRA-F-752	Capacity4Gas – DE/CZ	FID	E DE/CZ (Brandov-EUGAL)	Phase 1: 665	2019	NO
					Phase 2: +454	2021	
	TRA-F-918	Capacity4Gas – CZ/SK	FID	X CZ/SK (Lanžhot)	333	2020	NO

Source: Ten-Year Plan for the Development of the Transmission System in the Czech Republic 2019–2028

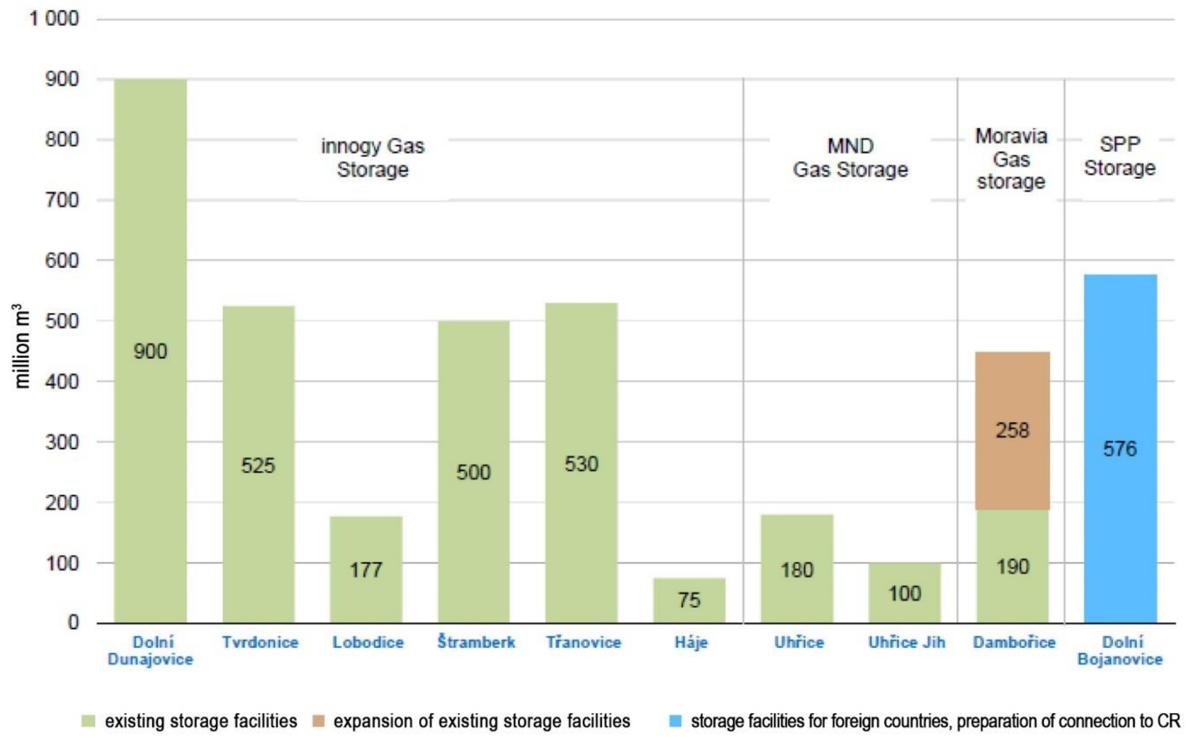
Gas storage facilities

At present, there is a certain development of Dambořice storage facility, which will be progressive. The capacity will increase from the current 190 million m^3 to 250 million m^3 in 2018, to 298 million m^3 in 2019, to an estimated 315 million m^3 in 2020 and then to the final 448 m^3; deliverability will gradually increase from 4.5 to 7.5 million m^3 per day and the injection rate from the current 3.5 to 4.5 million m^3 per day.

The increase in Dambořice storage facility parameters is the only development project of reservoirs in the Czech Republic. Furthermore, only the connection of the Dolní Bojanovice storage facility (576 million m^3) is expected in the Czech system. The implementation of other projects that were previously announced is not very realistic from the 2017 perspective: These include, for example, a cavern storage facility in Dolní Rožínka (200 million m^3), a cavern storage facility in Okrouhlá Radouň (200 to 400 million m^3), a deposit storage facility near Břeclav (200 million m^3).

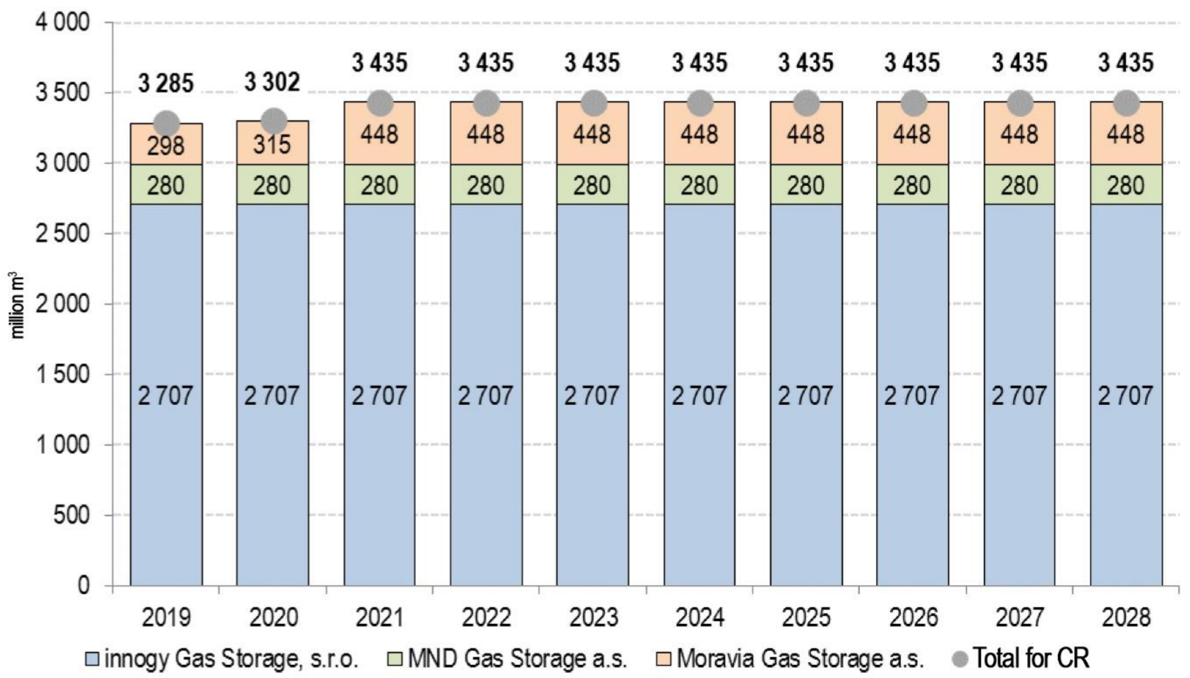
Chart 94 shows the current state and the expected development of natural gas storage. Chart 95 shows the maximum amount of stored gas in 2019–2028 for the Czech Republic according to the plans of underground storage facility operators. Chart 96 shows the expected maximum daily gas extraction output in 2019–2028 for the Czech Republic. Chart 97 then shows the expected share of natural gas storage capacity in domestic consumption based on the Ten-Year Transit Development Plan.

Chart 94: *Gas storage facilities – current state and development*



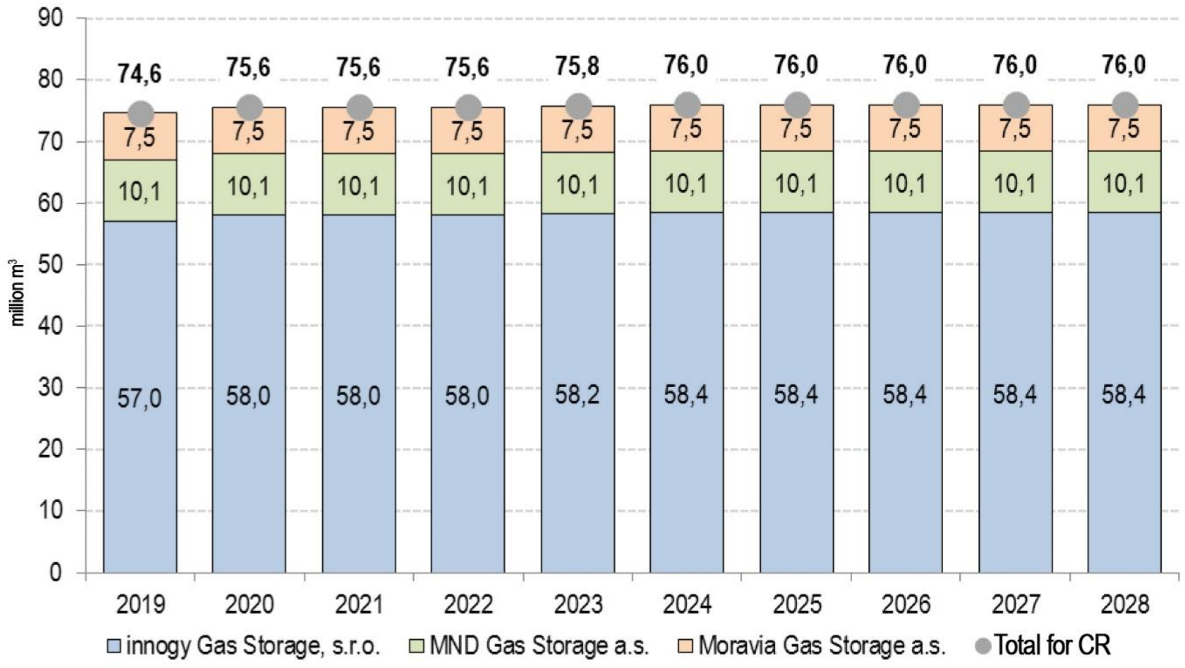
Source: Expected long-term balance between gas supply and demand (OTE, a.s., 2017)

Chart 95: *Maximum amount of stored gas in 2019–2028 for the Czech Republic*



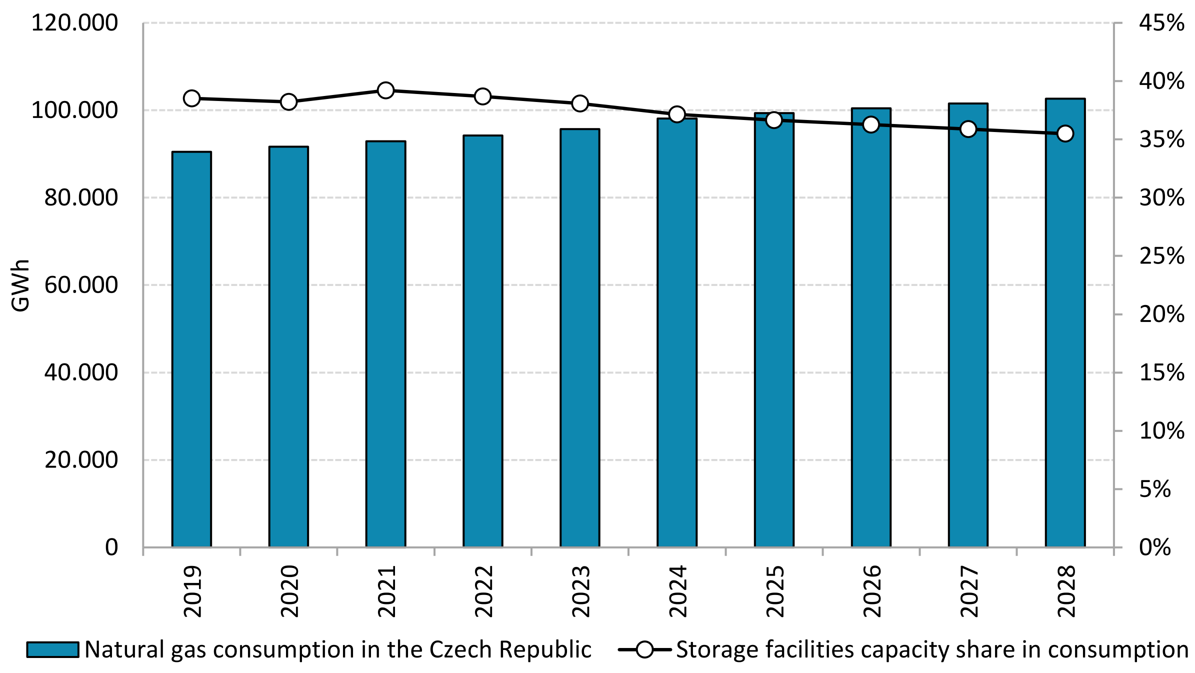
Source: Energy Regulatory Office

Chart 96: *Maximum daily gas extraction output in 2019–2028 for the Czech Republic*



Source: Energy Regulatory Office

Chart 97: *Expected share of the capacity of natural gas storage facilities in domestic consumption*



Source: Ten-Year Plan for the Development of the Transmission System in the Czech Republic 2019–2028

Distribution systems

While several large-scale development projects could be implemented on the transmission system, distribution networks are considered complete. All cities with more than 5 000 inhabitants and a total of 78 % of all municipalities have been connected to gas supply. The development of distribution is minimal in HP networks – only units of km per year. Increases are more likely to be expected in local MP and LP networks where new routes increase by approximately 100 km per year.

The State Energy Policy assumes that in the period until 2040 natural gas will allow for a gradual transition away from the use of solid fuels in final consumption and small heat supply systems, partial compensation for the loss of supply from coal-fired plants nearing the end of lifetime, and a partial departure from liquid fuels in transport. Distribution networks will play a key role in fulfilling this assumption. Therefore, it is necessary to ensure their high reliability and security of operation in accordance with European standards and their necessary development in line with the growth of final gas consumption.

In order to ensure reliability of operation, the distribution companies are currently focusing primarily on the renewal of existing networks and other facilities where they invest considerable funds. The high standard of safe operation will be maintained, in particular, by continuing technical risk mitigation, which is an integral part of the planned network restoration.

In terms of development of the distribution system, this will involve the connection of existing coal-fired sources in their transition to natural gas, the connection of new energy-efficient cogeneration and micro-cogeneration units, especially in the case of inefficient heat supply systems, connection of new CNG and LNG filling stations and creation of conditions for connecting biomethane-producing stations. It should be stressed that in many cases this will only involve the cost of building the connection because there is enough network capacity within the range of the above facilities.

Both the renewal and development of distribution networks are made more difficult by high administrative complexity, especially at the investment preparation phase. Here, the State should amend legislation to create the conditions for a major acceleration of the preparation and execution of line energy infrastructure. It will also be necessary to ensure territorial protection of areas and corridors for the regeneration and development of distribution systems through spatial planning tools.

Among the crucial aspects in the planning of investment projects is also the economic aspect of the distribution system operation, which consists in increasing the efficiency of distribution, thereby optimising the cost of network operation in relation to the distributed gas quantity, and improving network economy. Where effective, new modern trenchless technologies are used in the construction of networks to reduce already-high execution costs.

4.5.3 Electricity and gas markets, energy prices[165]

i. Current situation of electricity and gas markets, including energy prices

[165] During the finalisation of the national non-paper plans, the European Commission has published information about which information is considered relevant in this respect. This is a range of information on market concentration, liquidity, etc. Much of this information is already provided in this section, and much of this information is also monitored and reported by the relevant organisations, in particular ACER and CEER. The Czech Republic will try to complete this information in a coherent manner in the relevant progress report.

4.5.3.1 Legislative context

EU Directives and the Regulation on market liberalisation and ensuring the principle of regulated access to networks, namely Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC; Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity, are implemented through the functioning electricity market. In the liberalised gas market, this involves the implementation of Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC and Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005.

The EU's energy strategy is continually streamlined and corrected through the adoption of 'liberalisation packages'.

At the end of 2016, the European Commission (EC) has published proposals for changes that have a significant impact on the future structure and functioning of the European energy market. The set of EU legislation proposals entitled 'Clean Energy for All Europeans' is a comprehensive set of measures to promote the transition to clean energy. The aim is to make the electricity market more efficient and transparent, to increase the share of renewables in energy, to increase energy savings and to strengthen the position of consumers.

4.5.3.2 Market model

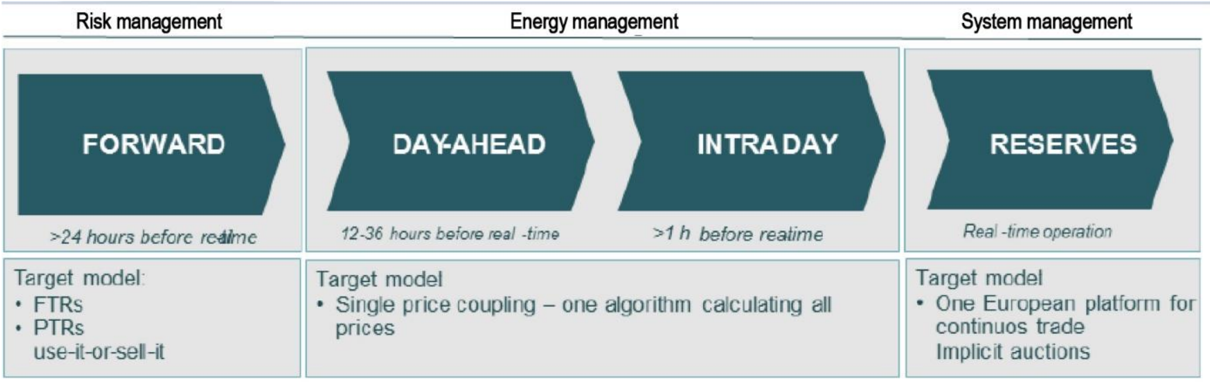
According to the energy-only market proposal, short and long-term market equilibrium should be effectively ensured by market mechanisms according to the established market framework. In practice, this means that responsibility is shared among market participants, market operator and system operator, i.e. between non-regulated and regulated entities. From the administrative perspective, it is possible to say that a significant part of the system balance planning preceding the hour of supply is left to the market participants, while ensuring the balance between electricity supply and demand at each moment of operation is entrusted to the transmission system operator. Markets are organised in consecutive time zones and their results are binding on individual participants.

Physical energy exchange takes place in real time, where equality of electricity supply and demand must apply at all times. Planning of the system operation is carried out by the transmission system operator on the basis of commercial results in the electricity markets. Based on these data, the TSO plans the system load and the required reserve power to ensure safe operation of the electricity system.

The entity's deviation from contractual values, i.e. the off-take / delivery from/to the electricity system in a quantity other than that based on the trading position of the entity, raises the need for electricity system regulation by the TSO and is therefore subject to a financial penalty.

Figure 15 then shows the time trajectory of the markets.

Figure 15: *Target model of electricity market in the EU*



Source: European Commission: Electricity Market Functioning: Current Distortions, and How to Model Their Removal

A functioning and transparent day-ahead electricity market with the follow-up intraday market is the cornerstone of the European electricity market model. The intraday gas market is dominant in the gas sector in this respect. Bids on the day-ahead or intraday market represent expectations of the market participants for the following day. Changes in weather forecasts, unexpected outages in the production base or in industry indicate that a deviation from planned consumption/production is inevitable. The deviation from planned consumption or production values is then charged in the billing, depending on the magnitude and direction of the deviation compared to the system deviation.

These deviations have to be compensated by the TSO in real time so that the European synchronous electricity system is in equilibrium at all times (this equilibrium is represented by a stable 50 Hz frequency). The regulatory energy needed to secure the system's balance is provided by the TSO by activating support services and purchasing in the balancing market for regulatory energy, which will be replaced in 2020 by the Trans European Replacement Reserves Exchange (TERRE), and in emergency cases by purchasing from abroad. Depending on the trades on the balancing market, the TSO activates support services. The costs incurred to ensure the power balance of the system are then spread among market participants based on the magnitude of their deviation.

Compared to the electricity market, where all deviations are settled financially at the price determined on the basis of the direction and magnitude of the system deviation, the 'linepack flexibility service' can be used in the gas sector to evaluate and settle deviations. The reason is the natural storage capacity of the gas system. It enables the trading position of clearing entities to oscillate within the set flexibility so that, if these limits are not exceeded, there are no additional costs of balancing these deviations. Deviations at or below these limit values do not affect the smooth and safe operation of the gas system.

4.5.3.3 Overview of the market situation in the Czech Republic

The rights and obligations of individual participants in the electricity and gas markets are laid down in Act No 458/2000, on the conditions for business and on the performance of State administration in the energy sector and amending certain acts, as amended (the Energy Act), and implementing decrees to this Act.

Electricity sector

Electricity sector is further regulated by ERO Decree No 408/2015, on electricity market rules (the 'Electricity Market Rules'), which was amended in 2017 by Implementing Decree No 127/2017 (effective from 1 June 2017).

The electricity market model in the Czech Republic is based on the principle of balancing responsibility of individual ‘balance responsible parties’.

Electricity market participants are subject to balancing responsibilities and may contractually transfer the balancing responsibility to another ‘balance responsible party’.

Under Section 22 of the Energy Act, electricity market participants are defined as:

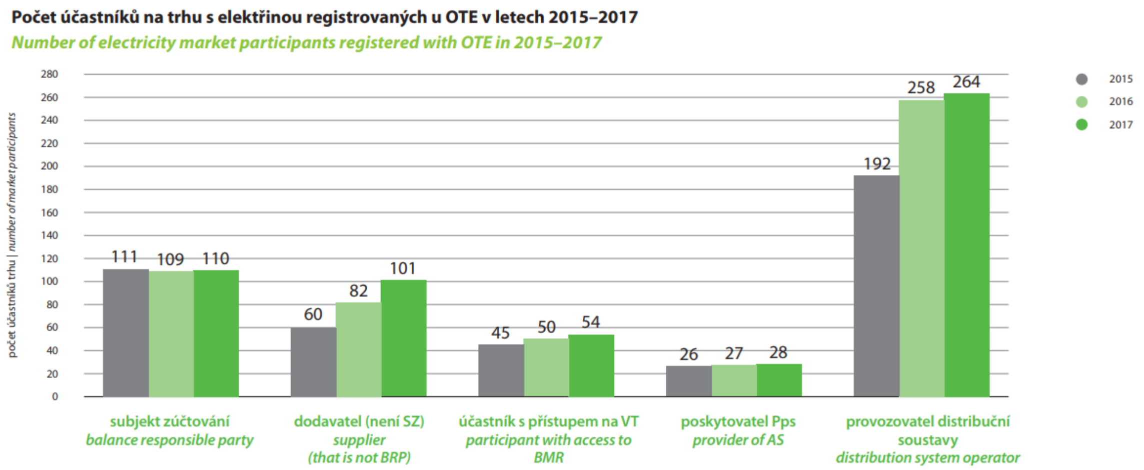
i) electricity producers;
ii) transmission system operator;
iii) distribution system operators;
iv) market operator;
v) electricity traders;
vi) customers.

The table and figure below show the number of registered electricity market participants by participant type at the end of 2017 and the year-on-year change compared to 2016.

Table 101: *Number of electricity market participants*

Počet účastníků trhu s elektřinou ke konci roku 2017
Number of electricity market participants at the end of 2017

typ účastníka | *type of participant*	počet k 31. 12. 2017 *number at 31 December 2017*	meziroční změna *year-on-year change*
subjekt zúčtování balance responsible party	110	+1
dodavatel supplier	101	+19
účastník s přístupem na VT participant with access to BMR	54	+4
poskytovatel PPS AS provider	28	+1
provozovatel distribuční soustavy distribution system operator	264	+6
provozovatel přenosové soustavy transmission system operator	1	0



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

Gas sector

The gas industry is regulated by the Energy Act and primarily by the related ERO Decree No 349/2015, on the gas market rules (the ‘Gas Market Rules’), as amended by Implementing Decree No 416/2016 (effective from 1 January 2017).

Gas market participants are:

i) gas producers;
ii) transmission system operator;
iii) distribution system operators;

iv) gas storage facility operators;
v) gas traders;
vi) customers;
vii) market operator.

The gas market model is based on the same principle where a gas market participant with the right of regulated access to the transmission system or distribution system has balancing responsibility and is the ‘balance responsible party’, or may contractually delegate its balancing responsibility to another ‘balance responsible party’.

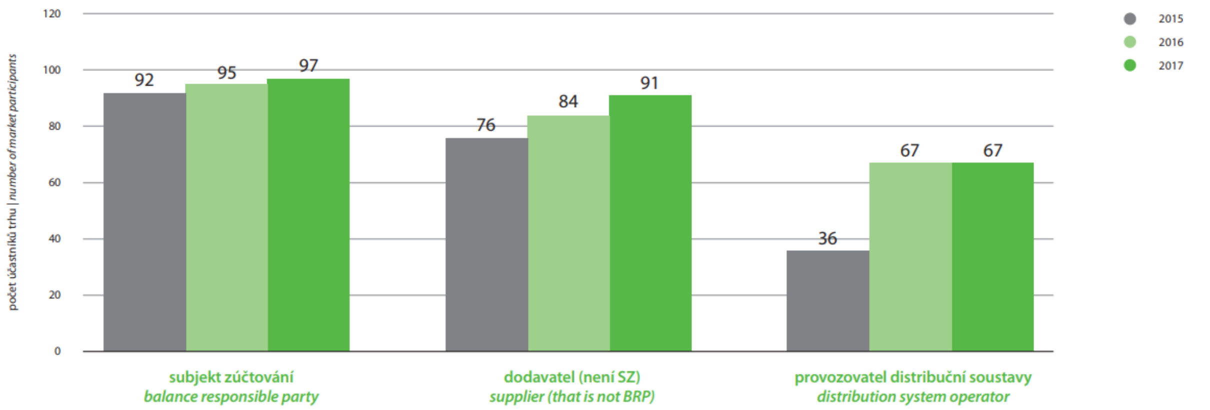
The table and figure below show the number of registered gas market participants by participant type at the end of 2017 and the year-on-year change compared to 2016.

Table 102: *Number of gas market participants*

Počet účastníků trhu s plynem ke konci roku 2017
Numbers of gas market participants at the end of 2017

typ účastníka | *type of participant*	počet k 31. 12. 2017 *at 31 December 2017*	meziroční změna *year-on-year change*
subjekt zúčtování balance responsible party	97	+2
dodavatel supplier	91	+7
provozovatel distribuční soustavy distribution system operator	67	0
provozovatel přepravní soustavy transmission system operator	1	0
provozovatel zásobníku plynu gas storage operator	4	0

Počet účastníků na trhu s plynem registrovaných u OTE v letech 2015–2017
Number of gas market participants registered with OTE in 2015–2017



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

Supplier change – electricity market

From 1 January 2006, the electricity market in the Czech Republic has been open to all customers, each of whom may choose any electricity supplier. In the Central System of the Market Operator (CS OTE), each supplier change is related to a specific off-take point (OP), i.e. the meter point where electricity is transferred and accepted between two market participants (where electricity is taken off). Any change of supplier, which replaces a trader of a vertically integrated undertaking, will require a new registration of the off-take point in the market operator’s system. This ensures the record of the metered supply and off-take of electricity by individual suppliers to the Czech system and their assignment to the relevant ‘balance responsible party’. The figure below shows an overview of the number of electricity supplier changes in recent years.

Table 103: *Number of electricity supplier changes*

Počet uskutečněných změn dodavatele elektřiny
Number of executed changes of electricity supplier

měsíc | *month*	počet uskutečněných změn dodavatele elektřiny | *number of executed changes of electricity supplier*			
	rok | *year*			
	2003–2014	2015	2016	2017
leden January	439 309	98 499	116 140	100 449
únor February	147 267	14 883	20 966	19 468
březen March	148 833	14 550	19 446	24 268
duben April	155 088	18 371	22 276	22 104
květen May	137 569	12 305	17 604	23 718
červen June	141 398	12 631	20 434	22 183
červenec July	142 200	14 989	24 046	27 449
srpen August	157 949	13 606	20 055	24 574
září September	146 148	18 010	27 852	28 022
říjen October	152 072	19 259	26 394	22 230
listopad November	166 081	18 830	23 650	21 170
prosinec December	162 762	21 823	20 673	22 212
celkem total	**2 096 676**	**277 756**	**359 536**	**357 847**
celkem 2003–2017 total 2003–2017		**3 091 815**		

Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

In 2017, there were 357 847 electricity supplier changes registered in the market operator's system. The comparison of the supplier changes in recent years shows that in 2016 the retail electricity market experienced a major revival in terms of supplier changes. As follows from the statistics on the number of supplier changes registered in the Central System of the Market Operator, consumer interest in electricity supplier change has remained almost the same in the past two years. In recent years, there has been an increase in wholesale electricity prices on energy exchanges, and a number of smaller vendors, who have so far offered cheaper electricity than large suppliers have been forced to reflect this development in their price offers. Competition in the electricity market thus constantly forces individual suppliers to improve the supply of their business products. When changing the electricity supplier, apart from the actual price of the commodity, the final consumer is interested in the accompanying services. Customers have a relatively wide variety of electricity supply offers, allowing them to find the optimal product for their needs. This is in turn reflected in an increased customer motivation to change the electricity supplier.

Supplier change – gas market

As of 1 January 2007, all final gas customers have the right to a free supplier change and thus also the possibility to influence part of their total gas supply costs. Thus, 2017 marked the seventeenth year of open gas market where every gas customer could select the supplier of their choice. The market operator's system individually registers all customer off-take points (OPs) where a supplier change replaced a trader belonging to the given network or the registration was explicitly requested by that trader. The remaining OPs (i.e. off-take points of the trader belonging to the given network) are registered in the market operator's system as a summary number. This ensures the registration of the entire metered gas supply and off-take of individual suppliers and, at the same time, their assignment to the 'balance responsible party'. The number of gas supplier changes for OPs by off-take category in individual months of 2017 is shown in the following figure.

Table 104: *Gas supplier changes for OPs by off-take category in 2017*

Počet změn dodavatele plynu u OPM podle kategorie odběru v jednotlivých měsících roku 2017
Number of changes of gas supplier at OPMs according to type of supply in specific months of 2017

měsíc | *month*	celkem | *total*	kategorie odběru | *customer supply category*			
		VO	SO	MO	DOM
leden 2017 January 2017	36 730	250	1 050	11 536	23 894
únor 2017 February 2017	13 750	2	25	1 189	12 534
březen 2017 March 2017	15 832	2	24	1 165	14 641
duben 2017 April 2017	16 404	2	11	1 311	15 080
květen 2017 May 2017	18 519	1	17	1 440	17 061
červen 2017 June 2017	15 260	2	23	1 023	14 212
červenec 2017 July 2017	16 639	1	24	1 287	15 327
srpen 2017 August 2017	14 828	3	42	1 444	13 339
září 2017 September 2017	18 069	7	61	1 867	16 134
říjen 2017 October 2017	17 495	0	28	1 378	16 089
listopad 2017 November 2017	24 614	24	26	1 449	23 115
prosinec 2017 December 2017	19 405	11	26	1 116	18 252
celkem za 2017 total in 2017	**227 545**	**305**	**1 357**	**26 205**	**199 678**

Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

The above table shows the number of OPs by off-take category with supplier change in the individual months of 2017. For the year 2017, there were 227 545 changes, which is approximately 23 500 more than in 2016 (203 950 changes). This is an almost 12 % year-on-year increase in supplier changes.

Table 105: *Gas supplier changes 2011–2016*[166]

	2011	2012	2013	2014	2015	2016
Large customer	537	979	449	330	329	617
Medium-sized customer	1 142	3 951	3 061	1 572	1 326	1 973
Small customer	26 994	27 829	29 091	23 704	21 642	28 441
Household	333 268	316 297	264 680	174 783	154 465	172 949
Total	**361 941**	**348 056**	**297 281**	**200 389**	**177 762**	**203 950**

Source: OTE, a.s.

4.5.3.4 Trading on the electricity market in the Czech Republic

In the Czech Republic, **electricity is traded** through:

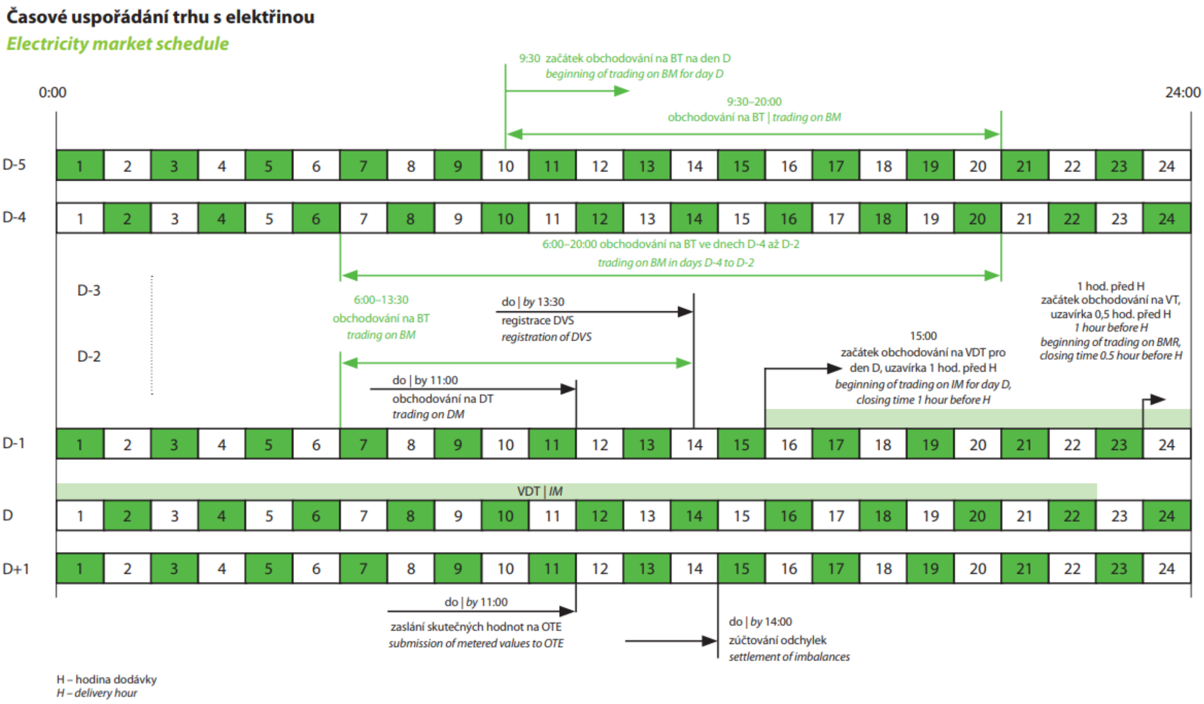
- bilateral trading;
- organised short-term market:
  - block market (BM);
  - day-ahead spot market (DM);
  - intraday market (IM).

Electricity trading in the Czech Republic also involves balancing responsibility (including trading in balancing energy and balancing energy market).

[166] In 2017, there were 227 545 supplier changes per year, in 2018 there were 263 425 supplier changes (see OTE: https://www.ote-cr.cz/cs/statistika/mesicni-zprava-plyn/zmeny-dodavatele?date=2019-01-01).

Energy legislation requires market participants – balance responsible parties – to register their bilateral transactions in the OTE system through the entity–relationship diagrams (ERDs). The time slots for individual electricity market activities are shown in the following figure.

Figure 16: *Time arrangement of electricity market*



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

Bilateral transactions

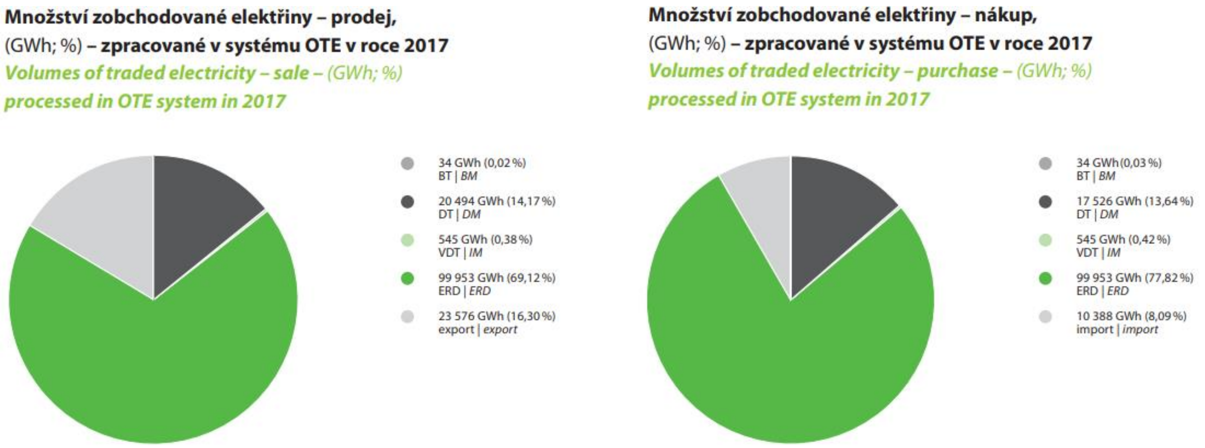
As noted above, when market participants sell or purchase electricity through bilateral transactions, they are required to register these transactions in the OTE system.

The bilateral national electricity supply transactions were submitted to the market operator for registration by the individual balance responsible parties in the form of entity–relationship diagrams (ERDs) by 13:30 hours on the day preceding the day on which the supply was to take place; this was also the closing time for the bilateral transaction. The OTE system registers only the amount of bilateral trade electricity, without its price. The financial settlement of these transactions takes place directly between trading parties outside the OTE system; OTE is not the central counterpart of these trades. The registration of these entity–relationship diagrams is, among other things, subject to the condition of the financial security of the balance responsible party given the possible imbalances of the balance responsible party that these transactions might cause.

By means of bilateral transactions, OTE system registers trades concluded through both classical bilateral contracts as well as brokerage platform trades, forward exchange trades, etc. In 2017, OTE system registered 99.95 TWh in the form of national entity–relationship diagrams. The following figure shows the amount of electricity traded and registered in OTE system in 2017.

In addition to the above, there are also electricity trades with financial settlement on commodity exchanges, which serve to hedge long-term risks against the rise/fall in electricity prices.

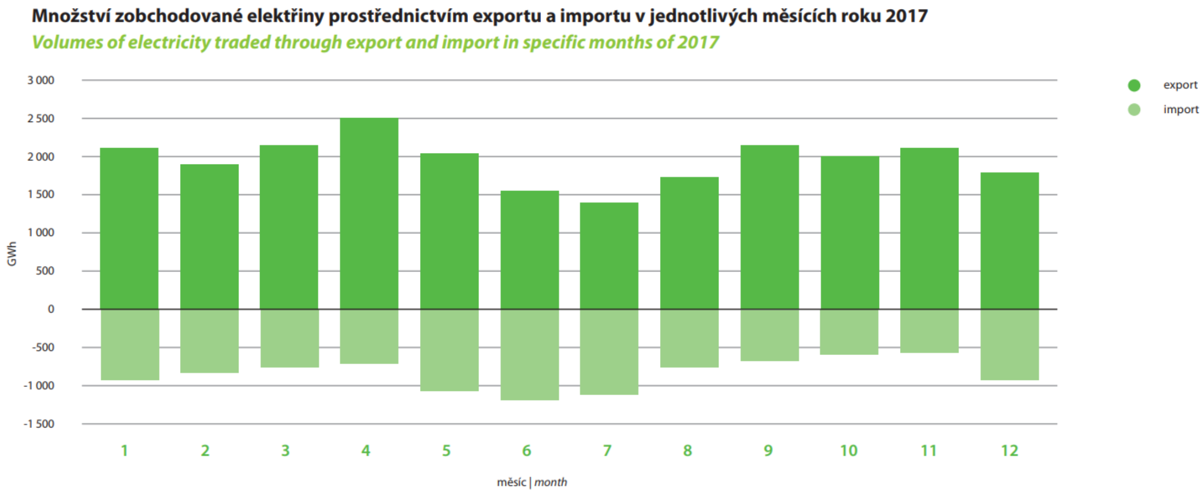
Chart 98: *Amount of electricity traded (purchase and sale) registered in OTE system in 2017*



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

The value of contractually concluded cross-border export trades amounted to 23 576 GWh in 2017; imports amounted to 10 388 GWh in 2017. The breakdown of these transactions in individual months of 2017 is shown in the following figure.

Chart 99: *Amount of electricity traded through export and import in 2017*



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

Organised short-term electricity market

The organised short-term market in the Czech Republic is an important form of electricity trading. Thanks to a substantial increase in liquidity in recent years, the energy market participants have a reliable guarantee that they can buy or sell the relevant commodity in response to the current situation in the system or in their production or customer's portfolio, even shortly before delivery (day, hour). The aim and purpose of the short-term market is not only to reduce the risk of imbalance, but also to increase the security and reliability of supplies. The essential importance of liquid short-term markets is also pricing, when the prices of transactions on these markets are used as a basis for the settlement of financial instruments traded on commodity exchanges or serve as a guideline for the prices of other contracts between the supplier and the customer.

Table 106: *Comparison of the basic parameters of individual markets*

	elektřina | *electricity*				plyn | *gas*
	BT | *BM*	DT | *DM*	VDT | *IM*	VT | *BMR*	VDT | *IM*
forma trhu type of market	kontinuální párování continuous matching	denní aukce daily auction	kontinuální párování continuous matching	kontinuální párování continuous matching	kontinuální párování continuous matching
obchodovaná perioda traded period	12 nebo 24 hod. 12 or 24 hours	1 hod. 1 hour	1 hod. 1 hour	1 hod. 1 hour	**24 hod. **24 hours
minimální možné obchodovatelné množství minimum tradable volume	1 MW × 12, nebo 24 hod. 1 MW × 12 or 24 hours	1 MWh	1 MWh	1 MWh	0,1 MWh
maximální možné obchodovatelné množství maximum tradable volume	*50 MW × 12, nebo 24 hod. *50 MW × 12 or 24 hours	99 999 MWh	99 999 MWh	99 999 MWh	99 999,9 MWh
nejmenší možný inkrement množství smallest quantity increment	1 MW × 12, nebo 24 hod. 1 MW × 12 or 24 hours	0,1 MWh	0,1 MWh	0,1 MWh	0,1 MWh
měna obchodování trading currency	Kč CZK	EUR	EUR	Kč CZK	EUR
minimální možná cena minimum price	1 Kč/MWh CZK 1/MWh	-500 EUR/MWh	-3 500 EUR/MWh	-99 999 Kč/MWh CZK -99,999/MWh	0,01 EUR/MWh
maximální možná cena maximum price	9 999 Kč/MWh CZK 9,999/MWh	***3 000 EUR/MWh	3 500 EUR/MWh	99 999 Kč/MWh CZK 99,999/MWh	4 000 EUR/MWh
nejmenší možný inkrement ceny smallest price increment	1 Kč/MWh CZK 1/MWh	0,01 EUR/MWh	0,01 EUR/MWh	1 Kč/MWh CZK 1/MWh	0,01 EUR/MWh
možnost nulové ceny zero price option	NE NO	ANO YES	ANO YES	NE NO	NE NO
čas otevření trhu market opens at	9:30 D-5	neomezené unlimited	15:00 D-1	H-1:00	10:30 D-1
čas uzavření trhu market closes at	13:30 D-1	11:00 D-1	H-1:00	H-0:30	5:00 D+1

* V rámci jedné nabídky | *Within one bid.*
** Plynárenský den od 6:00 do 6:00 hod. | *Gas day from 6:00 to 6:00.*
*** Druhá aukce je vyhlašována při dosažení či překročení dolní meze ceny -150 EUR/MWh nebo horní meze ceny 500 EUR/MWh.
Second auction is announced whenever the bottom price limit of EUR -150/MWh or the top price limit of EUR +500/MWh are reached or exceeded.

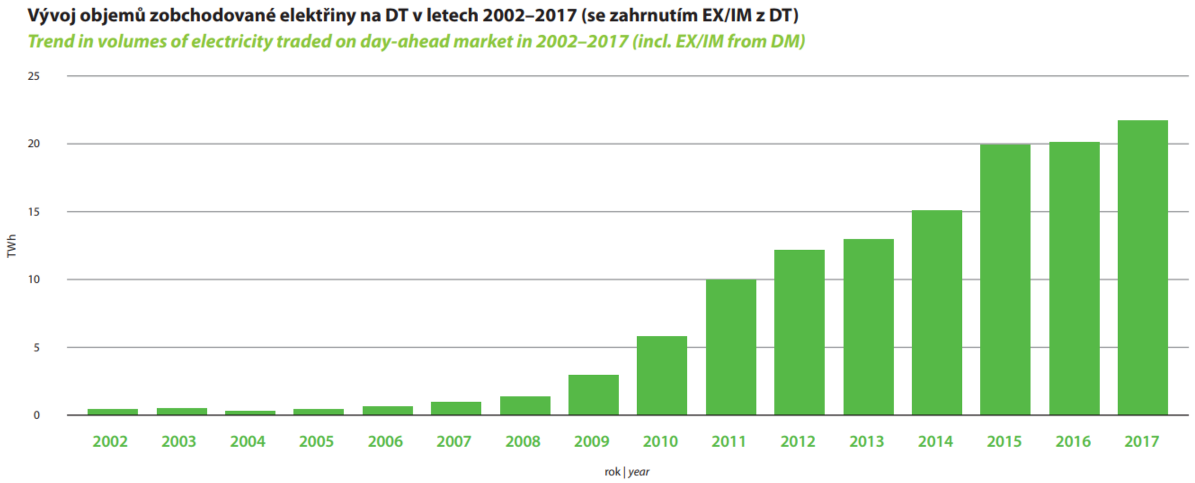
Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

Day-ahead electricity market

The day-ahead electricity market in the Czech Republic is based on the principle of the implicit allocation of cross-border capacities (MC) and is operated jointly with the Slovak, Hungarian and Romanian markets under the name of 4M MC. These four day-ahead markets are coupled by PCR, which is also implemented in the interconnected MRC region.

The day-ahead market of the Czech Republic operated within 4M MC on the MC principle, market participants in the CZ, SK, HU and RO therefore satisfy their electricity purchase or sale requirements for the next day in all four market areas without the need for explicit transmission capacity. The development of volumes of electricity traded on day-ahead market is illustrated in the following figure.

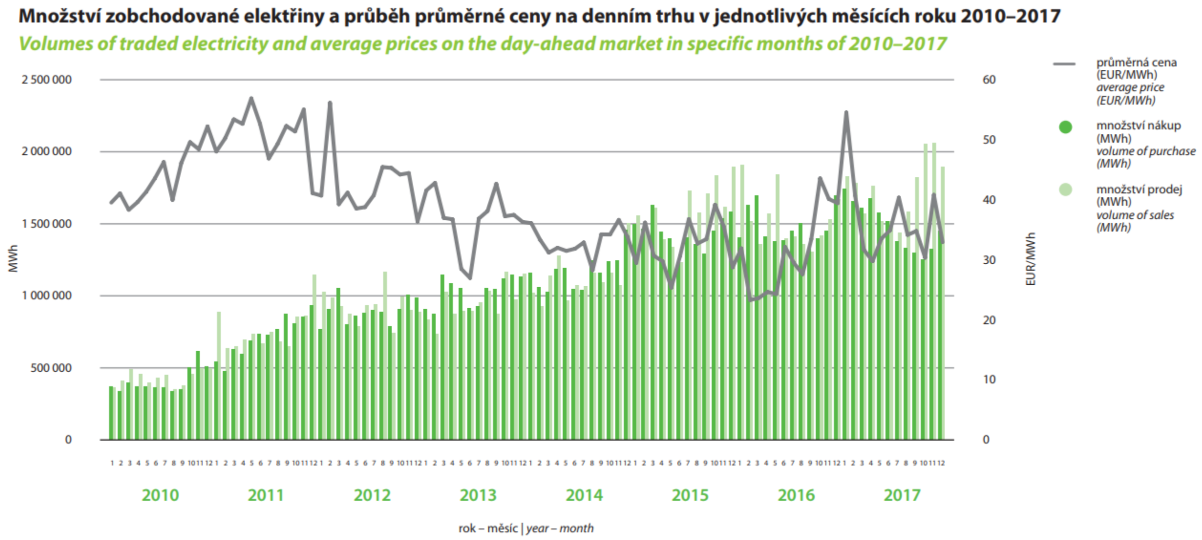
Chart 100: *Development of volumes of electricity traded on day-ahead market in 2002–2017*



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

The volume of electricity trades concluded on the OTE day-ahead market in 2017 reached a new annual maximum of 21.75 TWh. The total volume traded on day-ahead market in the Czech Republic in 2017 represented about 1/3 of domestic net consumption. The average price of trades on OTE day-ahead market reached EUR 36.46/MWh in 2017.

Chart 101: *Volume of electricity traded and the average price on the day-ahead market in 2017*

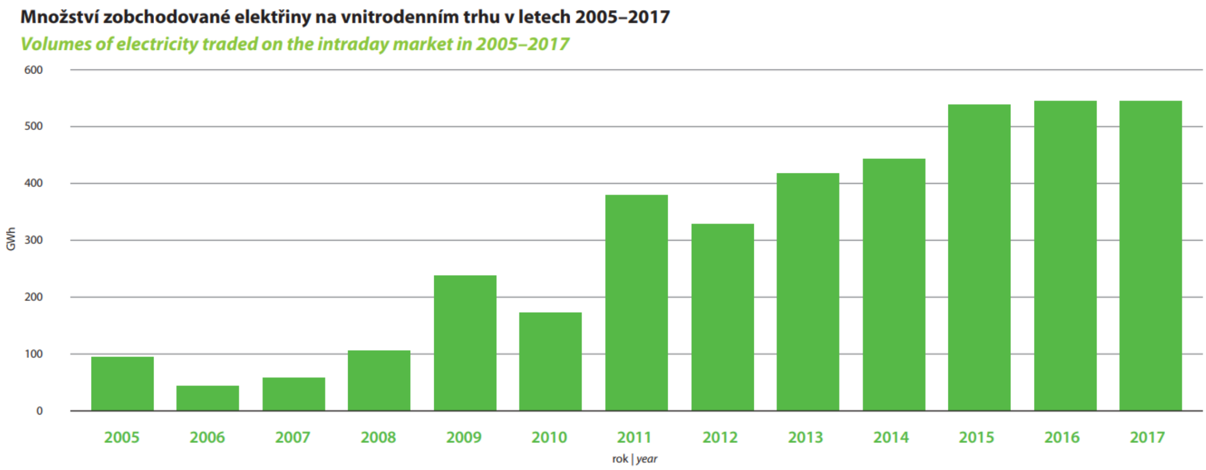


Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

Intraday electricity market

Through an organised intraday electricity market, traders anonymously offer or demand electricity on a trading day, up to a limit of 60 minutes prior to delivery or off-take. Intraday trading opens at 15:00 for all trading hours of the following day. The volume of trades concluded in 2017 on the intraday electricity market reached almost 545 GWh.

Chart 102: *Volume of electricity traded on intraday market in 2005–2017*

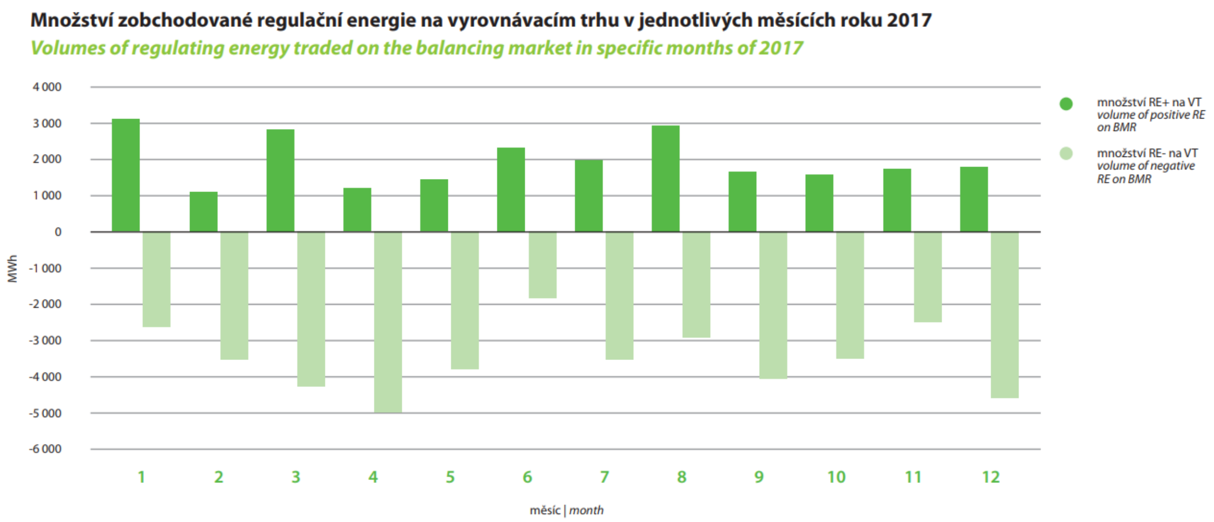


Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

Balancing energy market

A specific trading venue just before the time of delivery or off-take is the balancing energy market. In this market, participants may, up to 30 minutes before the trading hour, offer or demand electricity only in the form of positive or negative balancing energy, where in both cases the transmission system operator is the counterpart of that trade. It is therefore the last possibility for market participants to adjust their business position. Balancing energy purchased in this market helps the transmission system operator to effectively control and equalise the power balance of the electricity system. Several factors influence the liquidity of the balancing energy market. The primary effort of the transmission system operator is to reduce the costs of support services. Market participants then create pressure by imbalance prices, which forces the balance responsible party to exercise the option of minimising its imbalance at a time close to the trading hour. This market is expected to be gradually phased out with the implementation of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing.

Chart 103: *Volume of balancing energy traded on the balancing market in 2017*



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

4.5.3.5 Trading on the gas market in the Czech Republic

The gas market model is based on the principle of balancing responsibility where a gas market participant with the right of regulated access to the transmission system or distribution system has balancing responsibility and is the ‘balance responsible party’, or may contractually delegate its balancing responsibility to another ‘balance responsible party’. The business unit is one gas day starting at 6:00 o’clock on a given calendar day and ending at 6:00 o’clock of the next calendar day.

In the Czech Republic, **gas is traded** through:

- bilateral trading;
- organised short-term market;
  - intraday market (IM);
  - market with unused flexibility.

Electricity trading in the Czech Republic also involves the balancing responsibility.

In addition to the above, there are also gas trades with financial settlement on commodity exchanges, which serve especially to hedge long-term risks against the rise/fall in gas prices.

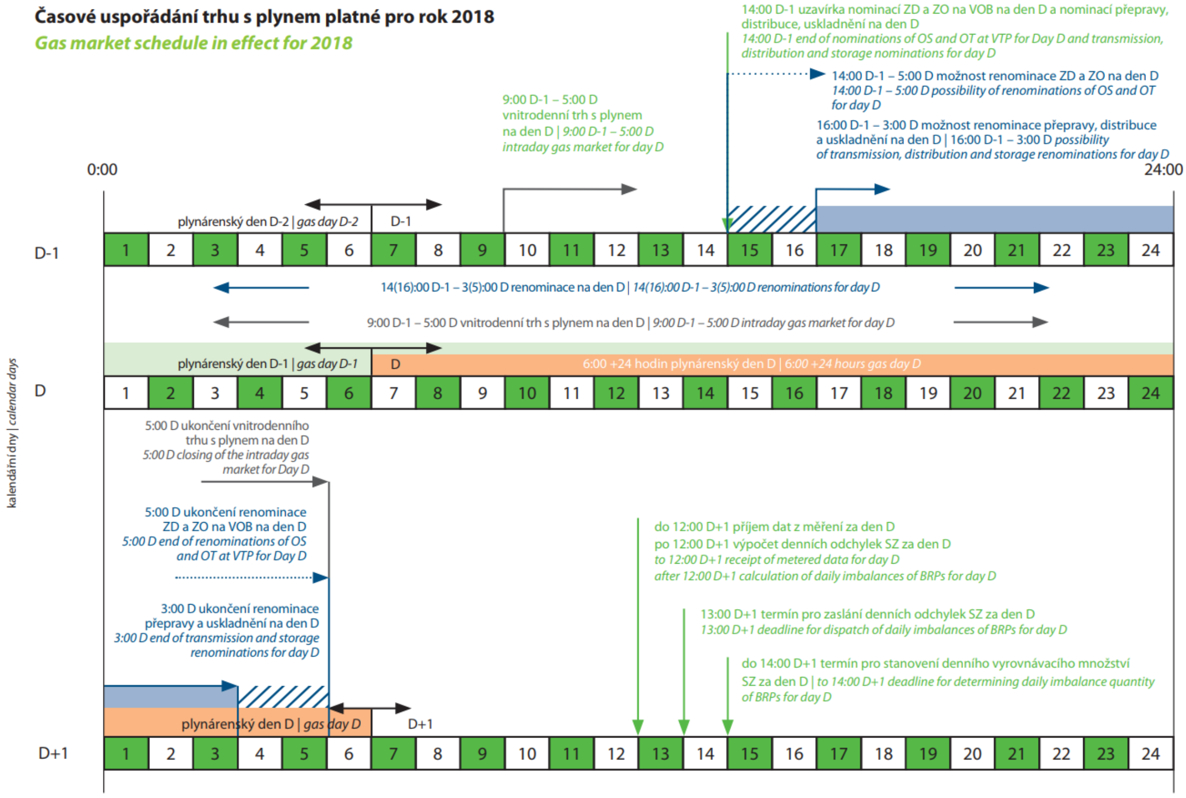
The trades and transmitted quantities of gas are registered by sending 'nominations'.

Nominations are divided into:

- transmission nomination – a command for the transmission of gas at the entry and exit points of the border transfer stations (BTS), i.e. the export and import of gas from/to the transmission system in the Czech Republic, an order for the transmission of gas at the input or output points of virtual gas storage facilities for the transmission of gas to the customer off-take point directly connected to the transmission system with a reserved capacity of at least 5 000 MWh per day;
- storage nomination – an order to inject or deliver the said amount of gas to or from the virtual gas storage facility;
- distribution nomination – an order to distribute gas at the entry points of gas production plants and at the entry and exit points of cross-border gas pipelines (CGP), i.e. export and import of gas from/to a given distribution system in the Czech Republic;
- delivery nomination (DN) and the off-take nomination (ON) – transactions that are carried out via VTP between individual traders (gas transfer at VTP); what is nominated at VTP must be delivered / off-taken.

All nominations are registered by the balance responsible party with the market operator or the relevant operators by 14:00 hours of the day preceding the commencement of the gas delivery day. After this time, transmission nominations are matched with neighbouring transmission system operators, distribution nominations are matched with neighbouring distribution or transmission system operators, storage nominations are matched between the transmission system operator and the gas storage facility operator, and virtual trade point nominations are matched between the individual balance responsible parties. However, market participants have other options to adjust their trade position. Until almost the end of the 'D' gas day, the balance responsible party may adjust its position by sending a renomination or a corrective nomination of its obligations. Quantity is nominated as one-off nomination for the entire gas day. The time arrangement of the gas market is shown in the figure below.

Figure 17: *Gas market time arrangement valid for 2018*



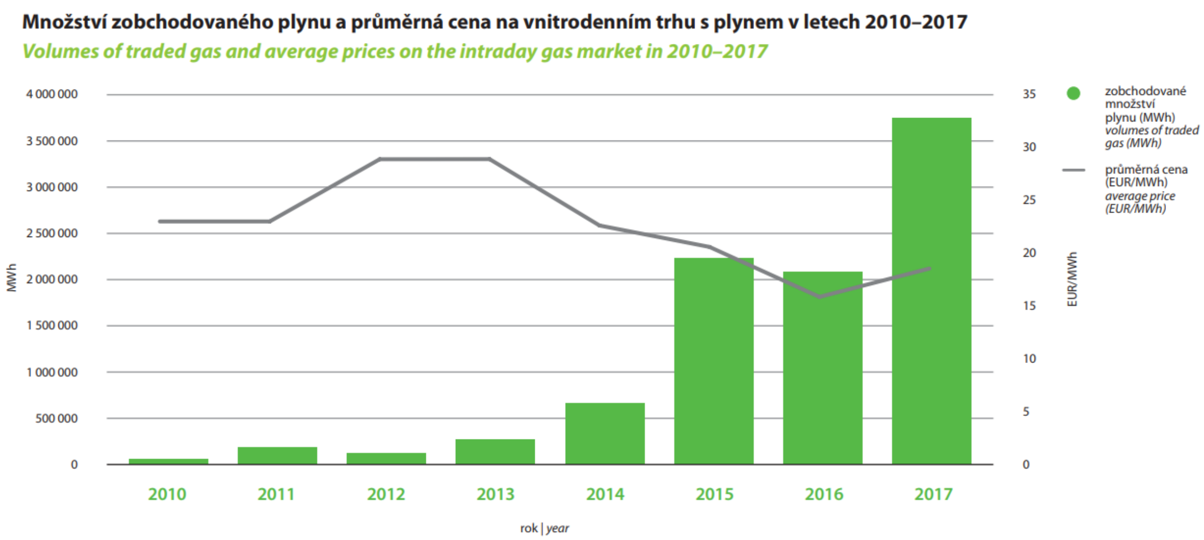
Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

Organised short-term gas market

The short-term gas market in the Czech Republic is represented by the intraday gas market. It allows market participants to continue trading even during the gas day. The intraday gas market for the given delivery day opens at 9:00 o'clock on the day preceding the gas day in which the delivery occurs and ends one hour before the end of the gas day when the delivery occurs.

In 2017, the intraday gas market saw trades totalling 3 747 GWh of gas. The average price of gas traded in the intraday market in 2017 was EUR 18.02/MWh.

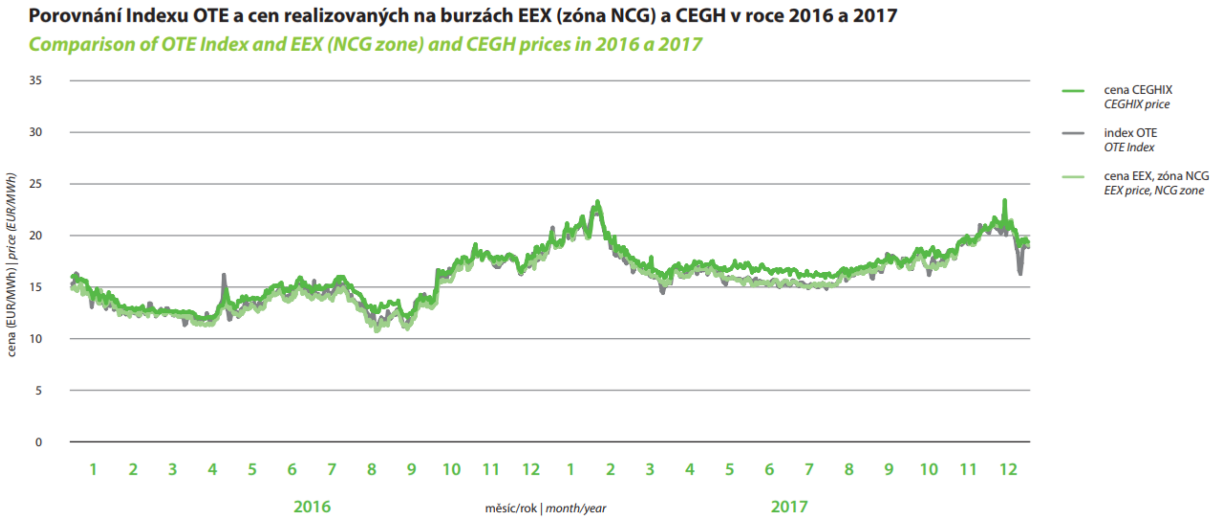
Chart 104: *Amount of gas traded and average prices on the intraday gas market in 2010–2017*



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

The OTE Index is determined on the basis of prices obtained on the intraday gas market organised by the market operator. The course of the OTE Index and the prices realised on EEX exchange in Germany (Daily Reference Price for the NCG zone) and the CEGH exchange in Austria during 2016 and 2017 are shown in the figure below.

Chart 105: *Comparison of the OTE Index and prices realised on the EEX and CEGH exchanges in 2016 and 2017*



Source: Annual Report on the Electricity and Gas Markets in 2017 (OTE, a.s.)

The high correlation of gas prices in the OTE market and the EEX exchange proves the sufficient cross-border capacities and maturity of the Czech short-term organised gas market.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

The gradual European integration of electricity markets extends the possibilities for mutual trade and makes it possible to make better use of the potential of electricity production in individual countries. At the same time, however, the interconnection leads to the natural interaction of the individual national energy systems.

Over the last few years, there were ongoing preparations, within spot trading in electricity, for the coupling of the regional project 4M MC to MRC on the basis of the implicit flow-based allocation of cross-border capacities within CORE, established by the CACM Regulation and consisting of 13 EU Member States[167]. The PCR solution is already being used in price-coupled markets in Europe and its further use can therefore be seen as a basis for a future pan-European solution.

Concerning intraday trading in electricity, 2018 saw the conclusion of the implementation of a platform for the single intraday continuous trading with the implicit allocation of cross-border capacities within the Cross-Border Intraday Coupling (XBID) project, which was established as the technical solution for the single intraday coupling in Europe under the MCO Plan. The XBID project responds to market needs by creating a more transparent and efficient continuous trading environment that enables market

167 France, Germany, Belgium, the Netherlands, Austria, Czech Republic, Slovakia, Poland, Hungary, Slovenia, Croatia, Luxembourg and Romania.

participants to easily trade their intraday positions across EU markets without the need for explicit allocation of transmission capacity.

Within the creation of a single gas market in the EU, the integration of gas markets lags far behind the integration of electricity markets. In addition to infrastructure projects that are geared towards facilitating the reservation of capacities for gas traders or making areas that are not directly coupled accessible for trading (e.g. between the Czech Republic and Austria through TRU[168]), no integration projects are currently under discussion with the aim of coupling organised gas markets in our region.

In this context, the Czech Republic is working on completing the internal energy market, specifically the internal gas market, in particular by removing infrastructure bottlenecks and market barriers between the Czech Republic and its neighbours, namely Poland and Austria.

4.6 Dimension 'Research, innovation and competitiveness'

i. Current situation of the low-carbon-technologies sector and, to the extent possible, its position on the global market (that analysis is to be carried out at Union or global level)

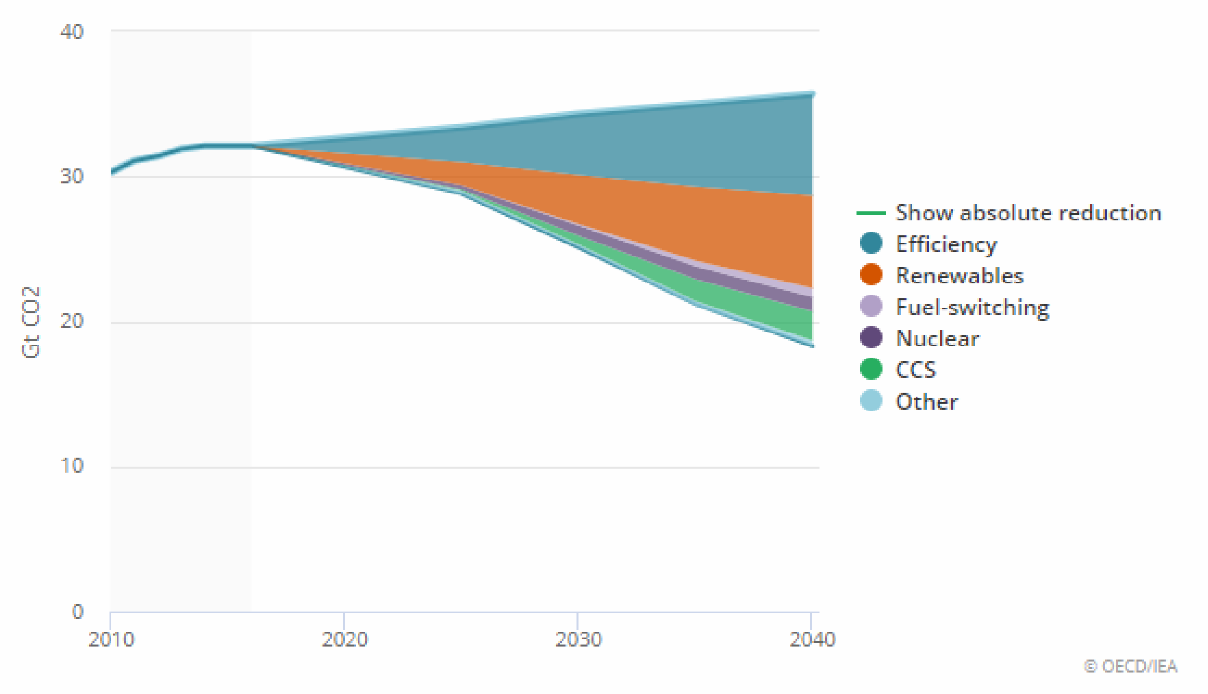
In the Czech Republic's view, the current state of the low-carbon technologies sector and its position on the global market goes beyond the scope of this document and it is not effective to carry out this assessment in isolation at Member State level.

The Czech Republic, however, carefully monitors the state of low-carbon technologies in order to be able to respond to this development. Since 2001, the Czech Republic has been a member of the International Energy Agency (IEA), which also addresses the state of low-carbon technologies and monitors their development with a view to achieving long-term targets in the field of global greenhouse gas emission reductions. This information is included especially in the 'Energy Technology Perspectives (ETP)' and 'Tracking Clean Energy Progress (TCEP)'.

Within TCEP, the International Energy Agency monitors the necessary additional CO_2 reduction to achieve the Sustainable Development Scenario, compared to the New Policies Scenario, which breaks down the necessary reduction to individual low-emission technologies / technologies, as well as demand-side measures (in particular increase in energy efficiency).

[168] For more information on this service, see NET4GAS website at: https://www.net4gas.cz/cz/media/tiskove-zpravy/zpravy/cesky-rakousky-trh-plynem-se-propojuji-diky-nove-sluzbe-trading-region-upgrade-tru.html

Chart 106: *Additional CO_2 reduction in the SDS compared to NPS*



Source: Tracking Clean Energy Progress (International Energy Agency)

Within TCEP, the IEA evaluates the contribution of individual technologies to achieving the objectives defined in the SPS. Altogether, there are a total of 30 low-carbon technologies (or procedures, these are not just technologies as such), which are ranked in five categories, namely (i) power; (ii) buildings; (iii) transport; (iv) industry and (v) energy integration. Renewable sources are further subdivided into a total of eight sub-categories (i.e. a total of 37 categories).

According to the latest available assessment, in 2017 only four categories were 'on track', namely, (i) solar PV; (ii) electric vehicles; (iii) lighting and (iv) data centres and networks. 22 technologies were labelled as 'more efforts needed' and 11 technologies were labelled 'off track'.[169]

ii. Current level of public and, where available, private research and innovation spending on low-carbon-technologies, current number of patents, and current number of researchers

It is not possible to precisely determine the exact level of public funding of research and innovation for low-carbon technologies. The 'low-carbon technologies' category is not defined and in place in the Czech Republic for the purposes of statistical surveys. The situation is further complicated by the fact that basic research does not have to be clearly assigned to low-carbon technology. Table 107 shows State budget expenditure for research, development and innovation in the period 2016–2019, when years 2016 and 2017 are actual figures, and years 2018 and 2019 are figures approved within the State budget. On the basis of the National Priorities of Oriented Research, 18 % of the total public expenditure should be allocated to Sustainable Energy and Material Resources (Table 40).

Table 107: *State budget expenditure on research, development and innovation by 2019 (in CZK)*

	2016 actual	2017 actual	State budget 2018	State budget 2019

[169] For more information on the methodology and overall evaluation process, see https://www.iea.org/tcep/.

Office of the Government of the Czech Republic	62 486 218	76 370 186	79 403 981	65 506 346
Ministry of Foreign Affairs	0	9 986 613	25 152 000	25 336 000
Ministry of Defence	397 053 604	483 263 504	436 040 000	414 486 150
Ministry of Labour and Social Affairs		9 977 391	60 000 000	80 000 000
Ministry of the Interior	364 055 447	640 874 187	608 321 000	798 822 402
Ministry of the Environment	0	153 231 534	248 379 554	257 600 199
Grant Agency of the Czech Republic	3 927 443 928	4 107 793 016	4 333 066 000	4 390 784 794
Ministry of Industry and Trade	640 374 977	1 927 225 968	2 993 928 152	2 924 604 421
Ministry of Transport	0	15 332 946	50 000 000	50 000 000
Ministry of Agriculture	858 044 769	875 396 428	884 726 000	982 682 952
Ministry of Education, Youth, and Sports	15 296 759 600	16 690 662 807	18 751 885 565	19 734 339 959
Ministry of Culture	375 571 758	388 182 239	521 382 000	487 296 138
Ministry of Health	1 190 098 792	1 588 405 901	1 557 640 512	1 552 100 648
Ministry of Justice	7 890 470	7 050 373	0	0
Institute for the Study of Totalitarian Regimes	2 931 128	4 286 063	0	0
Academy of Sciences of the Czech Republic	4 777 930 160	5 231 659 779	5 684 692 000	6 022 421 793
Technological Agency of the Czech Republic	2 823 387 117	2 923 837 660	4 335 548 383	4 274 646 444
Total	30 724 027 967	35 133 536 594	40 570 165 147	42 060 628 246

Source: State budget expenditure on research, development and innovation in 2019

Information on the extent of public funds directed to the energy sector can be obtained using categories of disciplines according to the classification of the Information System of Research, Development and Innovation[170]. For the energy sector, the relevant categories are JE (non-nuclear energy, energy consumption and use) and JF (nuclear energy). Table 108 provides information about support for JE and JF. It shows that between 2009 and 2015, almost CZK 3.6 billion was allocated in selected public procurement procedures for projects with JE and JF as the main field; the total costs amounted to approximately CZK 5.2 billion. For projects with JE and JF as the secondary field, public support amounted to approximately CZK 1.1 billion with the total cost of over CZK 1.5 billion. Table 109 shows the approved targeted support and total costs for 2016–2020 (projects approved before September 2016).

In 2018–2025, the energy sector should be allocated public funds for applied research of at least CZK 4 billion from state budged and CZK 5.7 billion of total funds respectively, which corresponds to the approved funds under the THÉTA programme (assuming that all allocated funds are disbursed). Of

[170] see www.rvvi.cz – Nomenclature – Fields classification

course, energy research expenditure is not limited to this programme and will therefore very likely be higher, but this cannot be precisely quantified.

Table 108: *Realised targeted support and total costs in JE, JF, CZK thousands (2009–2015)*

		2009	2010	2011	2012	2013	2014	2015
JE, JF as main field	Grant	314 843	428 187	586 492	726 330	606 529	489 885	436 152
	Costs	430 067	584 891	810 218	1 039 751	886 811	729 510	672 983
JE, JF as secondary field	Grant	86 743	117 971	177 803	195 609	187 285	178 226	153 883
	Costs	114 850	156 195	235 471	265 468	269 272	267 247	237 796

Source: Underlying study of THÉTA (TA CR, September 2016)

Table 109: *Approved targeted support and total costs in JE, JF, CZK thousands (2016–2020)*

		2016	2017	2018	2019	2020
JE, JF as main field	Grant	348 428	267 920	151 052	114 173	568
	Costs	540 405	407 460	218 280	164 684	887
JE, JF as secondary field	Grant	90 320	69 258	43 900	27 071	469
	Costs	138 903	107 366	67 016	42 403	629

Source: Underlying study of THÉTA (TA CR, September 2016)

Table 110 shows the basic science and research indicators. In addition, it shows the development of workers in science and research (in science and research centres). However, not all of these people carry out scientific work. Table 111 shows the number of science and technology specialists. Table 112 then describes the development of patens, in a breakdown to national patents and European patents valid for the Czech Republic. However, it should be emphasised that this information is not specific to energy and climate or low-carbon technologies, but it is an aggregate for the whole of the Czech Republic and for all science and research sectors. Detailed data specifically on energy and climate are not available.

Table 110: *Basic science and research indicators (number; CZK million)*

	2005	2009	2010	2011	2012	2013	2014	2015	2016	2017
R&D centres (number)	2 017	2 345	2 587	2 720	2 778	2 768	2 840	2 870	2 830	3 113
R&D workers (number)	43 370	50 961	52 290	55 697	60 329	61 976	64 443	66 433	65 783	69 718
R&D expenditure (CZK million)	38 146	50 875	52 974	62 753	72 360	77 853	85 104	88 663	80 109	90 377

Source: Statistical Yearbook of the Czech Republic (2018), Chapter 23. Science, research and innovation[171]

Table 111: *Science and technology specialists (thousands of persons)*

	2014	2015	2016	2017

[171] Available at: https://www.czso.cz/csu/czso/23-veda-vyzkum-a-inovace

Natural sciences, mathematics and statistics	8.0	11.9	9.7	9.7
Biological and related sectors	13.3	12.0	16.1	21.0
Production, construction and related sectors	56.7	64.2	67.5	72.8
Electrical engineering, electronics and electronic communications	12.2	13.1	17.6	20.0
Architecture, spatial planning, design and related sectors	17.0	16.9	19.1	21.0
Other	4.4	3.1	3.0	0.0
Total	111.6	121.3	133.1	144.5

Source: Statistical Yearbook of the Czech Republic (2018), Chapter 23. Science, research and innovation

Table 112: *Development of patents (number)*

Indicator	2010	2014	2015	2016	2017
National patents	911	688	749	781	669
European patents validated for the Czech Republic	3 693	4 543	4 827	5 961	6 901
Total	**4 604**	**5 231**	**5 575**	**6 742**	**7 570**

Source: Statistical Yearbook of the Czech Republic (2018), Chapter 23. Science, research and innovation

Further comprehensive information is available in the document ‘Analysis of the state of research, development and innovation in the Czech Republic and their international comparison’, which is prepared every year. The last available document is for 2017[172].

iii. Breakdown of current price elements that make up the main three price components (energy, network, taxes/levies)

Breakdown of current price elements

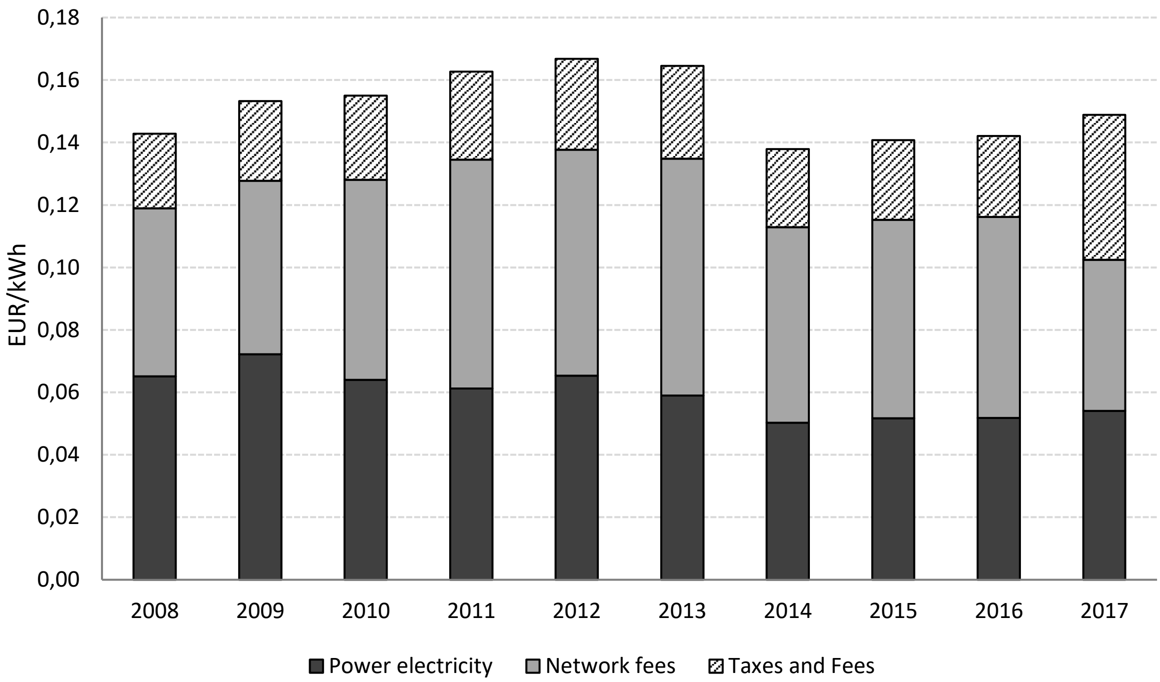
It should be noted that the ‘assignment’ of this subchapter is relatively unclear, as it is not stated what commodities/fuels these prices should concern. According to the requirement for breakdown to price elements, including the network element, it can be deduced that this is the requirement for network commodities, i.e. electricity and natural gas (the prices of heat are very region-dependent). Therefore, below is information on the prices of electricity, gas, and black coal. The Czech Republic also monitors the prices of other fuels/commodities, such as car gasoline and diesel fuel, LPG, light and fuel oil, etc.

[172] The document is available at: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=799467

Electricity prices

Electricity prices (as well as prices of natural gas) are available in the publicly available EUROSTAT databases (underlying data are sent by the Czech Statistical Office). Below is information on electricity price developments for the household and non-household sectors. Detailed information is available from EUROSTAT.[173] Prices are also available in different consumption ranges; the prices may vary between the ranges. Below are only selected ranges. Chart 107 shows the development of the electricity price for the household sector for the annual consumption of 2.5–4.9 MWh in EUR/kWh, broken down into individual price components, i.e. the non-regulated electricity, network charges and taxes and charges. Chart 108 shows a comparison of prices of the Czech Republic with neighbouring countries and Hungary in purchasing power parity. Chart 109 shows the price of electricity broken down into individual elements for non-household sectors for the selected consumption range. Chart 110 shows a price comparison for the non-household sector.

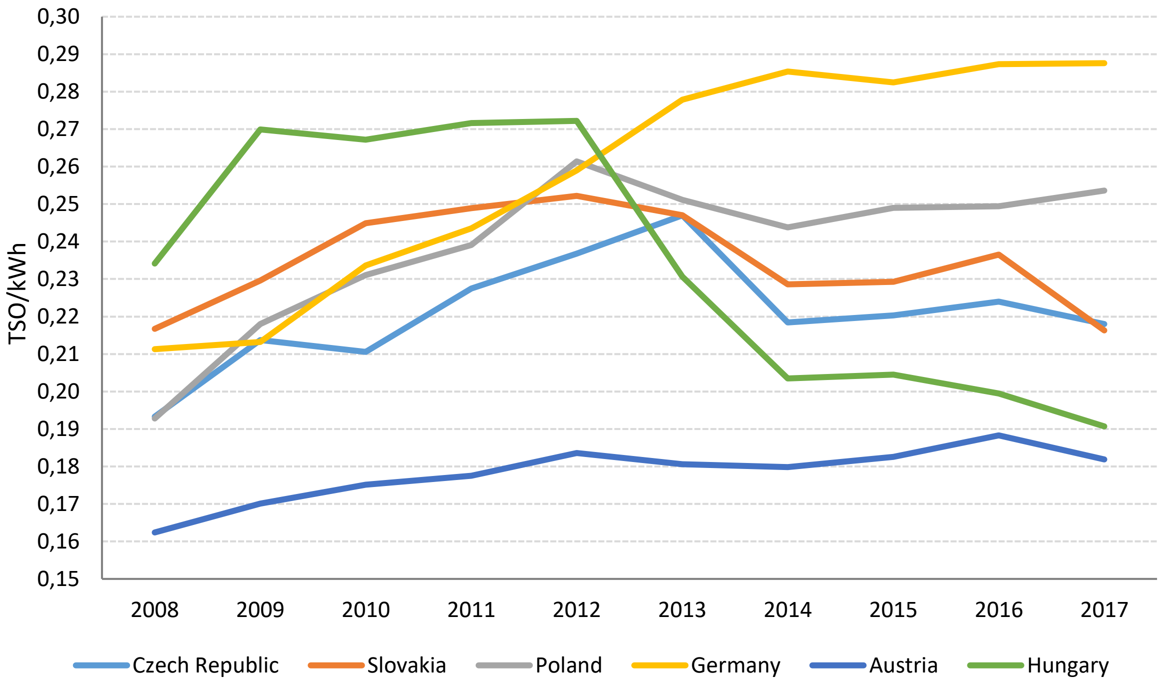
Chart 107: *Electricity price for households (annual consumption range of 2.5–4.9 MWh)*



Source: EUROSTAT (Electricity prices components for household consumers; nrg_pc_204_c)

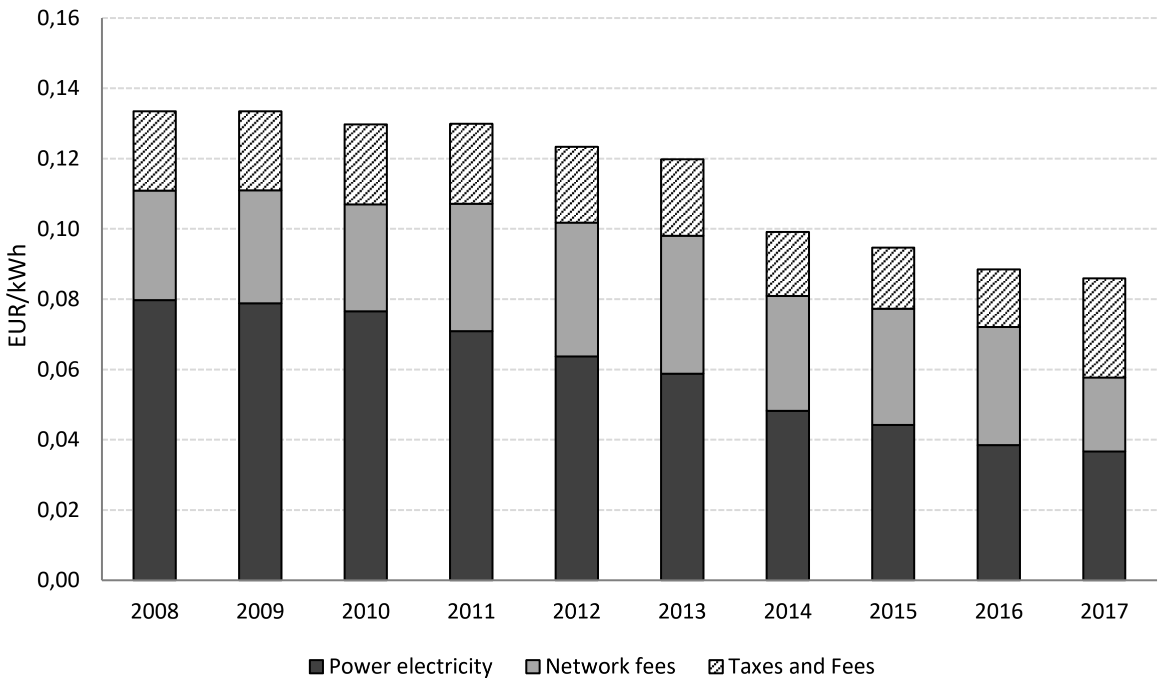
[173] This database is referred to as 'Energy statistics – price of natural gas and electricity (ngr_price)', which is available at https://ec.europa.eu/eurostat/web/energy/data/database

Chart 108: *Comparison of electricity prices for households (annual consumption range of 2.5–4.9 MWh)*



Source: EUROSTAT (Electricity prices for household consumers; nrg_pc_204)

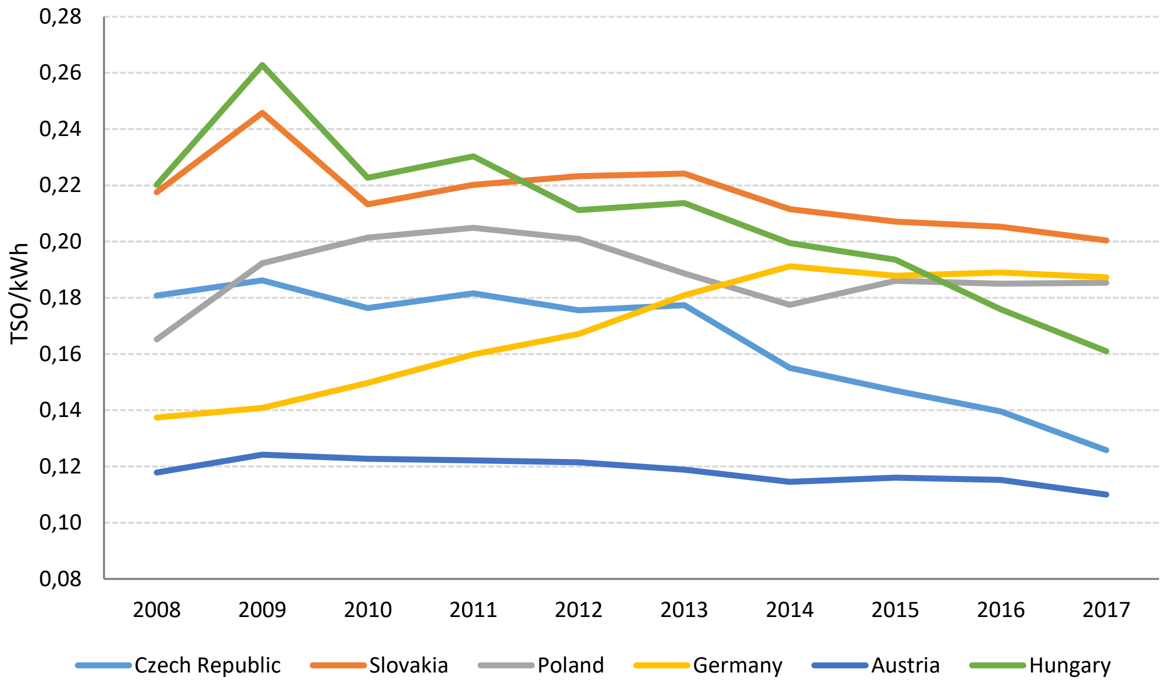
Chart 109: *Electricity price for non-households (annual consumption range of 500–2000 MWh)*[174]



Source: EUROSTAT (Electricity prices components for non-household consumers, Electricity prices for non-household consumers; nrg_pc_205_c, nrg_pc_205)

[174] Two types of databases, namely nrg_pc_205_c and nrg_pc_205, were used to create this chart.

Chart 110: *Comparison of electricity price for non-households (annual consumption range of 500–2000 MWh)*



Source: EUROSTAT (Electricity prices for non-household consumers; nrg_pc_205)

Table 113 shows the share of individual electricity supply components in 2018 according to the price decision of the Energy Regulatory Office for regulated prices in electricity and gas sectors for 2018 to illustrate the breakdown to regulated and non-regulated price components. Table 114 then shows the quarterly development of electricity prices for industry and households, including taxes.

Table 113: *Share of individual electricity supply components in 2018*

	Households	Small entrepreneurs	Wholesalers (VHV)	Wholesalers (HV)
Price of non-regulated electricity	43.31 %	38.4 %	75.26 %	61.85 %
Distribution price	33.57 %	41.2 %	4.49 %	18.89 %
Transmission price	4.24 %	4.1 %	6.84 %	5.84 %
SRES support	14.23 %	13.6 %	8.45 %	9.34 %
System services price	2.79 %	2.7 %	4.97 %	4.08 %
Price for market operator activities	1.87 %	0.1 %	0.00007 %	0.003 %

Source: ERO price decision for regulated prices in electricity and gas for 2018

Table 114: *Electricity price for industry and households, including taxes*[175]

	Price for industry in CZK/MWh						Price for households in CZK/MWh					
	Tr. tax	Cons. tax	VAT (%)	VAT	Total tax	Total	Tr. tax	Cons. tax	VAT (%)	VAT	Total tax	Total
Q1 2016	2 179.1	28.3	0.0	0.0	28.3	2 207.4	3 122.0	28.0	0.21	662.0	690.0	3 812.0
Q2 2016	2 151.0	28.3	0.0	0.0	28.3	2 179.3	3 122.0	28.0	0.21	662.0	690.0	3 812.0
Q3 2016	2 144.2	28.3	0.0	0.0	28.3	2 172.5	3 122.0	28.0	0.21	662.0	690.0	3 812.0
Q4 2016	2 152.0	28.3	0.0	0.0	28.3	2 180.3	3 122.0	28.0	0.21	662.0	690.0	3 812.0
Q1 2017	2 054.1	28.3	0.0	0.0	28.3	2 082.4	3 127.0	28.0	0.21	663.0	691.0	3 818.0
Q2 2017	2 038.2	28.3	0.0	0.0	28.3	2 066.5	3 127.0	28.0	0.21	663.0	691.0	3 818.0
Q3 2017	2 030.7	28.3	0.0	0.0	28.3	2 059.0	3 127.0	28.0	0.21	663.0	691.0	3 818.0
Q4 2017	2 040.0	28.3	0.0	0.0	28.3	2 068.3	3 127.0	28.0	0.21	663.0	691.0	3 818.0
Q1 2018	2 047.7	28.3	0.0	0.0	28.3	2 076.0	3 205.0	28.0	0.21	679.0	707.0	3 912.0
Q2 2018	2 048.5	28.3	0.0	0.0	28.3	2 076.8	3 238.0	28.0	0.21	686.0	714.0	3 952.0
Q3 2018	2 077.9	28.3	0.0	0.0	28.3	2 106.2	3 302.0	28.0	0.21	699.0	727.0	4 029.0

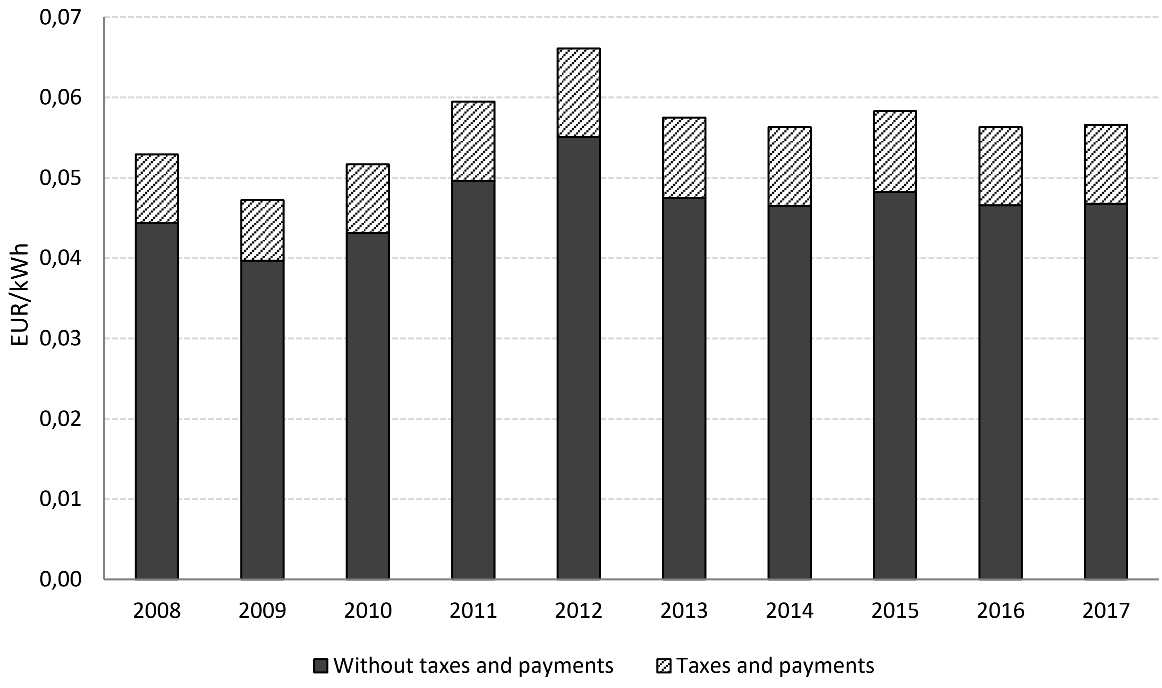
Source: Information for the 'Energy prices & taxes' report prepared for IEA purposes

Prices of natural gas

Chart 111 Chart 103 shows the development of natural gas price for the household sector for the annual consumption of 20–200 GJ in EUR/kWh, broken down into individual price components (tax and non-tax components). Chart 112 shows a comparison of prices of the Czech Republic with neighbouring countries and Hungary in purchasing power parity. Chart 113 shows the price of natural gas broken down into individual elements for non-household sectors for the selected consumption range. Chart 114 shows a price comparison for the non-household sectors.

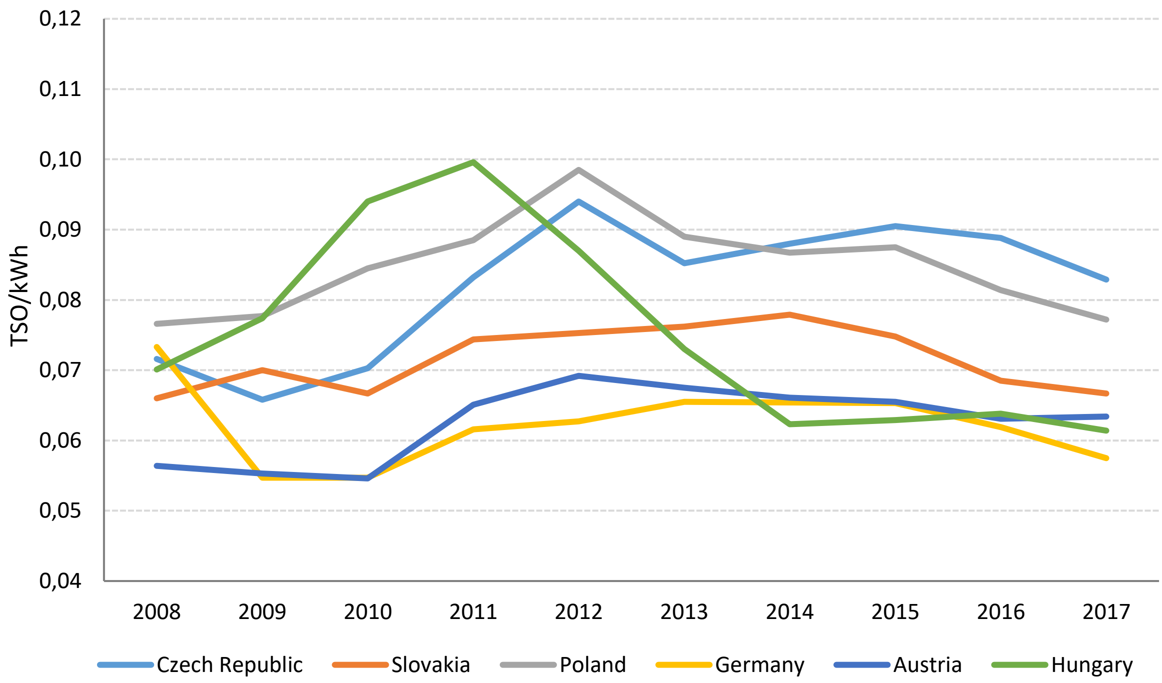
[175] On this basis of these statistical data, the International Energy Agency prepares on a quarterly basis the publication 'Energy prices and taxes'. The latest available version of this publication is for Q3 2018.

Chart 111: *Gas price for households (annual consumption range of 20–200 GJ)*



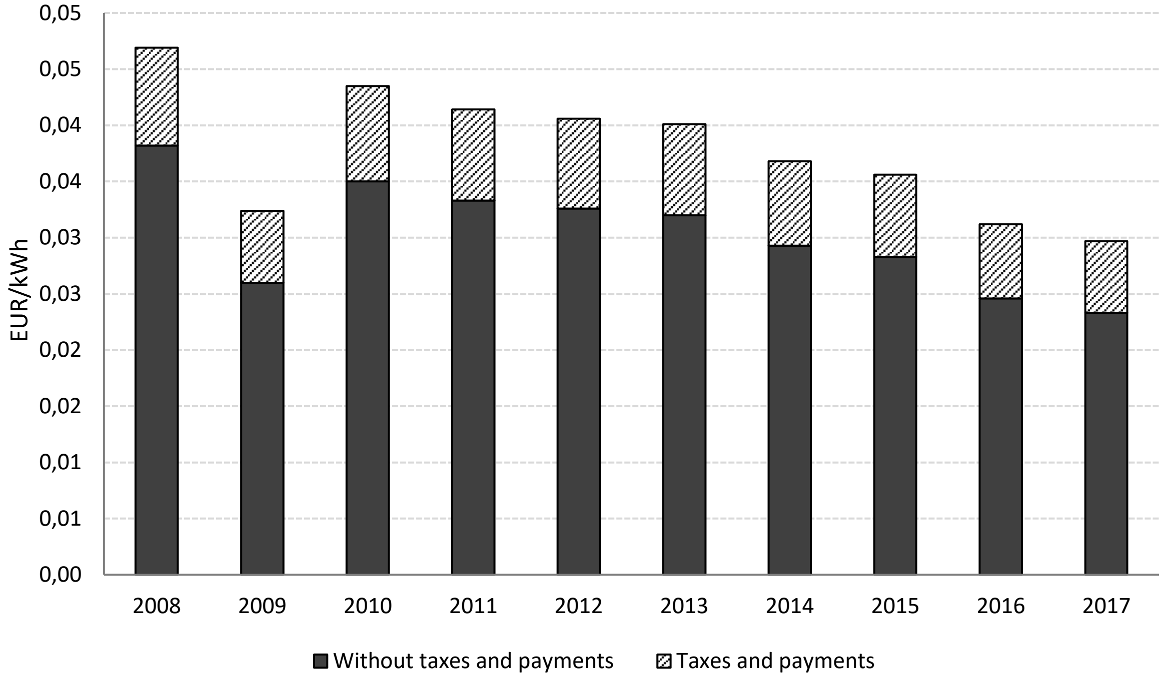
Source: EUROSTAT (Gas prices for household consumers; nrg_pc_202)

Chart 112: *Comparison of gas prices for households (annual consumption range of 20–200 GJ)*



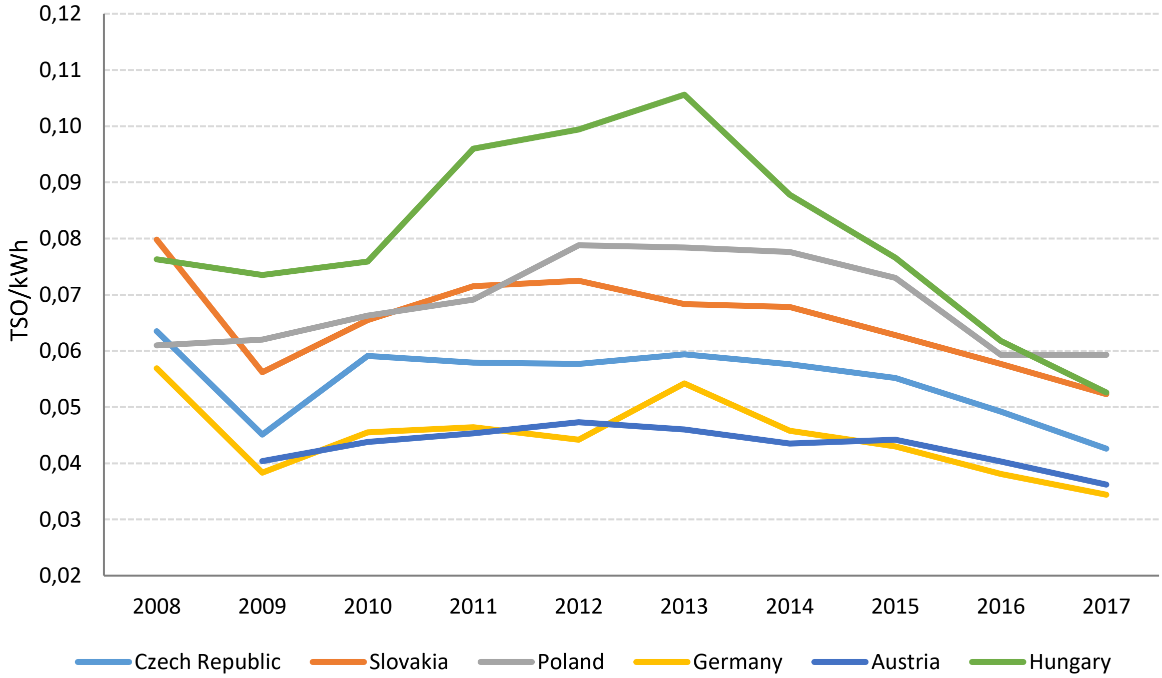
Source: EUROSTAT (Gas prices for household consumers, nrg_pc_202)

Chart 113: *Gas price for non-households (annual consumption range of 10–100 TJ)*



Source: EUROSTAT (Gas prices for non-household consumers; nrg_pc_203)

Chart 114: *Comparison of gas prices for non-households (annual consumption range of 10–100 TJ)*



Source: EUROSTAT (Gas prices for non-household consumers; nrg_pc_202)

Table 115 then shows the share of individual components for the supply of natural gas in 2018 according to the price decision of the Energy Regulatory Office for regulated prices in electricity and gas sectors for 2018 to illustrate the breakdown into regulated and non-regulated price components. Table 116 then shows the quarterly development of electricity prices for industry and households, including taxes.

Table 115: *Share of individual natural gas supply components in 2018*

	All customer categories
Trade and commodity	75.73 %
Distribution	22.84 %
Transmission	1.35 %
OTE services	0.08 %

Source: ERO price decision for regulated prices in electricity and gas for 2018

Table 116: *Natural gas prices for industry and households, including taxes*[176]

	Price for industry in CZK/MWh						Price for households in CZK/MWh					
	Tr. tax	Cons. tax	VAT (%)	VAT	Total tax	Total	Tr. tax	Cons. tax	VAT (%)	VAT	Total tax	Total
Q1 2016	716.5	30.6	0.0	0.0	30.6	747.1	1 354.5	0.0	0.21	284.4	284.4	1 638.9
Q2 2016	703.3	30.6	0.0	0.0	30.6	733.9	1 296.2	0.0	0.21	272.2	272.2	1 568.4
Q3 2016	704.0	30.6	0.0	0.0	30.6	734.6	1 267.8	0.0	0.21	266.2	266.2	1 534.0
Q4 2016	714.2	30.6	0.0	0.0	30.6	744.8	1 267.8	0.0	0.21	266.2	266.2	1 534.0
Q1 2017	655.6	30.6	0.0	0.0	30.6	686.2	1 271.2	0.0	0.21	267.0	267.0	1 538.2
Q2 2017	655.8	30.6	0.0	0.0	30.6	686.4	1 262.3	0.0	0.21	265.1	265.1	1 527.4
Q3 2017	665.4	30.6	0.0	0.0	30.6	696.0	1 262.3	0.0	0.21	265.1	265.1	1 527.4
Q4 2017	666.2	30.6	0.0	0.0	30.6	696.8	1 262.3	0.0	0.21	265.1	265.1	1 527.4
Q1 2018	659.3	30.6	0.0	0.0	30.6	689.9	1 258.0	0.0	0.21	264.2	264.2	1 522.2
Q2 2018	659.2	30.6	0.0	0.0	30.6	689.8	1 254.6	0.0	0.21	263.5	263.5	1 518.0
Q3 2018	670.0	30.6	0.0	0.0	30.6	700.6	1 254.6	0.0	0.21	263.5	263.5	1 518.0

Source: Information for the 'Energy prices & taxes' report prepared for IEA purposes

[176] On this basis of these statistical data, the International Energy Agency prepares on a quarterly basis the publication 'Energy prices and taxes'. The latest available version of this publication is for Q3 2018.

Black coal prices

Table 117: *Black coal prices for industry and households, including taxes*

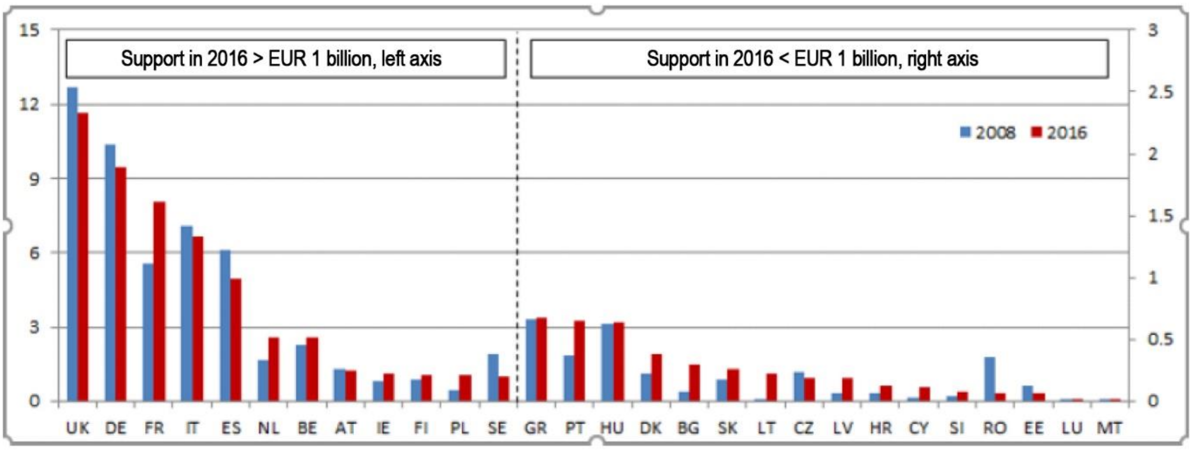
	Price for industry in CZK/MWh[177]						Price for households in CZK/MWh					
	Tr. tax	Cons. tax	VAT (%)	VAT	Total tax	Total	Tr. tax	Cons. tax	VAT (%)	VAT	Total tax	Total
Q1 2016							2 663.0	133.0	0.21	587.0	720.0	3 383.0
Q2 2016							2 710.0	133.0	0.21	597.0	730.0	3 440.0
Q3 2016							2 699.0	133.0	0.21	595.0	728.0	3 427.0
Q4 2016							2 729.0	133.0	0.21	601.0	734.0	3 463.0
Q1 2017							2 788.0	133.0	0.21	614.0	747.0	3 535.0
Q2 2017							2 772.0	133.0	0.21	610.0	743.0	3 515.0
Q3 2017							2 772.0	133.0	0.21	610.0	743.0	3 515.0
Q4 2017							2 853.0	133.0	0.21	627.0	760.0	3 613.0
Q1 2018							2 923.0	133.0	0.21	642.0	775.0	3 698.0
Q2 2018							2 892.0	133.0	0.21	635.0	768.0	3 660.0
Q3 2018							2 910.0	133.0	0.21	639.0	772.0	3 682.0

Source: Information for the 'Energy prices & taxes' report prepared for IEA purposes

iv. Description of energy subsidies, including for fossil fuels

According to the document Energy Prices and Energy Costs in Europe from 9 January 2019, total European energy subsidies have increased in recent years, from EUR 148 billion in 2008 to EUR 169 billion in 2016. This increase was mainly due to an increase in subsidies for renewable energy sources, which amounted to EUR 76 billion in 2016. Subsidies to fossil fuels are estimated at approximately EUR 55 billion. Chart 115 shows financial support for fossil fuels in the EU as described in the above document. Unfortunately, the Czech Republic does not have primary data in this respect. The Czech Republic also reports on subsidies to fossil fuels within its OECD membership. Table 118 provides a summary of energy subsidies.

Chart 115: *Financial support for fossil fuels in the EU*



Source: Energy prices and costs in Europe

177 This information is not publicly available.

Table 118 lists the identified subsidies in the energy sector. Subsidy titles are summarised only within a single line due to their scope. Information on individual public titles is publicly traceable and the Czech Republic reports them in more detail, for example, through the National Energy Efficiency Action Plan or the National Action Plan for the Development of Renewable Energy Sources. The European Structural and Investment Funds (ESIF) are the source of a significant part of these funds. These subsidies are key to meeting the EU's climate protection objectives, reducing air pollution, increasing the share of renewable energy sources and improving energy performance. Therefore, the Czech Republic does not intend to systematically phase these subsidies out, also in view of the increased ambition of the EU in these areas by 2030.

Table 119 lists identified fossil fuel subsidies. Regulation (EU) 2018/1999 of the European Parliament and of the Council does not contain a definition of the term 'fossil fuel subsidies'; the definition of the International Energy Agency (IEA) has been used for identifying 'fossil fuel subsidies'. Within the meaning of the IEA definition, only the housing allowance provided under Act No 117/1995, on state social support, as amended, can be considered a fossil fuel subsidy. More information about this allowance is provided in the table.

Regarding the planned phasing out of this subsidy, it may be noted that the Government in its Resolution No 502 of 8 July 2019, on the conclusions resulting from the Clean Air Dialogue and the proposal for further action, ordered the Minister of Labour and Social Affairs in cooperation with the Minister of the Environment to submit to the Government by 31 December 2019 an analysis of the setting of the housing allowance, including an assessment of the possibilities of changing its setting in order to increase the incentives of beneficiaries to prefer environmentally friendly heating methods. Therefore, it is not possible to anticipate the cancellation of this contribution, which also has a significant social character, but based on the above resolution, it should be modified to take environmental impacts into account. The Czech Republic will report on development in this area in the relevant progress report.

In this respect, it should also be noted that the combustion of fossil fuels is generally associated with external costs (as well as other areas of human activity) and, more generally, not only fossil fuel subsidies but also externalities should be quantified (this method is already being partially developed by the OECD).

Table 118: *Energy subsidies*

Subsidies, measures, plans	Specification
Subsidy titles	Operational Programme Enterprise and Innovation for Competitiveness; State programmes to promote energy savings and the use of renewable energy sources (EFEKT); Operational Programme Environment 2014–2020; Integrated Regional Operational Programme; New Green Savings Programme 2014–2020; ENERG Programme; Energy Saving with Reason Programme; Operational Programme Transport; Regeneration of panel housel – PANEL or NEW PANEL or Panel 2013+ Programmes; JESSICA Programme; Operational Programme Prague – Growth Pole (part devoted to energy savings in the building sector); Integrated Regional Operational Programme 2014–2020.
Operating Aid for Supported Energy Sources (SES) under Act No 165/2012, on supported energy sources.	Following the revision of the Directive on the promotion of the use of energy from renewable sources and the increase of the targets for energy from renewable sources and targets for the reduction of fossil fuels dependence, operating aid for the supported energy sources (renewable, secondary and CHP) has been introduced. The aid is paid on the basis of a price decision by the Energy Regulatory Office. In 2018, SES operating aid totalled CZK 46 128 million, of which RES support amounted to CZK 43 689 million. Operating aid for SES is financed from the state budget and through contributions from final consumers within the regulated price of electricity. In 2018 the contribution from the state budget was CZK 26 185 million.
Support for clean and high-percentage biofuels	The European Commission in its Decision of 12 August 2015 approved the support for clean and high-percentage biofuels until 2020. Compared to the support provided until the end of 2015, there were several fundamental

	changes. Above all, support for individual types of biofuels is lower and the most widespread biofuels are now subject to partial taxation. Another change is that distributors of pure and high-percentage biofuels can no longer count these biofuels towards meeting the obligation to put a minimum proportion of biofuels into free tax circulation. In accordance with the European Commission Guidelines on State aid for Environment and Energy 2014–2020, all support for biofuels made from food raw materials (e.g. rapeseed, cereals, sugar beet) will be phased out in 2020. The aid was notified for the following types of biofuels: FAME B100, rapeseed oil, SMN B30, Ethanol E85 and Ethanol E95.
Boiler subsidies	The boiler subsidies are included in the OP E under the specific objective *2.1. Reduce the emissions from local heating of households that contribute to the population's exposure to above-limit concentrations of pollutants* and they aim to promote the replacement of coal-fired boilers in households. Since the beginning of the programming period, the third wave of boiler subsidies has been running (i.e. three calls of the Managing Authority have been announced) with a total volume of CZK 9.84 billion (approximately 3.5 % of this amount can be used by regions to cover administrative costs and publicity). In the first two waves, a total of 69 719 applications were received in all regions, and 53 153 applications totalling CZK 5.8 billion have been reimbursed. In the currently running third wave of boiler subsidies, only a heat pump, a gas condensing boiler or a biomass boiler may be supported as a replacement for a coal boiler. In the first wave, the acquisition of a coal boiler or a combined boiler for coal and biomass could also be subsidised; in the second wave, support for coal-only boilers was abandoned.

Table 119: *Fossil fuel subsidies*

Grant	Description	Planned subsidy reduction
Refund of part of excise duties on diesel in the agricultural sector	Partial refund of diesel excise duty in the agricultural sector in accordance with Directive 2003/96/EC. In 2019, the refund amounted to CZK 4 380 per 1 000 litres in the forestry, pond cultivation and crop production sectors. In the livestock sector, it was CZK 9 500 per 1000 litres.	
Energy tax exemption for natural gas	The use of natural gas is exempt from energy tax in the following cases: • when used for the production of electricity (only the subsequently produced electricity is taxed); • when used for cogeneration, where this heat is subsequently supplied to households; • when used directly by households or boiler plants for heating purposes; • when used for non-recreational use of transport ships; • when used for certain mineralogical and metallurgical processes. In the case of natural gas, energy tax is refunded to persons enjoying privileges and immunities.	

Reduced energy tax for compressed and liquefied natural gas in transport	Reduced energy tax for compressed and liquefied natural gas compared to taxes on car gasoline and diesel.	The existing tax rates are to be increased (from 136.8 CZK/MWh of gross calorific value to 264.8 CZK/MWh of gross calorific value) on 1 January 2020. However, even after this increase, natural gas tax rates will be significantly more favourable than those of diesel and unleaded gasoline when converted to energy units.
Energy tax exemption for solid fuels	The use of solid fuels is exempt from energy tax in the following cases: • when used for cogeneration, where this heat is subsequently supplied to households; • when used for electricity production (electricity is subsequently taxed); • when used for non-recreational use of transport ships; • when used for certain mineralogical and metallurgical processes. In the case of solid fuel, energy tax is refunded to persons enjoying privileges and immunities.	
Mineral oil tax advantages	The exemption from or refund of the entire excise duty included in the price of mineral oil is applied in the following cases: • when used in mineralogical or metallurgical processes; • when used for non-recreational flying;	

	• when used for non-recreational cruises.	
Costs associated with the termination of mining in uneconomic underground mines and land quarries in the Czech Republic	At the end of 1992, the government announced a plan to end coal mining in uneconomic underground mines and quarries in the Czech Republic. By Government Resolution No 691/1992, the State undertook to finance technical work to close mines, to remedy the consequences of past mining activities and to cover the social costs of phasing out mining activities (e.g. health benefits for miners).	
Remediation of environmental damage associated with mining activities	The Czech Republic decided to use part of the revenues from the privatisation of mining companies to finance the remediation of past environmental damage associated with mining activities that occurred prior to the privatisation of Czech mining companies. Since the end of 2015, the ongoing remediation of past environmental damage is the responsibility of the Ministry of Finance. At the end of 2009, four companies were drawing money: (i) Diamo (uranium and coal mining); ii) OKD, a.s. (hard coal mining); iii) Sokolovská uhelná (lignite mining), a.s .; iv) and Severočeské doly, a.s. (lignite mining).	
Boiler subsidies	The boiler subsidies are included in the OP E under the specific objective *2.1. Reduce the emissions from local heating of households that contribute to the population's exposure to above-limit concentrations of pollutants*. Support is	In the currently running third wave of boiler subsidies, only a heat pump, a gas condensing boiler or a biomass boiler may be supported. In the first wave, the acquisition of a coal boiler or a combined boiler for coal and biomass could also

	provided to final beneficiaries (owners of single-family houses) through regions that first apply for an allocation in the Managing Authority's call and then launch calls for owners of single-family houses. In the first wave, 2 720 applications for coal-fired boilers, 9 092 applications for combined coal and biomass boilers, and 3 893 application for gas condensing boilers were approved. In the second wave, 6 550 applications for combined coal and biomass boilers and 8 834 applications for gas condensing boilers were approved. Since the beginning of the programming period, the third wave of boiler subsidies has been running (i.e. three calls of the Managing Authority have been announced) with a total volume of CZK 9.84 billion (approximately 3.5 % of this amount can be used by regions to cover administrative costs and publicity). In the first two waves, a total of 69 719 applications were received in all regions, and 53 153 applications totalling CZK 5.8 billion have been reimbursed.	be subsidised; in the second wave, support for coal-only boilers was abandoned.
Investment support for fossil fuel sources	Support of reconstruction and modernisation or construction of sources with cogeneration of electricity and heat or support for its introduction. The amount of the subsidy is determined by individual subsidy titles.	In this respect, it should be stressed that the use of fossil fuels is not primarily encouraged; the support focuses on modernisation and introduction of cogeneration. For this reason, the aid is not expected to be phased out.

Operating aid for fossil fuel sources	Support for sources burning fossil fuels with cogeneration. The amount of support is determined by the Energy Regulatory Office's Price Decisions.	In this respect, it should be stressed that the use of fossil fuels is not primarily encouraged; the support is aimed at the promotion of co-generation of electricity and heat to save primary energy sources, which is in line with the objectives and focus of EU legislation. Increased use of primary energy sources de facto contributes to reducing the use of fossil fuel. For this reason, the aid is not expected to be phased out.
Housing allowance	It is paid according to Act No 117/1995, on state social support, as amended – see Title Three, Sections 24 to 28. It is a social benefit to which the owner or tenant of an apartment who is declared to reside in an apartment is entitled if: (a) his or her housing costs exceed the product of decisive family income and a coefficient of 0.30, and in the City of Prague a coefficient of 0.35, and (b) the product of decisive family income and a coefficient of 0.30, and in the territory of the capital city of Prague a coefficient of 0.35, does not exceed the amount of normative housing costs.	The Government, in its Resolution No 502 of 8 July 2019, on the conclusions resulting from the Clean Air Dialogue and the proposal for further action, ordered the Minister of Labour and Social Affairs in cooperation with the Minister of the Environment to submit to the Government by 31 December 2019 an analysis of the setting of the housing allowance, including an assessment of the possibilities of changing its setting in order to increase the incentives of beneficiaries to prefer environmentally friendly heating methods.

5 IMPACT ASSESSMENT OF PLANNED POLICIES AND MEASURES[178]

5.1 Impacts of planned policies and measures described in section 3 on energy system and GHG emissions and removals, including comparison to projections with existing policies and measures (as described in section 4).

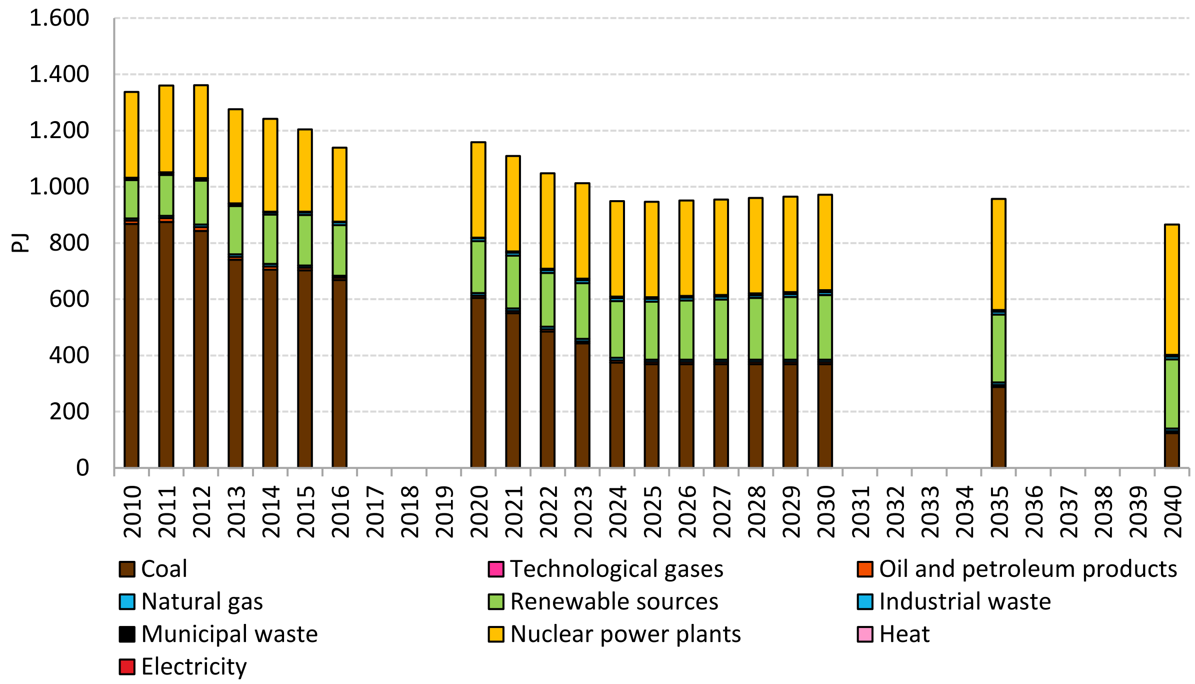
(i) Estimates of the development of the energy system and of greenhouse gas emissions and removals, and where appropriate emissions of air pollutants in accordance with Directive (EU) 2016/2284, drawn up in accordance with planned policies and measures for at least 10 years after the period covered by the plan (including the last year of the period covered by the plan), including relevant Union policies and measures.

Estimates of energy system development

Estimates of the energy system development are given in Chapter 4. Despite this, a clear summary is given below, in particular for the period of validity of the National Plan, i.e. 2021–2030, but also, as required by Regulation (EU) 2018/1999, with a view to the next ten years, 2040. Chart 116 shows expected primary production development. Chart 117 then shows the expected evolution of the energy mix at the primary energy source level. Chart 118 then shows expected development of gross electricity production and electricity consumption. Chart 119 then shows the expected development of gross heat production. Developments after 2030 must be taken as largely indicative; the expected development in 2031–2040 will be further specified in the next National Plan for 2031–2040. Developments with impact on this period will, of course, be reported in interim progress reports, such as outputs of the 'Coal Commission', which can potentially have a large impact on energy mix in the medium and long term, or the outputs based on the evaluation or update of the State Energy Policy.

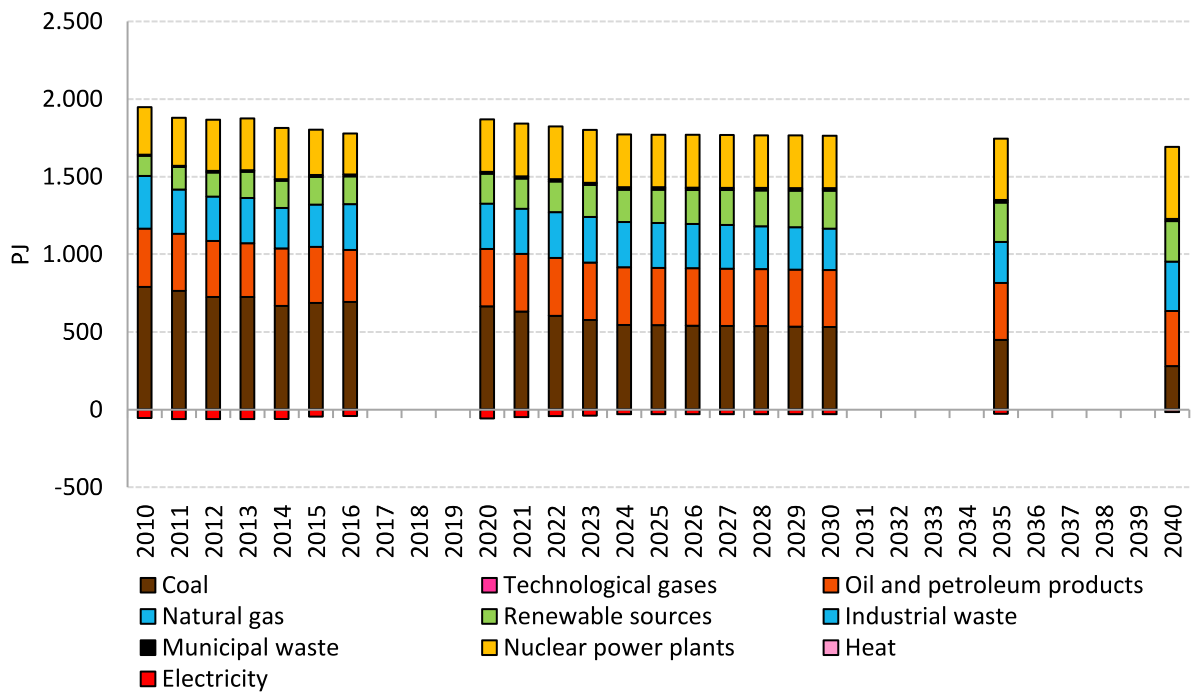
[178] Planned policies and measures are options under discussion that have a realistic chance of being adopted and implemented after the submission of the national plan. The resulting estimates under section 5.1. will therefore include not only the implemented and adopted policies and measures (estimates with existing policies and measures), but also planned policies and measures.

Chart 116: *Expected primary production development*



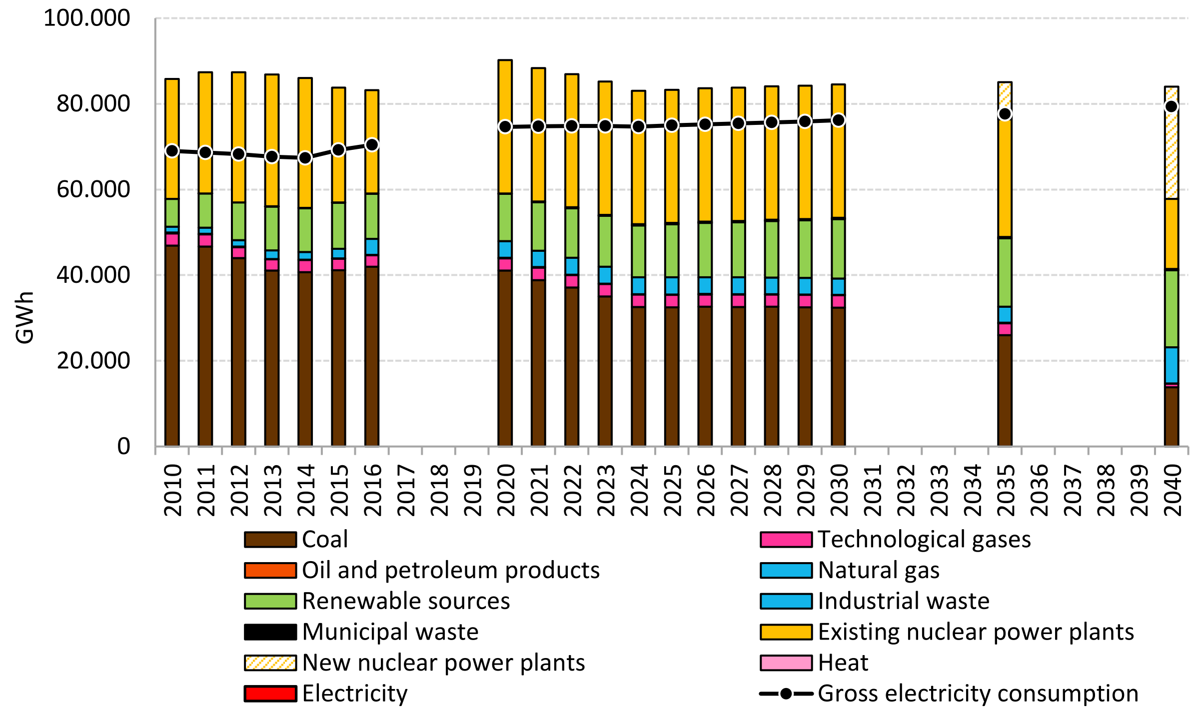
Source: Ministry of Industry and Trade

Chart 117: *Expected evolution of the energy mix at the primary energy source level*



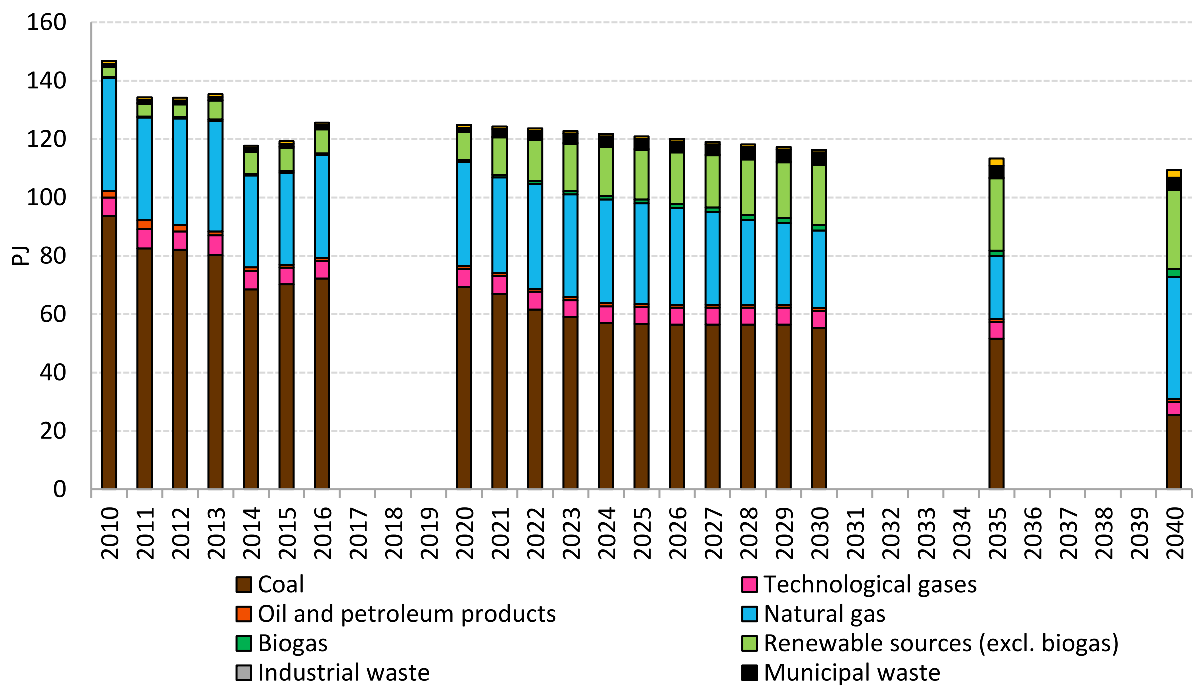
Source: Ministry of Industry and Trade

Chart 118: *Expected development of gross electricity production and electricity consumption*



Source: Ministry of Industry and Trade

Chart 119: *Expected development of gross heat production*

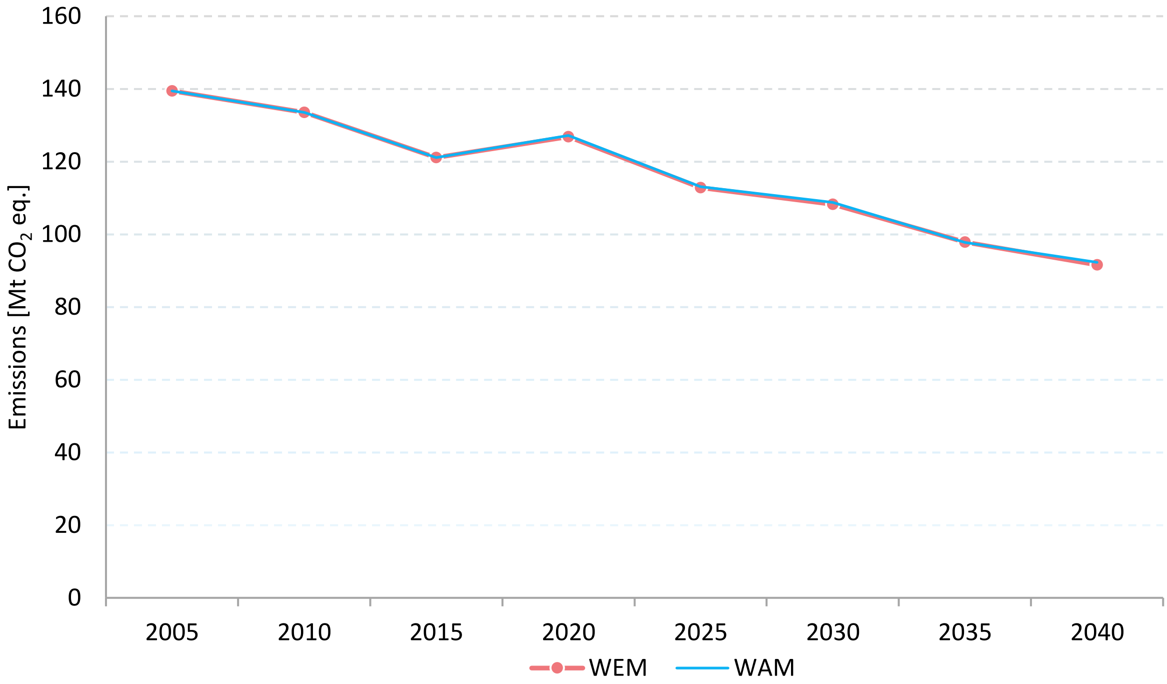


Source: Ministry of Industry and Trade

Estimates of greenhouse gas development and emissions

Estimates of greenhouse gas development and emissions on the basis of emission projections, up to 2040, are provided in Chapter 4.2.1, specifically in part (ii). Chart 120 shows the results of projections of total greenhouse gas emissions (including LLULUCF) – this chart is also presented in Chapter 4.2.1.

Chart 120: *The results of the projections of total greenhouse gas emissions for WEM and WAM scenarios (including LULUCF)*



Source: CHMI

Estimates of the development of emissions of air pollutants

Estimates of the evolution of emissions of air pollutants are detailed Chapter 4.2.1, specifically in part (iii). Table 120 provides a summary of national emission projections for the period up to 2030.

Table 120: *National emission projections for the period up to 2030 in kt/year*

		NERP–WM 2019			NERP–WaM 2019		
	2005	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
NO_x	276	152	129	107	152	124	97
VOC	252	173	148	141	173	144	126
SO_2	208	82	65	60	82	60	54
NH_3	77	66	68	72	66	53	57
$PM_{2.5}$	43	28	20	17	28	18	13

Source: CHMI, MOTRAN, IFER, VÚZT

(ii) Assessment of policy interactions (existing policies and measures and planned policies and measures within one policy dimension and existing policies and measures and planned policies and measures from different dimensions) at least up to the last year of the projected period, in particular to ensure a clear understanding of the impact of energy efficiency / energy saving measures on the size of the energy system and to mitigate the risk of unused investment in energy production

A comprehensive assessment of policy interactions is a relatively complex task. Also, policy interactions may not be predictable or quantifiable in advance. The policy interactions have already been largely reflected in individual sections of this document. The Czech Republic considers the interaction of policies in the field of renewable energy sources and energy efficiency to be very important; there is also an important interaction of targets in these areas. This link, including some quantification, is described in Chapter 2.1.2. Another important issue is the interaction of RES and energy efficiency targets and policies and impacts on greenhouse gas emissions, where unfortunately there is a trend where the targets are set at the same level as meeting the main greenhouse gas emission reduction target. However, these interactions have to be assessed at EU level, which proposes the setting of milestones. In this respect, the impact of RES and energy efficiency targets and measures on the EU ETS is also important, where setting targets can lead to surplus of emission allowances and to counterproductive impacts in terms of greenhouse gas emission reductions. Chapter 2.1.2 also contains information on the interaction between energy, climate and agricultural policies, as well as on interaction with biodiversity and ecosystem measures and objectives. Chapter 4.2.1 contains information on the interaction between energy, climate and air protection policies.

(iii) Assessment of the interaction between existing and planned policies and measures, and between those and the Union’s climate and energy policies and measures

The vast majority of policies and measures are based on EU legislation or rules set at EU level, such as the EEAG support rules. The aid schemes must then be notified to the EU. Therefore, the Czech Republic perceives that the assessment of the interaction between measures and policies at EU level and national policies that are based on EU legislation or are directly linked to the transposition of EU legislation should primarily be evaluated at EU level. To a certain extent this is done in the form of impact analyses of EU legislation. At this point, it should be stressed that the whole requirement of impact assessment at Member State level is largely questionable, since the objectives framework is clearly defined by EU legislation, so impact studies no longer have an impact on the overall setting of objectives and overall direction of EU policy; their role is thus questionable and all the more emphasis must be placed on impact studies at EU level. It should be noted here that impact studies for the agreed RES and energy efficiency targets have not been carried out at EU level due to the increased ambition in the negotiations of the relevant legislation.

5.2 Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts, including just transition aspects (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in section 3 at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

5.2.1.1 Macroeconomic impacts

Methodology

The starting point is the outlook for economic growth based on the Ministry of Finance's macroeconomic model, which is described in section 4.1.1.2 of this document. This outlook is based on a general equilibrium model that achieves the equilibrium of the economy as a whole, taking into account the underlying macroeconomic parameters and the degree of regional convergence of economies. The above macroeconomic outlook was used as an input parameter (therefore, there is the issue of certain cyclicality of the macroeconomic impact assessment if the macroeconomic outlook is also an input variable). However, this 'top-down' approach was combined with a 'bottom-up' approach to verify overall trends and in particular to obtain a detailed overview of the energy intensity of individual sectors.

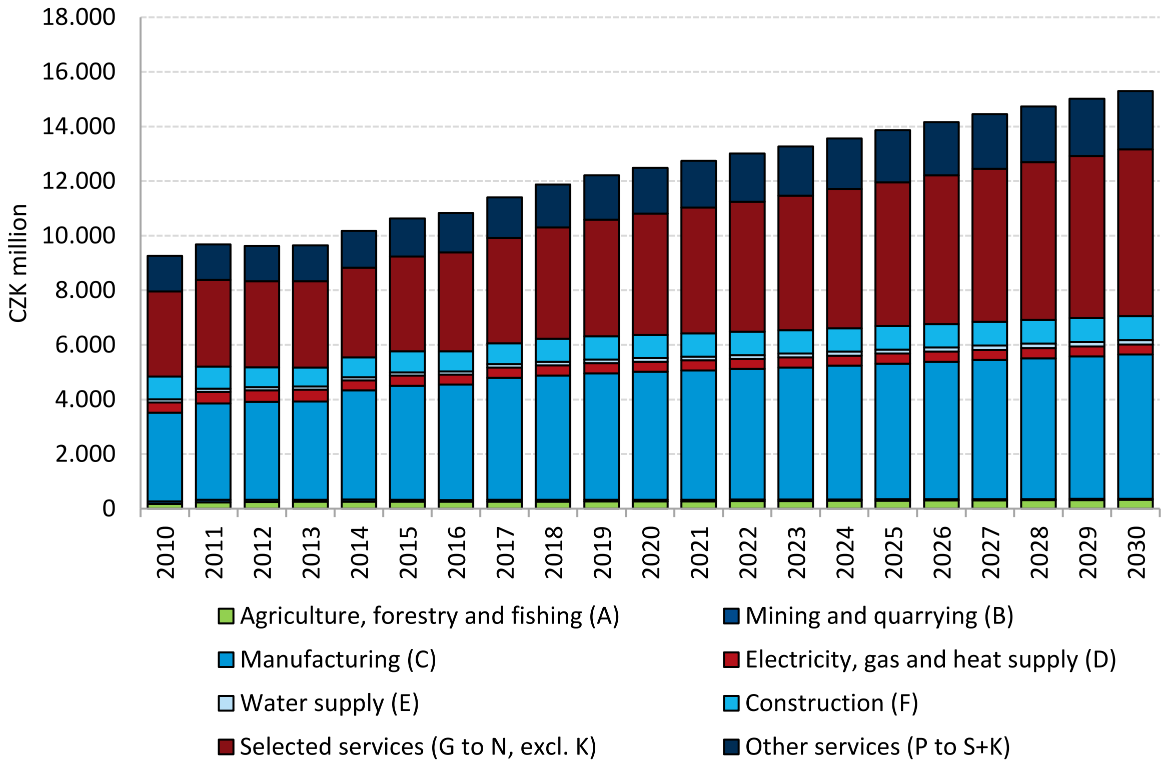
In this respect, the most significant energy-intensive products have been identified, which account for a significant part of energy consumption, for which the historical development of energy consumption and naturally expressed production is statistically monitored and it is thus possible to obtain an overview of energy intensity of production. Subsequently, the expected development of production of these products was determined in cooperation with industry associations and assumptions were made on the possible development of energy intensity taking into account the potential for switching to best available techniques. The economic development and energy consumption of these energy-intensive products have been projected into individual sectors within the overall macroeconomic model, for the remaining sectors (and the remaining production within the sector beyond energy-intensive products), energy intensity has been aggregated.

The impacts of the objectives and policies set out in this document were then reflected in individual sub-sectors (a total of 99 sectors in the 'NACE 2 breakdown'). Here, it was necessary to adopt a partial simplification, since translating specific measures into economic development is not a trivial matter. Therefore, this approach combines a top-down and bottom-up approach, with an emphasis on interconnection with energy consumption. A partial output is represented by the trajectory of energy intensity development according to individual sectors, which are supported by the expected production of basic energy-intensive products. This modelling is an important justification for the objectives outlined in section 2.2. The summary energy intensity provided in section 2.2 is only an aggregate expression and it is necessary to assess the energy intensity in individual sectors. A reduction in energy consumption beyond that target is thus possible through a reduction in economic growth or production in a given sector (or for a given energy-intensive product), or by substantiating a decrease in energy intensity per unit of production beyond the projected reduction. This corresponds to taking into account national circumstances, which, according to Article 6(2) of the Energy Union Governance Regulation, have to be taken into account when evaluating the target under Article 3 of the Energy Efficiency Directive.

Macroeconomic impacts until 2030

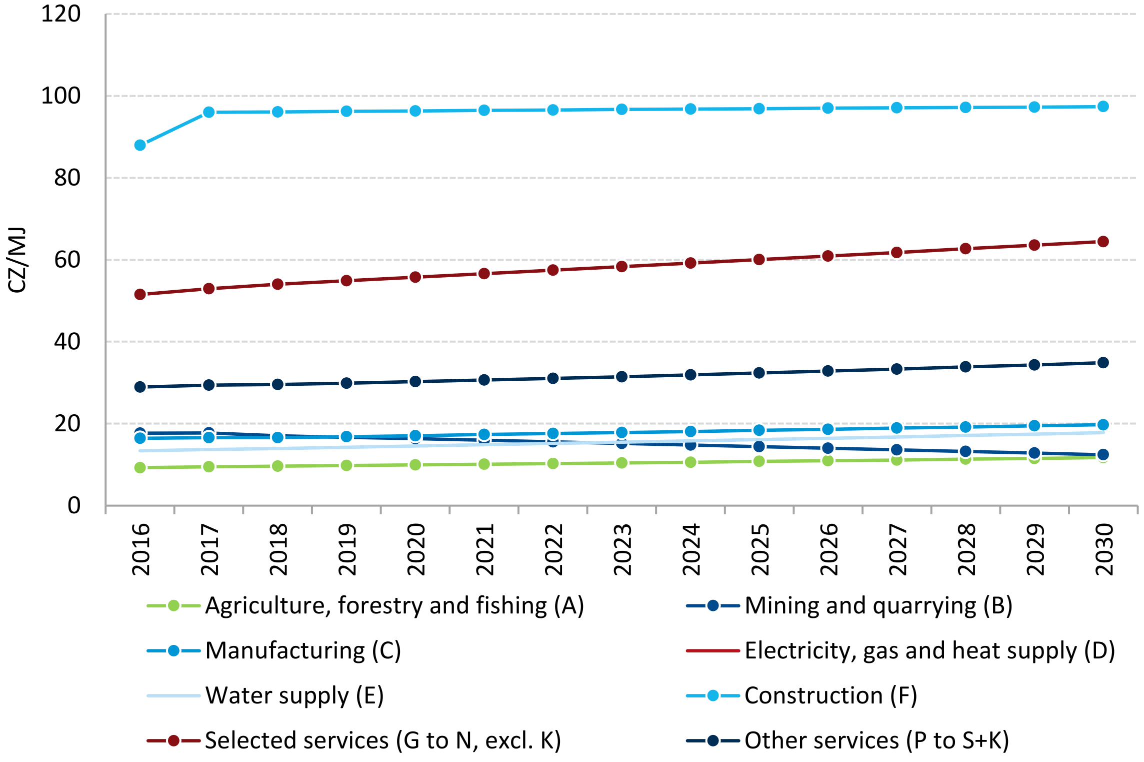
Chart 121 shows the development of monetary production by industry. This is an aggregation for display purposes; this development has been analysed at the level of approximately one hundred sectors of the economy (two-digit NACE). There is a partial change in the composition of the different sectors, which is in line with developments in the energy sector described in other sections of the document and the proposed policies and measures (but some simplification had to be adopted here to quantify these policies and measures). Chart 122 demonstrates the emphasis on maximising interconnection with the sector's energy consumption assumptions. Again, these energy intensity trajectories are an aggregation of approximately one hundred sub-sectors.

Chart 121: *Output by individual economy sectors (2016 prices)*



Source: Ministry of Industry and Trade

Chart 122: *Development of energy intensity of monetary production*



Source: Ministry of Industry and Trade

Health, environmental, skills, social and employment impacts

A comprehensive assessment of health, environmental, skills, social and employment impacts could not be carried out in the given time horizon, taking into account also the revision of the Czech Republic's contributions as a result of the European Commission recommendations published in mid-2019. Therefore, the Czech Republic uses the possibility provided by Regulation (EU) 2018/1999 not to elaborate on these impacts in detail, if this is not feasible. Environmental impacts are described in Chapter 4.2.1. In the case of lignite mining, economic, social and environmental impacts were analysed in 2015 in a relatively detailed manner. These analyses are available in a total of four public studies[179]. These impacts will most likely be revised following the activities and outputs of the 'Coal Commission' (see below). The comprehensive impacts will be gradually quantified and refined so that they can be presented in a coherent form in the relevant progress report or in the National Plan Update.

Relevant in this respect is the impact assessment of the State Energy Policy (approved in 2015) in accordance with Act No 100/2001, on environmental impact assessment and amending certain related acts (Environmental Impact Assessment Act), as amended. Information on the impact of energy development under the State Energy Policy is part of the process of monitoring the State Energy Policy. Evaluation of the State Energy Policy is carried out in accordance with Act No 406/2000, not later than five years after approval. The SEP evaluation will be carried out in 2020 and will also include the output of environmental monitoring. Impact monitoring of Climate Protection Policy is part of the regular monitoring of the state of the environment within the Report on the State of the Environment, the Report

[179]Studies can be found at following links: link, link, link a link.

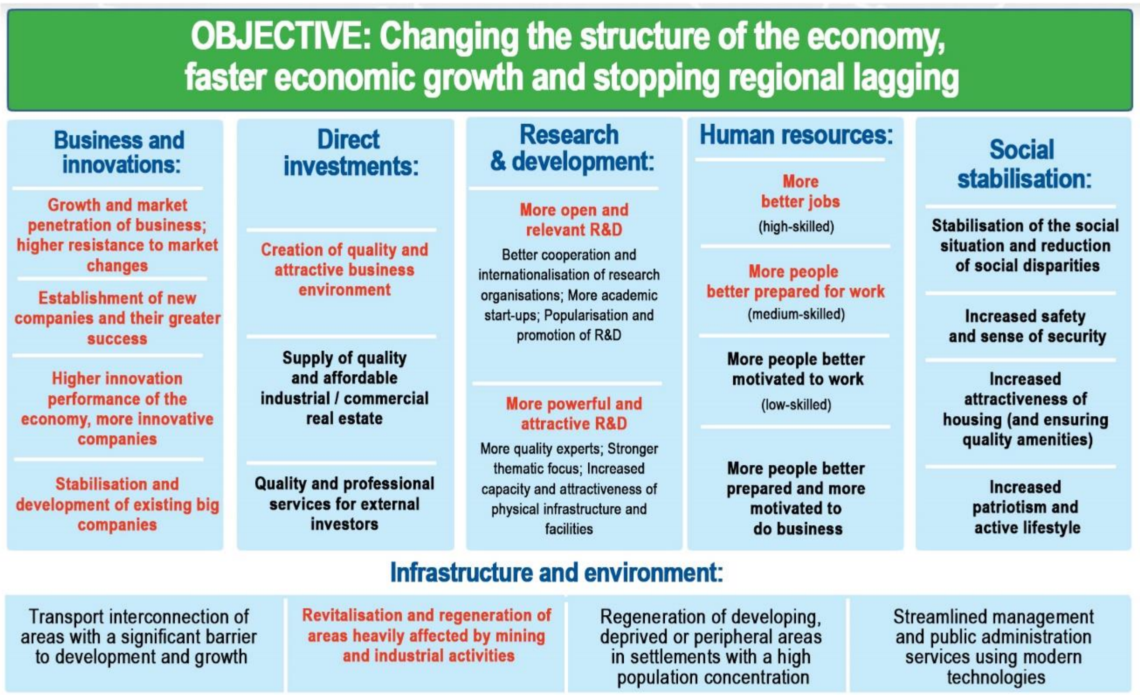
on Air Quality, the National Report on the Greenhouse Gas Inventory or indicators published in the Report on the State of Water Management, Report on the state of Forests and Forestry and Indicators of vulnerability and adaptation of the Czech Republic.

5.2.1.2 Aspects of fair transformation

RESTART Programme

The RESTART programme is a comprehensive framework for the restructuring of the Ústí, Moravian-Silesian and Karlovy Vary regions, which should contribute to the fair transformation of coal regions. The programme was established on the basis of Government Resolution No 826 of 19 October 2015, in which the Government decided on the need to support the economic restructuring of the Ústí, Moravian-Silesian and Karlovy Vary regions. Based on this resolution, the Ministry for Regional Development commissioned an input analysis which assessed in detail the current situation, the most serious problems and the development potential of the regions concerned. The subject of the analysis was not only an extensive macroeconomic analysis, but also a collection of impulses and experiences that took place directly in individual regions. A strategic framework was created based on the input analysis. This document does not yet contain a proposal for concrete measures, but identifies their basic principles common to all regions. The Strategic Framework expresses the government's long-term strategy to support, facilitate and accelerate the restructuring of the economy in structurally affected regions. Specific measures are then part of individual action plans. Government-approved action plans combine measures from the pillars of business and innovation, direct investment, R&D, human resources, social stabilisation, environment, infrastructure and public administration. On 17 June 2019, the 3rd comprehensive action plan for the restructuring strategy for the Ústí, Moravian-Silesian and Karlovy Vary Regions 2019–2020 was published. Figure 18 sets out the basic goals and pillars of the RESTART Programme. Table 121 then shows the overall financial requirements for measures under each action plan.

Figure 18: *Basic goals and pillars of the RESTART Programme*



Source: RESTART Programme

Table 121: *Overall financial requirements for measures under each action plan of the RESTART Programme*

	1st Action plan	2nd Action plan	3rd Action plan
Total allocations in CZK million	**40 445**	**15 838**	**11 090**
Implementation period	2017–2030	2018–2030	2019–2030

Source: RESTART Programme

Platform for Coal Regions in Transition

In 2017, the European Commission initiated the establishment of the Platform for Coal Regions in Transition. There are a total of 41 regions in 12 Member States. In 2019, 18 coal regions were actively involved in the platform, including three regions from the Czech Republic, namely the Moravian-Silesian, Ústí and Karlovy Vary Regions. The Czech Republic considers the platform to be very important and will strive for maximum involvement.

Coal Commission of the Czech Republic

The Czech Government Resolution No 565 of 30 July 2019 established the Coal Commission. This commission is chaired by the Minister of Industry and Trade together with the Minister of the Environment. The Commission has a total of 19 members. Key ministries and offices, trade unions and industrial / economic associations, non-profit organisations, regions, the Chamber of Deputies and the academic sphere are represented. The scope of the Coal Commission is defined by the following outputs: (i) assessing the future needs of lignite, focusing on the assessment of individual large combustion sources in the form of a comprehensive analysis; (ii) an analysis of the possibilities of future diversion from coal use in combustion sources. The Commission's scope is not limited in time. However, the partial outputs of the Commission must be prepared by 30 September 2020 at the latest according to the approved statute. The Coal Commission has appointed the following three working groups: (i) group to set a timetable for reducing coal use in the overall context of the Czech Republic's energy mix and climate protection; (ii) group for setting parameters for possible downsizing and legislative issues; and (iii) group for identifying social and economic impacts.

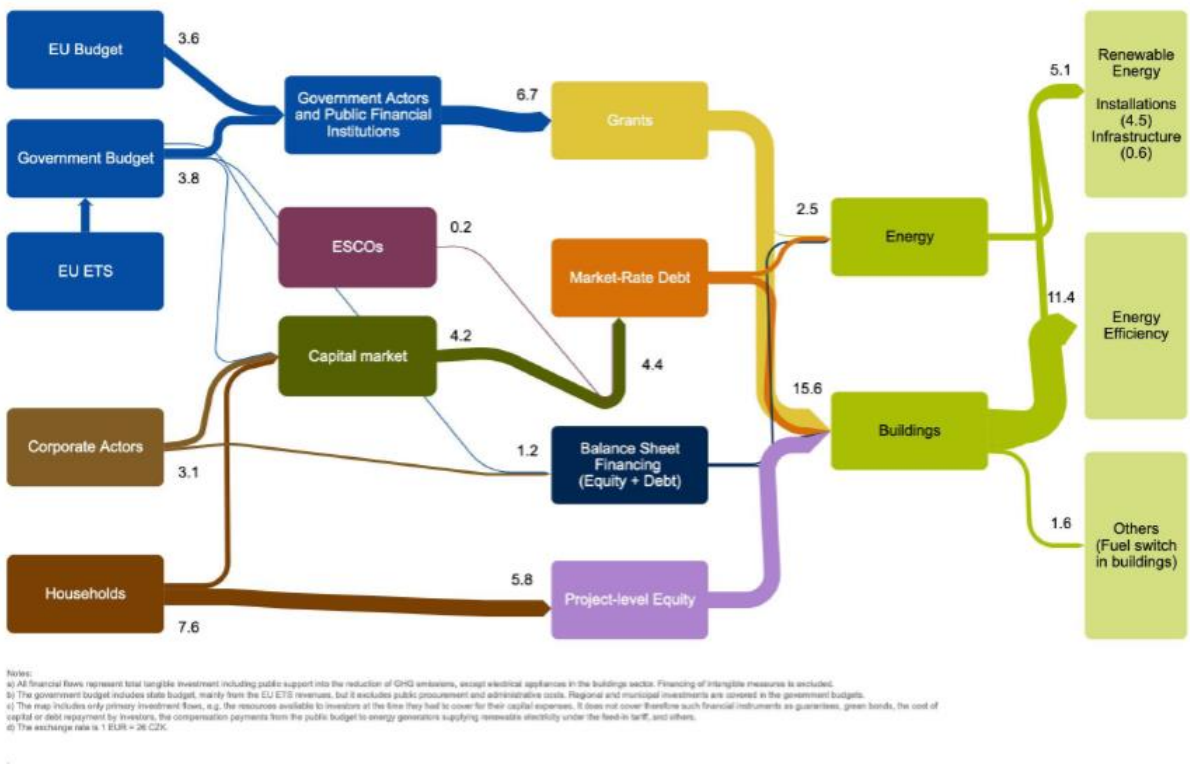
5.3 Overview of investment needs

According to Regulation (EU) 2018/1999, the following information should be provided in this section: (i) the existing investment flow and future investment prospects in terms of planned policies and measures; (ii) sectoral or market risk factors or obstacles at national or regional level; (iii) an analysis of the additional public financial support or means to remedy the shortcomings identified under point (ii). In this respect, a different structure has been chosen, but the information required by Regulation (EU) 2018/1999 should be available within that structure nonetheless.

5.3.1 Existing investment flow

Figure 19 presents the estimated flow in the energy and climate sectors in 2017. This concerns 'only' the buildings sector, the renewable energy sector and infrastructure investment flows. The aim is to prepare a similar flow of investment also for 2030, taking into account existing and planned policies, preferably across all sectors with possible identification of investment gaps. However, this investment flow is not currently available and will be supplemented, as appropriate, in the relevant progress report and/or National Plan Update.

Figure 19: *Energy and climate investment flow in 2017 (buildings, renewables and infrastructure)*[180]



Source: Climate and Energy Investment Map – Czechia (CUT)

5.3.2 Investment needs

5.3.2.1 Renewable energy sources and other supported energy sources

Under operating aid, the envisaged development of RES and other supported energy sources (see the objective in Chapter 2.1.2) for the period 2021–2030 corresponds to a total of CZK 511.2 billion, of which CZK 411.4 billion is represented by the existing operating aid for current sources, CZK 53.5 billion is represented by the related operating aid for current sources to keep them in operation and CZK 46.4 billion is represented by support for new sources (of which CZK 35.1 billion is for RES and the rest for other supported energy sources – high-efficiency cogeneration and secondary sources).

However, the support for resources in the period 2021–2030 is associated with costs after this period due to its legally guaranteed duration which, depending on the type of supported resource, last from 15 to 30 years after the commissioning of the power-generating facility. For this reason, for sources to be put into operation in the period 2021–2030, support will still be paid during the period 2031–2059. Overall, up to CZK 335.7 billion is expected to be paid in the period 2031–2059, of which up to CZK 49.4 billion will be represented by existing operating aid for current supported sources and another CZK 146.59 billion will be represented by the related operating aid for current sources to keep them in operation. Support for new supported sources put into operation in the period from 2021 to 2030, which will be paid out in the period from 2031–2059, is expected to amount up to CZK 139.7 billion (of which

[180] The source is the Climate and Energy Investment Map – Czechia (CTU) reports, prepared on the basis of the Climate Investment Capacity (CIC) project: climate finance dynamics & structure for financing the 2030 targets. More detailed assumptions are provided in this report.

CZK 124.6 billion is for RES and the rest for other supported energy sources – high-efficiency cogeneration and secondary sources).

Table 122 shows operating aid costs by period and by production breakdown. These are values that are calculated according to the current price of electricity or allowance prices and do not take into account any future development of the price of the emission allowance, where in case of its increase and subsequent impact on the price of electricity, the amount of aid paid would also decrease accordingly. Options taking into account the possible development of the price of electricity or emission allowance are (these options are described in more detail in Chapter 4.1.1.9) are provided in the background material 'Development of supported energy sources by 2030'[181]. Table 123 shows total investment support for RES. It is a quantification of the necessary investment support in order to achieve the 22 % share of RES by 2030.

It should also be noted that until 2018, operating aid for current resources had already been paid in the amount of CZK 354.7 billion and by the end of 2020 it will probably be paid in a total amount of CZK 448.7 billion.

Table 122*: Operating aid for RES and other supported sources (CZK billion)*

	Until 2020	2021–2030	2031–2059
Current sources	448.7	411.35	49.41
Maintenance support		53.50	146.59
New power-generating facilities		46.4	139.7
Total	448.7	511.2	335.7

Source: Ministry of Industry and Trade based on the material 'Development of supported energy sources by 2030'

Table 123: *Total investment aid for RES (in CZK billion)*

Source	Amount of aid
Biomass boilers and stoves	11.18
Heat pumps	11.97
Solar collectors	2.74
Wind power plants	6.60
Solar plants – buildings	12.79
Solar plants – areas	6.34
Total	51.6

Source: Ministry of Industry and Trade

[181] This material is available in Czech at the following link.

Table 124 shows total costs associated with the development of renewable energy sources, these costs amount to almost CZK 900 billion. In this respect, it is worth pointing out that this is a cost at the level of state aid, the total investment will be higher than that.

Table 124: *Total aid for RES (investment and operational) according to scenarios (in CZK billion)*

Source	Amount of aid
Operating aid 2021–2030	**511.2**
Current sources	411.35
Maintenance support	53.50
New power-generating facilities	46.4
Operating aid 2031–2059	**335.7**
Current sources	49.41
Maintenance support	146.59
New power-generating facilities	139.7
Investment subsidies 2021–2030	**51.6**
Total	898.5

5.3.2.2 Energy efficiency

According to the approved EU Energy Efficiency Directive (specifically Article 7), it is necessary to ensure that 8.4 PJ of new savings per year are achieved in the period 2021–2030, i.e. 462 PJ cumulatively[182].

Table 125 shows the public aid and total investment related to the implementation of Article 7 of Directive 2012/27/EU on energy efficiency, as amended. This table shows that the achievement of the Article 7 target is linked to a total investment of CZK 634.5 billion and an allocation of CZK 157.8 billion of public expenditure. Table 50 lists the related energy savings. Table 34 then provides detailed information on the expected financial costs associated with the renovation of buildings, which, however, are already included in the costs of compliance with Article 7.

Additional investments / public funds will have to be further spent to comply with Article 3 of Directive 2012/27/EU on energy efficiency, as amended. However, these investments could not be quantified in similar detail. Their total amount then largely depends on the contribution of Article 7 measures to the reduction of total final energy consumption based on Article 3.

[182] So far, this is a preliminary calculation, as data for reference years are not yet available.

Table 125: *Public aid and total investment linked to the implementation of Article 7 of Directive 2012/27/EU, as amended*

Measures/sources of funding	Measure type	Total investment (CZK million)	Of which public aid (CZK million)
Policy measures 2021–2030			
Operational Programme Competitiveness 2021–2027	Financial mechanism	19 000	8 000
Operational Programme Environment 2021–2027	Financial mechanism	35 000	14 000
Integrated Regional Operational Programme 2021–2027	Financial mechanism	20 000	8 000
New Green Savings Programme / Succession NGS Programme	Financial mechanism	118 000	40 000
EFEKT Programme	Financial mechanism	5 000	4 650
PANEL 2013+ Programme	Financial mechanism	15 000	15 000
Modernisation Fund[183]	Financial mechanism		50 000[184]
Taxation of household fuels	Tax measure	1 300	-
Taxation of fuel	Tax measure	180 000	-
Prohibition of boilers for 1st and 2nd emission class solid fuels	Regulatory measures	44 000	11 000
Ecodriving Support	Behavioural measures	120	100
Policy measures from 2014–2020 generating new individual measures			
Operational Programme Enterprise and Innovation for Competitiveness	Financial mechanism	11 500	4 000
Operational Programme Environment 2014–2020	Financial mechanism	800	400
Integrated Regional Operational Programme 2014–2020	Financial mechanism	300	100
New Green Savings Programme	Financial mechanism	4 050	1 350
Voluntary scheme for improving energy efficiency	Voluntary agreement	135 000	-
Financing overlap		- 65 000	- 11 000
Total		**524 070**	**156 600**

[183] A more detailed breakdown of allocations to individual areas aimed at increasing energy efficiency, as well as the overall set-up of the modernisation fund, will be specified during 2020.

[184] The above amount respects the preferential use of the part of the Modernisation Fund's resources corresponding to the allowance revenue referred to in Article 10c(4) of Directive 2003/87/EC, as amended, to support the projects of the electricity generating plant operators to modernise, diversify and decarbonise the energy sector in accordance with the Act on Emission Trading.

5.3.2.3 Infrastructure

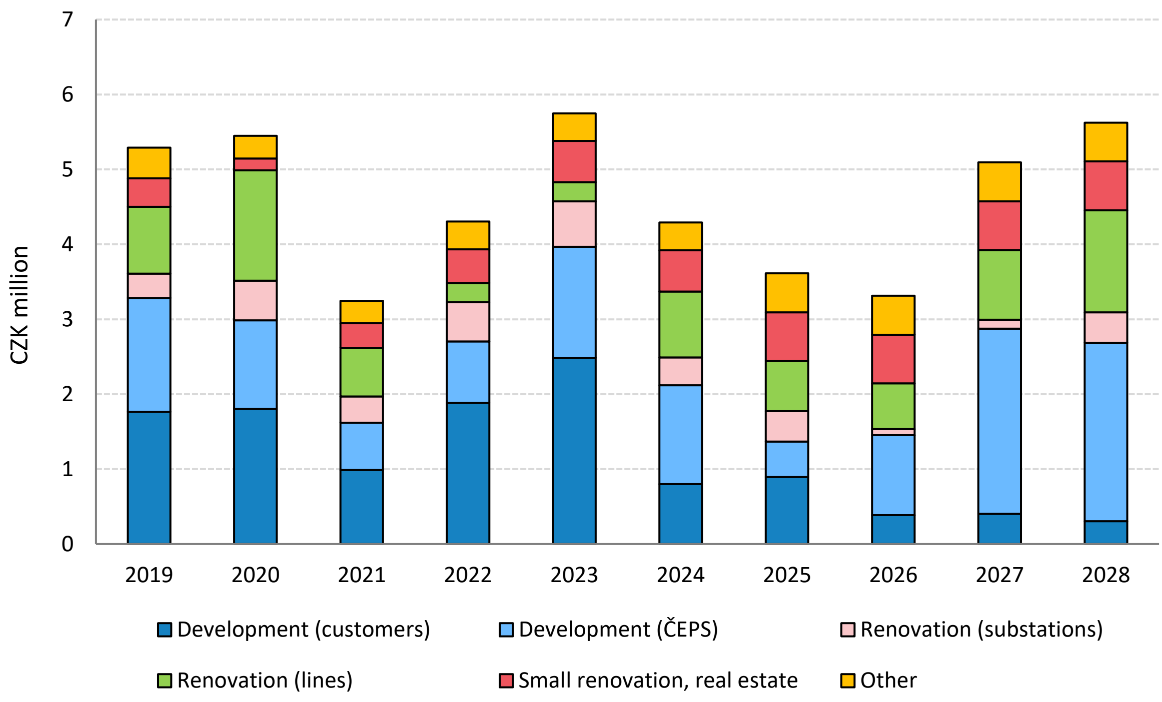
Table 126 shows the cumulative investments in the electricity system in the period 2021–2030. Chart 123 then shows the expected investments in the transmission system according to the ten-year development plan. Investments in the gas system are not publicly available, but investments in the transmission system are expected to amount to several tens of CZK billion. It is also an investment in smart grids. Accurate supporting documentation for cost estimates should be derived from work on projects included in the National Action Plan for Smart Grids (NAP SG). Based on the NAP SG approved in 2015, an additional cost of CZK 155 billion (up to CZK 120 billion for the integration of decentralised sources, beyond standard development and routine renewal) was envisaged for the development of smart grids by 2040. The NAP SG Update (NAP SG 2019–2030) quantifies the costs of the integration of decentralised sources as of 2040 in the amount of CZK 45 billion. This reduction is mainly due to the connection of voltage regulation at the high voltage level and other technical measures in smart grids. For more information about NAP SG, see Chapter 3.4.3, specifically part (ii).

Table 126: Cumulative investments in the Czech power system in the period 2021–2030

	Investment (CZK billion)
Power plants and accumulation	418
Distribution	181
Transmission	52
Total	651

Source: Expected Balance data (2018, OTE, a.s.)

Chart 123: *Investment in transmission system development*



Source: Plan for the Development of the Czech Transmission System 2019–2028

5.3.3 Sources of financing

5.3.3.1 Financing sources summary

EU Multiannual Financial Framework and other financial resources at EU level

Inside MFF, 25 % across the whole budget should be allocated to climate protection issues in 2021–2027. Table 127 shows an overview of the sources of EU energy-climate targets in 2021–2027 (part of the programmes goes beyond the MMF, namely the Innovation Fund, the Modernisation Fund and the Union Fund for the Promotion of RES). Table 128 then lists a quantification of the amount of resources available to finance energy-climate objectives at EU level. In this respect, it should be noted that this is a proposal which is subject to change. The Czech Republic should strive to use the maximum amount of EU funds to finance energy transformation.

Table 127: *Overview of sources of financing of energy and climate targets at EU level*

Programme title	Description
European Regional Development Fund and Cohesion Fund.	Proposed budget 2021–2027: EUR 273 billion; strengthening the link between the European Semester and the National Energy and Climate Plans; Relevant target area: Area 2 ‘a greener, low-carbon Europe’, percentage focused on climate mainstreaming: ERDF: 30 %, CF: 37 %.
Connecting Europe Facility (CEF)	Proposed budget 2021–2027: EUR 8.65 billion; continuing support for TEN-E; new support for cross-border RES support of 15 % (CEF-E), 1 % of the budget earmarked for technical and administrative assistance; percentage focused on climate mainstreaming: 60 %.
InvestEU Programme	New EU financial instrument, proposed budget: EUR 38 billion (mobilisation of private capital up to EUR 650 billion); main implementation partner: EIB; percentage focused on climate mainstreaming: 40 %.
Horizon Europe	Proposed budget 2021–2027: EUR 97.6 billion Climate, Energy and Mobility: EUR 15 billion; percentage focused on climate mainstreaming: 25 %.
LIFE Programme	Proposed budget 2021–2027: EUR 5.45 billion; programmes: nature and biodiversity, circular economy and quality of life, mitigation and adaptation to climate change, clean energy transition (EUR 1 billion); percentage focused on climate mainstreaming: 61 %.
Union RES support fund	Established in Article 33 of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action. The implemented action should be approved by the Energy Union Commission at the end of 2019 or early 2020.
Innovation Fund	Established for the EU as a whole (there is no direct allocation per Member State, as in the case of the Modernisation Fund); anticipated

	allocation: EUR 10 billion; adoption of first projects: mid-2020; co-financing at 60 %.
Modernisation Fund	Available only for 10 member countries (BG, CZ, EE; HR, LV, LT, HU, PL, RO, SK); at least 70 % must be allocated to priority projects; the possibility of transferring allowances under Article 10c of ETS legislation.

Source: An overview presentation of the European Commission sent to the Technical Working Group (17 September 2019)

Table 128: *Quantification of sources of financing of energy and climate targets at EU level (EUR million)*

Programme title	2021–2027 (EC Proposal)	2014–2020 (EU27+EDF)
Main energy and climate relevant programmes		
Connecting Europe Facility (CEF)	8.650	4.163
ITER	6.070	2 910
Decommissioning of Nuclear Sources (Lithuania)	552.0	451.0
Nuclear Safety and Decommissioning of Nuclear Sources (Bulgaria and Slovakia)	626.0	883.0
LIFE Programme	5 450.0	3 170.0
of which clean energy	1 000.0	-
InvestEU	14 725.0	-
Horizon Europe	97 600.0	66 034.0
European Regional Development Fund	226 308.0	193 398.0
Cohesion Fund	46 692.0	74 589.0
Other potentially relevant energy and climate programmes		
Euroatom Research and Training Programme	2 400.0	2 085.0
Neighbourhood, Development and International Cooperation Instrument	89 500.0	70 428.0
Instrument for pre-accession Assistance	14 500.0	12 799.0
Programmes outside of MFF		
Innovation Fund	10 000	-
Modernisation Fund	6 000	-

Source: An overview presentation of the European Commission sent to the Technical Working Group (17 September 2019)

Public sources of financing available for the Czech Republic

Table 129 provides an overview of the main sources of financing for the implementation of the National Plan of the Czech Republic. The main sources of public finance are as follows: (i) the state budget; (ii) the EU's multiannual financial framework / operational programmes for the period 2021–2027; (iii) proceeds from the sale of emission allowances; and (iv) the Connecting Europe Facility (CEF). Below you will find more detailed information on individual sources of financing.

Table 129: *Overview of sources of financing for implementation of the National Plan of the Czech Republic*

Financing source	Description
State budget	Within the state budget, mainly operating aid for renewable energy sources is envisaged, as well as programmes related to support the increase of energy efficiency (e.g. national programmes EFEKT, PANEL).
EU Multiannual Financial Framework / Operational Programmes (EU Funds) for the period 2021–2027	Energy and climate is mainly focused by Operational Programme Competitiveness, Operational Programme Environment, Operational Programme Transport and Integrated Regional Operational Programme, Rural Development Programme, etc.
Proceeds from the sale of emission allowances	In accordance with the amendment to Act No 383/2012, on the conditions of greenhouse gas emission allowance trading. The government's draft amendment envisages the establishment of a Modernisation Fund. Further utilisation of funds is envisaged within the Successor Programme New Green Savings (MoE) and also for the fulfilment of energy-climate goals under the responsibility of MoE and MIT. The Czech Republic will also try to prepare projects for the purpose of using funds from the Innovation Fund.
Connecting Europe Facility (CEF)	Connecting Europe Facility (CEF) is an important financing mechanism for financing key information infrastructure in the electricity and gas industry.

Source: Ministry of Industry and Trade

5.3.3.2 European Union funds (EU funds)

For the period 2014–2020, this is an important source of funding to ensure the development of the energy sector and the achievement of European and national targets in this area. As for the period 2021–2027, on 2 May 2018 the EC published the draft Multiannual Financial Framework 2021–2027. The budget is designed to address the main priorities and policies that deliver the highest European added value. Overall, the Commission proposes a long-term budget of EUR 1 279 billion in commitment appropriations (in current prices) for 2021–2027, which corresponds to 1.11 % of the EU-27 gross national income (GNI). Taking into account inflation, the budget has slightly increased compared to the current 2014–2020 budget (including the European Development Fund). The Commission has proposed a similar cohesion policy budget to the one in the current period (without the UK, however, there is a slight increase of 3 %). In its first draft, the Commission allocated EUR 226 billion for the European Regional Development Fund (ERDF), approximately EUR 47 billion for the Cohesion Fund (CF) and about EUR 100 billion for the European Social Fund (ESF). In addition, the Commission has also published information on where the funds will go and how they will be linked to those directly managed by the European Commission. The allocation for the Czech Republic amounted to EUR 18 billion in constant prices, representing a decline of about 24 % compared to the current period (EUR 20.1 billion in current prices).

Table 130: *Multiannual Financial Framework for the period 2021–2027*[185]

	07–13 (EUR billion)		14–20+ (EUR billion)		2021+ (EUR billion)	
	EU	**Czechia**	**EU**	**Czechia**	**EU**	**Czechia**
ERDF	201	13.66	212	11.94	226	10.524
CF	70	8.82	75.4 (including transfer to CEF)	6.14	47 (including transfer to CEF)	6.44
ESF/ESF+[186]	76	3.77	84	3.43	100	2.737
Total	347	26.12 (7.52 %)	371	21.51 (5.8 %)	373	ca 20.02[187]

Source: Ministry for Regional Development (National Coordination Authority)

On the basis of the analytical part of the National Cohesion Strategy (NCS) and taking into account the umbrella document of the Czech Republic 2030, five development priorities were formulated, which can be most efficiently achieved by EU funding. These priorities are: (i) low-carbon economy and environmental responsibility; (ii) development based on research, innovation and the use of technology; (iii) well-being and human capital; (iv) accessibility and mobility; (v) sustainable development of the territory.

Although the Czech Republic's allocation within the EU's financial framework for the period 2021+ is about 25 % lower compared to this period, it is still a significant source of funding, part of which will be allocated to the support of the transition to a low-carbon economy and circular economy and adaptation to climate change, which is one of the five basic policy objectives (namely PO 2)[188].

Table 131: *Five basic policy objectives of the Multiannual Financial Framework*

Objective	Target description
PO 1	A smarter Europe by promoting innovative and smart economic transformation
PO 2	A greener, low-carbon Europe by promoting clean and fair energy transition, green and blue investment, the circular economy, climate adaptation and risk prevention and management
PO 3	A more connected Europe by enhancing mobility and regional ICT connectivity
PO 4	A more social Europe implementing the European Pillar of Social Rights

[185] In this respect, it should be noted that the proposed post-2020 allocation may vary depending on the negotiations on the Multiannual Financial Framework, cohesion policy legislation and related financial aspects.
[186] For the period 2021+ it is 'ESF +' – the European Social Fund plus.
[187] Of the total amount, there is another EUR 314 million allocated to European Territorial Cooperation.
[188] Compared to the 11 thematic objectives in 2014–2020, the number of these thematic objectives has been reduced.

PO 5	A Europe closer to citizens by fostering the sustainable and integrated development of urban, rural and coastal areas and local initiatives

Source: Ministry for Regional Development (National Coordination Authority)

Several operational programmes, such as the Operational Programme Transport, the Integrated Regional Operational Programme and the Operational Programme Environment are relevant for meeting the climate-energy objectives. In particular, it is the Operational Programme Competitiveness. Table 132 then sets out specific objectives that correspond to the PO2, in the priority ‘moving towards a low-carbon economy’ (SO 3.1–SC 3.4) and ‘better source efficiency’ (SC 4.1–SC .4.2). CZK 16.7 billion should be allocated for the above specific objectives in 2021–2027. The draft Operational Programme Competitiveness should be submitted to the Czech Government for approval by 31 March 2020.

Table 132: *Specific objectives within PO2 (Operational Programme Competitiveness)*

Objective	Target description
SO 3.1	Aid for energy efficiency measures
SO 3.2	Aid for energy from RES
SO 3.3	Developing smart energy systems, grids and local level storage
SO 3.4	Improving biodiversity, green infrastructure and reducing pollution
SO 4.1	Promoting climate change adaptation, risk prevention and disaster resilience
SO 4.2	Supporting the transition to a circular economy

Source: Ministry for Regional Development (National Coordination Authority)

5.3.3.3 Revenues from the auctioning of emission allowances

The revenues from the sale of emission allowances are distributed equally between the Ministry of the Environment and the Ministry of Industry and Trade, in accordance with the current text of Section 7(7) of Act No 383/2012, on the conditions for trading in greenhouse gas emission allowances. The Ministry of the Environment is responsible for the Act on the Conditions for Trading in Greenhouse Gas Emission Allowances, which must also ensure the collection of data and calculation of the free allocation. In accordance with the requirements of the relevant directive, these funds are assigned in particular to reducing greenhouse gas emissions, promoting innovation in industry and to measures to increase energy efficiency, including the construction and renovation of heat supply systems, increase in the energy performance of buildings and increase in the efficiency of energy use in industry and the energy sector.

Table 133: *Revenues from emission trading until now (CZK billion)*

	2013	2014	2015	2016	2017	2018
Revenues from emission trading	3.80	0.96	3.03	3.17	5.22	14.93
New Green Savings sources	1.90	0.48	1.51	1.59	2.61	6.00/1.92
MoE share of emission trading revenues	1.90	0.48	1.51	1.59	2.61	7.47

Source: Prepared by MIT for the purposes of the National Plan

The Ministry of the Environment uses its 50 % share as the main source of funding for the New Green Savings (co-financed from the State budget).

Since 2015, the part that belongs to the Ministry of Industry and Trade has been wholly used to cover part of the support for electricity and heat from supported sources. The explanatory memorandum to the government decree on the determination of State budget funds in accordance with Section 28(3) of the Supported Energy Sources Act for 2019 shows the following State grant requirement between 2015 and 2018 (see Table 134).

Table 134: *State budget support for supported RES (CZK billion)*

	2015	2016	2017	2018	2019	2020
State budget support for supported RES	17.700	21.965	26.185	26.185	26.185	27.000

Source: Prepared by MIT for the purposes of the National Plan

The use of the proceeds from the sale of emission allowances in the fourth trading period (2021–2030) under the new EU legislation will depend on how the new legislation is transposed and implemented. The Ministry of the Environment is responsible for the Act on the Conditions for Trading in Emission Allowances.

The legislative process for the adoption of the amendment to Act No 383/2012, on the conditions for trading in greenhouse gas emission allowances, was launched in late 2018 (the consultation process on this amendment took place in December 2018). It is this amendment that should clarify the key points for predicting the use and the amount of funds available for energy efficiency policy and the supported energy sources policy after 2020.

Table 135 Table 44 shows the prediction of revenues from the auctioned emission allowances for the period 2021–2030. The following factors are important within the distribution of revenues from the auctioning of emission allowances: (i) the use of the 'Modernisation Fund'; (ii) the use of the free allocation under Article 10c ('derogation'); (iii) the introduction of the compensation of indirect costs[189]. The precise setting of these parameters was being discussed when this document was prepared; the table contains an estimate updated according to the draft amendment to Act 383/2012 and the development of the emission allowance market. However, it is necessary to maximise the targeted use of these funds to meet the RES and energy efficiency targets. This use should be at 60–70 % of total revenues.

Table 135: *Predicted revenues from auctioned emission allowances for the Czech Republic (CZK million)*

	Revenue from the use of 40 % of allowances to modernise electricity production and 50 % of allowances from the solidarity mechanism for the modernisation fund in line with the draft amendment	Revenues from the auctioning of allowances in the aviation sector
2021	12 160	40
2022	15 751	40
2023	20 246	40
2024	19 586	40

189 The amendment to the Act also deals with other transposition aspects following from the approved European legislation.

2025	18 896	39
2026	18 175	39
2027	16 098	38
2028	12 486	38
2029	12 948	38
2030	14 984	37
Total	**161 330**	389

Source: Updated MoE forecast, December 2019. The forecast expects the price of 30 EUR/EUA in 2021 and its steady growth to 35 EUR/EUA in 2030. The EUAA price follows the trend of the EUA price.

Table 136 provides detailed information on the distribution of revenues from sales of emission allowances in 2021–2030.

Table 136: *Breakdown of total revenues by subjects in 2021–2030 (CZK billion) according to selected variants, the price of the allowance 25.16 EUR/EUA*

Budget/Fund	Detailed breakdown	Amount
State budget	Total (depending on industry compensations)	94 – 125
	of which MoE (purpose-bond)	40
	of which MIT (purpose-bond)	40
	of which MoF (general state budget)	45
	of which max. industry compensation (state budget expenditure)	-31
Modernisation Fund	Total (purpose-bond)	135
	of which intended for the modernisation of the electricity generation sector	75
	of which for solidarity purposes	29
	of which the core of the Modernisation Fund	31

Source: Final report on Regulatory Impact Assessment (RIA) on the draft act amending Act No 383/2012, on the conditions for trading in greenhouse gas emission allowances

5.3.4 Coverage of investment needs with resources

Coverage of investment needs with energy efficiency resources is already shown in Table 125. Table 137 then provides a summary of financing sources.

Table 137: *Sources of financing for energy efficiency (CZK million)*

Measure	Public support	Investments
Operational Programme Competitiveness 2021–2027	8 000	19 000

Operational Programme Environment 2021–2027	14 000	35 000
Integrated Regional Operational Programme 2021–2027	8 000	20 000
Succession Programme of the New Green Savings Programme	40 000	118 000
EFEKT Programme	4 650	5 000
PANEL 2013+ Programme	15 000	15 000
Modernisation Fund	50 000	-[190]
Total	139 650	212 000

Table 124 shows the total public support of renewable and other supported sources of energy (investment and operational) for achieving the Czech Republic's contribution to the EU target of 22 %. Here it is assumed that the costs of operating aid of existing resources (in the form of 'maintenance support') and new resources amounting to approx. CZK 100 billion would be paid from the state budget. Public funds for investment aid then amount to CZK 52 billion for 2021–2030. Table 123 provides more detailed information. Table 138 then lists the sources of financing of investment aid by individual financial sources. The following tables then provide more specific information (including assumptions made, which are set out in footnote).

Table 138: *Sources of RES financing – basic indicative breakdown into individual financing programmes*[191]

Type of RES	Sources of financing
Biomass boilers and stoves	SPNGSP
Heat pumps	SPNGSP, OPC, Modernisation Fund, OP E
Solar collectors	SPNGSP, OPC, Modernisation Fund, OP E
Wind power plants	OPC, Modernisation Fund
Solar plants – buildings	SPNGSP, OPC, Modernisation Fund, OP E
Solar plants – areas	Modernisation Fund

Table 139: *Sources of RES financing – more detailed specifications for PVPP (CZK billion)*[192]

Sources of financing	Public aid intensity
SPNGSP (household buildings)	7.167
OP E[193]	
OPC – Energy savings (buildings with complex energy saving solutions)	1.534

190 It will be specified in relation to the settings of the supported areas.

191 SPNGSP – Successor Programme of the New Green Savings Programme; OPC – Operational Programme Competitiveness 2021–2027; OP E – Operational Programme Environment.

192 Assumptions made: 70 % of installations on buildings and 90 % of installations in areas (brownfields) will be supported by investment grants. The number of installations on buildings is expected with an output of 1.3 MW and the number of installations in areas is expected with an output of 0.587 MW. The amount of investment costs for PVPP on buildings in the amount of 35 000 CZK/kWe and for PVPP in areas of 30 000 CZK/kWe. The share of the subsidy in the total costs of 40 %.

193 The allocation could not be explicitly determined at the time of preparation of the National Plan.

OPC – RES (buildings with electricity consumption in the building)	1.023
Modernisation Fund[194]	
Total	9.724[195]

Table 140: *Sources of RES financing – more detailed specifications for WPP (CZK billion)*[196]

Sources of financing	Public aid intensity
NGS	-
OPC – Energy savings	-
OPC – RES (consumption of generated electricity from WPP in the cadastral district of the municipality)	0.66
Modernisation Fund[197]	
Total	0.66[198]

Table 141: *Sources of RES financing – detailed specifications for solar collectors (CZK billion)*[199]

Sources of financing	Public aid intensity
NGS (households)	1.495
OPC – Energy savings (buildings with complex energy saving solutions)	0.301
OPC – RES (buildings with electricity consumption in the building)	-
OP E – (individual installations without complex savings)	0.301
Modernisation Fund[200]	
Total	2.097[201]

194 In this respect, the setting up of the Modernisation Fund will be specified during 2020.

195 Without taking into account the resources of the Modernisation Fund (to be specified in relation to its precise settings).

196 Assumptions made: the investment subsidy will be supported by 50 % of installed capacity out of the total increase in installed capacity in the period 2021–2030 (i.e. 300 MW). The amount of investment costs according to the current regulation on technical and economic parameters for setting feed-in tariffs for electricity production and green bonuses for heat and for determining the lifetime of electricity and heat generation plants from renewable energy sources (Decree on technical and economic parameters) is 44 000 CZK/kWe and the share of the subsidy in the total costs of 50 %.

197 In this respect, the setting up of the Modernisation Fund will be specified during 2020.

198 Without taking into account the resources of the Modernisation Fund (to be specified in relation to its precise settings).

199 Assumptions made: the investment subsidy will support 50 % of installations out of the total number of needed replacement equipment. We consider investment costs of 83 000 CZK/installation and a subsidy of 70 % of total costs.

200 In this respect, the setting up of the Modernisation Fund will be specified during 2020.

201 Without taking into account the resources of the Modernisation Fund (to be specified in relation to its precise settings).

Table 142: *Sources of RES financing – detailed specifications for heat pumps (CZK billion)*[202]

Sources of financing	Public aid intensity
NGS (households)	5.864
OPC – Energy savings (buildings with complex energy saving solutions)	1.795
OPC – RES (buildings with electricity consumption in the building)	-
OP E – (individual installations without complex savings)	1.795
Modernisation Fund[203]	
Total	9.454[204]

Table 143: *Sources of RES financing – detailed specifications for biomass boilers and stoves (CZK billion)*[205]

Sources of financing	Public aid intensity
NGS (households)	5.59
OPC – Energy savings (buildings with complex energy saving solutions)	1.863
OPC – RES (buildings with electricity consumption in the building)	-
OP E – (individual installations without complex savings)	1.863
Modernisation Fund[206]	
Total	9.316[207]

5.4 Impacts of planned policies and measures described in section 3 on other Member States and regional cooperation at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

(i) Impacts on the energy system in neighbouring and other Member States in the widest possible range

202 Assumptions made: the investment subsidy will support 50 % of installations out of the total number of needed replacement equipment. We consider investment costs of 215 000 CZK/installation and a subsidy of 70 % of total costs.

203 In this respect, the setting up of the Modernisation Fund will be specified during 2020.

204 Without taking into account the resources of the Modernisation Fund (to be specified in relation to its precise settings).

205 Assumptions: the investment subsidy will support 30 % of installations out of the total number of needed replacement equipment. Investment costs of 130 000 CZK/installation and a subsidy of 70 % of total costs.

206 In this respect, the setting up of the Modernisation Fund will be specified during 2020.

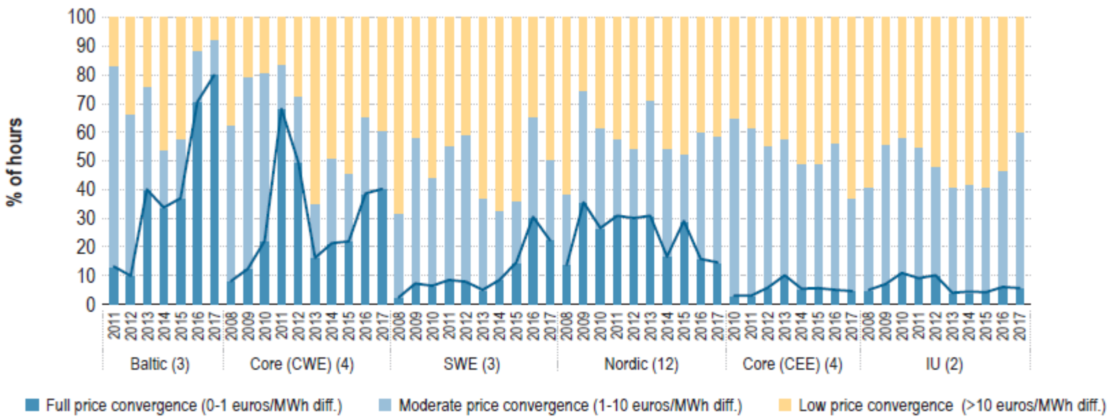
207 Without taking into account the resources of the Modernisation Fund (to be specified in relation to its precise settings).

Within the process of consultation of the National Plan of the Czech Republic with other Member States, which is described in more detail in Chapter 1.3, specifically part (iv), no policies and measures associated with significant regional impacts were identified by the consulted Member States. Or more precisely, policies and measures that may have a potential impact on other Member States are already undergoing specific impact assessments, such as cross-border infrastructure projects or other major projects that are subject to an environmental impact assessment. Key strategic documents are also subject to environmental impact assessment, including regional consultation. The State Energy Policy of the Czech Republic underwent this process in 2014 and 2015.

(ii) Impact on energy prices, utilities and energy market integration

The Czech Republic is not a large enough market to significantly affect the price of electricity in the region. With regard to natural gas, the Czech Republic is a negligible producer in terms of volume. Continued integration in electricity and gas contributes to the gradual convergence of prices (see Chart 124 and Chart 125 or ACER / CEER source publication).

Chart 124: *Convergence of electricity prices in selected regions (DA)*

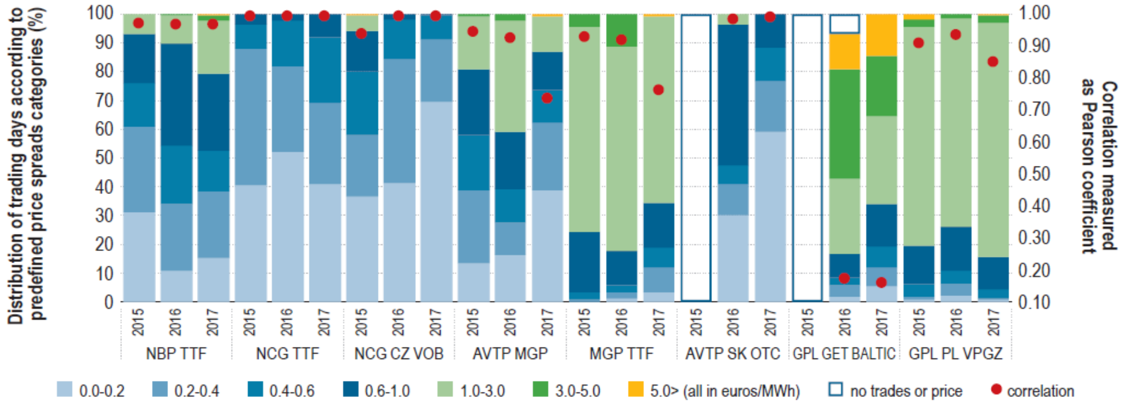


Source: ENTSO-E and ACER calculations (2018).

Note: The numbers in brackets refer to the number of bidding zones included in the analysis per CCR.

Source: Monitoring the Internal Electricity and Natural Gas Markets in 2017 (ACER/CEER)

Chart 125: *Convergence of gas prices in selected regions (DA)*



Source: ACER based on Platts and ICIS Heren.

Notes: Spreads in euros/MWh are calculated as the absolute price differential between pairs of hubs, independent of discount or premium. Lithuanian price analyses are based on a combination of day-ahead hub products and, for those days when day-ahead products were not traded, specific products traded ex-post of delivery for balancing purposes, used as a proxy. In some instances (e.g. AVTP-MGP), price correlation worsened year on year, despite enhanced price convergence; narrowing differentials gave some room for price movements in the opposite direction, which affects correlation results. Beyond that, some days of price spikes were registered with substantial impacts on correlations.

Source: Monitoring the Internal Electricity and Natural Gas Markets in 2017 (ACER/CEER)

(iii) Where appropriate, impacts on regional cooperation

The Czech Republic is already actively cooperating with other Member States in individual areas. The preparation of the National Plan has contributed positively to deepening this cooperation and identifying areas that can be further developed.

Annex 1 Simplified energy balance in the EUROSTAT methodology for 2016, 2020, 2025, 2030

Table 144: *Simplified energy balance by EUROSTAT methodology for 2016 (in PJ, electricity production in GWh and heat in TJ)*

	2016	Total	Coal	Technological gases	Oil and products	Natural gas	Renewable sources	Industrial waste	Municipal waste	Nuclear power plants	Heat	Electricity
+	Production	1 138.89	668.74		7.73	7.55	179.15	10.36	2.39	262.97		
+	Recycled products	6.57	5.74		0.83							
+	Import	904.41	124.29		431.14	281.15	18.05				0.03	49.74
-	Export	330.40	131.53		92.89		16.65				0.08	89.25
+	Balance differences	32.80	26.85		1.00	5.07	-0.12					
=	**Primary energy sources**	**1 739.01**	**694.09**		**334.56**	**293.76**	**180.44**	**10.36**	**2.39**	**262.97**	**-0.05**	**-39.51**
+	Yields	805.79	68.99	57.68	250.76						128.44	299.92
=	**Household sources total**	**2 544.80**	**763.08**	**57.68**	**585.32**	**293.76**	**180.44**	**10.36**	**2.39**	**262.97**	**128.39**	**260.41**
+	Transformation charge	1 332.75	655.28	28.53	252.56	60.39	63.91	0.66	1.78	262.97	1.01	5.68
	+ Refining fuels	421.95	171.13		250.82							
	+ Electricity and heat charge	910.79	484.14	28.53	1.73	60.39	63.91	0.66	1.78	262.97	1.01	5.68
+	Distribution losses	29.39	1.36	1.62		4.62					7.11	14.69
+	Own energy consumption	95.00	11.90	13.91	7.23	3.33					27.38	31.25
+	Non-energy consumption	77.46	18.04	0.75	54.47	4.20						
+	Final consumption	992.1	68.89	12.77	271.48	221.23	116.53	9.70	0.61		89.13	201.78
	+ Industry	270.3	28.85	12.77	6.12	84.37	20.17	9.08			25.44	83.53
	+ Transport	268.6	0.04		247.83	2.28	12.58					5.89
	+ Services	127.7	1.26		1.09	47.21	2.62	0.62	0.61		19.14	55.18
	+ Households	296.8	38.44		1.88	83.47	75.01				44.25	53.77
	+ Agriculture and fisheries	26.8	0.31		14.09	2.57	6.15				0.30	3.41
	+ Other unspecified	1.8			0.47	1.32						
=	**Total consumption**	2 526.72	755.47	57.58	585.73	293.76	180.44	10.36	2.39	262.97	124.62	253.40
	Gross electricity production	83 214.08	41 974.0	2 667.0	92.0	3 710.0	10 585.8	15.6	65.7	24 104.0		
	Gross heat production	125 660.00	72 184.0	5 985.0	1 093.0	35 282.0	8 828.0	405.0	1 000.0	883.0		

Table 145: *Simplified energy balance by EUROSTAT methodology for 2020 (in PJ, electricity production in GWh and heat in TJ)*

	2020	Total	Coal	Technological gases	Oil and products	Natural gas	Renewable sources	Industrial waste	Municipal waste	Nuclear power plants	Heat	Electricity
+	Production	1 158.16	604.82		7.78	8.84	184.56	10.43	2.42	339.30		
+	Recycled products	5.50	5.00		0.50							
+	Import	927.53	110.22		466.73	284.36	20.26				0.03	45.94
-	Export	261.17	56.14		89.20		13.79				0.08	101.96
+	Balance differences											
=	**Primary energy sources**	**1 813.95**	**663.90**		**369.74**	**293.20**	**191.03**	**10.43**	**2.42**	**339.30**	**-0.05**	**-56.02**
+	Yields	880.54	69.87	58.03	303.09						124.81	324.73
=	**Household sources total**	**2 694.49**	**733.77**	**58.03**	**672.84**	**293.20**	**191.03**	**10.43**	**2.42**	**339.30**	**124.76**	**268.71**
+	Transformation charge	1 489.20	644.15	30.46	342.38	56.69	67.04	0.66	1.84	339.30	1.00	5.68
	+ Refining fuels	513.44	172.50		340.94							
	+ Electricity and heat charge	975.76	471.65	30.46	1.44	56.69	67.04	0.66	1.84	339.30	1.00	5.68
+	Distribution losses	29.09	0.78	1.10		4.60					7.09	15.52
+	Own energy consumption	96.84	11.94	13.59	6.79	3.48					27.37	33.68
+	Non-energy consumption	77.37	17.81	0.75	54.62	4.20						
+	Final consumption	1 002.0	59.10	12.13	269.05	224.22	123.99	9.77	0.58		89.30	213.83
	+ Industry	283.8	27.91	12.13	6.61	88.24	21.41	9.15			27.38	90.93
	+ Transport	275.5	0.06		246.11	3.95	18.56					6.87
	+ Services	127.6	0.97		1.01	45.51	2.65	0.62	0.58		18.53	57.71
	+ Households	288.5	29.96		1.83	83.26	75.21				43.11	55.17
	+ Agriculture and fisheries	24.8	0.20		13.02	1.97	6.16				0.28	3.15
	+ Other unspecified	1.8			0.47	1.30						
=	**Total consumption**	**2 694.49**	**733.77**	**58.03**	**672.84**	**293.20**	**191.03**	**10.43**	**2.42**	**339.30**	**124.76**	**268.71**
	Gross electricity production	90 203.99	41 090.9	2 854.3	85.4	3 950.3	11 025.8	14.7	80.1	31 102.5		
	Gross heat production	124 808.69	69 339.8	6 064.9	1 051.6	35 627.4	10 340.3	282.9	1 209.3	892.5		

Table 146: *Simplified energy balance by EUROSTAT methodology for 2025 (in PJ, electricity production in GWh and heat in TJ)*

	2025	Total	Coal	Technological gases	Oil and products	Natural gas	Renewable sources	Industrial waste	Municipal waste	Nuclear power plants	Heat	Electricity
+	Production	946.58	368.93		7.72	8.84	205.81	10.23	5.51	339.53		
+	Recycled products	5.50	5.00		0.50							
+	Import	988.37	168.93		469.73	278.44	21.50				0.03	49.75
-	Export	183.28	0.73		90.45		12.18				0.08	79.84
+	Balance differences											
=	**Primary energy sources**	**1 740.55**	**542.13**		**370.89**	**287.28**	**215.13**	**10.23**	**5.51**	**339.53**	**-0.05**	**-30.09**
+	Yields	849.33	66.23	57.16	305.14						120.92	299.89
=	**Household sources total**	**2 589.88**	**608.35**	**57.16**	**676.03**	**287.28**	**215.13**	**10.23**	**5.51**	**339.53**	**120.87**	**269.79**
+	Transformation charge	1 393.16	532.20	30.61	344.58	57.44	76.50	0.67	4.92	339.53	1.00	5.69
	+ Refining fuels	511.21	168.03		343.18							
	+ Electricity and heat charge	881.95	364.17	30.61	1.40	57.44	76.50	0.67	4.92	339.53	1.00	5.69
+	Distribution losses	27.28	0.76	1.06		4.51					7.06	13.89
+	Own energy consumption	93.46	11.94	12.99	6.70	3.58					27.34	30.91
+	Non-energy consumption	76.60	17.81	0.75	53.84	4.20						
+	Final consumption	999.4	45.64	11.75	270.91	217.56	138.63	9.56	0.58		85.46	219.29
	+ Industry	282.7	21.13	11.75	6.55	90.82	23.67	8.94			25.68	94.16
	+ Transport	285.5	0.06		247.94	7.05	22.55					7.85
	+ Services	122.6	0.63		0.91	42.29	2.73	0.62	0.58		17.78	57.04
	+ Households	281.6	23.73		1.78	72.90	84.46				41.73	57.02
	+ Agriculture and fisheries	25.3	0.09		13.28	3.19	5.22				0.28	3.22
	+ Other unspecified	1.8			0.47	1.30						
=	**Total consumption**	**2 589.88**	**608.35**	**57.16**	**676.03**	**287.28**	**215.13**	**10.23**	**5.51**	**339.53**	**120.87**	**269.79**
	Gross electricity production	83 301.41	32 510.3	2 914.9	82.4	3 977.6	12 425.5	15.9	250.8	31 124.0		
	Gross heat production	120 916.88	56 700.1	5 753.2	1 038.7	34 543.9	18 283.8	283.4	3 421.2	892.5		

Table 147: *Simplified energy balance by EUROSTAT methodology for 2030 (in PJ, electricity production in GWh and heat in TJ)*

	2030	Total	Coal	Technological gases	Oil and products	Natural gas	Renewable sources	Industrial waste	Municipal waste	Nuclear power plants	Heat	Electricity
+	Production	971.51	368.93		7.66	8.84	229.95	10.02	6.34	339.77		
+	Recycled products	5.50	5.00		0.50							
+	Import	960.73	161.43		467.00	259.93	23.35				0.03	49.00
-	Export	185.90	4.93		90.79		10.98				0.08	79.12
+	Balance differences											
=	**Primary energy sources**	**1 734.63**	**530.42**		**367.17**	**268.77**	**242.31**	**10.02**	**6.34**	**339.77**	**-0.05**	**-30.11**
+	Yields	844.66	64.33	55.86	303.68						116.35	304.44
=	**Household sources total**	**2 579.29**	**594.75**	**55.86**	**670.85**	**268.77**	**242.31**	**10.02**	**6.34**	**339.77**	**116.30**	**274.33**
+	Transformation charge	1 393.49	527.10	30.42	342.99	50.90	89.18	0.67	5.76	339.77	1.00	5.71
	+ Refining fuels	507.03	165.43		341.60							
	+ Electricity and heat charge	886.46	361.67	30.42	1.39	50.90	89.18	0.67	5.76	339.77	1.00	5.71
+	Distribution losses	26.67	0.76	1.01		4.21					7.03	13.66
+	Own energy consumption	93.06	11.94	12.48	6.60	3.51					27.32	31.20
+	Non-energy consumption	75.82	17.81	0.75	53.06	4.20						
+	Final consumption	990.3	37.14	11.19	268.20	205.95	153.13	9.35	0.58		80.95	223.76
	+ Industry	278.4	19.49	11.19	6.43	89.08	24.09	8.72			23.26	96.11
	+ Transport	294.0	0.06		245.41	9.16	29.78					9.57
	+ Services	116.8	0.30		0.80	38.88	2.81	0.62	0.58		17.02	55.81
	+ Households	273.9	17.29		1.72	61.74	93.69				40.39	59.04
	+ Agriculture and fisheries	25.4			13.37	5.79	2.77				0.28	3.24
	+ Other unspecified	1.8			0.47	1.30						
=	**Total consumption**	**2 579.29**	**594.75**	**55.86**	**670.85**	**268.77**	**242.31**	**10.02**	**6.34**	**339.77**	**116.30**	**274.33**
	Gross electricity production	84 567.19	32 444.6	2 890.7	81.7	3 803.6	13 888.2	16.0	297.0	31 145.4		
	Gross heat production	116 350.39	55 351.0	5 747.2	1 028.4	26 553.8	22 474.3	283.5	4 019.7	892.5		

Annex 2: Detailed list of parameters and variables[208]

1. General parameters and variables[209]

Table 148: *Population*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Population (year average)	thousand	10 517.2	10 496.7	10 509.3	10 510.7	10 524.8	10 542.9	10 565.3	10 662.1	10 712.4	10 691.9	10 607.8	10 548.5
Population (as of 1 January)	thousand	10 462.1	10 486.7	10 505.4	10 516.1	10 512.4	10 538.3	10 553.8	10 652.4	10 711.9	10 685.9	10 615.8	10 552.3

Table 149: *Gross domestic product*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
GDP (prices of the given year)	CZK billion	3 962.5	4 034.8	4 060.9	4 098.1	4 314.8	4 596.8	4 769.0	5 838.4	7 249.5	8 922.0	10 929.0	12 960.9
GDP (2010 prices)	CZK billion	3 962.5	4 033.9	4 001.7	3 981.3	4 089.4	4 307.5	4 412.0	5 029.8	5 662.3	6 312.8	7 004.6	7 522.1

Table 150: *Gross value added*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
GVA (prices of the given year)	CZK billion	3 583.1	3 640.3	3 649.5	3 668.3	3 899.6	4 136.6	4 285.8	5 254.9	6 524.0	8 029.4	9 836.6	11 664.6
GVA (2010 prices)	CZK billion	3 583.1	3 655.0	3 624.2	3 606.4	3 729.0	3 905.2	3 998.6	4 526.2	5 096.4	5 681.0	6 303.6	6 770.3

Table 151: *Average household size*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040

[208] The annex contains a complete list of quantitative data required by the Energy Union Governance and Climate Action Regulation. Absent values are either not available or will be added if possible when this document is finalised.

[209] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action also requires the following data, which are not available: gross value added by industry – the Czech Republic has this information as monetarily expressed production (see Chart 121); gross value added by sector is only a derived indicator, therefore it was not listed here); key technology costs.

Average household size	persons/household	2.507	2.496	2.419	2.407	2.396	2.387	2.378	2.342	2.333	2.324	2.315	2.306

Table 152: *Number of households*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Number of households	thousand	4 195.3	4 205.5	4 344.3	4 367.2	4 391.9	4 416.3	4 442.7	4 552.1	4 662.9	4 744.1	4 805.2	4 877.4
Number of households, EU-SILC	thousand	4 149.7	4 180.6	4 254.9	4 282.5	4 304.5	4 324.7	4 347.8	4 452.8	4 561.3	4 640.6	4 700.4	4 771.1

Table 153: *Available household income*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Available income	CZK billion	2 178.9	2 184.1	2 205.7	2 207.7	2 284.6	2 383.3	2 474.0	3 009.1	3 735.8	4 597.8	5 632.7	6 679.5
Available income + NPISH	CZK billion	2 206.9	2 212.0	2 233.5	2 236.7	2 314.9	2 412.2	2 506.5	3 051.9	3 789.0	4 663.2	5 712.8	6 774.4

Table 154: *Passenger transport performances*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Car transport	pkm million	63 570.0	65 490.0	64 260.0	64 650.0	66 260.0	69 705.0	72 255.0	76 200.0	77 300.0	77 732.0	78 167.0	78 602.3
Railway transport	pkm million	6 590.7	6 714.0	7 264.7	7 600.6	7 796.5	8 298.1	8 843.4	9 753.2	10 410.0	11 203.0	11 862.0	12 355.5
Bus transport	pkm million	10 335.7	9 266.7	9 015.4	9 025.6	10 010.2	9 995.9	10 257.1	12 579.0	13 725.0	14 860.0	15 813.6	16 359.9
Air transport	pkm million	10 902.0	11 585.6	10 611.6	9 603.9	9 756.6	9 701.0	10 202.6	12 646.3	13 487.0	14 337.0	15 262.8	15 917.4
Inland waterway transport	pkm million	12.8	14.8	17.3	16.2	20.7	13.5	12.2	14.9	15.2	15.3	15.4	15.6
Public transport	pkm million	15 617.4	15 281.5	16 624.8	16 276.2	16 270.2	16 100.0	17 387.1	18 398.4	19 364.3	20 259.0	20 950.0	21 455.6
Passenger transport performances	pkm million	107 028.6	108 352.6	107 793.7	107 172.4	110 114.3	113 813.6	118 957.4	129 591.8	134 301.5	138 406.3	142 070.8	144 706.3

Table 155: *Cargo transport performances*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Road transport	tkm million	51 832.1	54 830.3	51 228.0	54 893.0	54 092.0	58 713.7	50 314.7	47 312.0	54 520.1	61 485.0	68 936.7	74 762.3
Railway transport	tkm million	13 770.4	14 315.8	14 266.2	13 964.9	14 574.2	15 261.1	15 618.0	16 249.1	17 167.0	18 087.0	19 003.2	19 835.8
Inland waterway transport	tkm million	679.5	695.0	669.3	693.5	656.5	584.9	620.4	680.0	768.8	864.8	944.5	998.5
Air transport	tkm million	22.4	22.0	16.6	24.3	35.0	31.1	30.9	33.6	34.5	35.6	36.9	38.2
Cargo transport performances	tkm million	66 304.3	69 863.0	66 180.1	69 575.7	69 357.7	74 590.7	66 584.1	64 274.6	72 490.4	80 472.4	88 921.3	95 634.8

Table 156: *International prices of basic fuels (EUR/boe)*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Oil	EUR/boe	N/A	N/A	N/A	N/A	N/A	46.65	39.52	69.17	91.47	100.77	105.12	111.30
Natural gas	EUR/boe	N/A	N/A	N/A	N/A	N/A	40.40	27.12	44.15	56.08	60.99	65.14	67.34
Coal	EUR/boe	N/A	N/A	N/A	N/A	N/A	11.71	12.54	16.58	18.36	22.04	23.34	24.32

Table 157: *International prices of basic fuels (EUR/GJ)*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Oil	EUR/GJ	N/A	N/A	N/A	N/A	N/A	8.02	6.80	11.90	15.73	17.33	18.08	19.14
Natural gas	EUR/GJ	N/A	N/A	N/A	N/A	N/A	6.95	4.66	7.59	9.64	10.49	11.20	11.58
Coal	EUR/GJ	N/A	N/A	N/A	N/A	N/A	2.01	2.16	2.85	3.16	3.79	4.01	4.18

Table 158: *International prices of basic fuels (EUR/toe)*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Oil	EUR/toe	N/A	N/A	N/A	N/A	N/A	335.86	284.54	498.05	658.59	725.51	756.83	801.36
Natural gas	EUR/toe	N/A	N/A	N/A	N/A	N/A	290.91	195.24	317.85	403.80	439.13	469.00	484.81
Coal	EUR/toe	N/A	N/A	N/A	N/A	N/A	84.28	90.31	119.39	132.21	158.67	168.02	175.13

Table 159: *CZK/EUR exchange rate*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
CZK/EUR (ECU)	CZK/EUR	25.3	24.6	25.1	26.0	27.5	27.3	27.0	24.6	23.1	22.0	21.4	20.9

Table 160: *EUR/USD exchange rate*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
EUR/USD exchange rate	EUR/USD	1.3	1.4	1.3	1.3	1.3	1.1	1.1	1.2	1.2	1.2	1.2	1.2

Table 161: *Emission allowance price*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Emission allowance price (€'10)	EUR/tCO_2	N/A	N/A	N/A	N/A	N/A	7.2	N/A	14.4	21.6	32.1	40.3	48.0
Emission allowance price (€'13)	EUR/tCO_2	N/A	N/A	N/A	N/A	N/A	7.5	N/A	15.0	22.5	33.5	42.0	50.0
Emission allowance price (€'16)	EUR/tCO_2	N/A	N/A	N/A	N/A	N/A	7.8	N/A	15.5	23.3	34.7	43.5	51.7

Table 162: *Number of degree days*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Number of heating degree days	dd°C	3 832.5	3 390.4	3 389.6	3 430.7	3 391.5	3 387.6	3 383.9	3 369.8	3 354.1	3 340.1	3 327.4	3 315.9
Number of cooling degree days	dd°C	107.5	126.0	120.4	120.7	121.1	120.9	121.2	122.5	124.0	125.4	126.7	128.0

2. Energy balances and indicators

2.1. Energy supply[210]

Table 163: *Production (including recycled products)*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Coal and coal products	ktoe	20 729.9	20 895.6	20 141.5	17 673.6	16 848.4	16 795.4	15 972.7	14 445.9	8 811.7	8 811.7	6 870.1	2 957.1

[210] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action also requires the following data, which are not available: imports of natural gas by country of origin (this information is given for historical years Chart 83 and Chart 84, but it is a business diversification; the prediction cannot be reliably determined).

Technological gases	ktoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and petroleum products	ktoe	268.8	334.0	313.6	256.0	260.4	206.0	184.5	185.9	184.4	183.0	181.6	180.1
Natural gas	ktoe	201.7	189.4	213.9	205.9	211.9	204.8	180.2	211.2	211.2	211.2	211.2	211.2
Renewable sources	ktoe	3 251.1	3 479.6	3 727.3	4 117.5	4 197.4	4 279.2	4 278.9	4 408.2	4 915.7	5 492.2	5 774.3	5 873.3
Non-renewable waste comp.	ktoe	200.8	219.9	225.2	216.3	250.7	277.3	304.5	307.0	376.0	390.8	389.1	387.4
Nuclear sources	ktoe	7 298.3	7 361.8	7 892.6	7 995.1	7 884.9	6 988.1	6 281.0	8 104.0	8 109.6	8 115.2	9 427.0	11 081.5
Heat	ktoe	20 729.9	20 895.6	20 141.5	17 673.6	16 848.4	16 795.4	15 972.7	14 445.9	8 811.7	8 811.7	6 870.1	2 957.1
Electricity	ktoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	ktoe	31 950.6	32 480.3	32 514.1	30 464.4	29 653.7	28 750.9	27 201.8	27 662.1	22 608.6	23 204.0	22 853.2	20 690.5

Table 164: *Net imports*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Coal and coal products	ktoe	-2 862.4	-2 050.9	-2 081.5	-1 680.6	-693.7	-264.6	-172.9	1 291.7	4 017.4	3 737.7	3 772.0	3 569.7
Technological gases	ktoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and petroleum products	ktoe	8 974.9	8 641.9	8 512.9	8 263.9	8 886.9	8 712.0	8 079.1	9 017.0	9 058.9	8 985.6	8 932.0	8 763.3
Natural gas	ktoe	6 846.0	7 505.4	6 101.4	6 961.4	5 951.6	6 164.4	6 715.1	6 791.8	6 650.4	6 208.2	6 088.0	7 388.6
Renewable sources	ktoe	-119.2	-36.1	-31.8	-76.7	-15.5	-6.0	33.5	154.4	222.5	295.3	323.6	323.6
Non-renewable waste comp.	ktoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear sources	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
Heat	ktoe	-2.1	-1.9	-1.7	-1.3	-1.1	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Electricity	ktoe	-1 285.3	-1 465.5	-1 472.1	-1 452.0	-1 401.5	-1 076.1	-943.6	-1 338.1	-718.8	-719.3	-644.4	-399.2
Total	ktoe	11 552.0	12 592.9	11 027.3	12 014.7	12 726.6	13 528.4	13 710.0	15 915.6	19 229.3	18 506.4	18 470.1	19 644.8

Table 165: *Import dependence*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Import dependence	%	25.5 %	29.0 %	25.6 %	27.7 %	30.4 %	32.2 %	33.01 %	36.7 %	46.3 %	44.7 %	45.0 %	49.1 %

Table 166: *Electricity import by country of origin*[211]

		2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040
Poland	%	N/A	N/A	N/A	N/A	N/A	N/A	32.6	N/A	N/A	N/A	N/A	N/A
Germany	%	N/A	N/A	N/A	N/A	N/A	N/A	65.5	N/A	N/A	N/A	N/A	N/A
Austria	%	N/A	N/A	N/A	N/A	N/A	N/A	1.0	N/A	N/A	N/A	N/A	N/A
Slovakia	%	N/A	N/A	N/A	N/A	N/A	N/A	0.9	N/A	N/A	N/A	N/A	N/A

Table 167: *Primary energy sources by fuel*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Coal and coal products	ktoe	18 860.0	18 314.2	17 320.8	17 310.3	15 997.9	16 427.6	16 578.1	15 857.0	12 948.5	12 668.8	10 761.6	6 646.3
Technological gases	ktoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and petroleum products	ktoe	8 983.2	8 743.7	8 623.5	8 282.7	8 811.6	8 610.7	7 990.8	8 831.2	8 858.5	8 769.7	8 697.3	8 515.9
Natural gas	ktoe	8 069.5	6 809.2	6 856.1	6 946.4	6 182.1	6 482.8	7 016.3	7 002.9	6 861.6	6 419.4	6 299.2	7 599.8
Renewable sources	ktoe	3 129.8	3 439.9	3 687.9	4 050.0	4 176.0	4 278.8	4 309.7	4 562.6	5 138.2	5 787.5	6 097.9	6 196.9
Non-renewable waste comp.	ktoe	200.8	219.9	225.2	216.3	250.7	277.3	304.5	307.0	376.0	390.8	389.1	387.4
Nuclear sources	ktoe	7 298.3	7 361.8	7 892.6	7 995.1	7 884.9	6 988.1	6 281.0	8 104.0	8 109.6	8 115.2	9 427.0	11 081.5
Heat	ktoe	-2.1	-1.9	-1.7	-1.3	-1.1	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Electricity	ktoe	-1 285.3	-1 465.5	-1 472.1	-1 452.0	-1 401.5	-1 076.1	-943.6	-1 338.1	-718.8	-719.3	-644.4	-399.2
Total	ktoe	45 254.3	43 421.3	43 132.4	43 347.5	41 900.5	41 988.0	41 535.6	43 325.5	41 572.4	41 431.0	41 026.5	40 027.3

2.2. Electricity and heat[212]

Table 168: *Gross electricity production by fuels*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040

211 Historical information is available in the Report on the Operation of the Electricity System (ERO). This is not the country of origin, but the country from which electricity entered the Czech Republic. ČEPS, a.s. has the outlooks according to individual assumptions. However, at the time of preparation, it was not possible to summarise this information in a comprehensive form for the purposes of this document.

212 Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action also requires the following data, which are not available: share of CHP in total electricity and heat production; development of installed power; capacity of cross-border interconnectors; use rate of cross-border interconnectors.

Coal and coal products	GWh	46 900.0	46 685.0	43 978.0	41 113.0	40 727.0	41 141.0	41 974.0	41 090.9	32 510.3	32 444.6	25 966.1	13 859.0
Technological gases	GWh	2 839.0	2 838.0	2 589.0	2 598.0	2 804.0	2 696.0	2 667.0	2 854.3	2 914.9	2 890.7	2 832.5	761.0
Oil and petroleum products	GWh	199.0	174.0	113.0	79.0	105.0	94.0	92.0	85.4	82.4	81.7	79.9	78.1
Natural gas	GWh	1 362.0	1 397.0	1 479.0	2 025.0	1 806.0	2 264.0	3 710.0	3 950.3	3 977.6	3 803.6	3 730.0	8 469.7
Renewable sources	GWh	6 494.3	7 946.5	8 796.3	10 213.4	10 223.7	10 696.3	10 585.8	11 025.8	12 425.5	13 888.2	15 988.3	17 997.3
Non-renewable waste comp.	GWh	27.1	66.5	64.9	64.9	69.1	77.5	81.3	94.9	266.8	313.0	313.0	313.0
Nuclear sources	GWh	27 998.0	28 283.0	30 324.0	30 745.0	30 325.0	26 841.0	24 104.0	31 102.5	31 124.0	31 145.4	36 179.7	42 529.5
Heat	GWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electricity	GWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	GWh	85 819.4	87 390.0	87 344.1	86 838.3	86 059.8	83 809.9	83 214.1	90 204.0	83 301.4	84 567.2	85 089.5	84 007.5

Table 169: *Heat production information*[213]

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Coal	TJ	93 648.0	82 556.0	82 136.0	80 180.0	68 503.0	70 235.0	72 184.0	69 339.8	56 700.1	55 351.0	51 568.2	25 443.2
Technological gases	TJ	6 339.0	6 511.0	6 169.0	6 841.0	6 301.0	5 711.0	5 985.0	6 064.9	5 753.2	5 747.2	5 740.5	4 559.2
Oil and products	TJ	2 308.0	3 083.0	2 250.0	1 345.0	1 263.0	1 016.0	1 093.0	1 051.6	1 038.7	1 028.4	1 018.3	1 005.9
Natural gas	TJ	38 657.0	35 220.0	36 550.0	37 820.0	31 470.0	31 453.0	35 282.0	35 627.4	34 543.9	26 553.8	21 575.3	41 767.8
Renewable sources	TJ	3 772.0	4 705.0	4 813.0	6 977.0	7 956.0	8 599.0	8 828.0	10 340.3	18 283.8	22 474.3	26 641.7	29 694.9
Industrial waste	TJ	260.0	343.0	312.0	290.0	314.0	350.0	405.0	282.9	283.4	283.5	283.5	283.5
Municipal waste	TJ	705.0	942.0	1 002.0	991.0	1 047.0	1 042.0	1 000.0	1 209.3	3 421.2	4 019.7	4 019.7	4 019.7
Nuclear power plants	TJ	1 062.0	923.0	983.0	898.0	871.0	899.0	883.0	892.5	892.5	892.5	2 499.9	2 635.3
Heat	TJ	0	0	0	0	0	0	0	0	0	0	0	0
Electricity	TJ	0	0	0	0	0	0	0	0	0	0	0	0
Total	TJ	146 751.0	134 283.0	134 215.0	135 342.0	117 725.0	119 305.0	125 660.0	124 808.7	120 916.9	116 350.4	113 347.1	109 409.4

213 A somewhat different structure was chosen compared to the requirements of Regulation (EU) 2018/1999.

2.3. Transformation sector

Table 170: *Electricity and heat production charge*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Coal and coal products	ktoe	13 859.3	13 475.4	12 740.1	11 949.2	11 565.7	11 586.3	11 563.6	11 265.1	8 698.1	8 638.3	6 921.8	3 532.6
Technological gases	ktoe	732.4	738.9	681.1	717.6	743.8	681.3	681.3	727.6	731.2	726.6	715.9	313.8
Oil and petroleum products	ktoe	92.3	106.5	79.1	50.6	52.3	49.6	41.4	34.3	33.5	33.2	32.6	32.2
Natural gas	ktoe	1 197.5	1 126.7	1 153.3	1 265.4	1 066.8	1 152.6	1 442.4	1 354.1	1 371.9	1 215.6	1 116.9	2 428.1
Renewable sources	ktoe	881.8	1 079.2	1 228.2	1 447.3	1 486.4	1 550.6	1 526.4	1 601.1	1 827.1	2 129.9	2 407.2	2 642.4
Non-renewable waste comp.	ktoe	39.6	55.6	56.3	52.6	53.8	55.7	58.2	59.6	133.7	153.6	153.6	153.6
Nuclear sources	ktoe	7 298.3	7 361.8	7 892.6	7 995.1	7 884.9	6 988.1	6 281.0	8 104.0	8 109.6	8 115.2	9 427.0	11 081.5
Heat	ktoe	7.5	10.1	10.3	10.3	11.8	8.6	24.0	24.0	23.9	23.9	23.9	22.7
Electricity	ktoe	69.2	81.8	85.2	105.3	117.8	143.3	135.6	135.7	136.0	136.3	136.6	136.9
Total	ktoe	24 177.9	24 036.0	23 926.4	23 593.6	22 983.3	22 216.4	21 753.9	23 305.6	21 065.0	21 172.7	20 935.5	20 343.8

Table 171: *Transformation charge (other)*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Transformation charge	ktoe	13 029.6	12 232.6	12 250.6	11 579.3	12 637.2	12 046.5	10 078.2	12 263.2	12 210.0	12 110.2	12 071.7	11 191.7

2.4. Power consumption[214]

Table 172: *Primary energy sources, final energy consumption and non-energy consumption*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Primary energy sources	ktoe	45 254.3	43 421.3	43 132.4	43 347.5	41 900.5	41 988.0	41 535.6	43 325.5	41 572.4	41 431.0	41 026.5	40 027.3
Final energy consumption	ktoe	24 273.5	23 475.7	23 466.6	23 233.0	22 529.6	23 153.8	23 696.5	23 931.9	23 869.9	23 652.0	23 492.6	23 231.0
Non-energy consumption	ktoe	5 279.3	4 791.0	5 030.2	4 865.9	5 297.8	4 524.7	3 242.9	3 239.5	3 206.9	3 174.4	3 141.8	3 109.2

[214] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action also requires the following data, which are not available: energy intensity of GVA production by sector; energy intensity of transport.

Table 173: *Final consumption by sector*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Industry	ktoe	6 979.7	6 854.1	6 806.6	6 500.6	6 402.9	6 527.6	6 456.7	6 777.3	6 752.1	6 649.0	6 600.0	6 538.8
Households	ktoe	7 506.9	6 926.0	7 182.2	7 329.5	6 596.4	6 807.8	7 089.5	6 891.8	6 726.1	6 541.0	6 360.2	6 159.8
Services	ktoe	3 244.3	3 126.8	3 032.9	2 977.3	2 893.1	2 943.0	3 051.0	3 047.5	2 928.0	2 790.4	2 652.9	2 515.3
Transport	ktoe	5 916.1	5 935.6	5 788.9	5 738.7	5 948.8	6 195.2	6 416.0	6 581.1	6 818.0	7 021.6	7 201.6	7 350.1
Agriculture and fisheries	ktoe	546.7	548.7	564.3	610.7	616.1	607.7	640.5	592.1	603.6	607.8	635.8	624.8
Other	ktoe	79.9	84.6	91.8	76.2	72.4	72.4	42.8	42.2	42.2	42.2	42.2	42.2
Total	ktoe	24 273.5	23 475.7	23 466.6	23 233.0	22 529.6	23 153.8	23 696.5	23 931.9	23 869.9	23 652.0	23 492.6	23 231.0

Table 174: *Final consumption by fuels*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Coal and coal products	ktoe	1 984.6	1 934.8	2 006.5	1 968.7	1 702.8	1 683.1	1 645.4	1 411.5	1 090.1	887.1	708.5	660.0
Technological gases	ktoe	335.6	341.0	330.8	312.9	323.6	311.3	305.1	289.8	280.8	267.4	265.4	263.3
Oil and petroleum products	ktoe	6 267.6	6 168.3	6 057.4	5 893.4	6 153.8	6 420.3	6 484.3	6 426.1	6 470.6	6 405.8	6 356.8	6 206.5
Natural gas	ktoe	6 088.4	5 508.4	5 386.9	5 367.0	4 806.7	5 024.2	5 284.0	5 355.5	5 196.2	4 919.1	4 900.2	4 869.2
Renewable sources	ktoe	2 248.1	2 360.7	2 459.7	2 600.1	2 688.1	2 728.8	2 783.3	2 961.4	3 311.1	3 657.6	3 690.7	3 554.5
Non-renewable waste comp.	ktoe	161.2	164.3	168.9	163.7	196.9	221.6	246.3	247.4	242.3	237.2	235.5	233.8
Nuclear sources	ktoe												
Heat	ktoe	2 525.8	2 385.2	2 423.3	2 346.0	2 076.8	2 066.6	2 128.7	2 133.0	2 041.2	1 933.4	1 862.9	1 790.8
Electricity	ktoe	4 662.3	4 613.2	4 633.2	4 581.3	4 580.9	4 698.0	4 819.4	5 107.3	5 237.6	5 344.5	5 472.6	5 653.0
Total	ktoe	24 273.5	23 475.7	23 466.6	23 233.0	22 529.6	23 153.8	23 696.5	23 931.9	23 869.9	23 652.0	23 492.6	23 231.0

Table 175: *Energy intensity of primary energy sources generation and final consumption*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Energy intensity of PES	toe/EUR	288.834	264.709	271.080	282.800	282.108	266.003	254.492	212.172	169.496	144.181	125.502	111.197
Energy intensity of FC	toe/EUR	154.925	143.115	147.484	151.573	151.687	146.684	145.190	117.199	97.321	82.310	71.865	64.536

2.5. Prices

Table 176: *Electricity prices by sector*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Industry	EUR/MWh	107.4	113.7	111.4	111.0	91.6	87.0	79.8	N/A	N/A	N/A	N/A	N/A
Households	EUR/MWh	121.2	131.1	133.9	133.1	111.5	112.2	115.5	N/A	N/A	N/A	N/A	N/A
Services	EUR/MWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 177: *Prices of diesel*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Prices of diesel	EUR/L	0.10	0.13	0.14	0.14	0.14	0.11	0.08	N/A	N/A	N/A	N/A	N/A

Table 178: *Prices of gasoline*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Gasoline 98	EUR/L	0.61	0.71	0.77	0.72	0.69	0.56	0.48	N/A	N/A	N/A	N/A	N/A
Gasoline 95	EUR/L	0.54	0.65	0.71	0.66	0.62	0.48	0.40	N/A	N/A	N/A	N/A	N/A

Table 179: *Prices of natural gas*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Industry	EUR/MWh	33.2	35.2	36.7	34.5	31.2	29.3	26.2	N/A	N/A	N/A	N/A	N/A
Households	EUR/MWh	43.1	49.7	56.7	52.2	48.0	49.9	48.0	N/A	N/A	N/A	N/A	N/A

2.6. Investments[215]

[215] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action also requires the following data, which are not available: investments in the energy and industry sectors relative to total investments.

2.7. Renewable energy[216]

Table 180: *Share of renewable sources in gross final consumption*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Heating and cooling	%	14.0 %	15.3 %	16.1 %	17.6 %	19.3 %	19.6 %	19.9 %	20.7 %	25.9 %	30.7 %	N/A	N/A
Electricity sector	%	7.5 %	10.6 %	11.7 %	12.8 %	13.9 %	14.1 %	13.6 %	13.4 %	15.2 %	16.9 %	N/A	N/A
Transport	%	5.1 %	6.4 %	6.1 %	6.3 %	6.9 %	6.5 %	6.4 %	8.8 %	9.5 %	14.0 %	N/A	N/A
Total	%	10.5 %	12.0 %	12.8 %	13.8 %	15.0 %	15.0 %	14.9 %	15.6 %	18.7 %	22.0 %	N/A	N/A

Table 181: *The contribution of transport to the overall target*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Transport sector contribution	%	0.9 %	1.2 %	1.2 %	1.2 %	1.4 %	1.3 %	1.3 %	1.8 %	2.1 %	2.8 %	N/A	N/A

Table 182: *More detailed information on the contribution of the transport sector (contribution to the transport target) plus multipliers*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Advanced biofuels (part A)	%	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	1.0 %	4.5 %	N/A	N/A
Advanced biofuels (part B)	%	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.9 %	1.7 %	N/A	N/A
Food biofuels	%	4.0 %	5.2 %	4.9 %	5.0 %	5.5 %	4.9 %	4.8 %	7.0 %	7.0 %	7.0 %	N/A	N/A
Other biofuels	%	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	N/A	N/A
RES electricity	%	1.1 %	1.2 %	1.3 %	1.4 %	1.4 %	1.5 %	1.6 %	1.8 %	0.6 %	0.8 %	N/A	N/A
Total	%	5.1 %	6.4 %	6.1 %	6.3 %	6.9 %	6.5 %	6.4 %	8.8 %	9.5 %	14.0 %	N/A	N/A

[216] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action also requires the following data, which are not available: final consumption of waste heat and RES in district heating systems; share of waste heat and RES in district heating systems; data on energy produced, energy consumed and energy supplied to the grid (if available); other national trajectories (if available).

Table 183: *Final consumption of renewable energy sources*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Heating and cooling	ktoe	3 780.7	3 912.8	4 156.2	4 486.0	4 629.6	4 783.0	4 907.8	5 033.5	6 035.6	6 891.5	N/A	N/A
Electricity sector	ktoe	755.3	1 069.1	1 175.4	1 279.5	1 385.1	1 425.3	1 392.0	1 403.1	1 652.0	1 864.8	N/A	N/A
Transport	ktoe	447.1	572.1	530.4	537.8	610.5	581.3	594.4	854.0	981.8	1 280.2	N/A	N/A
Total	ktoe	4 983.1	5 554.0	5 862.1	6 303.4	6 625.1	6 789.6	6 894.2	7 290.6	8 669.4	10 036.5	N/A	N/A

3. Indicators related to greenhouse gas emissions and removals

Table 184: *GHG emissions by sector (EU ETS, Effort Sharing Regulation, LULUCF)*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
EU ETS	tCO2eq	78 473 173	N/A	N/A	N/A	N/A	66 656 661	N/A	63 075 105	56 246 473	55 881 083	49 865 706	47 665 396
Effort Sharing Regulation	tCO2eq	N/A	N/A	N/A	N/A	N/A	54 428 565	N/A	63 749 266	56 597 741	52 334 638	47 973 760	43 914 208
LULUCF	tCO2eq	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 185: *Emission intensity of GDP (including LULUCF)*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Emission intensity of GDP	tCO2eq/GDP	35 224	N/A	N/A	N/A	N/A	26 347	N/A	21 723	15 568	12 131	8 953	7 067

Table 186: *Emission intensity of electricity and heat production*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Emission intensity of el. and heat prod.	tCO2eq/MWh	0.43	N/A	N/A	N/A	N/A	0.40	N/A	0.36	0.31	0.30	0.26	0.24

Table 187: *Emission intensity of final energy consumption by sectors*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Industry	tCO2eq/toe	N/A	N/A	N/A	N/A	N/A	1.49	N/A	1.45	1.45	1.45	1.46	1.45
Households	tCO2eq/toe	N/A	N/A	N/A	N/A	N/A	1.35	N/A	1.30	1.18	1.04	0.91	0.89
Services	tCO2eq/toe	N/A	N/A	N/A	N/A	N/A	0.96	N/A	0.95	0.91	0.87	0.83	0.79
Passenger transport	tCO2eq/toe	N/A	N/A	N/A	N/A	N/A	1.85	N/A	1.92	1.97	1.92	1.78	1.57
Freight transport	tCO2eq/toe	N/A	N/A	N/A	N/A	N/A	0.98	N/A	0.93	0.96	0.92	0.83	0.71
Total	tCO2eq/toe	N/A	N/A	N/A	N/A	N/A	6.62	N/A	6.55	6.46	6.21	5.80	5.42

Table 188: *Number of cattle*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Dairy cattle	thousand	384	N/A	N/A	N/A	N/A	376	N/A	369	387	401	405	408
Other cattle	thousand	966	N/A	N/A	N/A	N/A	1 031	N/A	1 061	1 113	1 154	1 165	1 172
Swines	thousand	1 909	N/A	N/A	N/A	N/A	1 560	N/A	1 600	1 900	2 100	2 200	2 200
Sheep	thousand	197	N/A	N/A	N/A	N/A	232	N/A	235	240	250	250	250
Poultry	thousand	24 838	N/A	N/A	N/A	N/A	22 508	N/A	23 780	24 180	26 695	26 695	26 695

Table 189: *Consumption of nitrogenous substances*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Application of synthetic fertilisers	kt	225 982	N/A	N/A	N/A	N/A	270 023	N/A	280 739	280 739	280 739	280 739	280 739
Fertilisers	kt	85 635	N/A	N/A	N/A	N/A	84 355	N/A	89 404	96 367	101 760	103 197	103 689
Nitrogen fixed by plants	kt	120 795	N/A	N/A	N/A	N/A	144 852	N/A	139 085	137 996	139 692	141 205	141 982
Nitrogen returned to the soil[217]	kt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

217 Emissions are calculated according to the formula 11.6. (IPCC 2006) and therefore it is not possible to break down nitrogen directly to soil, plant nitrogen and nitrogen in crop residues returned to the soil

Table 190: *Area of cultivated organic soil*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Area of cultivated soil	ha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 191: *Production of solid municipal waste (and landfilled volume)*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Production of SMW	kt	5 621 883	N/A	N/A	N/A	N/A	5 534 126	N/A	5 630 000	5 300 000	5 250 000	5 190 000	5 140 000
Landfilled SMW	kt	3 444 748	N/A	N/A	N/A	N/A	2 758 736	N/A	1 910 000	850 300	78 700	0	0

Table 192: *Share of CH4 recovery in total CH4 production from landfills*

		2010	2011	2012	2013	2014	2015	2016	2020	2025	2030	2035	2040
Ratio of CH_4 recovery	%	*14*	N/A	N/A	N/A	N/A	*12*	N/A	*14*	*16*	*17*	*16*	*15*

Annex 3: Expected development of international prices of basic fuels

Table 193: *Development of international prices of basic fuels, 2017 values with partial update of parameters (source: recommended parameters for preparation)*

	Constant 2016 prices (EUR/boe)			Constant 2016 prices (EUR/GJ)			Constant 2016 prices (EUR/toe)		
	EUR/boe	EUR/boe	EUR/boe	EUR/GJ	EUR/GJ	EUR/GJ	EUR/toe	EUR/toe	EUR/toe
	Oil	Gas (GCV)	Coal	Oil	Gas (GCV)	Coal	Oil	Gas (GCV)	Coal
2015	51.77	41.68	12.32	8.90	7.17	2.12	372.72	300.09	88.74
2016	60.36	43.72	12.95	10.38	7.52	2.23	434.60	314.75	93.25
2017	65.90	45.67	13.57	11.33	7.85	2.33	474.49	328.81	97.69
2018	71.66	47.66	14.18	12.32	8.20	2.44	515.95	343.15	102.07
2019	76.25	49.75	14.78	13.11	8.56	2.54	548.97	358.22	106.39
2020	80.58	51.84	15.37	13.86	8.91	2.64	580.18	373.23	110.65
2021	84.57	53.84	16.26	14.54	9.26	2.80	608.93	387.63	117.04
2022	85.95	54.01	16.75	14.78	9.29	2.88	618.85	388.89	120.58
2023	88.61	54.88	17.21	15.24	9.44	2.96	638.03	395.16	123.90
2024	90.45	55.57	17.78	15.56	9.56	3.06	651.26	400.12	128.01
2025	91.47	56.08	18.36	15.73	9.64	3.16	658.59	403.80	132.21
2026	93.75	56.97	19.07	16.12	9.80	3.28	675.04	410.19	137.28
2027	95.82	57.80	19.77	16.48	9.94	3.40	689.91	416.17	142.33
2028	97.23	58.72	20.50	16.72	10.10	3.52	700.02	422.81	147.57
2029	99.43	59.65	21.23	17.10	10.26	3.65	715.89	429.46	152.86
2030	100.77	60.99	22.04	17.33	10.49	3.79	725.51	439.13	158.67
2031	102.04	61.84	22.24	17.55	10.63	3.82	734.67	445.26	160.09
2032	102.66	62.81	22.52	17.65	10.80	3.87	739.17	452.25	162.14
2033	103.38	63.68	22.82	17.78	10.95	3.92	744.36	458.52	164.29
2034	104.20	64.47	23.09	17.92	11.09	3.97	750.22	464.20	166.27
2035	105.12	65.14	23.34	18.08	11.20	4.01	756.83	469.00	168.02
2036	106.15	65.77	23.49	18.25	11.31	4.04	764.30	473.52	169.14
2037	107.33	66.28	23.68	18.46	11.40	4.07	772.80	477.20	170.53
2038	108.62	66.77	23.91	18.68	11.48	4.11	782.03	480.78	172.12
2039	109.94	67.33	24.15	18.91	11.58	4.15	791.60	484.75	173.87
2040	111.30	67.34	24.32	19.14	11.58	4.18	801.36	484.81	175.13

Table 194: *Development of international prices of basic fuels with updated prices for the period 2015–2024*

	Constant 2016 prices (EUR/boe)			Constant 2016 prices (EUR/GJ)			Constant 2016 prices (EUR/toe)		
	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe
	Oil	Gas (GCV)	Coal	Oil	Gas (GCV)	Coal	Oil	Gas (GCV)	Coal
2015	46.65	40.40	11.71	8.02	6.95	2.01	335.86	290.91	84.28
2016	39.52	27.12	12.54	6.80	4.66	2.16	284.54	195.24	90.31
2017	47.78	33.64	17.30	8.22	5.78	2.97	344.02	242.20	124.53
2018	57.68	37.46	15.70	9.92	6.44	2.70	415.29	269.69	113.03
2019	63.39	40.72	16.16	10.90	7.00	2.78	456.44	293.20	116.32
2020	69.17	44.15	16.58	11.90	7.59	2.85	498.05	317.85	119.39
2021	74.92	47.51	17.30	12.88	8.17	2.97	539.42	342.05	124.55
2022	78.53	49.35	17.56	13.51	8.49	3.02	565.45	355.32	126.47
2023	83.48	51.76	17.78	14.36	8.90	3.06	601.03	372.68	127.99
2024	87.81	54.02	18.08	15.10	9.29	3.11	632.23	388.93	130.16
2025	91.47	56.08	18.36	15.73	9.64	3.16	658.59	403.80	132.21
2026	93.75	56.97	19.07	16.12	9.80	3.28	675.04	410.19	137.28
2027	95.82	57.80	19.77	16.48	9.94	3.40	689.91	416.17	142.33
2028	97.23	58.72	20.50	16.72	10.10	3.52	700.02	422.81	147.57
2029	99.43	59.65	21.23	17.10	10.26	3.65	715.89	429.46	152.86
2030	100.77	60.99	22.04	17.33	10.49	3.79	725.51	439.13	158.67
2031	102.04	61.84	22.24	17.55	10.63	3.82	734.67	445.26	160.09
2032	102.66	62.81	22.52	17.65	10.80	3.87	739.17	452.25	162.14
2033	103.38	63.68	22.82	17.78	10.95	3.92	744.36	458.52	164.29
2034	104.20	64.47	23.09	17.92	11.09	3.97	750.22	464.20	166.27
2035	105.12	65.14	23.34	18.08	11.20	4.01	756.83	469.00	168.02
2036	106.15	65.77	23.49	18.25	11.31	4.04	764.30	473.52	169.14
2037	107.33	66.28	23.68	18.46	11.40	4.07	772.80	477.20	170.53
2038	108.62	66.77	23.91	18.68	11.48	4.11	782.03	480.78	172.12
2039	109.94	67.33	24.15	18.91	11.58	4.15	791.60	484.75	173.87
2040	111.30	67.34	24.32	19.14	11.58	4.18	801.36	484.81	175.13

Source: Recommended parameters for the preparation of the National Plan (August 2018)

Table 195: *Development of international prices of basic fuels (2017 values)*

	Constant 2016 prices (EUR/boe)			Constant 2016 prices (EUR/GJ)			Constant 2016 prices (EUR/toe)		
	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe	EUR/boe
	Oil	Gas (GCV)	Coal	Oil	Gas (GCV)	Coal	Oil	Gas (GCV)	Coal
2015	48.19	38.80	11.47	7.46	6.00	1.78	353.28	284.44	84.11
2016	56.19	40.69	12.06	8.70	6.30	1.87	411.93	298.33	88.38
2017	61.35	42.51	12.63	9.49	6.58	1.95	449.74	311.66	92.59
2018	66.70	44.36	13.20	10.32	6.87	2.04	489.03	325.25	96.74
2019	70.97	46.31	13.75	10.98	7.17	2.13	520.33	339.54	100.84
2020	75.01	48.25	14.31	11.61	7.47	2.21	549.92	353.76	104.88
2021	78.73	50.12	15.13	12.18	7.76	2.34	577.17	367.42	110.94
2022	80.01	50.28	15.59	12.38	7.78	2.41	586.57	368.60	114.29
2023	82.49	51.09	16.02	12.77	7.91	2.48	604.75	374.54	117.44
2024	84.20	51.73	16.55	13.03	8.01	2.56	617.29	379.25	121.34
2025	85.15	52.21	17.09	13.18	8.08	2.65	624.24	382.74	125.32
2026	87.27	53.03	17.75	13.51	8.21	2.75	639.83	388.80	130.12
2027	89.19	53.81	18.40	13.81	8.33	2.85	653.92	394.47	134.91
2028	90.50	54.66	19.08	14.01	8.46	2.95	663.51	400.76	139.87
2029	92.55	55.52	19.76	14.33	8.59	3.06	678.55	407.06	144.88
2030	93.80	56.77	20.51	14.52	8.79	3.18	687.67	416.23	150.40
2031	94.98	57.57	20.70	14.70	8.91	3.20	696.35	422.03	151.74
2032	95.56	58.47	20.96	14.79	9.05	3.24	700.62	428.67	153.68
2033	96.23	59.28	21.24	14.89	9.18	3.29	705.53	434.60	155.72
2034	96.99	60.01	21.50	15.01	9.29	3.33	711.09	439.99	157.60
2035	97.85	60.63	21.72	15.14	9.38	3.36	717.35	444.53	159.25
2036	98.81	61.22	21.87	15.29	9.48	3.38	724.43	448.82	160.32
2037	99.91	61.69	22.05	15.46	9.55	3.41	732.49	452.31	161.64
2038	101.11	62.16	22.25	15.65	9.62	3.44	741.24	455.70	163.14
2039	102.34	62.67	22.48	15.84	9.70	3.48	750.31	459.47	164.80
2040	103.60	62.68	22.64	16.04	9.70	3.50	759.56	459.52	165.99

Source: Recommended parameters for the preparation of the National Plan (August 2018)

Annex 4: Measure cards for the purpose of complying with Article 7 of Directive 2012/27/EU, as amended

Table 196: *Operational Programme Competitiveness 2021–2027: Specific Objective – Investment aid for energy-efficiency measures*

Basic Information	
Policy measure title	**Operational Programme Competitiveness 2021–2027: Specific Objective – Aid for energy-efficiency measures**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment aid for increasing the energy efficiency of technological and production processes in industry and on improving the energy performance of buildings intended for business.
Planned budget	CZK 7 000 million
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	11 PJ
Estimated annual energy savings	0.2 PJ
Additional information	Due to a shift in project implementation, energy savings will be generated from 2022 at the earliest.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of Industry and Trade Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	Industry, services, non-residential buildings
Eligible individual energy-saving measures	increasing energy efficiency of production and technological processes; improving the energy performance of buildings (building envelope, technical equipment); reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution; recovery of waste energy in production processes; construction of buildings in high (passive) energy standard; implementation of monitoring, automation and energy management features in buildings;

	energy management
Lifetime of individual measures	Investment measures – industrial technologies: 10 years Investments measure – buildings: 12–30 years Energy management: 2 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The calculation of energy savings is supported by a professional documentation (energy assessment or energy performance certificate of the building) and is based on a comparison of the state of final energy consumption before and after the implementation of energy saving measures.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure. The lifetime of energy savings in the case of energy management is reflected in the calculation of cumulated energy savings. It is not expected that the

	annual energy savings would be reduced over the lifetime of the measure.
Sources of information	The calculation of energy savings in expert documents is carried out in accordance with the methodology under Decree No 78/2013, on the energy performance of buildings and Decree No 480/2012, on energy audit and energy assessment.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic. Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting.

How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support under a given financial mechanism (measure), each project is subject to a substantive evaluation process of proposed individual energy saving measures. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution and energy savings are verified for all projects even ex-post after project implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, State Energy Inspectorate

Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 197: *New Green Savings Programme*

Basic Information	
Policy measure title	**New Green Savings Programme**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment support for improving energy performance of single-family and apartment buildings. Partial and comprehensive renovation of residential buildings are supported.
Planned budget	CZK 1 350 million
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	8 PJ
Estimated annual energy savings	0.8 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of the Environment, State Environmental Fund Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	households, residential buildings (single-family houses, apartment buildings)

Eligible individual energy-saving measures	improving the energy performance of buildings (building envelope, technical equipment); reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution; construction of buildings in high (passive) energy standard; implementation of monitoring, automation and energy management features in buildings
Lifetime of individual measures	Investments measure – buildings: 12–30 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The calculation of energy savings is supported by a professional documentation (energy assessment or energy performance certificate of the building) and is based on a comparison of the state of final energy consumption before and after the implementation of energy saving measures.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure.
Sources of information	The calculation of energy savings in expert documents is carried out in accordance with the methodology under Decree No 78/2013, on the energy performance of buildings and Decree No 480/2012, on energy audit and energy assessment.
Additionality and significance	

How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic. Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported.

	In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support within the given financial mechanism (measure), each project undergoes a factual process of evaluation of the proposed individual energy-saving measures by the measure administrator – the State Environmental Fund. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution is also verified ex-post for all projects their implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management

	of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 198: *Succession Programme of the New Green Savings Programme*

Basic Information	
Policy measure title	**Succession Programme of the New Green Savings Programme**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment support for improving energy performance of single-family and apartment buildings. Partial and comprehensive renovation of residential buildings are supported.
Planned budget	CZK 40 000 million
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	85.6 PJ
Estimated annual energy savings	1.9 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of the Environment, State Environmental Fund Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	households, residential buildings (single-family houses, apartment buildings)
Eligible individual energy-saving measures	improving the energy performance of buildings (building envelope, technical equipment); reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution; construction of buildings in high (passive) energy standard; implementation of monitoring, automation and energy management features in buildings
Lifetime of individual measures	Investments measure – buildings: 12–30 years
Addressing energy poverty	No

Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The calculation of energy savings is supported by a professional documentation (energy assessment or energy performance certificate of the building) and is based on a comparison of the state of final energy consumption before and after the implementation of energy saving measures.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure.
Sources of information	The calculation of energy savings in expert documents is carried out in accordance with the methodology under Decree No 78/2013, on the energy performance of buildings and Decree No 480/2012, on energy audit and energy assessment.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy

	savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic. Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting. It can be assumed that the successor programme of the NGS Programme will, as it is now between the NGS and OP E II programmes, represent a risk of overlap with the boiler subsidies under the OP E III programme. This risk will be eliminated by the set eligibility conditions for both programmes, as it is now.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support within the given financial mechanism (measure), each project undergoes a factual process of evaluation of the proposed

	individual energy-saving measures by the measure administrator – the State Environmental Fund. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution is also verified ex-post for all projects their implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 199: *Operational Programme Environment (2021–2027): Specific Objective – Aid for energy-efficiency measures*

Basic Information	
Policy measure title	**Operational Programme Environment (2021–2027): Specific Objective – Aid for energy-efficiency measures**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measures are primarily focused on investment aid to improve energy performance of non-residential public buildings and activities related to increasing the use of renewable energy sources.
Planned budget	CZK 14 000 million
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	11 PJ
Estimated annual energy savings	0.2 PJ
Additional information	Due to a shift in project implementation, energy savings will be generated from 2022 at the earliest.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of the Environment, State Environmental Fund Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	households (single-family houses) and non-residential public buildings
Eligible individual energy-saving measures	improving the energy performance of buildings (building envelope, technical equipment); reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution; construction of buildings in high (passive) energy standard; implementation of monitoring, automation and energy management features in buildings
Lifetime of individual measures	Investments measure – buildings: 12–30 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional

	savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The calculation of energy savings is supported by a professional documentation (energy assessment or energy performance certificate of the building) and is based on a comparison of the state of final energy consumption before and after the implementation of energy saving measures.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure.
Sources of information	The calculation of energy savings in expert documents is carried out in accordance with the methodology under Decree No 78/2013, on the energy performance of buildings and Decree No 480/2012, on energy audit and energy assessment.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.

If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic. Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting. It can be assumed that the successor programme of the NGS Programme will, as it is now between the NGS and OP E II programmes, represent a risk of overlap with the boiler subsidies under the OP E III programme. This risk will be eliminated by the set eligibility conditions for both programmes, as it is now.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support within the given financial mechanism (measure), each project undergoes a factual process of evaluation of the proposed individual energy-saving measures by the measure administrator – the State Environmental Fund. The evaluation also assesses the energy savings resulting from the

	implementation of the project ex-ante. Project execution is also verified ex-post for all projects their implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 200: *PANEL Programme*

Basic Information	
Policy measure title	**PANEL Programme**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment aid for improving energy performance of single-family houses by concessional loans.
Planned budget	CZK 15 000 million
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	5.5 PJ
Estimated annual energy savings	0.1 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: State Housing Development Fund Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	households, residential buildings (apartment buildings)
Eligible individual energy-saving measures	improving the energy performance of buildings (building envelope, technical equipment); reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution;
Lifetime of individual measures	Investments measure – buildings: 12–30 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The energy savings calculation is supported by expert documentation and is based on a comparison of the

	final energy consumption status before and after the implementation of the energy-saving measure.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure.
Sources of information	The calculation of energy savings in expert documents is carried out in accordance with the methodology under Decree No 78/2013, on the energy performance of buildings and Decree No 480/2012, on energy audit and energy assessment.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the

	granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support within the given financial mechanism (measure), each project undergoes a factual process of evaluation of the proposed individual energy-saving measures by the measure administrator – the State Housing Development Fund. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution is also verified ex-post for all projects their implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application.

	Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	State Housing Development Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department of the State Housing Development Fund responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 201: *Integrated Regional Operational Programme 2021–2027*

Basic Information	
Policy measure title	**Integrated Regional Operational Programme 2021–2027**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measure is aimed at investment aid for the acquisition of public transport vehicles using alternative propulsion. The measure will increase the replacement rate of conventional engines with lower engine efficiency and the introduction of new alternative-drive vehicles with comparatively higher efficiency, thus directly leading to increased energy efficiency and energy savings in the transport sector.
Planned budget	CZK 8 000 million
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	11.5 PJ

Estimated annual energy savings	0.04 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of Regional Development Duties: Managing the financial mechanism, granting grants, approving and controlling projects
Target sectors	Transport
Eligible individual energy-saving measures	Individual measures supported: purchase of public transport vehicles with alternative propulsion
Lifetime of individual measures	Investment measure – 15 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate energy savings from the direct purchase of alternative-drive vehicles with higher efficiency, the method of proportional savings based on technical-engineering estimates will be used through the normal efficiency of internal combustion engines and engines using alternative propulsion engines. The calculation takes into account the evolution of the use of cars and the assumed state of the vehicle fleet without any policy measure. The calculation takes into account the energy savings resulting from the accelerated replacement of conventional cars with lower efficiency before the end of their lifetime, as well as from the incentive to buy alternative-drive cars instead of the conventional cars (market-based purchases).
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of energy savings corresponds to that of cars.
Additionality and significance	

How has the additionality criterion been taken into account?	Energy savings from the purchase of vehicles with alternative propulsion are energy savings resulting from premature replacement before the end of the life of the original vehicle or from the motivation to buy more efficient vehicles. Under standard conditions without policy measure, there would be no purchase of alternative vehicles. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices. Additionality is taken into account in the energy savings calculation model in relation to existing EU emission performance standards.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the identified market failure, in particular in relation to the low incentive to purchase alternative-fuel vehicles due to the high price and the long payback period, without the measure in question, i.e. without the granting of investment aid by the implementing authority, the target subject would not be motivated to replace conventional vehicles or to purchase alternative-fuel vehicles.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	Supported vehicle exchanges must exceed the established minimum EU emission performance standards.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support under the given financial mechanism (measure), each project undergoes an evaluation process by the implementing authority (financial mechanism administrator). The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The evaluation of energy savings is carried out by the Ministry of Industry and Trade on the basis of an independently prepared model for the calculation of energy savings. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out

	by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Regional Development, Ministry of Industry and Trade
Independence of monitoring and verification by obligated, involved or authorised parties	Verification is subject to a two-level evaluation of individual energy saving measures. Factual evaluation of projects is carried out by the department responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	

Table 202: *Modernisation Fund*

Basic Information	
Policy measure title	**Modernisation Fund**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment aid for improving energy performance of non-residential public and state buildings and business buildings, improving energy performance of technological and production processes in industry, and improving energy performance of transport
Planned budget	CZK 50 000 million[218]
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	-[219]
Estimated annual energy savings	1.23 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of the Environment, State Environmental Fund, Ministry of Transport, Ministry of Industry and Trade

218 This is not the overall ‘budget’ of the Modernisation Fund (see detailed information in the other sections), but the forecast part allocated to the fulfilment of Article 7 in the field of energy savings.

219 It will be specified in relation to the settings of the supported areas.

	Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	energy, industry, services, public sector, transport, community energy
Indicative list of energy-saving measures	improving the energy performance of buildings (building envelope, technical equipment); increasing energy efficiency of production and technological processes; reconstruction and replacement of energy production facilities; purchase of alternative-fuel vehicles; construction of support infrastructure for alternative-fuel vehicles
Lifetime of individual measures	Investment measures – industrial technologies: 10 years Investments measures – other: 12–30 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings in buildings and industrial processes, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The energy savings calculation is supported by expert documentation and is based on a comparison of the final energy consumption status before and after the implementation of the energy-saving measure. To calculate energy savings from the direct purchase of alternative-drive vehicles with higher efficiency, the method of proportional savings based on technical-engineering estimates will be used through the normal efficiency of internal combustion engines and engines using alternative propulsion engines. The method of examined energy savings will be used to calculate the energy savings resulting from the effect of construction of alternative-fuel infrastructure on the purchase of alternative-fuel vehicles. In order to evaluate the energy savings achieved under this measure, the link between state support for infrastructure construction and the rate of replacement of conventional cars with lower engine

	efficiency for alternative-fuel vehicles with comparatively higher efficiency is essential. Energy savings will be determined on the basis of the prepared methodology. The calculation takes into account the evolution of the use of cars and the assumed state of the vehicle fleet without any policy measure. The calculation takes into account the energy savings resulting from the accelerated replacement of conventional cars with lower efficiency before the end of their lifetime, as well as from the incentive to buy alternative-drive cars instead of the conventional cars (market-based purchases).
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure. The lifetime of energy savings also corresponds to that of cars.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of vehicles and products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. Energy savings from the purchase of cars with alternative propulsion are energy savings resulting from premature replacement before the end of the life of the original

	vehicle or from the motivation to buy more efficient cars. Under standard conditions without policy measure, there would be not be the purchase rate of alternative-fuel cars. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices. Additionality is taken into account in the energy savings calculation model in relation to existing EU emission performance standards (Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO2 emission performance standards for new passenger cars and for new light commercial vehicles).
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings shall take into account the age of the replaced product / fleet and the standard replacement time of the vehicles. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the granting of investment aid, the target entities would not be motivated to implement these measures. In view of the study of the incentives for the purchase of alternative-fuel cars and the identified market failure, in particular in relation to the low incentive to purchase alternative-fuel cars because of the high price and long payback period, as well as the non-existence of infrastructure for the operation of these cars, the target entities were not motivated to carry out the replacement of conventional cars without the measure in question, i.e. without the provision of investment aid by the implementing authority to replace conventional car or to buy alternative-fuel cars.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic. Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting. Direct State aid for the purchase of alternative-fuel cars will be taken into account in the energy savings calculation model. The energy savings from direct

	aid for the acquisition of cars will be deducted from the energy savings from aid for the construction of infrastructure in the calculation of savings for this policy measure.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported. Supported vehicle exchanges must exceed the established minimum EU emission performance standards.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support within the given financial mechanism (measure), each project undergoes a factual process of evaluation of the proposed individual energy-saving measures by the measure administrator – the State Environmental Fund. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution is also verified ex-post for all projects their implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). In the case of switching to alternative fuels, the energy-saving evaluation is carried out by the Ministry of Industry and Trade on the basis of an independently developed model for calculating energy savings. The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000,

	and by the provider of financial support when checking the aid application. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate, Ministry of Transport
Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 203: *EFEKT Programme*

Basic Information	
Policy measure title	**EFEKT Programme**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment and non-investment aid for energy efficiency support measures. The financial mechanism provides support for specific energy-saving measures with an emphasis on non-investment financial aid.
Planned budget	CZK 3 000 million
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	16.5 PJ

Estimated annual energy savings	0.3 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of Industry and Trade Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	Public sector, industry, services, households
Eligible individual energy-saving measures	Individual investment measures: reconstruction of public lighting Non-investment measures aimed at motivating the implementation of individual investment measures: providing targeted consultations with an impact on the implementation of energy-saving measures through the network of the Energy Consulting and Information Centres (ECIC); preparation of documentation for EPC project preparation; Non-investment measures: implementation of energy management events aimed at the active dissemination of information and education in the field of energy savings
Lifetime of individual measures	Investments measures: 12–30 years Training actions: 2 years Energy management: 2 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	In the case of the implementation of individual investment measures, the measured savings are used if it is feasible and cost-effective with regard to the implemented individual measures. In other cases, the method of proportional savings based on technical-engineering estimates is used. For the energy savings resulting from targeted consultations and measures to change consumer behaviour as a result of education and awareness raising, the method of examined savings is used. In order to evaluate energy savings achieved through

	targeted consultations, the link between the consultation itself and the follow-up activity of the consulting person is essential. Energy savings were determined on the basis of a methodology developed by the Czech Technical University. In the case of the method of measured or proportional savings, the calculation of savings is carried out by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management. The calculation of energy savings is given by comparing the state of final energy consumption before and after the implementation of the energy saving measure and it is supported by expert documentation – energy audit, energy assessment or energy performance certificate of the building – prepared in accordance with Act No 406/2000.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure. The lifetime of energy savings in the case of actions aimed at changing consumer behaviour and the implementation of energy management is taken into account in the calculation of cumulated energy savings. It is not expected that the annual energy savings would be reduced over the lifetime of the measure.
Sources of information	The methodology used to calculate energy savings is available here: https://www.mpo-efekt.cz/en/ekis/publikace/90641.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures.

	In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the granting of investment aid, the target entities would not be motivated to implement these measures. On the basis of the above research, it was found in a representative sample that individual energy-saving measures were implemented on the basis of a policy measure.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the individual measures, the risk of double counting is minimised. The risk of double counting has been identified in the case of targeted consultations with an impact on the implementation of energy saving measures where there are overlaps with other financial mechanisms. The survey conducted in the study entitled 'Impact Assessment of Soft Instruments in Meeting the Energy Efficiency Targets' identified 60 % overlap of implemented individual measures with other state financial mechanisms. Within the methodology of energy savings calculation, a reduction coefficient corresponding to the detected level of overlaps is calculated for the given individual measure.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported.

	In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support under a given financial mechanism, investment measures are subject to a factual evaluation process. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution and energy savings are verified for all projects even ex-post after project implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application. In the case of EPC projects, energy savings are verified and monitored as part of the obligations under the Energy Performance Contracting (EPC). In the framework of the energy savings calculated on the basis of the surveyed savings method, a survey was carried out to verify the energy savings rate on a representative sample of individual measures. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification by obligated, involved or authorised parties	Energy evaluation in the case of using the ex-ante and ex-post methods of measured and proportional energy savings, this savings calculation is performed by independent certified energy specialists authorised to

	perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 204: *Taxation of fuel*

Basic Information	
Policy measure title	**Taxation of fuel**
Brief description of the tax measure	As a result of the policy measure, energy savings from the introduction of excise duties on fuels are achieved beyond the minimum level of taxation under Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity. Savings are achieved by changing consumer behaviour with the effect of reducing fuel consumption.
Duration of the tax measure	2021–2030
Implementing authority	Ministry of Finance
Target sector and taxpayer segment	Transport, all fuel consumers
Source of information	Link to Act: https://www.psp.cz/sqw/sbirka.sqw?cz=353&r=2003
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	20 PJ
Estimated annual energy savings	2 PJ
Additional information	
Methodology of energy savings calculation	
Method for calculating savings including additionality	Energy savings are determined on the basis of the difference between the projected evolution of fuel consumption without the application of excise duties and actual fuel consumption on the basis of the following formula:

	$(\text{skutečná daň} - \text{minimální úroveň daně}) * \frac{1}{\text{cena energie}} = \Delta p$ $\text{spotřeba energie} * \frac{1}{1 + \Delta p * \text{cenová elasticita}} = \text{spotřeba energie bez zdanění}$ $\text{spotřeba energie bez zdanění} - \text{spotřeba energie} = \text{úspora energie}$ In calculating price elasticity, a robust analysis was carried out taking into account exogenous variables affecting energy consumption. For this reason, the construction of a counterfactual scenario is not performed. Short-term price elasticity of 0.2052 is used to calculate energy savings. Short-term price elasticity was chosen because of the need to minimise overlaps with other measures. Where there is a risk of overlap with other measures, the individual measures shall be deducted on the basis of a bottom-up approach. In calculating energy savings, the level of taxation beyond the minimum level of taxation under the relevant EU regulation has been taken into account. The calculation used a value corresponding to the difference between the valid tax amount and the minimum tax amount according to the relevant EU regulation.
Price elasticity used in the calculation	Short-term price elasticity was used to calculate energy savings. The value of price elasticity corresponds to the conditions in the Czech Republic. Price elasticity was calculated by the Centre for Economy in Regulated Sectors of the University of Economics. Multivariate regression analysis of time series of endogenous and exogenous quantities was used to determine the results. For the purposes of the calculation, seasonally unadjusted quarterly data of the relevant variables over the time series 2001 to 2017 were used. Relevant variables surveyed include: fuel price, fuel consumption, population, number of cars, freight and passenger road transport performance incl. urban public transport, gross domestic product (GDP) per capita, average nominal gross monthly wage, nominal USD / CZK exchange rate, inflation. Data sources are official statistics of the Czech Statistical Office, Ministry of Industry and Trade, Ministry of Transport, Czech National Bank and Eurostat.
Taking into account the reduction of savings over time	Given the nature of the measure, the savings do not change over time. Savings are not accumulated during the commitment period.

How are possible overlaps with other policy measures treated to avoid double counting of savings?	Short-term price elasticity was used to minimise the risk of overlaps and double counting. Where there is a risk of overlap with other measures, the individual measures shall be deducted on the basis of a bottom-up approach.
How independence from the implementing authority is ensured	The implementing body of the tax measure is the Ministry of Finance. Verification of achieved energy savings, including eligibility and reportability according to the criteria of Article 7 and Annex V of the Directive, is carried out by the Ministry of Industry and Trade.
Additional information and resources	**Price elasticity study source:** Estimation of price elasticity of demand for petrol and diesel in the Czech Republic (University of Economics, Prague)

Table 205*: Taxation of household fuels*

Basic Information	
Policy measure title	**Taxation of household fuels**
Brief description of the tax measure	As a result of the policy measure, energy savings from the introduction of excise duties on electricity and solid fuels used in households are achieved beyond the minimum level of taxation under Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity. Savings are achieved by changing consumer behaviour with the effect of reducing the consumption of these fuels.
Duration of the tax measure	2021–2030
Implementing authority	Ministry of Finance
Target sector and taxpayer segment	Households, the whole population
Source of information	Link to Act: https://www.psp.cz/sqw/sbirka.sqw?cz=261&r=2007
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	0.5 PJ
Estimated annual energy savings	0.05 PJ
Additional information	
Methodology of energy savings calculation	
Method for calculating savings including additionality	Energy savings are determined on the basis of the difference between the projected evolution of fuel consumption without the application of excise duties and actual fuel consumption on the basis of the following formula:

	$$(\text{actual tax - minimum tax level}) * \frac{1}{\text{Price of energy}} = \Delta p$$ $$\text{energy consumption} * \frac{1}{1 + \Delta p * \text{price elasticity}} = \text{energy consumption without taxation}$$ $$\text{energy consumption without taxation - energy consumption = energy saving}$$ In the calculation of price elasticity, a robust analysis was carried out taking into account exogenous variables affecting energy consumption, including the impact of other measures to promote energy savings in households. For this reason, the construction of a counterfactual scenario is not performed. Short-term price elasticity is used to calculate energy savings. Short-term price elasticity was chosen because of the need to minimise overlaps with other measures. Where there is a risk of overlap with other measures, the individual measures shall be deducted on the basis of a bottom-up approach. In calculating energy savings, the level of taxation beyond the minimum level of taxation under the relevant EU regulation has been taken into account. The calculation used a value corresponding to the difference between the valid tax amount and the minimum tax amount according to the relevant EU regulation.
Price elasticity used in the calculation	Short-term price elasticity was used to calculate energy savings. The value of price elasticity corresponds to the conditions in the Czech Republic. Price elasticity was calculated by the Centre for Economy in Regulated Sectors of the University of Economics. Multivariate regression analysis of time series of endogenous and exogenous quantities was used to determine the results. For the purposes of the calculation, seasonally unadjusted quarterly data of the relevant variables over the time series of at least 15 years were used. Relevant variables examined include: price of the fuels in question, consumption of the fuels in question, population, gross domestic product (GDP) per capita, average nominal gross monthly wage, nominal USD / CZK exchange rate, average air temperature, energy savings from other measures. Data sources are official statistics of the Czech Statistical Office, Ministry of Industry and Trade, Ministry of Transport, Czech National Bank and Eurostat.

Taking into account the reduction of savings over time	Given the nature of the measure, the savings do not change over time. Savings are not accumulated during the commitment period.
How are possible overlaps with other policy measures treated to avoid double counting of savings?	Short-term price elasticity was used to minimise the risk of overlaps and double counting. Where there is a risk of overlap with other measures, the individual measures shall be deducted on the basis of a bottom-up approach.
How independence from the implementing authority is ensured	The implementing body of the tax measure is the Ministry of Finance. Verification of achieved energy savings, including eligibility and reportability according to the criteria of Article 7 and Annex V of the Directive, is carried out by the Ministry of Industry and Trade.
Additional information and resources	**Price elasticity study source:** The price elasticity study was prepared at the time of finalisation of the National Plan of the Czech Republic.

Table 206: *Ecodriving Support*

Basic Information	
Policy measure title	**Ecodriving Support**
Policy measure type	Financial mechanism, behavioural measures
Brief description of the policy measure	The measure aims to promote energy-efficient driving with a direct effect on improving energy efficiency in transport. Support for energy-efficient driving is realised through financial aid for the organisation of educational activities in the field of energy-efficient driving.
Planned budget	
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	6 PJ
Estimated annual energy savings	0.2 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of Industry and Trade Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	Public sector, industry, services, households
Eligible individual energy-saving measures	activities aimed at active dissemination of information and education in the field of energy-efficient driving (ecodriving)
Lifetime of individual measures	Training actions: 2 years

Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	For the calculation of energy savings the method of examined savings is used. Energy savings will be determined on the basis of the prepared methodology. The model will be based on the assumption of motivation to economical way of driving a vehicle caused by the educational activity.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of energy savings and its inclusion in the calculation of cumulated energy savings does not assume a reduction in the annual energy savings over the lifetime of the measure.
Sources of information	
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. This is due to low awareness of energy savings and low fuel prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	Not relevant.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the low level of awareness of energy savings and low fuel prices, without the measure in question, i.e. without providing support for educational activities, target entities would not be motivated to reduce fuel consumption.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the individual measures, the risk of double counting is minimised.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	Not relevant.
Monitoring and verification of achieved energy savings	

A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support under a given financial mechanism, investment measures are subject to a factual evaluation process by the financial measure administrator. The evaluation considers the key criteria for the determination of energy savings, i.e. type of educational action (individual measure), type of target group, number of people, etc. As part of the analysis for the calculation of energy savings, a survey will be conducted to verify the percentage of energy savings on a representative sample of individual measures. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade
Independence of monitoring and verification by obligated, involved or authorised parties	Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 207: *Operational Programme Enterprise and Innovation for Competitiveness 2014–2020 (SO 3.2): Energy Savings Programme*

Basic Information	
Policy measure title	**Operational Programme Enterprise and Innovation for Competitiveness 2014–2020 (SO 3.2): Energy Savings Programme**
Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment aid for increasing the energy efficiency of technological and production processes in industry and on improving the energy performance of buildings intended for business.
Planned budget	

Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	12 PJ
Estimated annual energy savings	1.2 PJ
Additional information	This is a measure implemented in the period 2014–2020 that generates new individual measures in the period 2021–2030.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of Industry and Trade Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	Industry, services, non-residential buildings
Eligible individual energy-saving measures	increasing energy efficiency of production and technological processes; improving the energy performance of buildings (building envelope, technical equipment); reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution; recovery of waste energy in production processes; construction of buildings in high (passive) energy standard; implementation of monitoring, automation and energy management features in buildings energy management
Lifetime of individual measures	Investment measures – industrial technologies: 10 years Investments measure – buildings: 12–30 years Energy management: 2 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The calculation of energy savings is supported by a professional documentation (energy assessment or

	energy performance certificate of the building) and is based on a comparison of the state of final energy consumption before and after the implementation of energy saving measures.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure. The lifetime of energy savings in the case of energy management is reflected in the calculation of cumulated energy savings. It is not expected that the annual energy savings would be reduced over the lifetime of the measure.
Sources of information	The calculation of energy savings in expert documents is carried out in accordance with the methodology under Decree No 78/2013, on the energy performance of buildings and Decree No 480/2012, on energy audit and energy assessment.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out

	product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic. Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support under a given financial mechanism (measure), each project is subject to a substantive evaluation process of proposed individual energy saving measures. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution and energy savings are verified for all projects even ex-post after project implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects.

	The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 208*: Operational Programme Environment 2014–2020 (PO5): Energy savings*

Basic Information	
Policy measure title	**Operational Programme Environment 2014–2020 (PO5): Energy savings**

Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment aid for improving energy performance of non-residential public buildings from the Operational Programme Environment 2014–2020.
Planned budget	
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	0.5 PJ
Estimated annual energy savings	0.05 PJ
Additional information	This is a measure implemented in the period 2014–2020 that generates new individual measures in the period 2021–2030.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	<u>Implementing authority:</u> Ministry of the Environment, State Environmental Fund <u>Duties</u>: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	households, residential buildings (single-family houses, apartment buildings)
Eligible individual energy-saving measures	improving the energy performance of buildings (building envelope, technical equipment); reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution; construction of buildings in high (passive) energy standard; implementation of monitoring, automation and energy management features in buildings
Lifetime of individual measures	Investments measure – buildings: 12–30 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The calculation of energy savings is supported by a professional documentation (energy assessment or

	energy performance certificate of the building) and is based on a comparison of the state of final energy consumption before and after the implementation of energy saving measures.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure.
Sources of information	The calculation of energy savings in expert documents is carried out in accordance with the methodology under Decree No 78/2013, on the energy performance of buildings and Decree No 480/2012, on energy audit and energy assessment.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the

	granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic. Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting. It can be assumed that the successor programme of the NGS Programme will, as it is now between the NGS and OP E II programmes, represent a risk of overlap with the boiler subsidies under the OP E III programme. This risk will be eliminated by the set eligibility conditions for both programmes, as it is now.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support within the given financial mechanism (measure), each project undergoes a factual process of evaluation of the proposed individual energy-saving measures by the measure administrator – the State Environmental Fund. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution is also verified ex-post for all projects their implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects.

	The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	State Environmental Fund, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department of the State Environmental Fund responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 209: *Integrated Regional Operational Programme 2014–2020 (SO 2.5): Improvement of energy performance in the housing sector*

Basic Information	
Policy measure title	**Integrated Regional Operational Programme 2014–2020 (SO 2.5): Improvement of energy performance in the housing sector**

Policy measure type	Financial mechanism
Brief description of the policy measure	The measure focuses on investment aid for improving energy performance of apartment buildings within the Integrated Regional Operational Programme.
Planned budget	
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	0.5 PJ
Estimated annual energy savings	0.05 PJ
Additional information	This is a measure implemented in the period 2014–2020 that generates new individual measures in the period 2021–2030.
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of Regional Development Duties: Financial mechanism management, granting grants, project approval and control, independent monitoring and verification of energy savings.
Target sectors	households, residential buildings (single-family houses, apartment buildings)
Eligible individual energy-saving measures	improving the energy performance of buildings (building envelope, technical equipment); reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution; implementation of monitoring, automation and energy management features in buildings
Lifetime of individual measures	Investments measure – buildings: 12–30 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	To calculate the energy savings, the method of measured savings will be used if it is a cost-effective option with regard to the implemented individual measure. In other cases, the method of proportional savings based on technical-engineering estimates is used. The calculation of energy savings is carried out in both cases by certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended. The calculation of energy savings is supported by a professional documentation (energy assessment or energy performance certificate of the building) and is based on a comparison of the state of final energy

	consumption before and after the implementation of energy saving measures.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure.
Sources of information	The calculation of energy savings in expert documents is carried out in accordance with the methodology under Decree No 78/2013, on the energy performance of buildings and Decree No 480/2012, on energy audit and energy assessment.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the existence of policy measures. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the

	granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. There will be no other financial mechanism for the same type of target group in the Czech Republic. Within the tracking and verification system, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Within the system of providing financial support within the given financial mechanism (measure), each project undergoes a factual process of evaluation of the proposed individual energy-saving measures by the measure administrator – Ministry of Regional Development. The evaluation also assesses the energy savings resulting from the implementation of the project ex-ante. Project execution is also verified ex-post for all projects their implementation. The ex-post control is supported by documentation demonstrating the implementation of the measure and an ex-post random on-the-spot check of a randomly selected sample of projects. The ex-ante and ex-post energy evaluation of individual measures and calculation of savings are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000, on energy management, as amended (see methodology of energy savings calculation). The processing of the documents in question, the accuracy of the calculations and the declared savings are subject to control by the State

	Energy Inspectorate during inspections in accordance with Act No 406/2000, and by the provider of financial support when checking the aid application. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Regional Development, Ministry of Industry and Trade, State Energy Inspectorate
Independence of monitoring and verification by obligated, involved or authorised parties	Ex-ante and ex-post energy evaluation and savings calculation are carried out by independent certified energy specialists authorised to perform activities in accordance with Act No 406/2000. Accuracy of energy evaluation and control of the activity of energy specialists is carried out by the State Energy Inspectorate, in accordance with Act No 406/2000. Verification is subject to a two-level assessment of the energy savings achieved. Factual evaluation of projects is carried out by the department of the Ministry of Regional Development responsible for the management of the financial mechanism (measures) independent of energy policy making. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	Ex-post evaluation verifies each implemented project (individual measure).

Table 210: *Prohibition of boilers for 1st and 2nd class solid fuels*

Basic Information	
Policy measure title	**Prohibition of boilers for 1st and 2nd class solid fuels**
Policy measure type	Regulatory measures
Brief description of the policy measure	These are regulatory measures laying down minimum standards for the operation of stationary combustion sources of energy that are set beyond EU law. From 2022 on, the operation of low-efficiency boilers for 1st and 2nd class solid fuels according to EN 303-5 will be banned on the whole territory of the Czech Republic. The obligation can be implemented in advance based on a decision of a municipal authority. The legislative obligation is based on Section 17(1) and Annex 11 of Act No 201/2012, on air protection, as amended. Under this Act, the operation of stationary combustion sources with a rated thermal input of 300 kW and

	below, which do not meet the requirements of class 1 and 2 boilers according to EN 303-5, is prohibited. Specifically, they are class 1 solid fuel boilers with an efficiency of <66 % and class 2 solid fuel boilers with an efficiency of <66–73 %.
Planned budget	
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	64 PJ
Estimated annual energy savings	1.6 PJ
Additional information	The measure generates savings in the period 2021–2025
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	Implementing authority: Ministry of the Environment, municipalities with extended powers Duties: implementation of legislation, compliance check
Target sectors	Energy consumers
Eligible individual energy-saving measures	Regulatory measures – Prohibition of the operation of low-efficiency solid fuel combustion sources and their mandatory replacement by energy-efficient sources.
Lifetime of individual measures	Investments measure – buildings: 12–30 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	The calculation of energy savings will be based on a combination of proportional and examined savings based on statistical data and technical-engineering estimates. The calculation of energy savings is made on the basis of the calculation of the difference between the energy consumption of compulsory decommissioned boilers falling under the legislative obligation and the consumption of current and most likely alternatives available on the market to replace the decommissioned boilers.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the

	length of the commitment period. Given the conditions for granting financial support and sustainability, there is no reduction in annual energy savings over the lifetime of the measure.
Additionality and significance	
How has the additionality criterion been taken into account?	The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, without the existence of the measure, i.e. without the granting of investment aid, the target entities would not be motivated to implement these measures.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. According to the set rules for providing financial support, it is not possible to financially support the fulfilment of the legislative obligation connected with the ban on the operation of the boilers in question. For this reason, the risk of overlap of this measure with other measures or financial mechanisms is minimised.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	Not applicable
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Compliance with the ban on the operation of the classes of solid fuel boilers in question is, under Act No 201/2012, the competence of municipalities with extended powers, which have the right of on-site inspections, including inspections of operated boilers and their accessories. Failure to comply with the obligations arising from this Act shall be penalised. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.

Authorities responsible for the monitoring and verification process	Ministry of the Environment, Ministry of Industry and Trade, municipal authorities of municipalities with extended powers
Independence of monitoring and verification by obligated, involved or authorised parties	The calculation of energy savings shall be carried out on the basis of an analysis carried out by a body that is independent of the implementation of the combustion sources prohibition in question. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	The ex-post evaluation will verify the impact of the legislative obligation on a representative sample.

Table 211: *Voluntary scheme for improving energy efficiency*

Basic Information	
Policy measure title	**Voluntary scheme for improving energy efficiency**
Policy measure type	**Voluntary agreement**
Brief description of the policy measure	The voluntary scheme for improving energy efficiency is an alternative policy measure on the basis of a voluntary arrangement between the State and stakeholders to carry out end-consumer end-use activities aimed at reducing final energy consumption. Stakeholders may be energy distributors and / or sellers operating on the market for energy services in the electricity, gas and heating sectors, or companies with significant energy consumption. Individual stakeholders will implement individual energy saving measures in accordance with the obligations under Directive 2012/27/EU on energy efficiency as amended by Directive (EU) 2018/2002.
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	157 PJ
Estimated annual energy savings	2.3 PJ
Additional information	
Main features of the scheme	

Implementing authority, stakeholders and their responsibilities	Implementing authority: Ministry of Industry and Trade Stakeholders: energy distributors and / or energy sellers active in the electricity, gas and heat sectors Duties: initiation, implementation and registration of energy-saving measures to reduce energy consumption at the final consumer; evaluation of energy-saving measures based on the approved methodology; providing information on the implementation of energy-saving measures in the previous year in accordance with the approved methodology as of 31 March of the calendar year, namely: type of measures implemented; the amount of savings achieved from each individual measure determined on the basis of an approved netting methodology; upon request provide information or copies of documents demonstrating the implementation of individual measures and the reported energy savings while respecting privacy requirements; in the case that financial aid was used for the implementation of a measure or project from national or European sources, provide this overview to the responsible ministry; cooperate on verification of energy savings from implementation of measures; communicate best practices and experience through communication and information activities for the professional / general public, including communication according to the content standard for communication prepared by the responsible ministry; cooperate with the responsible ministry on the creation of a catalogue of measures; cooperate with the regulator on the preparation of a uniform information system for reporting energy savings.
Target sectors	Households, industry, services, public sector
Eligible individual energy-saving measures	improving the energy performance of buildings (building envelope, technical equipment); replacement of lighting (external, internal), introduction of control and optimisation elements increasing the energy efficiency of production and technological processes, including heat recovery reconstruction and replacement of energy production equipment for own consumption; reconstruction of electricity, gas and heat distribution;

	implementation of monitoring, automation and energy management features in buildings construction of electric vehicle charging stations, hydrogen filling stations and CNG / LNG filling stations; construction of support infrastructure for alternative-fuel vehicles purchase of new alternative-fuel cars; support for the introduction and implementation of energy management; consulting and targeted promotional activities; awareness raising activities to reduce energy consumption.
Lifetime of individual measures	Investments measures: 12–30 years Training actions, awareness-raising activities: 2 years Energy management: 2 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	For the calculation of energy savings, the expected savings method will be used on the basis of a catalogue of standardised energy savings measures, elaborated on the basis of monitored energy savings measures by an independent entity and subsequently approved by the Ministry of Industry and Trade as the coordinator of energy efficiency improvement policy.
Energy saving metric	Final energy consumption
Taking into account the reduction of savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. With regard to the energy services provided by stakeholders during the lifetime of the measure, there is no reduction in annual energy savings over the lifetime of the measure. The lifetime of energy savings for training, awareness-raising and energy management activities is taken into account in the calculation of cumulated energy savings. It is not expected that the annual energy savings would be reduced over the lifetime of the measure.

Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the activity of the stakeholders. In the case of building renovation (derogation under paragraph 2(b) of Annex V), the default value for determining energy savings is energy consumption before the individual measure is implemented. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the scheme promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The assessment of energy savings will take into account the age of the replaced product. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular in relation to the long payback period of individual measures, these measures would not be implemented by the target entities without the activities of stakeholders.
Other criteria	
How are potential overlaps of schemes and policy measures handled to prevent double counting of savings?	Within the monitoring and verification system, an IT platform will be used for reporting, monitoring and verification of implemented individual measures. Within the IT platform, unique identifiers are tracked that allow you to assign individual measures to a specific entity or object. This ensures that, within the tracking system, energy savings are automatically deducted in the case of overlaps so as to avoid double counting.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	If individual measures are implemented in a building, the individual parts of the building must meet the minimum energy performance requirements of Directive 2010/31/EU on the energy performance of buildings. In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes

	according to the relevant EU regulations are supported. Supported vehicle exchanges must exceed the established minimum EU emission performance standards.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Energy savings are monitored and verified as part of the standard energy service contract. Stakeholders shall provide, through the online IT platform, information on the actions taken to report the energy savings by the implementing authority. The implementation of individual measures is supported by appropriate documentation from stakeholders, which is archived for ex-post control purposes. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, stakeholders
Independence of monitoring and verification by obligated, involved or authorised parties	Monitoring of energy savings is carried out by stakeholders on the basis of an elaborated catalogue of standardised measures. Verification of the implementation of the declared individual measures is carried out by the implementing authority, possibly authorised by the independent state control authority, on the basis of the documentation provided, or on-the-spot. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	The achieved energy savings are verified ex-post on a representative sample of individual measures.
Procedure in case of insufficient progress in savings achievement	Introduction of a legislative obligation to achieve energy savings in accordance with Article 7a of Directive 2012/27/EU on energy efficiency, as amended by Directive (EU) 2018/2002

Table 212*: Voluntary agreement with distributors and sellers of energy receivers*

Basic Information

Policy measure title	**Voluntary agreement with distributors and sellers of energy receivers**
Policy measure type	**Voluntary agreement**
Brief description of the policy measure	The aim of the voluntary agreement is to implement measures to promote the replacement of high-energy appliances by distributors and retailers of such appliances. By a voluntary agreement, stakeholders will encourage energy consumers to replace obsolete appliances, to speed up the replacement of appliances and to purchase the most efficient alternatives available on the market. Increased motivation is achieved through direct exchanges of appliances, customer services and information activities by distributors and retailers of energy appliances.
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	6.6 PJ
Estimated annual energy savings	0.12 PJ
Additional information	Not yet implemented.
Main features of the scheme	
Implementing authority, stakeholders and their responsibilities	Implementing authority: Ministry of Industry and Trade Stakeholders: distributors and/or sellers of energy related products Duties: implementation of information activities, monitoring of sales of energy appliances by energy performance classes, monitoring of decommissioning of energy appliances by energy performance classes
Target sectors	Households, industry, services, public sector
Eligible individual energy-saving measures	exchange of energy-related products consulting and targeted promotional activities; awareness raising activities on how to reduce energy consumption through proper operation of energy appliances
Lifetime of individual measures	Investments measures: 10 years Training actions, awareness-raising activities: 2 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	For the calculation of energy savings the method of examined savings will be used. The survey carried out will demonstrate the impact of a voluntary agreement on the replacement of energy appliances, based on an analysis of data on discarded appliances,

	purchased appliances and information activities of stakeholders.
Energy saving metric	Final energy consumption
Taking into account the reduction of savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of savings in the case of the implementation of investment measures exceeds the length of the commitment period. With regard to the energy services provided by stakeholders during the lifetime of the measure, there is no reduction in annual energy savings over the lifetime of the measure. The lifetime of energy savings for training and awareness-raising activities is taken into account in the calculation of cumulated energy savings. It is not expected that the annual energy savings would be reduced over the lifetime of the measure.
Additionality and significance	
How has the additionality criterion been taken into account?	Individual measures and achieved savings are monitored, calculated and verified at the level of implemented individual energy saving measures. Given the market failure, these energy savings would not have been realised without the activity of the stakeholders. The energy savings resulting from the realisation of individual exchanges of products related to the energy consumption covered by the ecodesign are energy savings resulting from premature replacement before the end of the life of the original product. This is due to low incentives to carry out product exchanges due to low awareness of energy savings and low energy prices.
If the scheme promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	The average age of the products to be replaced will be taken into account in the evaluation of energy savings. The energy savings calculation shall be carried out in accordance with the Commission Recommendation on the transposition of mandatory energy savings.
How has the significance criterion been taken into account?	Given the market failure, in particular due to the low awareness and the long payback period of individual measures, without the activities of the stakeholders, replacements of energy appliances would not be

	realised to such an extent and the most effective alternatives on the market would not be purchased.
Other criteria	
How are potential overlaps of schemes and policy measures handled to prevent double counting of savings?	Given the nature of the measure and the target group, the risk of double counting is minimised. In the Czech Republic there will be no financial mechanism or other policy measures for the replacement of energy appliances. For this reason, the risk of overlapping and double counting is minimised.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	In the case of exchanges of products related to energy consumption covered by ecodesign, only exchanges for products meeting these parameters shall be supported. In the case of exchanges of products labelled with energy labels, only exchanges for products belonging to the two highest energy performance classes according to the relevant EU regulations are supported.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	Energy savings are monitored and verified on the basis of data on discarded and sold energy appliances and on the activities of stakeholders. Stakeholders shall provide, through the online platform, information on the actions taken to report the energy savings by the implementing authority. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade, stakeholders
Independence of monitoring and verification by obligated, involved or authorised parties	Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Verification of a representative sample	

Table 213: *Information campaign on raising awareness about energy efficiency*

Basic Information	
Policy measure title	**Information campaign on raising awareness about energy efficiency**
Policy measure type	Behavioural measures
Brief description of the policy measure	The measure aims to raise awareness of energy efficiency with a view to changing the behaviour of energy consumers and reducing energy consumption. The information campaign will be multilevel in order to maximise the impact on energy consumers. Information activities will be realised through TV spots, information activities in print media, information activities on social networks and, last but not least, through an Internet platform.
Planned budget	
Estimated energy savings in 2021–2030	
Estimated cumulative energy savings	30 PJ
Estimated annual energy savings	10 PJ
Additional information	
Main features of the policy measure	
Implementing authorities, stakeholders or entrusted parties and their responsibilities in the implementation of the policy measure	<u>Implementing authority:</u> Ministry of Industry and Trade <u>Duties</u>: implementation of individual measures, independent monitoring and verification of energy savings.
Target sectors	households
Eligible individual energy-saving measures	national multi-level energy efficiency awareness campaign
Lifetime of individual measures	Training actions: 2 years
Addressing energy poverty	No
Energy saving calculation methodology (basic information on energy saving calculation methodology)	
Methods of measuring energy savings	For the energy savings resulting from measures to change consumer behaviour as a result of education and awareness raising, the method of examined savings is used. The calculation of energy savings takes into account the impact of campaigns on consumer behaviour reducing energy consumption in ordinary households. The prerequisite is that these entities would not, in most cases, care about their energy consumption without energy-focused advice.

	The average level of energy savings is 2–3 % per year. Based on a survey conducted by the Ministry of Industry and Trade, it is clear that the level of household awareness about energy consumption and the importance of energy savings is low in the Czech Republic. Therefore, it can be assumed that the level of average energy savings is at the upper limit of 3 %. Average household consumption is used to calculate energy savings.
Energy saving metric	Final energy consumption
Considering lifetime and reduction of energy savings over time	The lifetime of individual measures listed above is taken into account in the calculation of the cumulated energy savings. The contribution of individual measures in cumulated savings is taken into account in line with the Commission Recommendation on the transposition of mandatory energy savings. The lifetime of energy savings in the case of actions aimed at changing consumer behaviour is taken into account in the calculation of cumulated energy savings. It is not expected that the annual energy savings would be reduced over the lifetime of the measure.
Sources of information	Research showing average energy savings: Hunt Allcott. (2011). Social norms and energy conservation. Journal of Public Economics, Volume 95, Issues 9–10, https://doi.org/10.1016/j.jpubeco.2011.03.003
Additionality and significance	
How has the additionality criterion been taken into account?	Given the market failure due to low awareness of the wider benefits of energy-saving measures and low energy prices, these energy savings would not have been realised without the existence of a policy measure.
If the measure promotes the accelerated introduction of more energy efficient products, how was the savings calculation methodology approached?	Not relevant.
How has the significance criterion been taken into account?	Given the market failure, target actors would not be motivated to change behaviour and reduce energy consumption without a targeted awareness-raising campaign. On the basis of the above research, it was found in a representative sample that awareness measures lead to a reduction in energy consumption.
Other criteria	
How are potential overlaps of individual policy measures handled to prevent double counting of savings?	Given the nature of the individual measures, the risk of double counting is minimised. No other national awareness-raising campaign will be carried out in a

	given year. Other awareness-raising activities under other actions or stakeholder activities will be deducted based on a bottom-up approach.
How are quality standards (for products, services and installations of measures) supported or required by policy measure?	Not relevant.
Monitoring and verification of achieved energy savings	
A brief description of the monitoring and verification system and the verification process;	The research carried out a survey that verifies the energy saving rate on a representative sample of individual measures. The impact of information activities on the number of energy consumers will be assessed in order to evaluate the effect of the campaign. Verification of the eligibility and reportability of achieved energy savings according to the criteria of Article 7 and Annex V of the Directive is carried out by the relevant department of the Ministry of Industry and Trade responsible for the implementation of the energy efficiency improvement policy.
Authorities responsible for the monitoring and verification process	Ministry of Industry and Trade
Independence of monitoring and verification by obligated, involved or authorised parties	The evaluation of the impact of the campaign on energy consumers will be carried out by an independent body.
Verification of a representative sample	As part of the ex-post evaluation, a percentage of energy savings of selected energy consumers will be surveyed on a representative sample.

Annex 5: List of figures, tables and charts

List of figures:

List of tables:

List of charts:

Annex 6: List of Abbreviations

4M MC	trading on the Czech-Slovak-Hungarian-Romanian coupled day-ahead market (4M market coupling)
ANO	political party
BACI	Bidirectional Austrian-Czech Interconnection
BAT	Best Available Technology
BAU	Business as usual
BEV	Battery Electric Vehicle
bottom-up	Bottom-up approach (in reference to regional cooperation)
BP	British Petroleum
BGS	Biogas station
BREF	Best Available Techniques reference documents (IPCC)
BMW	biodegradable municipal waste
BW	biodegradable waste
SSS	Supply security standard (natural gas)
BM	Block market (with electricity in the Czech Republic)
business as usual	
CACM	Capacity Allocation and Congestion Management
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
CDD	Cooling degree days
CEE GRIP	Gas Regional Investment Plan for Central and Eastern Europe
CEF	Connecting Europe Facility

CEGH	Central European gas distributor – Baumgarten
CRP	Central registration of projects
ceteris paribus	a condition or assumption where the result is valid only if the other conditions remain unchanged
CF	Cohesion Fund
CIF	Costs of Insurance and Freight
CNG	Compressed natural gas
CO	Carbon monoxide
CO2	Carbon dioxide
COP 21	Conference of Parties
CORE flow-based	common methodology for the calculation of intraday capacity developed by the regional transmission system operators
Coreso, TSC, SSC	Coordination platforms to ensure operational coordination between dispatching sites of participating transmission network operators
CPI	Czech-Polish Interconnection
CPO02	European target for energy efficiency improvement
ČEPS	Czech Transmission System Operator (ČEPS, a.s.)
CGS	Czech Geological Survey
CHMI	Czech Hydrometeorological Institute
CNB	Czech National Bank
CR	Czech Republic
ČSSD	Czech Social Democratic Party
CZSO	Czech Statistical Office
SES	Secondary energy sources
DS	Distribution systems
DT	day-ahead spot market (in electricity in the Czech Republic)
EBGL	Commission Regulation (EU) establishing a guideline on electricity balancing
NPD	Nuclear Power Plant Dukovany

EEPR	European Energy Programme for Recovery
EEX	European Energy Exchange
EFEKT	State Programme to Support Energy Savings
EIA	Environmental Impact Assessment
ECIC	Energy Consultation and Information Centres
ENERGO	Statistical survey in the household sector
ENS	Energy not served
ENTSO-E	European Network of Transmission System Operators for Electricity
EPC	Energy Performance Contracting
ERD	Entity–Relationship Diagram
ERDF	European Regional Development Fund
ERO	Energy Regulatory Office
ES CR	Electricity system of the Czech Republic
ESF	European Social Fund
ESIF	European Structural and Investment Funds
ESR	Effort Sharing Regulation
ETP	Energy Technology Perspectives (IEA)
EU ETS	European Union Emission Trading Scheme
EUA	European Emission Allowances
EUPHEMIA	EU Pan-European Hybrid Electricity Market Integration Algorithm
EURACOAL	European Association for Coal and Lignite
Eurostat	Statistical Office of the European Union
EU-SILC	EU Survey on Income and Living Conditions
EA	Energy Act
FACTS	Flexible Alternating Current Transmission System
FCA	Regulation (EU) establishing a guideline on forward capacity allocation
FiD	Final investment decision
FSC	Forest Stewardship Council

PVPP	Photovoltaic power plant
GASPOOL	German business zone
Gazela	Gas pipeline
GHG	Greenhouse gas
HDD	Heating degree days
GDP	Gross domestic product
GNI	Gross national income
GVA	Gross value added
BTS	Border transfer station
IEA	International Energy Agency
IGCC	International Grid Control Cooperation
IPCC	Intergovernmental Panel on Climate Change
IPI	Industrial Production Index
IPPC	Intergovernmental panel on climate change
IROP	Integrated Regional Operational Programme
MW	Municipal waste
ktoe	Kiloton of oil equivalent
CHP	Combined heat and power generation
LČR	Forests of the Czech Republic
LIP 15	Local implementation project, a joint cross-border trading project of the Czech Republic, Bulgaria, Austria, Germany, Hungary, Poland, Romania, Slovenia and Croatia
LOLE	Loss of Load Expectation
LPG	Liquified petroleum gas
LRF	Linear reduction coefficient (emission allowances)
LULUCF	Land use, land use change and forestry
M1	Vehicles with a maximum of eight passenger seats
M2	Vehicles with more than eight passenger seats (weight not exceeding 5 000 kg)

M3	Vehicles with more than eight passenger seats (weight exceeding 5 000 kg)
MAF	Mid-Term Adequacy Forecast
MARI	Manually Activated Reserves Initiative
MC	market coupling
MCO	Market Coupling Operator Plan
MERO, a.s.	Czech company owning and operating the Druzhba and IKL oil pipelines on the Czech territory
ROME	Rape oil methyl ester
MoF	Ministry of Finance of the Czech Republic
MoRD	Ministry of Regional Development of the Czech Republic
PRIMES	modelling tool for EU analysis (when assessing impacts and analysing policy options)
Mothballing	Deactivation and storage of equipment or production equipment for future use
MIT	Ministry of Industry and Trade
MRC	Multi Regional Coupling
Mt	Mega-tonne
Mtoe	Million tonnes of oil equivalent
MoI	Ministry of the Interior
MW	megawatt
N1	Vehicles with a maximum permissible weight not exceeding 3 500 kg
N-1	Safety criterion
N2	Vehicles with a maximum permissible weight exceeding 3 500 kg but not exceeding 12 000 kg
N2O	Nitrous oxide
N3	Vehicles with a maximum permissible weight exceeding 12 000 kg
NAP CM	National Action Plan for Clean Mobility
NAP NE	National Action Plan for the Development of Nuclear Energy
NAP RES	National Action Plan for Renewable Energy Sources

NAP SG	National Action Plan for Smart Grids
NAPEE	National Action Plan for Energy Efficiency
NATO	Central European Pipeline System (CEPS)
NC CAM	Network Code Capacity Allocation Management
NC ER	Network Code for Emergency Restoration
NCG	German business zone
NEMO	Nominated Electricity Market Operator
NON-RES	Non-Renewable Energy Sources
NET4GAS	Transmission system operator in the Czech Republic
NFI	National forest inventory
NPISH	Non-profit institutions serving households
NCS	National Cohesion Strategy
LV	Low voltage (low voltage networks)
North Sea Brent FOB	World-renowned oil price index (free on board)
NOx	Nitrogen oxides
NPOR	National Priorities of Oriented Research
NRP	National Reform Programme of the Czech Republic
NTC	Net transmission capacity
GD	Government decree
OECD	Organisation for Economic Cooperation and Development
OLTC	On-Load Tap Changer
OP EIC	Operational Programme Enterprise and Innovation for Competitiveness
OPT	Operational Programme Transport
OPEC	Organisation of the Petroleum Exporting Countries
OP	Off-take point
OP EI	Operational Programme Enterprise and Innovation
OP E	Operational Programme Environment
UN	United Nations

OTE, a.s.	Electricity and gas market operator
RES	Renewable Energy Sources
PCIs	Projects of Common Interest
PCR	Price Coupling of Regions
PEFC	Programme for the Endorsement of Forest Certification
PES	Primary energy sources
PFCs	Perfluorocarbons
PHEV	Plug-in hybrid electric vehicles (plug-in hybrid electric vehicles)
Fuel	Motor fuels and lubricants
PICASSO	Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation
PJ	Petajoule (power unit)
PLEXOS	Integrated energy model for energy market modelling
PM 10	Particulate matter in microns
WMP	Waste Management Plan of the Czech Republic
CP	Climate Policy in the Czech Republic
CGP	Cross-border gas pipeline
TSO	Transmission system operator
C4G	Capacity for Grid
RDP	Rural Development Programme
TS	Transmission system of the Czech Republic
PST	Phase-shifting transformers
LFF	Land intended to fulfil forest functions
SES	Supported Energy Sources
RDE	Real Driving Emissions
RIA	Regulatory Impact Assessment
RIS3 Strategy	National Research and Innovation Strategy for Smart Specialisation of the Czech Republic
RSC	Regional Security Coordinator

rTPA	Regulated third party access
SDAC	Single day-ahead coupling
SEA	Strategic Environment Assessment
SEP	State Energy Policy
SET Plan	European Strategic Energy Technology Plan
SDIC	Single intraday coupling
SO GL	System Operation Guidelines
SOAF	ENTSO-E report
SoS	Security of Supply
RDS	Regional Development Strategy of the Czech Republic
BRP	Balance responsible parties
HSS	Heat Supply System
TACR	Technological Agency of the Czech Republic
TAL	Transalpine Pipeline
SAF	Solid alternative fuels
TCEP	Tracking Clean Energy Progress (IEA publication)
TEN-E	Trans-European Energy Networks
TEN-T	Trans-European Transport Networks
TERRE	Trans-European Replacement Reserves Exchange
THÉTA	A programme to support applied research, experimental development and innovation
TJ	Terajoule (energy unit)
SMW	Solid municipal waste
DNC	Domestic net consumption
TriHyBus	Czech hybrid hydrogen-powered bus fuel using fuel cells
TRU	Trading Region Upgrade
TSO	Transmission System Operator
TYNDP	Ten-Year Network Development Plan of the Czech Republic

FMI	Forest Management Institute
USD PPP	USD in purchasing power parity
USD/bbl	USD per barrel
R&D	Research and development
IM	Intraday market (with electricity in the Czech Republic)
VIP	Virtual interconnection point
HV	high voltage (or high voltage networks)
VTP	Virtual trading point (gas)
VOC	Volatile organic compound
VoLL	Value of Loss Load
NTS	National transmission system
LFS	Labour Force Survey
WPP	Wind power plant
HP, MP, LP	System of high-pressure, medium-pressure and low-pressure gas pipelines
VHP	Very high pressure long-range gas pipelines
VGS	Virtual gas storage
WEO	World Energy Outlook (IEA)
XBID	Czech–Polish and Bulgarian–Romanian cross-border intraday market project
DN	nomination of obligation to deliver (natural gas)
ON	nomination of obligation to off-take (natural gas)
NG	natural gas
ESF+	European Social Fund Plus