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# INTEGRATED NATIONAL ENERGY AND CLIMATE PLAN OF THE REPUBLIC OF SLOVENIA

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# SECTION A: NATIONAL PLAN

## 1 OVERVIEW AND PROCESS FOR ESTABLISHING THE PLAN

Regulation (EU) 2018/1999 of 11 December 2018 on the Governance of the Energy Union and Climate Action ('the Regulation'), which entered into force on 24 December 2018[1], requires Member States to draw up and submit the following to the European Commission ('the Commission'):

- by 31 December 2018: a draft of the integrated national energy and climate plan (NEPN) for 2020-2030 (with a view to 2040),
- by 31 December 2019: the final NEPN,
- by 1 January 2020: a long-term climate strategy for reducing emissions by 2050.

The NEPN is a strategic document that must set goals, policies and actions up to 2030 (with an outlook to the year 2040) for the five dimensions of the Energy Union:

1. decarbonisation (greenhouse gas (GHG) emissions and renewable energy sources (RES)),
2. energy efficiency,
3. energy security,
4. the internal energy market, and
5. research, innovation and competitiveness.

Slovenia started drawing up the NEPN in October 2017 when, by Decision of the Government of the Republic of Slovenia, an inter-service working group on preparing the NEPN was set up, headed by the Ministry of Infrastructure, which was competent for energy. In spring 2018 the inter-service working group reviewed the current situation and this summer reviewed the targets under the individual dimensions of the Energy Union. Pursuant to the Regulation requirement that Member States submit an initial draft NEPN to the Commission by 31 December 2018, the Ministry of Infrastructure, in cooperation with the inter-service working group, drew up a first draft of the NEPN, which included a cross-section of the targets, policies and measures adopted for all five dimensions of the Energy Union up to 2020 and, in part, up to 2030.

Slovenia was one of 22 Member States to submit a draft NEPN to the Commission by the deadline set by the Regulation, i.e. 31 December 2018. The draft document was based on previously adopted documents and decisions because, on account of early parliamentary elections, Slovenia did not adopt any new decisions in 2018 concerning higher requirements for reducing GHG emissions, the use of renewable energy or energy efficiency.

The documents and decisions that formed the basis of the draft NEPN were thus based on the following targets: of at least a 27% share of RES in gross final energy use, at least a 27% improvement in energy efficiency compared to the baseline scenario of 2007 (in line with the Energy Efficiency Directive) and the sharing of GHG emission reduction burdens, as confirmed by the EU Heads of States at the European Council in October 2014. In the first draft of the NEPN (December 2018), the target for renewables is taken from Slovenia's Development Strategy 2030, in which Slovenia set a target of 27% of RES by 2030, while the target of 15% reduction of GHG emissions by 2030 was officially confirmed by the EU Effort Sharing Regulation in 2018. The target for energy efficiency [EEU] for Slovenia by 2030 was set on the basis of an assessment drawn from the then existing expert bases, which showed that by 2030 Slovenia could achieve a 30% improvement in energy efficiency compared to the baseline scenario in 2007.

This first draft of the NEPN, drafted in December 2018, was the starting point for the preparation of the final NEPN, which includes a comprehensive update of the expert bases, the establishment of a multi-level climate and energy dialogue, and the updating and adoption of the NEPN. In parallel

[1] The Regulation can be accessed at: https://eur-lex.europa.eu/legal-content/SL/TXT/HTML/?uri=CELEX:32018R1999&from=SL#d1e2221-1-1.

with the drafting of the NEPN, the Ministry of Infrastructure successfully carried out a procurement procedure to obtain external expert and technical support. On the basis of this procedure, in November 2018 a contract was concluded with a consortium of institutions headed by the Jozef Stefan Institute (JSI).

In 2019, the Ministry of Infrastructure and the consortium of institutions under the leadership of the JSI, in cooperation with the inter-service working group, carried out a number of activities:

- there was a multi-level climate and energy dialogue, the following components of which *inter alia* should be highlighted:
  - design and upgrade of NEPN website[2],
  - preliminary public consultation on the drafting of the NEPN[3],
  - many activities organised in coordination with the preparation of the long-term Climate Strategy, including in the form of participation in targeted communication workshops[4],
  - an open call to young persons in favour of climate justice to be actively involved in drafting the NEPN[5],
  - extensive preparation for a comprehensive environmental impact assessment[6],
  - reporting to the Government of the Republic of Slovenia and informing the National Assembly[7],
- the first update of NEPN expert bases and projections[8],
- continuous cooperation with the Commission and updating of the original draft NEPN in line with the Commission's recommendations[9],
- regional meeting and consultation of experts and representatives of neighbouring countries involved in the preparation of the draft NEPN from Italy, Austria, Hungary, Croatia and Slovenia and the Commission, held in July 2019 in Ljubljana[10],
- preparation of the updated draft NEPN (Version 4.0) and its public presentation in September[11],
- a complete update of the updated draft NEPN (4.0) as a new version of the NEPN (4.1)[12],

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2 The NEPN website is accessible at: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/.

3 The results of the preliminary consultation are available on the NEPN website: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/dogodki-predhodno-posvetovanje/.

4 Information on communication workshops is available on the NEPN website: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/dogodki-komunikacijske-delavnice/.

5 The open prompt is available on the NEPN website at: https://www.energetika-portal.si/nc/novica/n/poziv-ministrstva-mladim-in-gibanju-mladi-za-podnebno-pravicnost-4210/.

6 Information on the Comprehensive Environmental Impact Assessment is available on the NEPN website: https://www.energetika- portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/cpvo/.

7 A report on the process of drawing up and adopting the integrated national energy and climate plan, August 2019, is available on the NEPN website Poročilo o procesu priprave in sprejemanja celovitega nacionalnega energetskega in podnebnega načrta.

8 The presentation of the first results is available on the NEPN website: https://www.energetika-portal.si/fileadmin/dokumenti/publikacije/nepn/dokumenti/nepn_predstavitev_MZI_maj_2019.pdf.

9 The Commission recommendations are published and available on the NEPN website: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/dokumenti/#c965.

10 Regional meeting information is available on the NEPN website: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/regionalno-posvetovanje/.

11 Information on the presentation of the completed NEPN draft is available on the NEPN website https://www.energetika- portal.si/nc/novica/n/predstavitev-dopolnjenega-osnutka-nepn-ter-posvet-o-pripravi-celovite-presoje-vplivov-na-o-4268/.

12 More information on the updated draft NEPN (4.1) is available on the NEPN website: https://www.energetika-portal.si/nc/novica/n/dopolnjen-osnutek-nepn-41-in-dopolnjen-osnutek-okoljskega-porocila-poslana-v-mnenje-na-4305/.

- public discussion of NEPN version 4.1 together with the environmental report[13],
- a comprehensive update of NEPN 4.1 and the Environmental Report, taking the greatest possible account of the comments and suggestions made in the public hearing, and drafting of NEPN 5.0[14].

In parallel with the preparation of the draft NEPN, on 22 November 2018, the Ministry of Infrastructure, in accordance with the Environmental Protection Act, informed the Ministry of the Environment and Spatial Planning of the intention to draw up the NEPN and on 4 January 2019 the latter issued Decision No 35409-412/2018/9 to the effect that a comprehensive environmental impact assessment, including an assessment of acceptability with regard to protected areas, should be carried out as part of the NEPN preparation process. In November 2018, through the 'EU Structural Reform Program', the Ministry of Infrastructure asked the Commission for technical assistance in drawing up the draft environmental report. Following the timely submission of the NEPN draft report, Slovenia obtained the technical assistance and the Ministry of Infrastructure, together with the Commission services, coordinated the call for a draft environmental report, on the basis of which the Commission independently managed the process and, on 12 July 2019, signed a contract to draft the environmental report with a consortium of institutions under the direction of the Milan Vidmar Institute of Electrical Engineering [EIMV].

The Integrated Environmental Impact Assessment process (IEIA), which also included numerous non-governmental organisations as concerned parties, was carried out in accordance with Slovenian law in several steps: i) preparation of starting points for content and consultation, ii) preparation of the draft environmental report and consultation, obtaining the opinion of the Ministry of the Environment and Spatial Planning [MOP] on the appropriateness of the draft environmental report, public presentation of the draft environmental report, public consultation and updating of the draft environmental report, participation of the Member States in the event of significant cross-border impacts and the Ministry of the Environment and Spatial Planning decision on the acceptability of the updated environmental report.

Four scenarios of future energy use and supply were discussed and analysed as part of the preparation of the NEPN:

- a scenario with the existing measures (EM [OU]) - further development is based on continuation of the implementation of all measures already adopted or carried out by 1 October 2018,
- a scenario with additional measures (AM [DU]), which takes into account measures in addition to the existing measures,
- a scenario with additional ambitious measures (AMA [DUA]), taking into account a more demanding implementation of additional measures in all sectors,
- a scenario based on recommendations received from the European Commission (REC), which *inter alia* takes into account a more intense rate of construction of new hydro-electric power plants (HPP) and more intensive implementation of energy efficiency improvement measures.

Under the Integrated Environmental Impact Assessment process, starting points were drawn up for the content (i.e. the content report) and the Report on the process of public involvement in the content process[15]; the environmental report was then drafted and expert opinions[16] were consulted.

13 More information on the public reading of the updated NEPN draft and the environmental report is available at: https://www.energetika- portal.si/nc/novica/n/zacetek-javne-obravnave-dopolnjenega-osnutka-nepn-in-okoljskega-porocila-4308/.

14 More information on the end of the public reading of the updated NEPN draft and the environmental report and preparation of the updated version NEPN 5.0 is available on the NEPN website: https://www.energetika-portal.si/nc/novica/n/konec-javne-obravnave- dopolnjenega-osnutka-nepn-in-njegovega-okoljskega-porocila-4319/.

15 More information on drawing up baselines for content and consultation is available at: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/cpvo/cpvo1/.

16 The updated version NEPN 5.0 is available on the NEPN website: https://www.energetika-portal.si/nc/novica/n/konec-javne-obravnave- dopolnjenega-osnutka-nepn-in-njegovega-okoljskega-porocila-4319/.

After receiving the Ministry of the Environment and Spatial Planning's opinion that the environmental report and NEPN should be supplemented, the Ministry of Infrastructure, together with both consortia, comprehensively supplemented and upgraded both documents, as far as possible taking into account the opinions received and mitigation measures proposed, and re-submitted the document to the Ministry of the Environment and Spatial Planning for its opinion. After receiving a favourable opinion from the Ministry of the Environment and Spatial Planning, the NEPN and the environmental report underwent public presentation and public consultation[17]. Both documents were comprehensively updated in the light of the comments received and re-submitted to the Ministry of the Environment and Spatial Planning for a decision on admissibility. Upon receipt of the decision confirming the acceptability of the environmental impacts of the implementation of the NEPN, the NEPN was submitted to the Government of the Republic of Slovenia for adoption.

In drawing up the NEPN, Slovenia reviewed all the targets set previously and, on the basis of the updated professional bases, prior public consultation, comprehensive environmental impact assessment and taking into account all the Commission's recommendations, except in the determination of the share of RES due to specific national circumstances, set development-oriented and demanding targets for 2030, stemming from an ambitious scenario of additional measures, further enhanced by some feasible measures from the REC (European Commission recommendations) scenario. The following ambitious scenario is referred to as the NEPN scenario with additional measures.

**A comprehensive assessment of the environmental impact of the NEPN was carried out, in parallel with the drafting of the NEPN. The NEPN drafting and comprehensive impact assessment process also addressed the scope of the 2030 targets and contributions. There was far-reaching and structured discussion of the expert bases, which was key to achieving broad stakeholder consensus on Slovenia's challenging but feasible 2030 targets, which will take account of significant national circumstances and mark an appropriate step towards a climate-neutral Slovenia by 2050.**

**The projects and measures set out in the NEPN will, in accordance with the Energy Act, be in the public interest in terms of energy and climate policy.**

**The adoption of the NEPN and its submission to the European Commission are also a condition enabling the enlistment of cohesion funds under the new multi-annual financial framework.**

[17] More information on the public hearing of the updated NEPN draft and the environmental report is available on the NEPN website: https://www.energetika-portal.si/nc/novica/n/zacetek-javne-obravnave-dopolnjenega-osnutka-nepn-in-okoljskega-porocila- 4308/.

## 1.1 Summary

**Political, economic, environmental and social framework of the plan**

On 7 December 2017, the Government of the Republic of Slovenia adopted the **Slovenian Development Strategy 2030** (Strategija razvoja Slovenije - SRS 2030), a framework document on national development that places quality of life for all[18] at the forefront. The strategy incorporates globally agreed sustainable development goals as well as five strategic orientations and twelve interrelated development goals that lay down new long-term development foundations for Slovenia.

As is emphasised in SRS 2030, Slovenia's future development will depend greatly on its ability to respond and adapt to trends and challenges in the global environment. Trends point to profound changes, especially in demographic trends, pressures on ecosystems, competition for global resources, and economic development. Co-operation and cohesion at global, European and national levels and cross-border co-operation are thus increasingly important.

Slovenia is making steady progress in terms of quality of life and economic development and some environmental pressures have been reduced. Nonetheless, in many areas of economic, social and environmental development, it lags some way behind the most developed countries, with backlogs that vary from one region to another.

In the decade preceding the outbreak of the 2008 crisis, Slovenia had achieved high economic growth; during this, however, many structural deficiencies indicated even before the crisis that the development model was unsustainable. During the crisis, GDP underwent a steep decline, which severely undermined economic stability and had a negative impact on the well-being of the population. In 2014, five years on, Slovenia started catching up with economically more developed countries, and the stability of the banking system and public finances, damaged in the crisis, was restored.

Slovenia faces demographic changes that will have a major impact on the future development of society and the quality of life, namely the increase in the number of people over 65, the low fertility rate and the decrease in the population in the age group 20 to 64. The demographic changes also increase pressure on the financial sustainability of the social protection and pension systems.

In recent years positive shifts have been achieved in reducing the burden on the environment, which is still overburdened by the Slovenian population through their lifestyle and production processes. Although greenhouse gas emissions declined in the context of lower economic activity during the crisis, nonetheless per unit of GDP their level remains higher than the EU average. Increased transit road traffic and overall non-sustainable mobility are particularly problematic for the environment. Total energy consumption is reduced on account of lower consumption in households and industry but remains relatively high per unit of GDP due to the high proportion of energy-intensive activities. Consequently, taking into account the dimension of the Energy Union, Slovenia will actively strive by 2030 to gradually decarbonise the energy-intensive industry and provide financial incentives for restructuring production processes with the introduction of green technologies.

The Slovenian economy is above the EU average on the basis of its consumption of raw materials, which is reflected in its lower material efficiency and reduces its competitiveness. In some areas, such as the share of renewables and organic farming, Slovenia is more successful than the EU average.

Slovenia also has favourable natural resources, coastal and marine resources and diverse biodiversity, but due to the inappropriate use of natural resources (especially in the areas of urbanisation, agriculture and water management), the conservation of species and their habitats is deteriorating.

[18] Strategy development of Slovenia 2030: http://www.vlada.si/fileadmin/dokumenti/si/projekti/2017/srs2030/Strategija_razvoja_Slovenije_2030.pdf.

Adapting to climate change, the transition to a climate-neutral and circular economy that would enable competitiveness and the quality of life of the population while preserving natural resources calls for changes in production and consumption to more sustainable forms.

**A strategy addressing the five dimensions of the Energy Union**

In accordance with SRS 2030, Slovenia's central 2030 target is to ensure quality of life for all; which can be achieved through balanced economic, social and environmental development that respects the limitations and capabilities of the planet and creates the right conditions and opportunities for present and future generations. At the individual level, quality of life is reflected in good opportunities for work, education and creativity as part of a decent, safe and active existence in a healthy, clean environment while being included in democratic decision-making and the co-management of society.

Slovenia's strategic orientations for achieving quality of life by 2030 are:
- an inclusive, healthy, safe and responsible society,
- learning for life and lifelong learning,
- a highly productive economy that creates added value for all,
- conservation of a healthy natural environment,
- a high level of cooperation, competence and efficient management.

Slovenian will implement the five strategic orientations for achieving the Strategy's central target by means of activities in various interrelated and interdependent fields covered by the Strategy's twelve development targets. Each target also relates to the **sustainable development goals of Agenda 2030** and identifies key areas that will need to be addressed with a view to achieving quality of life for all. The targets provide the basis for the formulation of priorities and actions of the Government of the Republic of Slovenia, regional development actors, local communities and other stakeholders.

In accordance with SRS 2030 and taking into account the dimension of the Energy Union, Slovenia's development guidelines up to 2030 will be **transition to a low-carbon circular economy and sustainable management of natural resources.** The **long-term climate strategy** (analysis period 2020 to 2050) will include a comprehensive analysis of various scenarios to contribute to EU and Member State commitments under the United Nations Framework Agreement on Climate Change and the Paris Agreement, including the scenario for achieving zero net GHG emissions in the Union by 2050 and negative emissions beyond that year, and the impact of these scenarios on the rest of the global and EU carbon budget as a basis for discussing cost-effectiveness, efficiency and fairness in reducing GHG emissions. The NEPN update in 2023 and 2024 will also take into account new EU strategic and legislative decisions that will be drawn up and adopted under the European Green Deal.

**The expert bases for the Long-Term Climate Strategy up to 2050 and the NEPN have been drawn up in Slovenia in a coordinated manner.**

Slovenia will also draw up the **Energy Concept of Slovenia** (ECS) as a fundamental long-term development document in the area of energy that will set targets, on the basis of the country's economic, environmental and social development projections and international commitments, for achieving a secure, sustainable and competitive energy supply for the next 20 years and for a framework of 40 years. On the proposal of the Government of the Republic of Slovenia, the ECS will be adopted by resolution of the National Assembly of the Republic of Slovenia. The renewed ECS will have to be drawn up in accordance with the adopted long-term climate strategy, as it covers only part of the measures to achieve the objectives of the long-term climate strategy.

**A transparent table with key objectives, policies and measures of the plan**

The first draft of the NEPN was based on updated medium- and long-term forecasts of energy consumption up to 2020 and 2030 and all the action documents adopted by Slovenia prior to 2018. The final NEPN was drawn up in accordance with the comprehensively updated professional bases, consultations with a broader professional base and the general public, the findings of the

environmental report and the results of regional consultation. As far as possible Slovenia also complied with the recommendations of the Commission or duly explained the parts of the recommendations that were not taken into account in the preparation of the final NEPN adopted by the Government of the Republic of Slovenia following the completion of the comprehensive environmental impact assessment in accordance with the Energy Act.

The key objectives and contributions of NEPN across the five dimensions of the Energy Union are set out below. In the second chapter, the key objectives (GHG, RES and EEU) are broken down in more detail in accordance with individual scenarios.

***Table 1: Key objectives and contributions of Slovenia by 2030***

| ***KEY OBJECTIVES AND CONTRIBUTIONS OF SLOVENIA UP TO 2030*** |
|---|
| **Improving energy and material efficiency in all sectors** (and therefore **REDUCING CONSUMPTION OF ENERGY AND OTHER NATURAL RESOURCES**) is the first and key measure for the transition to a climate-neutral society. |
| **Decarbonisation: climate change mitigation and adaptation** |
| **Reduce GHG emissions in sectors not covered by the trading scheme** by 2030 as laid down by the Effort Sharing Regulation for Slovenia, i.e. by **at least 20% compared to 2005, achieving** the following **sectoral targets:**<br>- transport: + 12 %,<br>- general consumption: – 76 %,<br>- agriculture – 1 %,<br>- waste management: – 65 %,<br>- industry*: – 43 %,<br>- energy*: – 34 %.<br>** Only part of the sector not covered by the ETS.* |
| Ensure that **LULUCF** [Land Use Land Use Change and Forestry] sectors will not produce net emissions by 2030 (after applying accounting rules), i.e. emissions in the LULUCF sector will not exceed sinks. |
| In the area of **adaptation**, reduce Slovenia's exposure, sensitivity and vulnerability to climate change, and increase society's resilience and adaptive capabilities. |
| To reduce **the use of fossil energy sources and dependence on importing them** by:<br>- phasing out consumption of coal: by at least 30% by 2030, and the decision to phase out coal consumption in Slovenia in line with the principles of just transition by 2021,<br>- a ban on the sale and installation of new fuel-oil boilers by 2023,<br>- support for the implementation of pilot projects for the production of synthetic methane and hydrogen (the indicative target is a 10% share of renewable methane or hydrogen in the transmission and distribution network by 2030). |
| **Decarbonisation: renewable energy** |
| Reach **at least a 27% share of renewables** in energy end-use by 2030, i.e. (indicative):<br>- at least 2/3 of **energy consumption in buildings** to come from RES by 2030 (the share of RES in end-use of energy products excluding electricity and district heating),<br>- at least a 30% share of RES[19] in **industry**,<br>- 43% share in the **electricity sector**,<br>- 41% share in the **heating and cooling sector**,<br>- 21% share in **transport** (with a **share of biofuels of at least 11%**). |

[19] Taking surplus heat into account.

| **Efficient energy use** |
|---|
| **Improving energy and material efficiency in all sectors** (and therefore reducing energy and other natural resources) as first key measure in the transition to a climate-neutral society. |
| By 2030 **improve energy efficiency by at least 35%** compared to the 2007 baseline (in line with the Energy Efficiency Directive). |
| Ensure **systematic implementation of the policies and measures adopted** so **that the energy end-use does not exceed 54.9 TWh (4 717 ktoe).** When converted to primary energy level, 2030 usage will not exceed 73.9 TWh (6 356 ktoe). |
| **Reduce final energy consumption in buildings** by 20% by 2030 compared to 2005 and ensure the reduction of GHG emissions in buildings by at least 70% by 2030 compared to 2005. |
| **Energy security and the internal energy market** |
| **Provide additional financial, human and technical resources to expedite the integrated development and management of the electricity distribution network to increase capacity, reinforce resistance to disruption and future development potential, boosting connectivity and adaptability,** making it possible to exploit flexible sources and loads and expedite the incorporation of heat pumps, the roll-out of e-mobility and the integration of renewable electricity production and storage facilities. |
| Slovenia's other energy security and internal energy market targets for 2030 are:<br>- to ensure a **reliable and competitive energy supply,**<br>- to maintain a **high level of electricity interconnection** with neighbouring countries,<br>- **at least 75% of electricity supply from sources in Slovenia** by 2030 and by 2040, and ensuring an adequate level of security of electricity supply,<br>- to **continue to exploit nuclear energy and maintain excellence** in the operation of nuclear facilities in Slovenia,<br>- to **reduce** fossil fuel **import dependency**,<br>- to **increase electricity distribution network resilience** to disruption - increase the share of the underground medium-voltage network from the current 35% to at least 50%,<br>- further **development of system services** and the **active role of clients,**<br>- development of **energy storage** technologies, infrastructure and services**,**<br>- to establish a **development-oriented regulatory framework** to determine the amount of the network charge for the transition to a climate-neutral society,<br>- to support the development of an efficient and competitive market for full use of the **flexibility of the energy system** and new technologies<br>- support for cross-sectoral integration and implementation of new cross-sectoral system services,<br>- to encourage development and research cooperation between companies in and outside the sector,<br>- to ensure the further development of the pipeline system in accordance with the gas flows and system performance, including **new sources of renewable gas and waste**,<br>- to prepare a regulatory and support environment for renewable gas alternatives in the natural gas network, while analysing and determining the maximum possible share of hydrogen in the natural gas network,<br>- to support the implementation of **pilot projects for the production of synthetic methane and hydrogen** (with an indicative target 10% share of renewable methane or hydrogen in the transmission and distribution network by 2030), |

- to provide appropriate conditions to **maximise the share of renewable energy stored and used**, when and where necessary, and to maximise the capacity of RES generating facilities,
- to enable the **mitigation and reduction of energy poverty** by accelerating the implementation of social policy measures, general housing policy measures and existing targeted measures.

**Research, innovation and competitiveness**

Slovenia's 2030 targets in the research, innovation and competitiveness dimension are:

- to increase investment in R&D - at least 3% of GDP by 2030 (of which 1% of GDP is public funding),
- to **increase investment in human resources** and new knowledge needed to move to a climate-neutral society,
- to support businesses **for an efficient and competitive transition to a climate-neutral and circular economy,**
- to stimulate **targeted research projects and multidisciplinary R&D programmes and demonstration projects** with the goal of achieving a climate-neutral society, in line with the direct interest of the economy or public sector, and meeting the country's development goals, in particular in the areas of energy efficiency, the circular economy and green energy technologies,
- to **incentivise businesses to finance and become involved** in R&D programmes and demonstration projects by means of an active tax policy,
- to **promote new and bolster existing R&D programmes** in line with the objectives of the NEPN and the Long-Term Climate Strategy,
- to **promote the use of digitisation** for climate action and **increase cyber security across all strategic systems,**
- to promote public and private sector R&D cooperation,
- to create competitive conditions for innovative research work in public companies.

## 1.2 Overview of current policy situation

The goal of Slovenia's energy and climate policy is to ensure a reliable, secure and competitive energy supply in a sustainable way in such a way as to ensure the transition to a climate-neutral society and achieve sustainable development goals by, among other things, establishing an environment that stimulates economic development and creating jobs with high added value, improving the quality of life, increasing environmental responsibility and providing acceptable energy services for Slovenia's population and economy.

The **key challenges** for Slovenia in the area of energy and climate policy are:

- gradual reduction of energy consumption and increasing energy and material efficiency in all sectors,
- accelerated development of the electricity distribution network for greater strength, resistance to disruption and future development potential, which will enable accelerated exploitation of resource and load flexibility, integration of heat pumps, fulfilment of requirements related to accelerated deployment of e-mobility and accelerated integration of renewable electricity generation facilities; it will be necessary to ensure financial resources for the additional investments of distribution companies and to ensure the sustainable setting of network charges,
- efficient placement of infrastructure projects contributing to the goal of a climate-neutral society,
- phasing out of fossil resources in all sectors,
- sustainable transport management and transition to alternative fuels,
- accelerated development of district heating and cooling systems,
- decarbonisation of the natural gas supply and integration of the gas and electricity sectors,
- maintaining the excellence and safe operation of nuclear facilities in Slovenia and drawing up guidelines for deciding on the future use of nuclear energy and the possible construction of a new nuclear power plant,
- technological development and commercial breakthrough of RES, advanced technologies and services, including storage and efficient use of energy,
- reducing the implementation deficit for all actors and at all levels for comprehensive and successful management and implementation of measures for the transition to a climate-neutral society.

The **main task** of the future development of energy in Slovenia is to ensure a balance between the three fundamental pillars of energy policy, which are inextricably linked: climate sustainability, security of supply and competitiveness of the energy supply.

Slovenia has undertaken in the long term to uphold the Paris Agreement commitments and, by reducing greenhouse gas emissions, to keep the global temperature rise below 2°C and to limit the rise in temperature to 1.5°C compared to the pre-industrial era. Slovenia ratified the Paris Agreement in 2016[20].

In May 2019, the Government of the Republic of Slovenia endorsed the goal of achieving net-zero greenhouse gas emissions in the EU by 2050.

**In terms of adaptation to climate change**, in December 2016, Slovenia adopted a strategic framework for adaptation to climate change containing guidelines for adaptation to climate change in Slovenia. With this document, Slovenia established the vision that '*by 2050, society in Slovenia will*

[20] Act ratifying the Paris Agreement, UL RS No 77/16.

*adapt and become resilient to climate change impacts with high quality and safety of life, fully exploiting the opportunities in a changing climate on the basis of sustainable development*'.

The vision aims to reinforce the capacity to adapt to climate change, manage risks and exploit the opportunities presented by climate change, and its overall objective is to reduce Slovenia's exposure and vulnerability to the impact of climate change and to increase society's resilience and adaptability.

The objective of reducing GHG emissions is reflected in **setting an ambitious and development-oriented share of RES in final use.** The NEPN reaffirms the national target of at least a 27% share of RES by 2030 set by the SRS 2030 and actively seeks to create an appropriate structural environment and to stimulate the necessary changes that will enable Slovenia when updating the NEPN (2023 and 2024) to set a more ambitious target for the share of renewables by 2030.

In the area of transport and transport infrastructure up to 2030, the fundamental document in Slovenia is the **Transport Development Strategy in the Republic of Slovenia up to 2030**[21]. In recent years, many measures have already been carried out to develop rail infrastructure and public transport as well as in the area of sustainable mobility (measures detailed in Chapter 4).

**Energy efficiency** measures have positive effects both for final consumers and the economy and also for the environment, while at the same time having particularly favourable macro-economic effects, such as stimulating economic growth, creating jobs and reducing dependency on fossil fuel imports. Promoting energy efficiency will reduce consumption and thus energy costs for consumers, will have a positive impact on human health and the economy, and the more efficient use of energy will boost competitiveness. Increasing energy efficiency (and hence reducing consumption) is **Slovenia's first key measure for the transition to a climate-neutral society.**

**Security of supply** is one of the three fundamental pillars of energy policy and is inextricably linked to climate sustainability and competitiveness of the energy supply. To create a secure energy supply, Slovenia will, in a well-founded sustainable and economical fashion, ensure a sufficient supply of energy resources and sufficient capacity and diversification of supply routes, sufficiently powerful and regularly maintained networks, appropriate cross-border connections, and operationally reliable and efficient cooperation between energy systems, diverse sources of electricity and energy storage. Considering the size of Slovenia and EU energy policy, the integration of supply routes and resources in the region is very important for Slovenia. Having regard to climate change, maintaining the security of supply will be particularly emphasised in the electricity system.

To achieve its ambitious energy and climate policy targets, **Slovenia will ensure better conditions for accelerated development of the electricity distribution network** conferring greater intensity, resistance to disruption, future development potential and exploitation of the flexibility of resources and loads, as the network represents a **cornerstone of the future transition to a climate-neutral society**, which alone will enable accelerated connection of heat pumps and the fulfilment of requirements related to accelerated deployment of e-mobility and accelerated integration of renewable energy generation facilities.

Slovenia will endeavour **as far as possible to reduce the use and importation of fossil energy sources** by gradually phasing out fossil energy sources while focusing on increasing energy efficiency use and greater use of renewable and low-carbon sources. In accordance with decarbonisation projections, the share of renewables in the energy balances will increase.

Slovenia's electricity connectivity was 83.6% in 2017, well above the 10% target for 2020 and the 15% target for 2030.

Slovenia has several projects of common interest in the area of electricity and natural gas transmission. The natural gas transmission project is a transmission link between Slovenia and Hungary, which will create the missing pipeline connection between the two systems and enable the

[21] Available on the website: http://www.MZI.gov.si/si/dogodki/strategija_razvoja_prometa_v_rs/.

transfer of gas from Hungary via Slovenia to Italy and vice versa, affording access to LNG terminals and underground storage facilities. A second project is to increase the bilateral capacity of the transmission link between the Slovenian-Croatian and Slovenian-Austrian interconnection for access to LNG terminals.

In the area of **research and innovation**, in 2010 the Slovenian Government adopted the target of achieving by 2020 joint public-private investment in R&D amounting to 3% of GDP (with a target of 1% of GDP for the public investment). In the SRS 2030, whereby Slovenia also committed itself to implementation of the 2030 Agenda for Sustainable Development, Slovenia set itself two targets related to the research, innovation and competitiveness dimension in Slovenia:

- a competitive and socially-responsible enterprise and research sector, including, among other things, a focus on environmentally-friendly technologies and eco-innovation, which as an important factor in the competitiveness of enterprises also contributes to reducing environmental burden as an important factor;
- transition to a low-carbon circular economy as a priority development trajectory for the whole economy, breaking the link between economic growth and the growth in the use of raw materials and non-renewable energy sources and the associated increased environmental burden.

**Key issues of cross-border importance**

Slovenia is a small country, and its energy system is highly connected with those of neighbouring countries, in particular Italy, Austria and Croatia and, in terms of the construction of missing electricity and gas infrastructure, also with Hungary. With a view to increasing the volume of energy transmission within the energy system, a well-functioning integrated energy market at regional and EU level is essential for Slovenia. In addition, it should be noted that joint freight transport management in Slovenia and the wider region is one of the key issues of cross-border importance that Slovenia will address at neighbourhood, regional and EU level with the aim of seeking to limit freight traffic on roads also through inter-state cooperation. Knowledge of targets, energy policies and measures in neighbouring countries, as well as consultation and constructive cooperation on regional infrastructure issues, is extremely important for Slovenia.

**The administrative structure of the implementation of national energy and climate policies**

In Slovenia, the Ministry of Infrastructure is competent for energy matters and the Ministry of the Environment and Spatial Planning for the environment, climate change and spatial planning. Many other ministries are involved in the implementation of the measures, especially in the area of climate policy. In order to support the drafting of the NEPN, an inter-departmental expert group of different ministries was therefore formed. The NEPN also provides for the establishment of an Energy and Climate Council as a government advisory body to monitor the implementation of the NEPN, i.e. the achievement of NEPN targets and the roll out of policies and instruments established therein, drawing up positions and recommendations for the Government of the Republic of Slovenia with regard to improvement of the implementation of the NEPN.

## 1.3 Consultations and cooperation of national and Union entities and their outcome

### National parliamentary cooperation

In May 2019, the Ministry of Infrastructure presented the starting points and first results of the NEPN projections to the members of the National Assembly (NA) Committee on Infrastructure, Environment and Spatial Planning.

In August 2019, in accordance with the decisions of the National Assembly Committee on Infrastructure, Environment and Spatial Planning adopted on 10 April 2019, the Government of the Republic of Slovenia submitted a report to the National Assembly on the preparation and adoption of the NEPN. The Government of the Republic of Slovenia, which in accordance with the Energy Act adopts the NEPN, will keep the National Assembly informed as appropriate regarding the adopted NEPN.

### Cooperation of local and regional authorities

Organisations representing local communities were invited, in the same way as other stakeholders, to the preliminary and final rounds of consultation on the drafting of the NEPN. In the first round of consultation, in March and April 2019, comments were submitted by the Community of Municipalities of Slovenia[22] and, in the second, also by some municipalities, e.g. the Municipality of Ljubljana[23].

The National Council, comprising 40 council members including 22 local community representatives, is also kept informed of the preparation and adoption of the NEPN.

### Consultations with stakeholders, including social partners, and involvement of civil society and the general public

In accordance with the Regulation, in Slovenia the NEPN is drafted in such a way as to enable the public to participate effectively in the process[24]. To that end, an NEPN website was set up, where for public information purposes all information on the drafting of the NEPN is published. Reasonable deadlines for the public to participate and express their views are set. A multi-level climate and energy dialogue has also been set up in which local authorities, civil society organisations, the business community, investors and other stakeholders and the general public can actively participate.

The public consultation on the drafting of the NEPN comprised three phases:

1. the preliminary consultation on the drafting of the NEPN was held in March and April 2019: all interested stakeholders, i.e. local authorities, civil society organisations, the business community, investors and other stakeholders and the general public, were invited to a public consultation and dialogue, with contributions on prepared questions[25];
2. communication workshops aimed at targeted consultation and expert dialogue on specific NEPN content were conducted in 2019 in coordination with the LIFE CLIMATE PATH 2050 project and

22 The Community of Municipalities of Slovenia contribution is available at: https://www.energetika-portal.si/fileadmin/dokumenti/publikacije/nepn/predhodno_posvetovanje/11-sos.pdf.

23 All comments received and suggestions made in the framework of the public consultation on NEPN 5.0 and the environmental report relating to it are available on the NEPN website at: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/dogodki-zakljucno-posvetovanje/pripombe-jo/.

24 The NEPN website is available at: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/.

25 Further information on the preliminary consultation is available at: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/dogodki-predhodno-posvetovanje/.

the preparation of the Long-Term Climate Strategy led by the Ministry of the Environment and Spatial Planning[26];

3. the final consultation on the drafting of the NEPN was held after obtaining the favourable opinion of the Ministry of the Environment and Spatial Planning on the acceptability of the NEPN and the environmental report, i.e. in January and February when both documents were publicly presented, and public consultation was held with all interested stakeholders, whose opinions and comments were then taken into account as far as possible in drawing up the final NEPN (Version 5.0) and the environmental report[27].

**Consultation with the other Member States**

On 4 July 2019 in Ljubljana, Slovenia organised a regional consultation with neighbouring countries on the preparation of the NEPN. Representatives from Austria, Croatia, Hungary, Slovenia and the Commission attended the regional meeting of experts involved in the preparation of the NEPN, while representatives of Italy participated via video conference.

Slovenia set the goals of the first regional consultation in agreement with the representatives of the neighbouring countries:

- meeting and networking between experts from different countries and different ministries actively involved in the preparation of the NEPN,
- overview of the status and progress of NEPN preparation, exchange of information and views,
- identification of the central challenges and opportunities for regional cooperation with neighbouring countries in the preparation and implementation of the NEPN.

The national representatives and experts involved in the preparation of the NEPN confirmed their interest in further regional consultation and cooperation. In particular, they indicated as a particular aim of consultation: the exchange of good practices and cooperation in the area of alternative fuels, in particular synthetic gases, in the area of joint transport management, RES projects and energy efficiency, small islands as laboratories for RES deployment, smart grids, cross-border infrastructure projects, soft education and awareness measures, efficient integration of electricity markets and governance and energy poverty.

Slovenia drew up a summary of the exchange of views and consultations and collected and briefly outlined the common challenges and opportunities for further regional consultation and cooperation, which will also serve as a starting point for future bilateral and multilateral consultations and the promotion of regional cooperation between participating countries.[28]

**Cooperation with the Commission**

Slovenia actively participates in the work of the NEPN Technical Preparation Team under the guidance of the Commission and strives for constructive cooperation with both the Commission and the other EU Member States in the preparation of the draft NEPN, with fair distribution of burdens and respect for relevant national obstacles and circumstances.

In its ongoing cooperation with the Commission on several levels and on multiple occasions, including bilateral exchanges, Slovenia has emphasised that one of the most important areas of NEPN is the determination of the share of renewables, noting the Commission's obligation in assessment of the

26 More information on communication workshops is available at: https://www.energetika-portal.si/dokumenti/strateski- razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/komunikacijske-delavnice/.

27 More information will be available on the NEPN website at: https://www.energetika-portal.si/dokumenti/strateski-razvojni- dokumenti/nacionalni-energetski-in-podnebni-nacrt/zakljucno-posvetovanje/.

28 More information on the regional consultation and all materials are available on the NEPN website: https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/regionalno- posvetovanje/.

share of renewables in accordance with the Regulation (Article 31(2)) to also take into account the indicative formula as well as the specific circumstances indicated by Member States in the draft NEPN.

On 18 June, the Commission published an assessment of the Member States' draft NEPNs up to 2030, examining the projected joint contribution of the Member States towards achieving the 2030 targets of the Energy Union and the EU[29]. Whereas, on the one hand, Slovenia finds that the Commission has given Slovenia a clear and particularly welcome recommendations that contributed significantly to the comprehensive updating of the NEPN draft, on the other Slovenia finds that, in its assessment, the Commission recommends a greater share of renewables, namely 37%, based solely on application of the formula in Annex 2, which is only indicative, while clearly the Commission did not take into account Slovenia's specific circumstances as recorded in the draft NEPN, despite the fact that, under Article 31(2) of the Regulation, the Commission should make its recommendations based not only on application of the formula but also taking into account the specific national circumstances indicated by Slovenia in the draft NEPN.

The Commission also highlighted certain aspects of Slovenia's draft NEPN as an example of good practice, singling out, among other things, the area of transport, as Slovenia identified specific measures in the draft NEPN, including quantification of the required charging infrastructure, and the area of adaptation, where the draft NEPN also identifies adaptation targets and measures.

Slovenia has thoroughly examined the Commission's recommendations and in the update of the NEPN has taken them into account almost in their entirety or, in the event of non-compliance, has, in accordance with the Regulation, provided due justification.

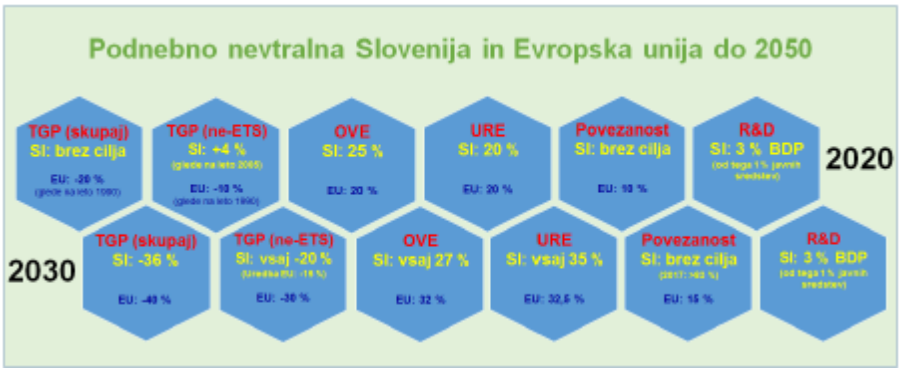
[29] The Commission Recommendations are available on the NEPN website: https://www.energetika-portal.si/dokumenti/strateski- razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt/dokumenti/#c965.

# 2 NATIONAL OBJECTIVES

The main national energy and climate targets for all five dimensions of the NEPN for 2020 and 2030 are shown below.

***Figure 1: Summary of objectives for all five NEPN dimensions for EU and Slovenia***

Climate neutral Slovenia and European Union by 2050




Key to Figure 1:

| | | |
|---|---|---|
| TGP (skupaj) – GHG (total) | Povezanost – Integration | glede na leto – based on the year |
| TGP (ne-ETS) – GHG (non-ETS) | | BDP - GDP |
| OVE – RES | SI: brez cilja – SLO: no target | (od tega 1 % javnih sredstev) – (of which 1% of public funds) |
| URE – EEU | | |

The main and sectoral energy and climate targets are set out below in a meaningful way and displayed by individual dimensions, although some of the targets affect multiple dimensions.

In drawing up the NEPN, after reviewing all objectives adopted previously and on the basis of updated professional bases, prior public consultation and the comprehensive environmental impact assessment and taking into account all the Commission recommendations, except with regard to determining the share of renewables due to specific national circumstances, Slovenia has set development-oriented and ambitious goals up to 2030, derived from a scenario with additional ambitious measures (AMA[DUA]), further enhanced by some feasible measures under the REC scenario (European Commission Recommendations). **The following upgraded ambitious scenario with additional measures is referred to as the NEPN scenario.**

## 2.1 Decarbonisation Dimension

**Overview of key objectives:**

- **contribute to achieving net-zero GHG emissions at EU level by 2050, which is the starting point for planning objectives, policies and actions up to 2030,**
- **effective placement in space for accelerated use of RES,**
- **further reduce GHG emissions by 2030,** as determined for Slovenia by the Effort Sharing Regulation, i.e. **at least 20% compared to 2005**, while achieving sectoral objectives:
  - transport: + 12 %,
  - general consumption: – 76 %,
  - agriculture – 1 %,
  - waste management: – 65 %,
  - industry*: – 43 %,
  - energy*: – 34 %.

  ** only part of the sector not covered by the ETS,*
- **reduce GHG emissions in buildings** by at least 70% by 2030 compared to 2005,
- **ensure that no net emissions are produced in the LULUCF sectors by 2030** (after applying the accounting rules), i.e. in the LULUCF sector emissions will not exceed sinks,
- **in the area of adaptation, reduce Slovenia's exposure to climate change impacts** and its sensitivity and vulnerability to them, and increase society's resilience and adaptive capacity,
- **achieve at least a 27% share of RES in energy end-use by 2030 and**
  - **achieve at least 2/3 renewable energy use in buildings** (share of RES in final energy use excluding electricity and district heating), a ban on the sale and installation of new heating oil boilers after 2022,
  - **at least 30% share of renewables** (including surplus heating) in industry,
  - **1% annual increase in the share of RES and surplus heat and cold** in district heating and cooling systems,
  - **at least 43% share of RES** in the production of electricity,
  - **at least 41% share of RES** in heating and cooling,
  - **at least a 21% share of RES** in transport,
- **decarbonisation of electricity production - phasing out of coal**: at least by -30% by 2030 and the decision to abandon coal use in Slovenia in accordance with the just transition principles by 2021,
- gradual decarbonisation of **energy-intensive industries:** guarantee **financial incentives** for restructuring production processes with the introduction of green technologies,
- **increased investment in human resources** and the new knowledge needed for the transition to a climate-neutral society and to **reduce the implementation deficit.**

### 2.1.1 GHG emissions and removals

The EU has set itself the goal of reducing GHG emissions by 2030 as its nationally determined contribution[30] to the objective of the Paris Agreement and the United Nations Framework Convention on Climate Change, by **40% compared to 1990**, which means a **36% reduction of GHG emissions compared to 2005**. This objective is divided into two sub-objectives:

**43% reduction in emissions** under the EU Emissions Trading Scheme (EU ETS);

**30% reduction in emissions** in sectors outside emissions trading for which nationally binding targets are set.

The Government of the Republic of Slovenia stipulated in SRS 2030 that 'the transition to a low-carbon circular economy [...] is a priority development orientation for the whole economy'[31]. A key objective of Slovenia's long-term climate policy is the necessary transition to achieving zero net greenhouse gas emissions by the middle of the century for the sustainable development of the economy and society. The NEPN targets take these long-term orientations into account and are consistent with the long-term Climate Strategy.

Exemptions or refunds of duties that promote the use of fossil fuels contrary to the greenhouse gas emission reduction targets will be **gradually phased out by 2030**. Inefficient use of fossil fuels and coal imports will become uneconomical thanks to **gradually increasing the environmental tax on $CO_2$** [32]and other duties. With a view to achieving the target of decarbonising the economy, **energy-intensive industries** will be required to commit themselves to reducing energy and emission intensity. At the same time, we will give them financial incentives to restructure production processes into less energy-intensive processes, based on the expedited introduction of green technologies. Slovenia will also provide fiscal incentives - in the form of incentives - to invest in energy efficiency, reduce final energy use or invest in self-supply and renewable energy (RES).

#### Slovenia's binding objectives for greenhouse gas emissions for 2030 in sectors outside the ETS (non-ETS)

In accordance with the Regulation on binding greenhouse gas emission reductions by Member States[33], **Slovenia is obliged by 2030 to reduce greenhouse gas emissions in sectors not covered by the ETS by at least 15% compared to 2005 levels.** In addition to the 2030 target, the Regulation also lays down a linear trajectory, which, given the flexibility laid down in the Regulation, should not be exceeded.

The NEPN sets higher targets for reducing GHG emissions (non-ETS) by 2030, i.e. **by at least 20% compared to 2005.** The more challenging target for reducing GHG emissions does not envisage any increase in ambition or expectations in the area of the share of renewables (RES), where Slovenia is limited by some important or specific national circumstances that determine the further increase of the share of RES.

In order to successfully achieve and exceed the GHG emission reduction target (non-ETS), it is important to manage and reduce emissions in all the sectors involved; the NEPN therefore sets more

30 NDC.

31 Accepted on 7 December 2017, available at: http://www.vlada.si/fileadmin/dokumenti/si/projekti/2017/srs2030/Strategija_razvoja_Slovenije_2030.pdf.

32 Gradual adjustment of the level of the environmental tax on CO2 pollution to the level of emission allowances.

33 Regulation (EU) 2018/842 sets national GHG emission reduction targets for each EU Member State in the range of 0% to 40%. The format and method of control and reporting under the Effort Sharing Regulation has been harmonised for all Member States with the Regulation on the Governance of the Energy Union and Climate Action.

demanding sectoral targets for reducing GHG emissions by 2030 compared to 2005 (*Table 2*)[34] than in the guidelines from the Operational Program for GHG Emission Reduction Measures (OP-GHG)[35].

***Table 2: Sectoral targets for the reduction of GHG emissions in sectors not covered by the ETS***

| Sectors | Annual GHG emissions [kt CO2 eq] | | Reduction targets compared to 2005 [kt CO2 eq] | | Reduction compared to 2007 |
|---|---|---|---|---|---|
| | 2005 | 2017 | 2020 OP-GHG | 2030 NEPN | 2030 NEPN |
| Transport | 4 416 | 5 541 | + 27 % | + 12 % | - 10 % |
| General consumption | 2 661 | 1 456 | - 53 % | - 76 % | - 57 % |
| Agriculture | 1 709 | 1 688 | + 5 % | - 1 % | 0 % |
| Waste management | 848 | 557 | - 44 % | - 65 % | - 47 % |
| Industry*[36] | 1 542 | 1 132 | - 42 % | - 43 % | - 23 % |
| Energy*[37] | 591 | 509 | + 6 % | - 34 % | - 23 % |

** Only part of the sector not covered by the ETS.*

It is of vital importance for Slovenia to take proper and efficient actions in to address the issue of transport and its contribution to greenhouse gas emissions. In the first stages, given the constant growth of road transport (freight and passenger), Slovenia needs to pay special attention to **rail transport and sustainable mobility measures.** This will reduce the carbon footprint of the transport sector and relieve heavy traffic, which is becoming unsustainable on Slovenian roads. To achieve this goal, we plan to:

- **upgrade railway infrastructure (preparation by 2025, implementation by 2030)** and increase the capacity of passenger corridors and upgrade lines to meet TEN-T standards and increase capacity,
- **develop integrated public transport** (harmonisation of timetables, integration of urban transport, establishment of a public passenger transport operator)
- promote **sustainable transport choices** in the calculation of travel costs,
- reduce **the need for private motor vehicle use** (telework, modified parking policy, etc.),
- join up spatial planning and transport planning,
- arrange micro-mobility nodes along city thoroughfares and highways, as appropriate,
- **change excise and toll policy** with the aim of, as far as possible, diverting freight transit transport to rail,
- provide an adequate support environment for the **integrated electrification of the Port of Koper**,
- **organise and establish a digital platform** that will promote all possibilities of public passenger transport, forms of co-travel and the creation and establishment of new sustainable mobility business models,
- by 2023 analyse the prospects for banning the sale of new and import of old vehicles that use liquid fossil fuels as motor fuels,

34 Determined by taking into account legally binding targets, policy decisions already made at EU level on long-term targets, the cost of reducing GHG emissions in Slovenia and other general development, sectoral and environmental targets and taking into account the effects of technological solutions.

35 https://www.energetika-portal.si/fileadmin/dokumenti/publikacije/op_tgp/op_tgp_2020.pdf.

36 'Industry' includes emissions from the Industrial Fuel Combustion Sectors (1.A.2) and Industrial Processes (2.).

37 'Energy' includes emissions from the Energy Supply sector (1.A.1) and Fugitive Emissions (1.B).

- provide an adequate support environment for the introduction of **alternative fuels such as liquefied natural gas (LNG) for freight transport and compressed natural gas and other synthetic fuels and hydrogen ($H_2$) for road transport,**
- **streamline administrative procedures** in the electrification of transport.

In the next decade, Slovenia needs to manage the rapid growth of passenger and freight transport and to direct traffic flows to alternative means of transport. It is crucial to **gradually reduce energy consumption by increasing energy efficiency and switching to low-emission vehicles.** Since walking and cycling also contribute to sustainable mobility, we will actively promote the construction of cycling and pedestrian infrastructure. Slovenia will thus provide the population with simple, fast, green transport that is non-invasive for the environment and urban centres in the last kilometres. The target is to reduce the number of journeys by private motor vehicle (now 67% of journeys) and significantly increase the number of journeys by foot, bicycle or public transport.

### Total GHG emissions

**The NEPN shows that by 2030 Slovenia will reduce its GHG emissions by up to 36% compared to 2005.**

The NEPN makes provision for the gradual **phasing out of the use of domestic and imported coal** for energy needs or a reduction of at least -30% by 2030 and a decision to abandon the use of coal Slovenia in accordance with the just transition principles by 2021. The exact timetable for abandoning coal use in Slovenia will be determined by a strategy for abandoning coal use and restructuring coal regions in accordance with the just transition principle, which will be adopted by 2021 at the latest. The objective of abandoning coal use in Slovenia will be duly taken into account in the NEPN update in 2024.

### Slovenia's commitments under Regulation (EU) 2018/841

Part of the EU national contribution is the Land Use, Land Use Change and Forestry (LULUCF) sector, where **Slovenia's objective is to ensure that the LULUCF sector does not produce net emissions, i.e. emissions in the LULUCF sector will not exceed sinks, and that we maximise the scope of emission sinks by 2030.**

### Other national targets

SRS 2030[38] under the eighth development goal, i.e. **transition to a low-carbon circular economy**, identifies three performance indicators[39] to monitor the achievement of the set goal:

1. **material productivity** - by 2030 reach the target of 3.5 purchasing power standard (PPS)/kg (compared to the baseline value of 1.79 PPS/kg in 2015),
2. **share of renewables in energy end-use** - by 2030 reach the target of 27% (compared to the baseline of 22% in 2015),
3. **emission productivity** - by 2030 reach the EU average in 2030 (compared to the baseline of 2.9 PPS/kg $CO_2$ equivalent in 2015).

The Resolution *Naša hrana, podeželje in naravni viri po 2021* [Our Food, Rural and Natural Resources after 2021][40] - Strategic Framework for the Development of Slovenian Agriculture, Food Processing and Rural Development defines the basic strategic framework for the operation of agriculture, food

38 Slovenia's Development Strategy 2030, available at: https://www.gov.si/assets/vladne-sluzbe/SVRK/Strategija-razvoja-Slovenije-2030/Strategija_razvoja_Slovenije_2030.pdf.

39 SRS 2030, page 39.

40 Resolution Naša hrana, podeželje in naravni viri po 2021, available at: https://www.gov.si/assets/ministrstva/MKGP/DHKUMENTI/KMETIJSTVO/ded1a797fe/Resolucija-Nasa-hrana-podezelje-in- naravni-viri-po-2021.pdf.

and rural areas and is the basis for new strategic planning beyond 2021. The resolution, among specific objectives under the heading 'Sustainable management of natural resources and the provision of public goods', includes **adaptation** (production/technological and economic adjustments to changed conditions) and **climate change mitigation** (reduction of greenhouse gas emissions). For climate change adaptation and mitigation, the following objectives are also important; they will need to be revised and adapted in coming years in the light of the newly adopted EU climate neutrality objectives up to 2050:

- reinforcing research support for agricultural and rural development,
- effective transfer of knowledge to final beneficiaries,
- functioning and efficient AKIS (Agricultural Knowledge and Innovation System),
- adaptation of species and varieties of agricultural plants,
- adherence to modern guidelines for rotation,
- support for the use of modern technological solutions for adaptation to climate change.

Agricultural land is among Slovenia's most important natural resources and in total accounts for 33% of its territory. Slovenia has limited high-quality agricultural land, so maintaining such land is of paramount importance. Given that agriculture also plays an important role in reducing GHG emissions; **agricultural measures need to be adopted to reduce the environmental burden of greenhouse gas emissions and the consumption of natural resources.**

In 2016, Slovenia already adopted its **National Strategic Framework for Climate Change Adaptation (SOPPS)**[41], including guidelines to incorporate adaptation more widely into policies, measures and practices. The document sets out the vision that by 2050 Slovenia will become an adaptable and resilient society ensuring high quality and safety of life in such a way as to fully exploit the opportunities in the climate change situation.

The key objectives of the NEPN in the area of climate change adaptation are:

- **to substantially reinforce research and the production of expert bases** (at least five targeted research projects should be launched in 2020, gaps must be considered beforehand, and a plan for the necessary bases should be drawn up),
- **by 2021 to draw up an action plan for adaptation** with clear measures to accelerate the integration of climate change adaptation in all areas (e.g. adaptation of railway infrastructure and electricity transmission and distribution networks, increasing resilience to extreme weather events in agriculture, forestry, etc.).

[41] The strategic framework for adapting to climate change, adopted by the Government of the Republic of Slovenia in December 2016, sets the framework and guidelines for adaptation to climate change in Slovenia. It is available at: http://www.mop.gov.si/fileadmin/mop.gov.si/pageuploads/podrocja/podnebne_spremembe/SOzP.pdf.

### 2.1.2 Renewable energy

#### Total RES share by 2030

**As a target for 2030, the NEPN sets a share of at least a 27% of renewables in end-use energy.**

When drawing up the NEPN, Slovenia reviewed the previously adopted SRS 2030 target of a 27% share of RES by 2030 and - based on updated expert bases, prior public consultation, comprehensive environmental impact assessment[42] and to the maximum extent possible taking account of the Commission recommendations[43] and specific national circumstances – fixed a development-oriented and feasible national share of renewables and sectoral targets up to 2030.[44]

Slovenia will actively strive to improve energy efficiency and thus limit energy use. This will reduce primary and final energy consumption. **Through appropriate legal incentives (positive legal discrimination), Slovenia will actively promote and encourage the use of renewables with a favourable impact on security of energy supply, as it will reduce dependency on fossil fuel imports.** In addition to increasing the share of renewables in the final consumption of energy, the share of renewables in the electricity generation and gas sectors should also be increased.

In the adoption of RES measures, special attention will be given to **reducing bureaucracy and the appropriate integration of RES into the buildings, spatial planning and energy system** and the process of siting all the necessary facilities.

With the successful implementation of all planned policies and measures by 2030, the **following can be achieved**:

- **at least a 27% total share of RES** and sectoral shares of RES:
  - 43% share in the electricity sector,
  - 41% share in the heating and cooling sector,
  - 21% share in transport (with an 11% share of biofuels[45]).
- The use of renewables is projected to increase by 3 890 GWh by 2030 in relation to 2017, renewable electricity generation by 2 223 GWh, the use of biofuels in transport by 1 841 GWh, with renewable heat consumption reduced by 488 GWh. In the same period, final energy consumption is reduced by 3 247 GWh (with electricity consumption increasing by 1 246 GWh, consumption in transport by 253 GWh and energy consumption for heating and cooling decreasing by 4 746 GWh).
- In line with the new RES Directive, the share of advanced biofuels is gradually increasing in all scenarios for biofuels.
- An indicative target for 2030 is also set for the supply of natural gas: a 10% share of renewable natural gas (biogas, compressed natural gas (CNG), $H_2$).

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42 The comprehensive environmental impact assessment showed the extent of the RES contribution that can be achieved in a sustainable manner by 2030 through measures and investment in Slovenia, provided that a stable and predictable environment for investors is ensured. Slovenia has already had to remove several of the projects already taken into account in the RES targets up to 2020 and 2030 from the strategy papers due to the negative environmental impact assessment.

43 In its recommendation of 18 June 2019, the Commission called upon Slovenia to in particular significantly increase the level of ambition for the share of renewables by 2030 to at least 37%, based on the formula in Annex II to Regulation (EU) 2018/1999, and to raise the level of ambition in the heating and cooling sector, to achieve the indicative target referred to in Article 23 of Directive (EU) 2018/2001 and the transport target referred to in Article 25 of Directive (EU) 2018/2001 (available at: https://ec.europa.eu/energy/sites/ener/files/documents/si_rec_sl.pdf). Slovenia has to indicate in the NEPN which relevant circumstances affecting the RES target have been taken into account.

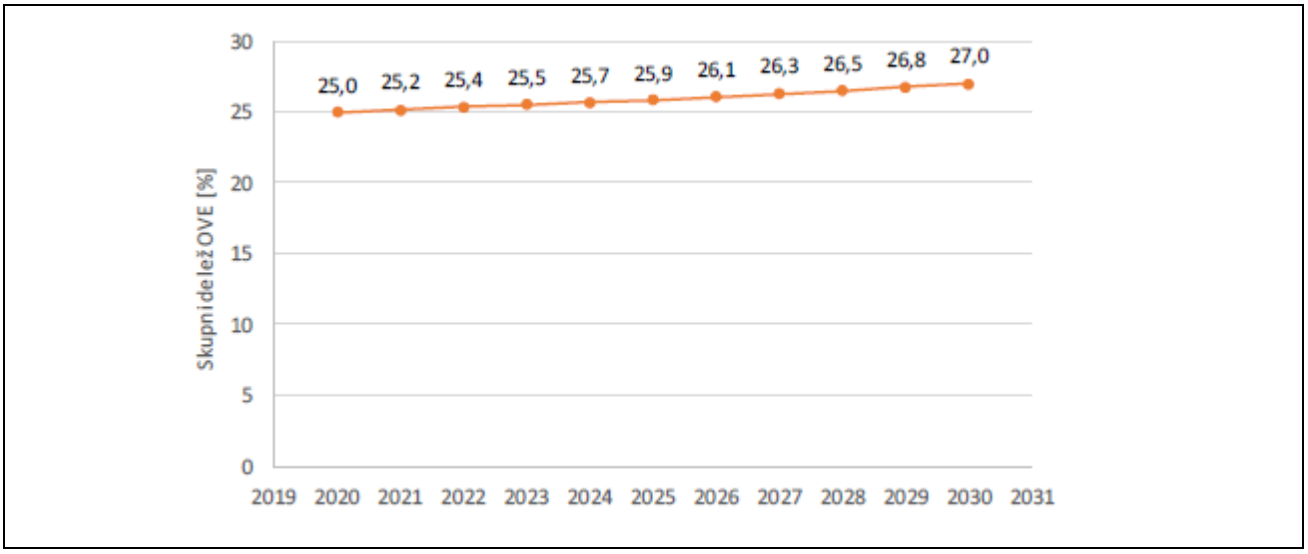
44 The share of renewables that, on account of environmental constraints or other reasons, we will not be able to achieve in Slovenia will have to be ensured in accordance with the Regulation by other measures, e.g. participating in cross-border projects, through statistical transfer or payments into the EU financial mechanism for renewables.

45 Share of biofuels in non-LPG liquid fuel consumption in road and rail transport.

## Outline of development of the total share of RES in the period 2021-2030

Figure 2 and Table 3 show the outline of development of the total share of RES from 2021 to 2030.

***Figure 2: Estimated outline of development of the total share of RES in final energy consumption from 2020 to 2030***



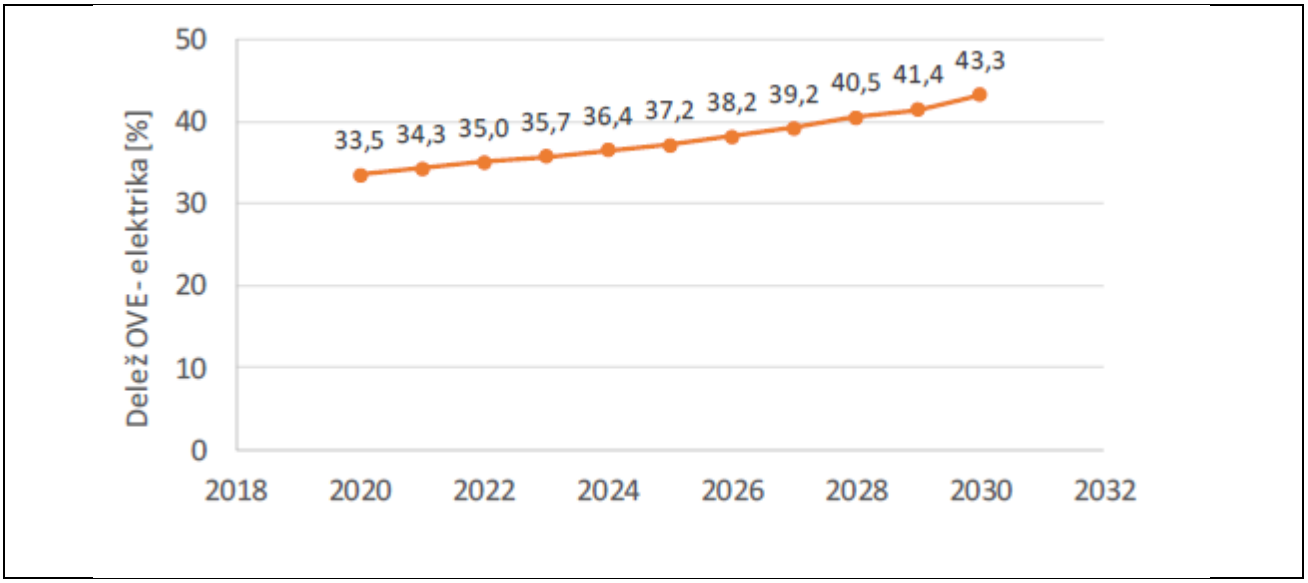

Key to Figure 2:
Total share of renewables [%]

***Table 3: Estimated outline of the total share of RES in final energy consumption from 2020 to 2030***

| RES<br>Year | **Reference values** for the binding target, i.e. 27% RES [%] |
|---|---|
| 2020 | 25.0 |
| 2021 | 25.2 |
| **2022** | **25.4** |
| 2023 | 25.5 |
| 2024 | 25.7 |
| **2025** | **25.9** |
| 2026 | 26.1 |
| **2027** | **26.3** |
| 2028 | 26.5 |
| 2029 | 26.8 |
| 2030 | 27.0 |

## Sectoral shares of RES in the period 2021-2030

***Figure 3: Estimated outline of development for the sectoral share of renewable energy in final energy consumption from 2020 to 2030 in the electricity sector***

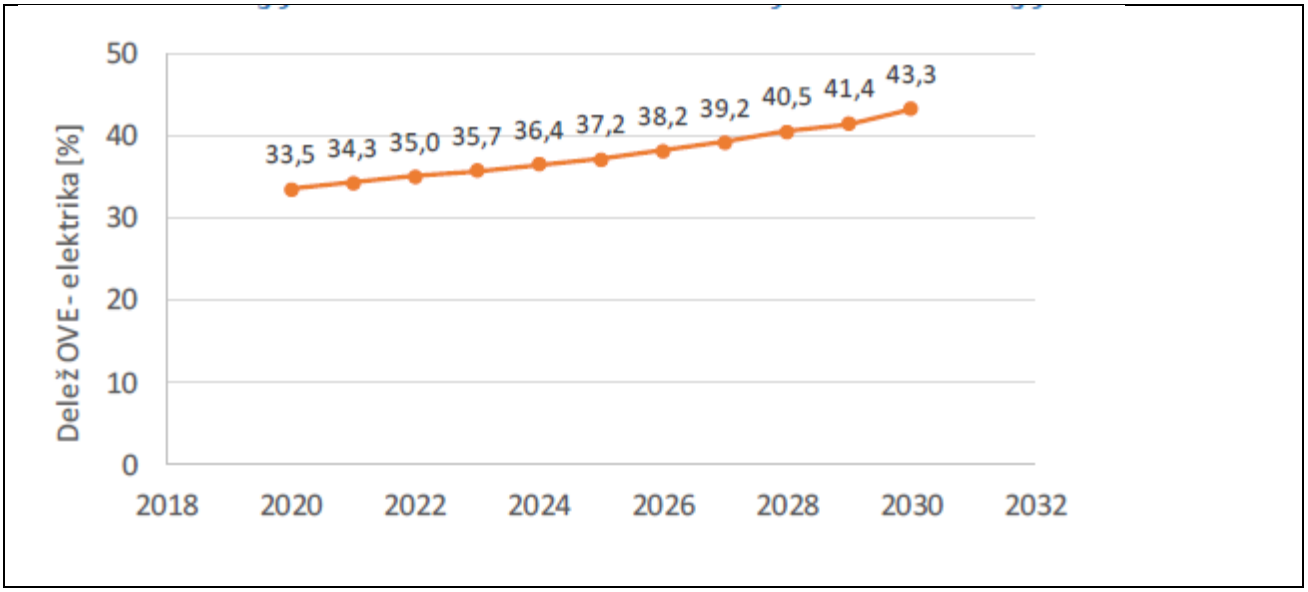



Key to Figure 3:
Share of renewables - electricity [%]

***Table 4: Estimated outline of development for the sectoral share of renewable energy in final energy consumption from 2020 to 2030 in the electricity sector (RES-E)***

| RES-E<br>Year | Development of the share of RES-E [%] |
|---|---|
| 2020 | 33.5 |
| 2021 | 34.3 |
| 2022 | 35.0 |
| 2023 | 35.7 |
| 2024 | 36.4 |
| 2025 | 37.2 |
| 2026 | 38.2 |
| 2027 | 39.2 |
| 2028 | 40.5 |
| 2029 | 41.4 |
| 2030 | 43.3 |

***Figure 4: Estimated outline of development for the sectoral share of renewable energy in final energy consumption from 2020 to 2030 in the heating and cooling sector***

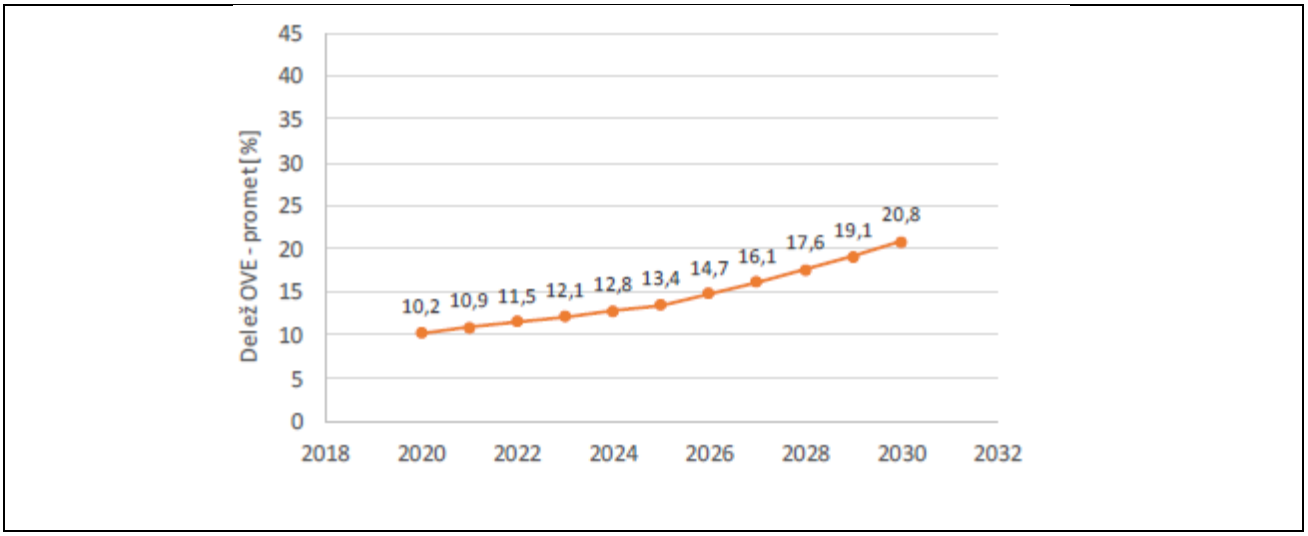



Key to Figure 4:
Share of renewables - heating and cooling [%]

***Table 5: Estimated outline of development for the sectoral share of renewable energy in final energy consumption from 2020 to 2030 in the heating and cooling sector***

| RES-HaC<br>Year | Development of RES-HaC share [%] |
|---|---|
| 2020 | 36.4 |
| 2021 | 36.6 |
| 2022 | 36.8 |
| 2023 | 36.9 |
| 2024 | 37.1 |
| 2025 | 37.3 |
| 2026 | 38.1 |
| 2027 | 38.9 |
| 2028 | 39.7 |
| 2029 | 40.5 |
| 2030 | 41.4 |

***Figure 5: Estimated outline of development for the sectoral share of renewable energy in final energy consumption from 2020 to 2030 in the transport sector***




Key to Figure 5:
Share of renewables - transport [%]

***Table 6: Estimated outline of development for the sectoral share of renewable energy in final energy consumption from 2020 to 2030 in the transport sector (RES-T)***

| RES-T<br>Year | The course of RES-T share |
|---|---|
| 2020 | 10.2 |
| 2021 | 10.9 |
| 2022 | 11.5 |
| 2023 | 12.1 |
| 2024 | 12.8 |
| 2025 | 13.4 |
| 2026 | 14.7 |
| 2027 | 16.1 |
| 2028 | 17.6 |
| 2029 | 19.1 |
| 2030 | 20.8 |

## Outlines of development scenarios for individual renewable energy technologies that Slovenia intends to use

The projected results of the future development of the renewable energy technologies are shown in the tables which follow.

***Table 7: Estimated development scenarios for individual renewable energy technologies that Slovenia intends to use in order to achieve joint and sectoral development scenarios for renewable energy from 2020 to 2030, including expected gross final energy consumption, for each specific technology in ktoe***

| ktoe | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gross final use of RES TOTAL** | **1 227** | **1 234** | **1 242** | **1 249** | **1 257** | **1 264** | **1 292** | **1 319** | **1 356** | **1 383** | **1 419** |
| Solar energy | 48 | 58 | 68 | 79 | 89 | 99 | 115 | 130 | 146 | 162 | 177 |
| Wind energy | 1 | 3 | 5 | 6 | 8 | 10 | 12 | 14 | 17 | 19 | 21 |
| Hydro energy | 382 | 382 | 383 | 383 | 383 | 383 | 383 | 383 | 393 | 393 | 394 |
| Biogas | 12 | 12 | 12 | 12 | 13 | 13 | 13 | 14 | 14 | 15 | 15 |
| Liquid biofuels | 126 | 131 | 137 | 142 | 148 | 154 | 160 | 165 | 171 | 177 | 182 |
| Wood biomass | 528 | 512 | 496 | 481 | 465 | 450 | 442 | 435 | 428 | 420 | 422 |
| Energy from the environment | 78 | 82 | 85 | 89 | 93 | 97 | 100 | 104 | 107 | 111 | 114 |
| Other renewable heat | 53 | 54 | 56 | 57 | 58 | 59 | 66 | 73 | 80 | 87 | 94 |

***Table 8: Estimated development scenarios for renewable energy technologies that Slovenia intends to use in order to achieve joint and sectoral development scenarios for renewable energy from 2020 to 2030 in the electricity sector***

| ktoe | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gross final consumption of renewable electricity** | **444** | **456** | **469** | **481** | **494** | **506** | **526** | **546** | **575** | **595** | **624** |
| Solar energy (solar photovoltaic energy) | 36 | 46 | 55 | 65 | 75 | 85 | 100 | 115 | 130 | 145 | 160 |
| Wind energy | 1 | 3 | 5 | 6 | 8 | 10 | 12 | 14 | 17 | 19 | 21 |
| Hydro energy | 382 | 382 | 383 | 383 | 383 | 383 | 383 | 383 | 393 | 393 | 394 |
| Biogas | 12 | 12 | 12 | 12 | 13 | 13 | 13 | 14 | 14 | 14 | 15 |
| Wood biomass (SPTE and co-incineration) | 13 | 13 | 14 | 14 | 15 | 15 | 17 | 20 | 22 | 24 | 35 |
| Energy from the environment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### *Table 9: Estimated development scenarios for renewable energy technologies that Slovenia intends to use in order to achieve joint and sectoral development scenarios for renewable energy from 2020 to 2030 in the heating and cooling sector*

| ktoe | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gross final use of RES in heating and cooling** | **658** | **647** | **636** | **626** | **615** | **604** | **606** | **608** | **609** | **611** | **613** |
| Solar energy | 12 | 12 | 13 | 13 | 14 | 14 | 15 | 15 | 16 | 16 | 17 |
| Biogas | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 |
| Wood biomass | 515 | 499 | 483 | 466 | 450 | 434 | 425 | 415 | 406 | 397 | 387 |
| Energy from the environment | 78 | 82 | 85 | 89 | 93 | 97 | 100 | 104 | 107 | 111 | 114 |
| Remaining renewable heat | 53 | 54 | 56 | 57 | 58 | 59 | 66 | 73 | 80 | 87 | 94 |

### *Table 10: Estimated development scenarios by renewable energy technologies that Slovenia intends to use in order to achieve joint and sectoral development scenarios for renewable energy from 2020 to 2030 in the transport sector*

| ktoe | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gross final use of RES in transport** | **133** | **140** | **147** | **153** | **160** | **167** | **177** | **187** | **198** | **209** | **220** |
| Biofuels | 126 | 131 | 137 | 142 | 148 | 154 | 159 | 165 | 171 | 177 | 182 |
| of which advanced biofuels | 63 | 67 | 72 | 76 | 80 | 85 | 86 | 87 | 88 | 89 | 89 |
| Electricity from RES | 8 | 8 | 10 | 11 | 12 | 13 | 18 | 22 | 27 | 32 | 38 |

### *Table 11: Estimated development scenarios by individual renewable energy technologies that Slovenia intends to use in order to achieve joint and sectoral development scenarios for renewable energy from 2020 to 2030, including total planned installed capacity, by individual technology in MW in the electricity generation sector*[46]

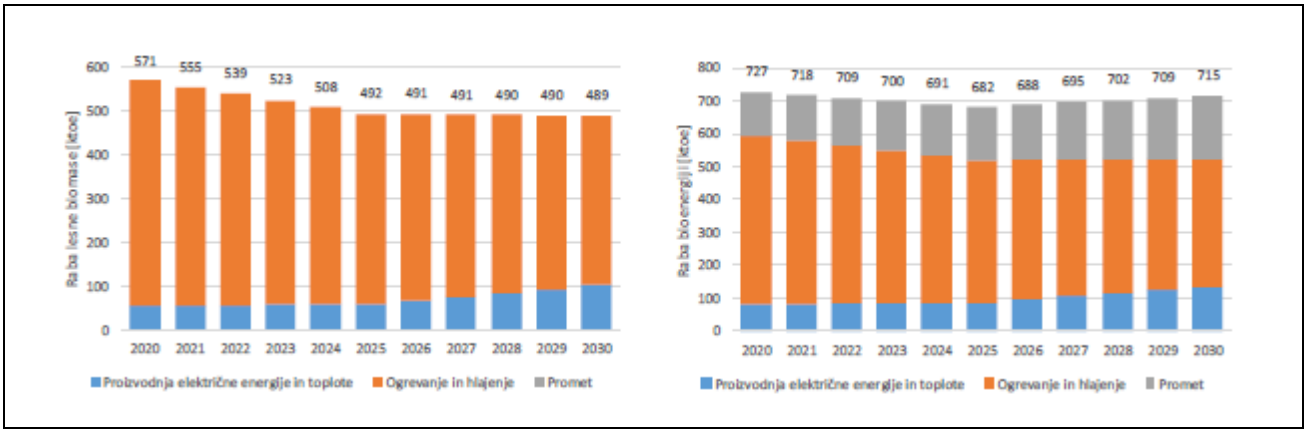
| MW | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar energy | 400 | 500 | 600 | 700 | 800 | 900 | 1 050 | 1 200 | 1 350 | 1 500 | 1 650 |
| Wind energy | 10 | 22 | 34 | 46 | 58 | 70 | 86 | 102 | 118 | 134 | 150 |
| Hydro energy | 1 167 | 1 168 | 1 168 | 1 168 | 1 168 | 1 169 | 1 169 | 1 170 | 1 198 | 1 199 | 1 199 |
| Biogas | 31 | 32 | 32 | 32 | 33 | 33 | 33 | 33 | 34 | 34 | 34 |
| Wood biomass | 33 | 34 | 36 | 37 | 38 | 40 | 45 | 50 | 55 | 60 | 90 |
| Environmental energy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

[46] The planned development scenario by individual RES technologies does not prevent the launch or continuation of RES projects not listed in the NEPN. Nor does it pre-determine the outcome of any of the processes associated with these projects.

## Demand for biomass and biofuels energy

The figure below shows the estimated development in the demand for bioenergy broken down into heat, electricity and transport sectors.

***Figure 6: Estimated scenario for development of demand for wood biomass (left) and bioenergy (right) broken down into heat, electricity and transport sectors***




Key to Figure 6:

| | | |
|---|---|---|
| Use of wood biomass [ktoe] | Use of bioenergy [ktoe] | ▪ electricity and heat production,<br>▪ heating and cooling,<br>▪ transport |

***Table 12: Estimated scenario for development of wood biomass and total biomass use in the period 2020–2030***

| | Wood biomass use [ktoe] | Biomass shared use [ktoe] |
|---|---|---|
| 2020 | 571 | 727 |
| 2021 | 555 | 718 |
| 2022 | 539 | 709 |
| 2023 | 523 | 700 |
| 2024 | 508 | 691 |
| 2025 | 492 | 682 |
| 2026 | 491 | 688 |
| 2027 | 491 | 695 |
| 2028 | 490 | 702 |
| 2029 | 490 | 709 |
| 2030 | 489 | 715 |

Use of biomass

The NEPN does not provide for significant imports of wood biomass for energy purposes. The use of wood biomass is in line with the objectives of LULUCF and does not reduce sinks. Achieving this goal requires careful management of forests and improvement of the sustainable cascade use of wood. Therefore, the NEPN policies are as follows:

- to maximise the share of Slovenian wood processed domestically for products with the highest added value (strengthening value chains), using only wood that is not suitable for industrial processing into semi-finished or finished products and used wood for energy purposes (including as a source for synthetic fuels);

- wood should be properly integrated into the system and into the indicators of sustainable construction and green public procurement.

Wood biomass from Slovenian forests is an important factor in mitigating climate change, in sustainable development, the security of the heat supply, positive economic effects, synergistic effects throughout the wood processing chain and reducing dependency on imports. The economic aspect is also important since the use of lower quality wood for industrial and energy purposes greatly improves the economics of wood processing chains. Wood biomass waste is of great importance in the production of heat and electricity in district heating systems, in the use of the latest technologies that contribute to reducing air pollution, and in the production of synthetic fuels. It will only be possible to use wood biomass for energy purposes in a controlled and environmentally friendly manner so as not to cause excessive emissions of particulate and volatile matter, a challenge which is feasible from both educational, legislative and technical perspectives.

Increasing the use of biomass in modern individual, collective and industrial installations for heating and generating heat and power is important for Slovenia, as it makes it possible for the country to improve reliability and competitiveness in the energy supply, reduce greenhouse gas emissions and protect the environment.

Use of biofuels

The use of biofuels will be **prioritised for the development, production and use of advanced sustainable biofuels.** In doing so, we will take advantage of development opportunities with respect to the raw materials available and will stimulate the necessary technological development with development incentives to carry out pilot projects.

In line with the objectives of the NEPN, we will supplement the strategy in the area of market development by establishing suitable infrastructure associated with alternative fuels in the transport sector in the Republic of Slovenia[47]. Slovenia will intensively promote the development of technologies for the production of sustainable biofuels, advanced synthetic gas and liquid fuels and use imported ones until it develops and establishes its own production structures.

### Other RES targets

Due to the complexity of achieving the overall target for renewables, Slovenia has set goals in the following sectors:

- **at least 2/3 of energy use in buildings from RES** (share of RES in final energy use excluding electricity and district heat) and a ban on the sale and installation of new heating oil boilers to be introduced by 2023 at the latest;
- **1.3% annual increase in the share of RES in heating and cooling in the industry sector**, including waste heat and cold (priority resource utilisation);[48]
- **at least 30% share of RES** (including surplus heat) in industry;
- **1% annual increase in the share of RES and surplus heat and cold in district heating and cooling systems;**[49]
- **by 2021, establish a legislative framework incentivising accelerated community development** in the area of renewable energy (shared power plants) and targeting RES investments in areas where no major additional investment is needed in the network.

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47 The strategy already envisages a 7% blending of biodiesel in fossil diesel from 2018, increasing its share in the coming years and gradually increasing the share of heavy goods vehicles operating on pure biodiesel from 0 to 10% between 2020 and 2030 (available at: www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/strategija-za-alternativna-goriva/).

48 In accordance with the requirements of Article 23 of the revised (EU) Directive 2018/2001 on the promotion of the use of RES.

49 In accordance with the requirements of Article 24 of the revised (EU) Directive 2018/2001 on the promotion of the use of RES.

Status of the renewables sector and relevant national circumstances

Article 5 of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action stipulates that in determining the national contribution for its share of energy from renewable sources by 2030, Member States should also take into account any relevant circumstances affecting renewable energy deployment, such as the equitable distribution of deployment across the Union; the economic conditions and potential, including GDP per capita; the potential for cost-effective renewable energy deployment; the geographical, environmental and natural constraints, the level of power interconnection and other relevant circumstances. Slovenia notes that the Commission recommendation for Slovenia of a 37% share of RES by 2030 is based solely on application of the indicative formula in Annex 2 of Regulation (EU) 2018/1999, clearly ignoring relevant circumstances with an impact on determination of the share of renewables, despite the requirement under Article 31(2) of the Regulation.

Considering the relevant circumstances, Slovenia cannot comply fully with the Commission recommendations with regard to the national contribution to the RES target by 2030. Below, Slovenia provides justifications for a set of relevant circumstances which should also under Article 5 of Regulation (EU) 2018/1999 have been taken into account when determining the national contribution to the RES target up to 2030.

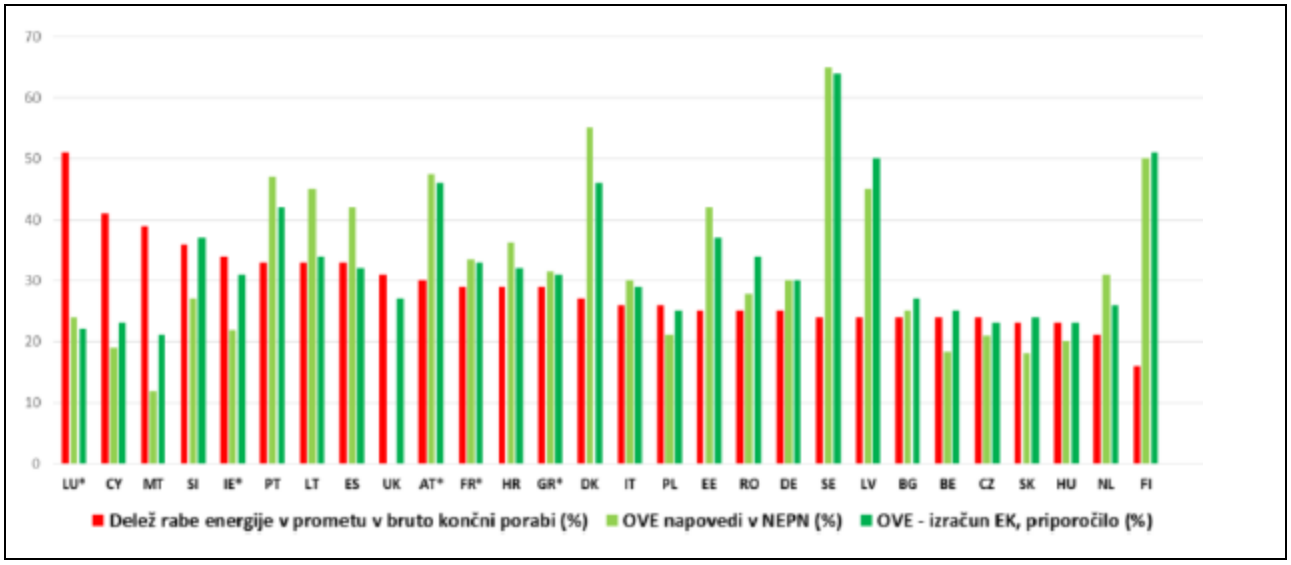
### a. Transport sector situation

In accordance with the RES Directive, Slovenia has adopted an ambitious target for the use of RES, i.e. a 25% share of RES by 2020. Slovenia achieved a 21.04% share of RES in 2017 and, in 2018, a 21.14% share, which is below the target. Except for the heat and cooling sector, Slovenia was lagging behind in achieving the indicative sectoral targets in the transport and electricity sectors.

Countries where transport accounts for a large share of gross final energy consumption and which have a high baseline share of RES find it much more difficult to make progress than other countries in spite of the perhaps greater potential and available financial resources, because the small share of RES in transport calls for much higher (often unattainable) shares in the heat and electricity sector (the total RES potential is thus less).

Slovenia ranks fourth in the EU in terms of the share of energy consumption in transport in the end-use of energy (Figure 8 [sic]), as here the introduction of RES is extremely demanding, as the only RES are biofuels, whose use is restricted under different standards and whose production is a major sustainability challenge (especially the first generation).

***Figure 7: Comparison of projected national RES shares, EC calculations and shares of energy use in transport, source: MzI based on IJS-CEU calculations, 2019***




Key to Figure 7:

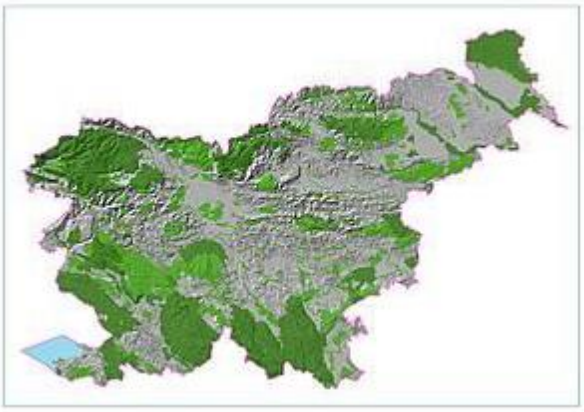
- Share of energy consumption in transport in gross final consumption,
- RES forecasts in NEPN,
- RES - EC calculation, recommendation

Projections of the transport sector indicate a further increase in transport in Slovenia by 2030, i.e. passenger and especially freight transport, which will further increase energy consumption in the sector - the projections for various scenarios up to 2030 show an increase in energy consumption in the transport sector by between 6% and 24% by 2030. This will make the introduction of RES in the transport sector up to 2030 extremely demanding and difficult and put significant restrictions on the achievement of the total RES share by 2030 since Slovenia will have to compensate for the smaller share of RES in the transport sector by action in other two sectors (electricity and heat).

### b. Environmental and other restrictions affecting the introduction of energy from renewable energy sources in Slovenia

There are 355 Nature 2000 sites in Slovenia, of which 324 are designated under the Habitats Directive and 31 under the Birds Directive. The areas cover 37.46% of Slovenia's surface area and are home to 114 endangered plant and animal species and 60 habitat types under the Habitats Directive and 122 protected species under the Birds Directive. Slovenia tops the list in Europe in terms of the area covered by Natura 2000 sites and the number of protected species. Many areas (see figure below) that are suitable for the introduction of RES (mainly hydro and wind power plants) are subject to Natura 2000 protection. The possibilities for using wind energy are consequently limited and substantially more restricted than in other EU countries (Slovenia does not have the option of setting up offshore wind farms). The possibility of using wind power is further restricted by the extremely dispersed population settlement patterns (very few locations with adequate wind speeds meet the noise protection requirements for the necessary distance from residential settlements).

*Figure 8: Map of Natura 2000 sites in Slovenia*



Source: Natura2000.si

The execution of large hydro-electric plant (HPP) construction projects, aside from the conservation of nature and the protection of water bodies, is also highly dependent on spatial siting procedures and the implementation of related water infrastructure projects.

Further promotion of the use of renewables in Slovenia is strongly conditioned by environmental and spatial legislation - the future implementation of RES projects by 2030, in particular in the area of hydro-electric power and wind, will be feasible in Slovenia only if EIA procedures are properly implemented, with other public interest procedures outweighing the public benefit of nature conservation and enforcement of water exemptions (in accordance with EU legislation).

In addition to demanding spatial placement processes, opposition to the continued use of hydro-electric power and wind energy in Slovenia is also intensifying in some local communities, the general public and parts of the non-governmental sector. The target set for a 27% share of RES in 2030 will not be achieved solely through the implementation of projects outside Natura 2000, or projects whose environmental impact is likely to be considered insignificant. In order to achieve this goal, it will also be necessary to carry out projects for the construction of hydro-electric power plants and wind power plants (WPP), which are likely to have a significant impact on nature and therefore require a procedure to ascertain that public interest takes precedence over the public interest of nature conservation. Without effective environmental measures that will respect successful decisions allowing for exceptions under EU legislation in the area of water and nature protection, the implementation of these projects will not be possible.

### c. Enhancing energy efficiency in the heating and cooling sector and the impact on the overall share of RES

Increasing energy efficiency in the building and heating and cooling sectors also has a direct impact on reducing RES consumption. Specifically, through restoring or improving the thermodynamic properties of buildings and distribution network, savings in the consumption of heat for space heating and cooling can be achieved, which in turn reduces the consumption of RES (biomass) in this sector and has a negative effect on the total share of RES. In the period 2012 to 2017 energy efficiency measures in the heating and cooling sector reduced the use of wood biomass in households by 497 GWh.

### d. Consideration of the share of energy-intensive industry in Slovenia, which is higher than the EU average

Nearly two-thirds (62.2%) of the final energy in industry is consumed by four energy-intensive industries: the production of metals, the production of paper and paper products, the production of

non-metallic mineral products, and the production of chemicals and chemical products. Almost 30% of value added in industry was generated by emission-intensive activities in 2014, which places Slovenia at a high, fourth place in the EU in terms of this indicator. This share is higher only in Belgium, Ireland and Denmark, but in these Member States, the contribution of the chemical and pharmaceutical industries in value added is significantly higher than the contribution of these industries in Slovenia. At present, the commercially available technologies in these industries do not allow for greater use of RES.

### e. Inconsistency of the framework equation in Annex II of Regulation (EU) 2018/1999 with the provisions of Article 5 of Regulation (EU) 2018/1999 and the inadequacy of input data when considering the contributions to be taken into account in the framework of the equation in Annex II

Slovenia takes the view that the framework equation in Annex II does not reflect all the elements that Member States must take into account in determining their national contribution to the 2030 RES target in accordance with Article 5. Important circumstances which must be taken into account by a Member State and which are not evaluated by objective criteria in the equation are geographical, environmental and natural constraints and other relevant circumstances.

Moreover, the input data used to calculate individual items for calculating the share of RES for Slovenia in the equation are not appropriate. According to the EUCO32.5 scenario, the PRIMES 2016[50] model for Slovenia predicts that energy consumption in transport will decrease by -5% in the period 2015 to 2030, while expert bases drawn up for the NEPN indicate that energy consumption in transport, even with deployment of the most ambitious measures, will continue to increase by around 6% up to 2030. In this scenario, the PRIMES model also envisages that an additional 121 MW of hydro-electric power plants and 208 MW of wind power will be built in Slovenia by 2030 compared to the year 2015, which does not take into account the real restrictions on spatial placement and implementation of environmental legislation. The data used to determine the proportion of RES on the basis of potential are therefore not appropriate in expert terms.

Far exceeding the EU target of interconnectivity should not entail additional burdens for the Member State. There is still great ambiguity regarding the use of input data in determining the national contribution which reflects the level of interconnectedness of Member States. Not only is the input that is an integral part of the equation nowhere publicly available or accessible (e.g. the Union average), but the definition of the contribution in such a way that more connected Member States have to contribute a higher proportion of RES than less connected Member States is also inconsistent with the fundamental principle of the fair sharing of effort throughout the Union. Due to the specific nature of electricity systems, small Member States are in principle much more interconnected than large Member States, and increasing the obligation to contribute in this way, on the basis of the equation, does not reflect the provisions of Article 5.

50 https://ec.europa.eu/energy/sites/ener/files/documents/20170125_-_technical_report_on_euco_scenarios_primes_corrected.pdf.

## 2.2 Energy Efficiency Dimension

**Overview of key targets:**

- **improving energy and material efficiency in all sectors** (and therefore reducing consumption of energy and other natural resources) as the first and key measure for the transition to a climate-neutral society,
- by 2030 **improve energy efficiency by at least 35%** in relation to the 2007 baseline scenario (in line with the Energy Efficiency Directive),
- ensure the **systematic implementation of policies and measures adopted**, so that **final energy consumption will not exceed 54.9 TWh (4 717 ktoe),**
- **reduce final energy use in buildings** by 20% by 2030 compared to 2005 and ensure a reduction of GHG emissions in buildings by at least 70% by 2030 compared to 2005,
- **speed up implementation** of programmes for informing, raising awareness and training of different target groups on the benefits and practical aspects of the development and use of EEI technologies and the use of RES.

**Energy and material efficiency** in connection with sustainable use and local energy supply is the most important developmental segment of modern society. The accelerated development of these areas, which is based on increasing the quality of energy services with less energy input, is one of the cornerstones of the transition to a climate-neutral society and will have a key impact on the competitiveness of Slovenian industry and society in future, and it is important to reinforce the already highly developed competencies of Slovenian companies in this field.

**Efficient use of energy and natural resources is a priority and key measure of development and energy policy for increasing competitiveness and decarbonisation of Slovenian industry and society.**

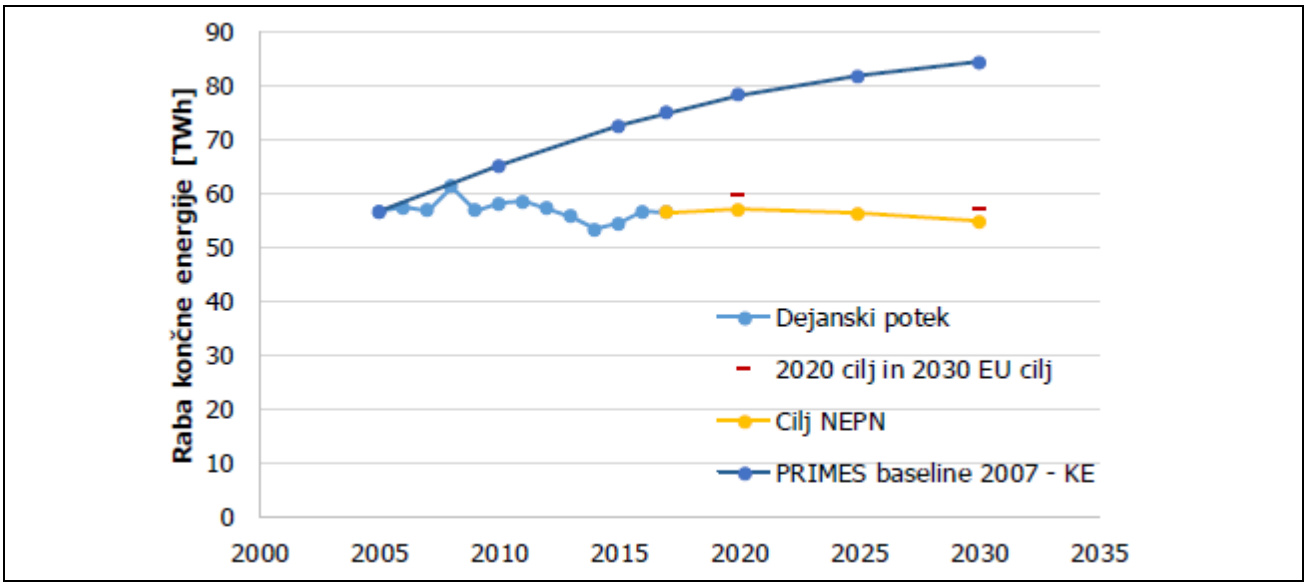
For Slovenia, the accelerated development of energy-efficient technologies also means reducing energy dependency, which will contribute not only to the achievement of environmental and climate goals but also to an increase in security of energy supply and to other beneficial national economic effects.

### 2.2.1 National contribution to energy efficiency by 2030

**Slovenia's goal is to improve energy efficiency by 2030 by at least 35%, i.e. so that with the systematic implementation of the policies and measures adopted, final energy consumption in 2030 will not exceed 54.9 TWh (4 717 ktoe). Converted to primary energy terms, consumption in 2030 will not exceed 73.9 TWh (6 356 ktoe).**

The NEPN scenario confirms that Slovenia can by 2030 achieve a 35% **reduction in final and primary energy consumption** compared to the 2007 PRIMES reference scenario, a more ambitious target than the overall EU target of 32.5%. **Transport has the greatest impact on the long-term management of primary and final energy consumption** and - due to high 'volatility', expected growth trends and a large share of energy consumption (in 2017, 36% of total final energy consumption) – will, if measures are not implemented, seriously jeopardise the achievement of the targets set for 2030.

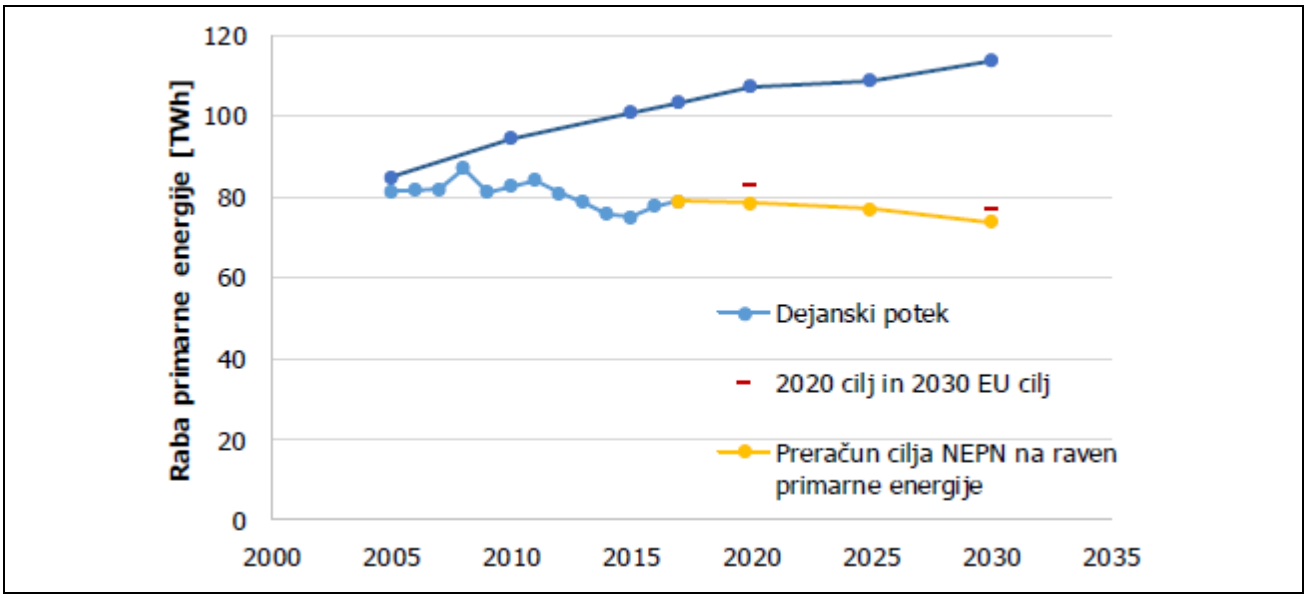
### *Figure 9: Demonstration of the contribution to the EEU by 2030 in final energy*




Key to Figure 9:

| | | |
|---|---|---|
| Final energy consumption | ▪ actual development<br>▪ 2020 target and 2030 EU target | ▪ NEPN target<br>▪ PRIMES baseline 2007 |

### *Figure 10: Demonstration of the contribution to the EEU by 2030 in primary energy*




Key to Figure 10:

| | | |
|---|---|---|
| Primary energy consumption | ▪ actual development<br>▪ 2020 target and 2030 EU target | ▪ recalculation of NEPN target to primary energy level |

### *Table 13: Estimated outline of primary and final energy use by 2030 in ktoe*

| [ktoe] | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PE | 6 754 | 6 728 | 6 701 | 6 675 | 6 648 | 6 622 | 6 569 | 6 515 | 6 462 | 6 409 | 6 356 |
| FE | 4 909 | 4 896 | 4 883 | 4 871 | 4 858 | 4 845 | 4 819 | 4 794 | 4 768 | 4 743 | 4 717 |

Source: NEPN projections were made using the updated and expanded REES-SLO model, more in Chapter 4.

### 2.2.2 Savings achieved under the mandatory savings scheme

Slovenia will continue to implement the mandatory energy savings scheme for end consumers[51] by implementing energy services and measures from energy suppliers and the Eco fund and will upgrade the scheme in line with the amendments to the Energy Efficiency Directive.[52]

The new annual savings for the period from 1 January 2021 to 31 December 2030 should be **at least 0.8% of annual final energy consumption** compared to the average over the last three years before 1 January 2019. The commitment will be split over the 2020-2030 period into the contribution of providing savings to energy suppliers and, through an alternative measure, implementing the Eco fund programmes and tax mechanisms.[53]

The savings made under the mandatory savings scheme are shown in the table below.

***Table 14: Estimated annual and total savings over the period 2021 - 2030***

| 2030 0bjective | Estimated annual savings | | Estimated total savings | |
|---|---|---|---|---|
| | ktoe | GWh | ktoe | GWh |
| Article 7 | 39.4 | 458.7 | 2 169 | 25 230 |

### 2.2.3 Indicative milestones of the long-term renovation strategy for the national stock of residential and non-residential buildings, both public and private, a roadmap with 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 under Directive 2012/27/EU in accordance with Article 2a of Directive 2010/31/EU

On 29 October 2015, the Government of the Republic of Slovenia adopted a **Long-term strategy to encourage investment in the energy renovation of buildings** (DSEPS), which set out significant energy reduction targets for buildings.[54] On 22 February 2018, a supplement to the DSEPS was adopted.[55]

The **vision defined in the applicable DSEPS and included in the NEPN** is to achieve low-carbon energy use in buildings by 2050 and Slovenia will achieve this by significantly improving energy efficiency and increasing the use of RES in buildings. This will also substantially reduce emissions of other harmful substances into the atmosphere. The objective is also to raise Slovenia's profile in the area of sustainable construction. A new 'Long-term renovation strategy to support the renovation of buildings by 2050' in line with Directive 2018/844 amending the Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency is in preparation and will also be brought into line with the NEPN and the Long-Term Climate Strategy.

51 Decree on ensuring energy savings, UL RS No 96/14.

52 Directive (EU) 2018/2002 of 11 December 2018, available at: https://eur-lex.europa.eu/legal-content/SL/ALL/?uri=LEGISSUM:4372644.

53 The NEPN envisages a gradual increase in the environmental tax on $CO_2$ and the contribution to energy efficiency. Prior to the notification of an additional alternative mechanism, it will be necessary to carry out more detailed analyses of energy price flexibility in view of the anticipated increase in duties.

54 Long-term strategy to encourage investment in the energy renovation of buildings (DSEPS), October 2015, available at: http://www.energetika-portal.si/fileadmin/dokumenti/publikacije/dseps/dseps_final_okt2015.pdf.

55 Supplement to the Long-Term Strategy for the Promotion of Building Energy Investment, February 2018, available at: https://www.energetika-portal.si/fileadmin/dokumenti/publikacije/dseps/dopolnitev_dseps_feb_2018.pdf.

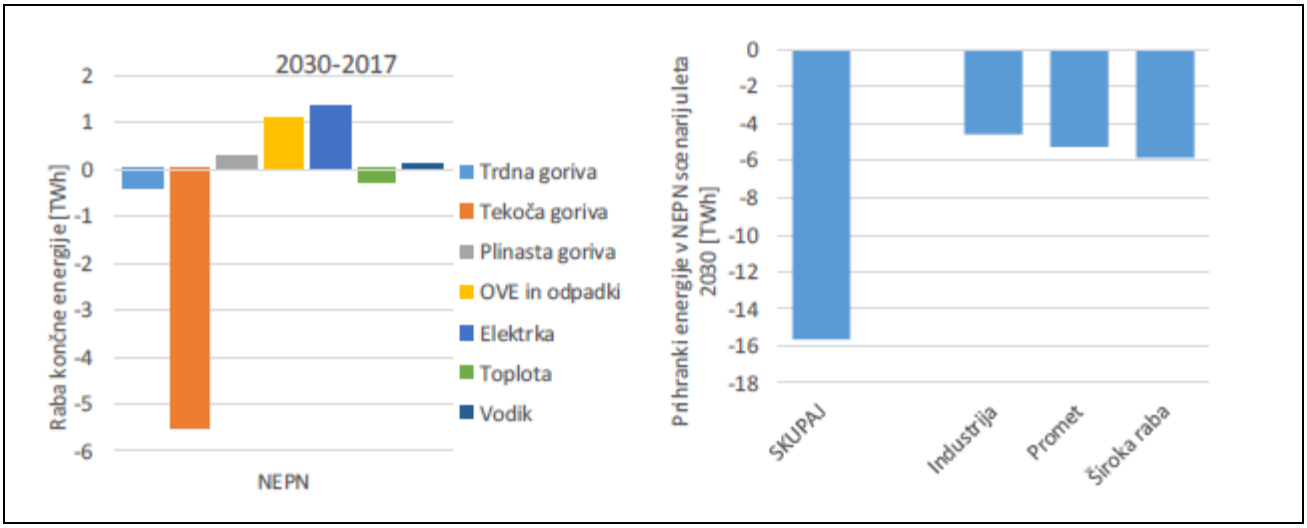
### 2.2.4 Indicative milestones for 2030, 2040 and 2050, domestically established measurable progress indicators, an evidence-based estimate of expected energy savings and wider benefits, and their contributions to the Union's energy efficiency targets as included in the roadmaps set out in the long-term 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 for 2030, 2040 and 2050, 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 will be set out in a new Long-Term Renovation Strategy to support the renovation of buildings up to 2050.

### 2.2.5 Overview of key assumptions for projections of contribution to energy efficiency (EEU) by 2030, including long-term goals or strategies and sectoral objectives and national objectives in areas such as energy efficiency in the transport sector and in terms of heating and cooling

The NEPN is based on the premise that new energy technologies, especially in the areas of energy efficiency and local energy supply, will be crucial for successfully combating climate change and must make it possible to achieve targets at costs that the economy can bear. The expected changes in final energy consumption by sector and fuel are shown in the figure below.

***Figure 11: Expected changes in final energy consumption by individual sectors and fuels***




Key to Figure 11:

| | | | |
|---|---|---|---|
| Final energy consumption | ▪ Solid fuels<br>▪ Liquid fuels<br>▪ Gaseous fuels<br>▪ Res and waste<br>▪ Electricity<br>▪ Heat<br>▪ Hydrogen | Energy savings in the NEPN scenario in 2030 | TOTAL<br><br>Industry<br>Transport<br>General consumption |

The penetration of energy-efficient technologies in the markets today is limited primarily by the lack of information and limited investment capacity of end consumers. The NEPN anticipates that necessary social changes and related changes in financial flows will occur in the next decade, significantly accelerating the penetration of competitive energy-efficient technologies. Additional support is planned for the implementation of new technologies and further development of energy services and to manage their quality: design, implementation, construction supervision, targeted monitoring of energy use and active energy management in buildings.

Slovenia has started drawing up an assessment of potentials for efficient heating and cooling, and plans are being made to develop a comprehensive heating and cooling strategy, a district heating action plan and heat maps.

The vision, defined by strategy in the area of market development to establish adequate infrastructure associated with alternative fuels in the transport sector in the Republic of Slovenia and also contained in the NEPN, envisages intensive promotion of e-mobility. In order to achieve these goals and accelerate the promotion of e-mobility, it is necessary to ensure, by 2021, the adequate conditions to accelerate the transition from the existing to the new, smart distribution network, which will, with the necessary reinforcements and information and communication technology, enable connections between customers, suppliers and manufacturers and the development of new services specifically aimed at optimising costs, increasing reliability and reducing environmental impacts in the accelerated electrification of personal transport.

## 2.3 Energy Security Dimension

**Overview of key objectives:**

- **ensure a reliable and competitive energy supply,**
- **maintain a high level of electricity connection with neighbouring countries,**
- **at least 75% of electricity supply from sources in Slovenia by 2030** and 2040 and ensuring an adequate level of security of electricity supply,
- **continue to exploit nuclear energy and maintain excellence** in the operation of nuclear facilities in Slovenia,
- **comprehensive examination of the potential for long-term use of nuclear energy** (economic and other expert analyses as a basis for a decision by 2027 at the latest on the construction of a new nuclear power plant),
- **reducing dependency on fossil fuel imports,**
- **increasing distribution network resistance to disruption** - increasing the proportion of underground medium-voltage network from the current 35% to at least 50%,
- **further development of system services and the active role of clients,**
- **development of energy storage technologies, infrastructure and services,**
- **diversification of sources and supply routes and decarbonisation of the natural gas supply.**

### 2.3.1 National objectives and contributions referred to in Article 4(c)

**The key objective of the future development of energy in Slovenia** is to continue to strike a balance between the three fundamental objectives of energy policy, which are:

(1) minimising environmental impacts,

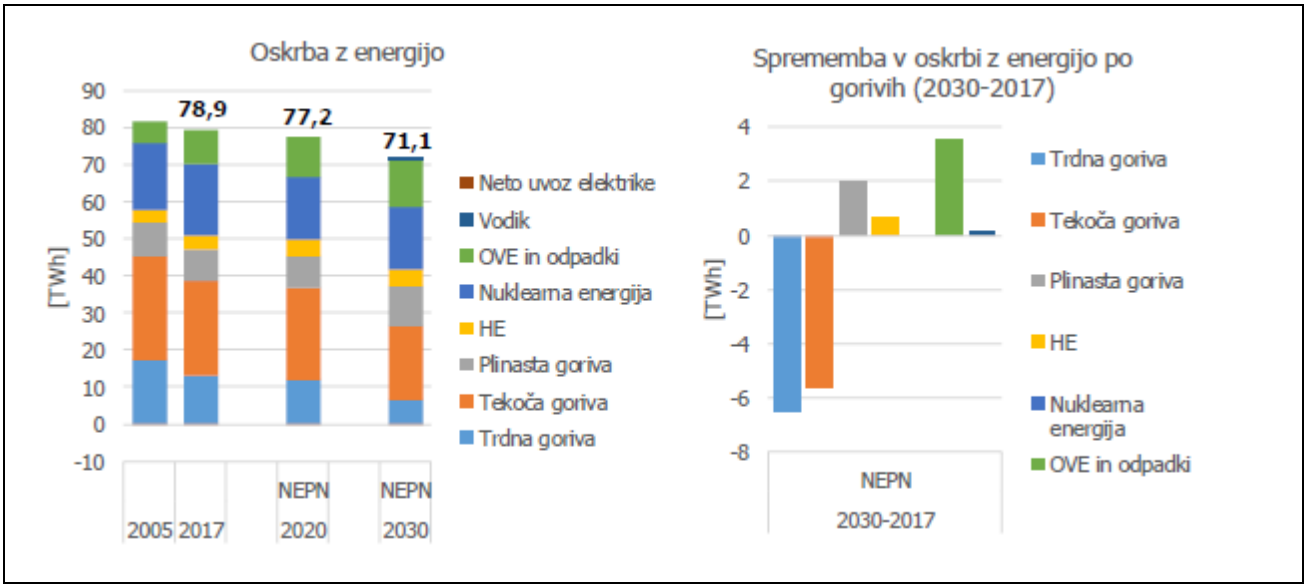
(2) appropriate security of supply, and

(3) a competitive energy supply.

Further development of the energy sector in Slovenia will require coordinated technological, legislative, economic and social action with a view to **reducing energy requirements, reducing import dependency, increasing diversification and energy storage, and managing risks and emergencies in the energy markets.** Without proper support and communication with the public, the new investments laid down in the NEPN will not have the proper effect or be implemented at all. The expected structure of primary and final energy consumption is shown in the figures below.

The cornerstone of individual resource relationships will be long-term resource provisioning, competitive price of the final product, spatial and environmental acceptability and sustainability. **The target is to achieve at least 75% of the electricity supply from sources in Slovenia by 2030 or 2040, and ensure an adequate level of security of electricity supply.** In this process, it will be necessary to ensure an adequate supply during the different seasons, to store surplus renewable electricity by means of integration of sectors, and to provide adequate resources for the provision of system services and an adequate level of operational reliability at all times.

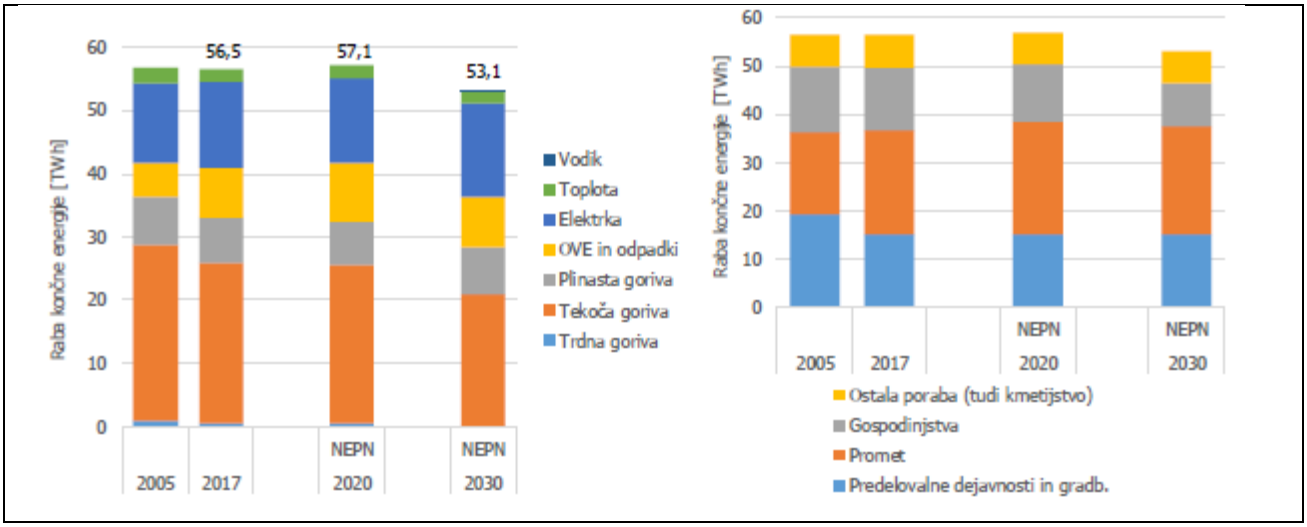
***Figure 12: Expected structure of primary energy consumption - energy supply***




Key to Figure 12

| Energy supply | | Change in energy supply by fuels (2030-2017) | |
|---|---|---|---|
| ▪ Net electricity imports | ▪ NE | ▪ Solid fuels | ▪ HPP |
| ▪ Hydrogen | ▪ Gaseous fuels | ▪ Liquid fuels | ▪ Nuclear |
| ▪ RES and waste | ▪ Liquid fuels | ▪ Gaseous fuels | ▪ RES and waste |
| ▪ Nuclear energy | ▪ Solid fuels | | |

***Figure 13: Expected structure of final energy consumption***




Key to Figure 13

| Final energy consumption [TWh] | | Final energy consumption [TWh] |
|---|---|---|
| ▪ Hydrogen | ▪ Gaseous fuels | ▪ Other consumption (incl. agriculture) |
| ▪ Heat | ▪ Liquid fuels | ▪ Households |
| ▪ Electricity | ▪ Solid fuels | ▪ Transport |
| ▪ RES and waste | | ▪ Manufacturing and construction |

**Energy storage** is of increasing strategic importance. In accordance with Council Directive 2009/119/EC, Slovenia will continue to ensure a quantity of reserves of oil and oil derivatives, which corresponds to at least ninety days' average consumption in the previous year. However, on account

of the increased scope of renewables, the storage of electricity and the integration of different sectors are an ever-increasing challenge, and Slovenia is seeking to participate actively in the development of centralised and decentralised solutions and to support the implementation of demonstration and pilot projects on energy storage up to 2030, including through the installation of battery capacity, and other storage apparatus on the transmission and distribution networks (including pumped hydro-electric power plants), heat storage in district heating systems and using gas pipelines to store surplus electricity in the form of CNG/$H_2$. Different options for seasonal energy storage should also be considered. In order to maximise the share of renewables in gross final energy use by 2030, we will build a sufficient number of different energy storage facilities, appropriate in terms of technology, size and duration of storage, connected to the transmission or distribution network that will ensure that the maximum possible share of daily electricity needs is stored in the Slovenian electricity system.

In the area of **security of the natural gas supply,** Slovenia will continue to implement and reinforce measures to ensure the security of supply in the natural gas market, to ensure diversification of sources and supply routes, and will cooperate with other EU Member States (promotion of regional and bilateral solidarity) and guarantee suppliers obligations to supply of natural gas to final customers in accordance with signed supply contracts from at least two different supply sources and guarantee the protection of protected customers, etc., in accordance with the requirements of the Energy Act and implementing regulations.

Through energy efficiency measures, Slovenia will strive to reduce the consumption of imported natural gas. In addition to the possibility of adding natural gas from production within Slovenia[56], we will promote pilot projects for the domestic production of renewable gases. The pilot projects will be in the area of the production of hydrogen from renewable electricity and of synthetic methane and other fuels from wood and other biomass and waste.

In the area of **electricity supply**, Slovenia's electricity transmission system will continue to be able to operate at all time in the event of a single part failure. The transmission system operator ELES in its development plans is planning to reinforce and upgrade the network and develop complex system platforms, which in future will be able to ensure a high-quality electricity supply to customers and improved resistance to potential disruption that may occur in the Slovenian electricity system[57].

The current development plan does not fulfil the expected increased electricity distribution needs, so we will introduce **more development-oriented financing of the future development of the distribution network for greater capacity, resilience, future development potential and exploitation of resource and burden flexibility.** We will also achieve greater future development potential and capacity to take advantage of the flexibility of our distribution network resources and burdens by improving the interoperability of the elements behind the measuring point with the elements before the measuring point (final introduction of smart networks, communities, cities, etc.).

In view of increasing and intensifying weather events (e.g. ice storm of 2014, wind storm of 2017), for greater energy reliability (and security) it is vital to boost the resilience of the distribution network to disruption, including by increasing the proportion of underground medium-voltage network from 35% to at least 50%.

We will significantly increase funding for investments in the distribution network, which is the cornerstone of the transition to a climate-neutral society. Additional measures will ensure appropriate conditions for its accelerated development for greater capacity and flexibility (adaptation of consumption and production), which will allow for greater integration of heat pumps, accelerated

56 Natural gas reserves have been identified in the territory of North-Eastern Slovenia and the way is being paved towards the start of exploitation. The successful establishment of sustainable and environmentally friendly production and supply to the Slovenian transmission pipeline network would have a limited positive impact on the security of natural gas supply in Slovenia.

57 Simulation-based analyses showed that, in the event of outages, problems may be expected most of all in the Primorska and Dolenjska networks, with loads also reaching high values in the Pomurje network.

deployment of e-mobility, and accelerated integration of RES generators and energy storage devices. **It is important that network capacity building (which is and will be a necessary but time-consuming process) and the introduction of the flexibility market go hand in hand as they support each other.**

The future development of the electricity generation sector includes the following:

- up to 2030, the sector will continue to be based largely on the use of a mix of primary sources from Slovenia, in particular RES and nuclear energy, and will continue to use domestic coal - lignite;
- we will maintain the excellence and safe operation of nuclear facilities in Slovenia;
- we will examine the possibilities of introducing new nuclear technologies and will carry out all the necessary economic and other expert analyses and activities, on the basis of which it will be possible by 2027 at the latest to decide on the construction of a new nuclear power plant;
- we will improve the diversification of primary sources of electricity production, increase the use of RES and increase the use of natural gas in the high-efficiency cogeneration of heat and power, which will reach the target of at least 5% of electricity production in Slovenia by 2030;
- by 2030, the closure of Unit 5 at Šoštanj thermal power plant (TEŠ) will reduce lignite extraction and put an end to the use of imported coal for electricity production at Energetika Ljubljana, the Ljubljana thermal power plant unit.

### 2.3.2 Other objectives and contributions referred to in Annex 1 related to the energy security dimension

Other than the above, the NEPN does not envisage additional specific targets for increasing the flexibility of the national energy system, increasing diversification of energy sources and supplies from third countries to increase the resilience of regional and national energy systems and reducing dependency on energy imports from third countries and to increase the resilience of State and regional energy systems.

## 2.4 Internal Energy Market Dimension

**Overview of key objectives:**

- **ensure additional financial, human and technical resources to accelerate integrated development and management of the electricity distribution network for increased capacity, resilience to disruption, future development potential, connectivity and adaptability**, thus enabling the exploitation of the flexibility of resources and loads, the integration of heat pumps, the accelerated deployment of e-mobility, the integration of renewable electricity generation and storage devices,
- establish **a development-oriented regulatory framework for determining the number of network charges** for the transition to a climate-neutral society,
- **support the development of an efficient and competitive market** to take full advantage of the flexibility of the electricity system and new technologies,
- support for cross-sector integration and implementation of new cross-sector system services,
- promote development and research cooperation between companies within and outside the sector,
- **ensure further development of the pipeline system in line with gas flows and system capacity, including new sources of renewable and waste gas,**
- **prepare a regulatory and supportive environment** for alternative **renewable gas sources in the natural gas network** and at the same time analyse and determine the maximum permissible fraction of hydrogen in the natural gas network,
- **support the implementation of pilot projects for the production of synthetic methane and hydrogen** (an indicative target of 10% renewable methane or hydrogen in the transmission and distribution network by 2030),
- **ensure appropriate conditions to store and use as much renewable energy as possible**, when and where necessary, and maximise the capacity of renewable generating facilities,
- **enable energy poverty to be mitigated and reduced** by accelerating the implementation of social policy measures, general housing policy measures and existing targeted measures.

### 2.4.1 Electricity interconnectivity

**Slovenia's long-term goal is to continue to improve electricity connectivity in the region.** Slovenia's electricity interconnectivity was **83.6%** in 2017, with Slovenia well above the 10% target for 2020 and the 15% target for 2030[58].

### 2.4.2 Electricity transmission and distribution infrastructure

**Electricity transmission and distribution infrastructure**

The current development plan does not satisfy the expected additional needs in the area of electricity distribution. To achieve its ambitious energy and climate policy targets, **Slovenia will ensure better conditions for the accelerated development of the electricity distribution network, which is the basis for the future transition to a climate-neutral society** and

[58] **State of the Energy Union – Slovenia**, available at: https://ec.europa.eu/commission/sites/beta-political/files/energy-union-factsheet-slovenia_en.pdf.

enables the accelerated integration of renewable energy generation facilities, the adaptation of production and consumption, increased connectivity and the integration of heat pumps and other elements behind the metering point, as well as fulfilling requirements associated with the expedited deployment of e-mobility. The objective is to increase capacity, resistance to disruption and future development potential and exploit electricity distribution network source and load flexibility in accordance with the sustainable needs of distribution system users. To ensure support for the operation of the electricity distribution network and development of the internal electricity market, appropriate development of telecommunications infrastructure will also be important, so it will be necessary to set up networks for the provision of machine-to-machine (M2M) communications for distribution telecommunications infrastructure for the entire territory of Slovenia.

The deployment of smart grids in the electricity distribution system requires accelerated digitisation of the distribution electricity network and the provision of new services, including on the distribution and transmission network, which will require an appropriate number of professional staff and technical means to manage, develop and maintain a modern distribution network. Integration of the distribution and transmission systems and the establishment of a single platform for monitoring and insight into the current production and consumption of Slovenia's electricity at all times will be essential.

**Natural gas transmission and distribution infrastructure**

Slovenia will ensure further development of the gas pipeline system in line with gas flows and the use of the system, including new sources of renewable gas and waste gas[59].

Based on an analysis of the envisaged infrastructure projects, it is estimated that the N-1 infrastructure standard will range between 65.6% and 75.0% over the next five years. In the longer term, we estimate that the transmission system operator can ensure the development of the N-1 infrastructure standard for the Slovenian transmission system with a connection to Hungary and/or an additional connection to Italy.

About 30% of natural gas is supplied to final customers through the natural gas distribution network in 83 local communities (out of 212). The development potential of existing and new natural gas distribution networks lies primarily in ensuring the supply of renewable gas. The development and possible expansion of distribution networks is thus linked to the development and provision of alternative gases in the natural gas network. An important new use of distribution networks is to ensure the supply of motor vehicles with natural gas and, subsequently, with alternative gas, which will help to increase the share of renewable sources in transport.

**Decarbonisation of the natural gas supply**

The goal of the NEPN is to establish technical, legislative and incentive conditions for facilitating the decarbonisation of the natural gas supply in Slovenia. To this end, we will prepare a regulatory and support environment for alternative gas in the natural gas network, while analysing and determining the maximum permissible hydrogen content of the natural gas network. Efforts are being made to replace as much as possible fossil methane with alternative gases in the natural gas network (10% target by 2030), which will be produced in Slovenia or imported respecting the system of guarantees of origin.

In accordance with EU legislation, the market for alternative renewable gases will be developed.

Decarbonisation of the natural gas supply will be achieved by replacing natural gas with renewable gases:

[59] **Transmission System Operator Development Plan for 2020-2029, available at:** https://www.agen-rs.si/documents/10926/106759/Desetletni+razvojni+načrt+prenosnega+plinovodnega+omrežja+za+obdobje+2020-2029/53c79c54-ced1-49fc-8225-3ab7693dd783.

1. **hydrogen** - produced by electrolysis of water using excess renewable electricity (sector coupling),
2. **synthetic methane** - produced by $CO_2$ or CO hydrogen methanation in catalytic or biological methanation reactors, in which hydrogen, CO and $CO_2$ are obtained by means of the gasification of organic materials, using the hydrogen mentioned in point 1 and $CO_2$ recovered from pollution sources,
3. **biomethane** – methane obtained from the gasification of wood biomass or from biogas produced by the decomposition of organic substances such as slurry, crop residues and plant material, municipal effluent in sewage treatment plants, etc., under anaerobic conditions in fermenters (digesters), since, because of its composition, biogas is not suitable for injection into the pipeline network (it may contain up to 50% of $CO_2$ and, in smaller concentrations, other impurities).

## Sector integration

The integration of the various energy sectors, in particular the integration of the electricity, gas and district heating and cooling sectors. will be crucial for the successful achievement of energy and climate objectives. To this end, we will ensure appropriate technical capacity for the conversion of renewable electricity[60] into renewable gas, hydrogen or synthetic methane and heat (power-to-gas and power-to-heat). This will allow the seasonal storage of renewable energy in the form of methane, including in warehouses in neighbouring countries. If necessary, it will be possible to store renewable gases for a short time only or to offset briefer fluctuations in intraday consumption (in transmission pipeline storage facilities, heat storage tanks, etc.), which are made possible by the gas pipeline system and district heating systems to a greater extent than the electricity system.

Thanks to energy conversion, the construction of the electricity and gas pipelines will be optimised, since the most appropriate network in any given conditions can be used for energy transmission. This helps reduce the costs of investments for the transition to a climate-neutral society.

The increased volume of renewable electricity production will have a significant impact on the functioning and integration of energy markets, where, due to greater fluctuations in unpredictable production, it will be necessary to provide efficient market-based instruments to develop flexibility and necessary new energy services. By converting and storing surplus electricity to gas fuels and heat, we will link the gas, heat and electricity sectors to achieve synergistic effects and bring down energy prices.

A national approach to integrating thermal infrastructure and integration into other sectors at the local and national level will need to be shaped.

[60] In this period possibly also surplus conventional electricity.

### 2.4.3 Market integration

The electricity and natural gas market in Slovenia is open and liberalised.

#### Wholesale and retail electricity market

The long-term goal of the NEPN is to continue to open up the electricity market in Slovenia without regulatory restrictions.

Slovenia will continue to actively support activities in the area of market integration and merger to optimise the capacity of existing interconnectors for trading. Slovenia is one of the leading countries in this field and already has coupled day-ahead markets with Italy, Austria and Croatia.

Slovenia achieves the 70% criterion for the availability of cross-border transmission capacities at all borders, and the exemption is likely to apply only to the Italian border, harmonised throughout the northern Italian border.

Slovenia has no regulated prices in the area of electricity, except for the price of the last resort supply, performed by the distribution operator for customers if requested. This price should be higher than the market price but not by more than 20%. The purpose of this arrangement is to divert customers to a contract with a selected supplier at market price.

Slovenia has completed the coupling of daily and intra-day markets with all its neighbours (Italy, Austria, Croatia). It is already linked to a common Central European daily market. The Central European Common Market is also linked to the intra-day market, except at the border with Italy. Long-term trading for transfer across Slovenian borders is carried out in a common Central European auction house. Once established, the same mechanisms will be used on the connection with Hungary. The daily and intra-day markets are projected to shift to flow-based cross-border capacity calculation in line with the joint development of this mechanism. In this area, Slovenia is not behind EU trends but is even maintaining a position at the forefront, the aim being to continue to participate in advanced mechanisms.

The Exchange in Slovenia operates successfully and successfully operates as a Nominated Electricity Market Operator (NEMO). The share of energy exchanged on the stock exchange is high due to the large share of imports and exports in relation to energy consumed or produced in Slovenia. The daily and intra-day markets give a good price signal. The derivatives market is also under way.

Part of the system services is already supplied by a response aggregator. In line with EU law, we will continue to develop solutions that allow system users to be able to offer their services through independent aggregators as well.

The final introduction of advanced meters is planned by 2025. At the same time, a system for capturing and storing data and the advanced connectivity of elements behind the measuring point with those in front is being developed. In order to increase the efficiency of the network, we will strive to accelerate the introduction of advanced measurement systems (AMS) by 2023 at the latest.

A single platform will be established for monitoring and oversight of current production and consumption of Slovenia's electricity at all times.

There is great competition between suppliers, although the size of the market limits the number of competitors. Indicators will be difficult to improve in this area. The legal restriction that has weakened an effective price comparator was already lifted in 2019. Traditional suppliers are no longer dominant because the new supplier has the largest market share, having started with a market share of 0%. We expect that the pressure of new Slovenian and foreign stakeholders will continue to maintain pressure on retail prices.

Within the envisaged legislative measures, more flexible consumption and all the roles of the active customer (promoting the introduction of battery storage, dispersed generation, community

aggregation, energy community, concurrent contracts with multiple suppliers and independent aggregators, the possibility of supply at a dynamic price, etc.) have been promoted.

The development of an efficient and competitive market for harnessing the full potential of the flexibility of the electricity system and new technologies is an important development direction laid down in the NEPN. The Energy Agency maintains an active dialogue with stakeholders in the electricity market to establish a market with flexibility, aimed at identifying the areas that are the most demanding in terms of implementation and which will require more detailed consideration when introducing the market with flexibility in Slovenia.

Outside current EU legislation, Slovenia does not have any other national targets identified that would be related to other aspects of the internal energy market.

### The natural gas market

The long-term goal is to continue to open the natural gas market in Slovenia without regulatory restrictions, but with appropriate incentives, especially for greater use of RES.

In future, Slovenia will continue to reinforce its links with outlets in neighbouring countries. The planned connection with Hungary will also enable direct delivery from the Hungarian point of sale.[61]

In order to achieve our energy and climate goals, Slovenia will also comply with EU guidelines and legislation for the gradual replacement of the share of natural gas with renewable gases, such as synthetic gas, hydrogen and biomethane. Adequate penetration of renewable gases into the energy balance will require the development of a renewable gas market, which may exist within the natural gas market or as a standalone market. Natural gas system operators must also contribute to the development of the renewable gas market with impartial connection and access to the system of producers of renewable and other low carbon gases.

[61] In order to locate and gain insight into the possibilities and opportunities regarding the integration of gas markets in Slovenia's immediate neighbourhood, the Energy Agency conducted a study in 2018, which concludes that there is no need for the Slovenian market to formally integrate markets according to the models recommended by ACER, target market model. Instead, Slovenia is advised that the regulator enforces network codes, and Slovenian traders may continue to use the easily accessible Austrian hub. Adequate short-term cross-border capacity at competitive prices is crucial. In addition, the study encourages the regulator and the transmission system operator to pursue projects that enable the diversification of gas sources (Self-assessment and Development Opportunities of the Slovenian Wholesale Gas Market, 2018, p. 54, available at: https://www.agen-rs.si/documents/10926/135879/Samoocena-in-razvojne-možnosti-slovenskega-veleprodajnega-trga-z-zemeljskim-plinom---končni/9506c55a-3dbe-4648-91ed-20284d1af87a.

### 2.4.4 Energy poverty

**Slovenia's objective is to mitigate and reduce energy poverty through accelerated implementation of social policy measures, general housing policy measures (e.g. 100% subsidies in multi-household buildings) and existing targeted measures.**

International comparisons of primary indicators of energy poverty that have been carried out for Slovenia do not indicate a larger scope of the phenomenon in question, except for the indicator 'late payment for utilities due to financial problems', where the deviation of the indicator value is mostly related to payment habits and priority payments in Slovenian households.[62]

On the basis of international comparisons, the NEPN concludes that energy poverty in Slovenia is not significant, but due to the planned development guidelines in the area of energy and climate policy, measures should be prevented from affecting on an above average basis the most vulnerable part of the population, i.e. part of the population, which, due to insufficient resources, information and lack of competencies, is unable to defend itself from the negative effects of price increases and become aware of the availability of energy products through investments in greater energy efficiency and restructuring of energy sources.

**In the area of energy poverty**, the NEPN sets out the following activities:

1. by 2021 at the latest, in sectoral legislation, **identify energy poverty and determine the obligation to periodically measure** the dimensions of the occurrence of energy poverty (estimates of the number of energy-poor households in the country),
2. by 2021 at the latest, based on the definition of energy poverty, **determine how energy poverty is measured** and specify indicators for the statistical measurement of the phenomenon, which will enable the measurement of energy poverty and the analysis of the phenomenon, as well as allow better insight into its magnitude and characteristics,
3. by 2021 at the latest **determine the target indicator** for energy poverty in future, with the aim of avoiding increases in energy poverty despite planned energy and climate action,
4. from 2022 **monitor in real-time**, whether existing general social policy measures, general housing policy measures and existing energy poverty target measures ensure that the objective is achieved,
5. by 2022 produce **an action plan to tackle energy poverty,** improve and increase the scope of existing instruments and identify additional measures to be taken in the event of a major gap between the measured energy poverty indicator and the target.

[62] See Cirman, A.: Energy poverty in Slovenia: expert bases for the preparation of the National Energy and Climate Plan, Ljubljana, 2019.

## 2.5 Research, Innovation and Competitiveness Dimension

**Overview of key objectives:**

- **increase investment in R&D** - at least 3% of GDP by 2030 (of which at least 1% of GDP is public funding),
- **increased investment in the development** of human resources and new skills needed for the transition to a climate-neutral society,
- **support for businesses for an efficient and competitive transition to a climate-neutral and circular economy,**
- encourage **targeted research projects and multidisciplinary R&D programmes and demonstration projects** to reach a climate-neutral society based on the direct interest of the economy or the public sector, and fulfilling national development goals, in particular in the areas of energy,
- **preparation of a new Research and Innovation Strategy of Slovenia (RISS), taking into account the achievement of the targets of a climate-neutral society,**
- **direct companies towards financing and inclusion** in R&D programmes and demonstration projects **with an active tax policy,**
- **promote new and reinforce existing R&D programmes** in the area of energy, in line with the objectives of the NEPN and the Long-Term GHG emission reduction strategy,
- **promote the use of digitisation** for climate action and **enhancing cybersecurity across all strategic systems,**
- promote R&D cooperation between the public and private sectors,
- create competitive conditions for innovative research work in public companies.

In order to achieve the set objectives, the NEPN confirms as a target **increasing investment in R&D by at least 3% of GDP by 2030 (of which 1% of GDP is public funding), with funds earmarked for climate-neutral goals and projected to be directed towards** targeted research projects, multidisciplinary programmes and demonstration projects. In order to achieve the set objectives, we will intensify R&D investment in future, since the level of investment in 2017 was 1.87% of GDP, including public funds amounting to 0.44% of GDP (SORS, 2019). Slovenia thus lags behind the EU average of 2.06% of GDP in 2017, of which 0.70% of GDP is spent on public R&D (Eurostat, 2017).

A new **Research and Innovation Strategy for Slovenia (RISS) will be drawn up for Research, Innovation and Competitiveness** (including Energy Union objectives); while ensuring the achievement of the objectives of a climate-neutral society, it will also include R&D to achieve these objectives.

We will also target more **funding to transform educational content** to create a digital and research-driven society of the future. Such a society will create personnel of the future that will be properly educated to meet the ever-changing needs associated with climate change and the need to handle it. At the same time, Slovenia will develop into a country with a competitive workforce capable of greening the jobs within its economy.

The NEPN provides for the following activities in the area of research and innovation:

- **long-term priority development of scientific disciplines in line with Slovenia's development needs and the interests of the domestic economy**, especially in the area of the climate-neutral society,
- **introduction of multidisciplinary research and development programmes** in all fields related to energy management, in particular in the area of sustainable energy use,
- **implementation of targeted R&D programmes and demonstration projects** that improve the practical qualification for the quality preparation and implementation of projects in the area of energy efficiency, the circular economy and green energy technologies,
- **preparation of a new Research and Innovation Strategy of Slovenia (RISS), taking into account the achievement of the goals of a climate-neutral society,**
- **accelerated cooperation between R&D institutions and the economy** and joint involvement in international projects,
- **introduction of digitisation** by promoting and accelerating digitisation in the implementation and monitoring of measures in the fight against climate change, increasing the use of advanced technologies, influencing the progressive functioning of individual stakeholders in society, and thus innovatively addressing climate and social challenges; **particular emphasis will be placed on increasing cybersecurity** and reducing the vulnerability of all key strategic systems in the country,
- **active involvement of Slovenia in European innovation promotion initiatives** and projects with centralised EU funds in the area of climate-neutral society and the circular economy.

Thanks to the above set of planned activities, we are engaged in research and innovation-related development policies, with especially close links with industrial, corporate and educational policies. To move towards a climate-neutral society, sustainable energy production and use must become a priority area for research, development and innovation. Investing in research and promoting innovation in low-carbon technologies and energy efficiency not only contributes to sustainable development but at the same time contributes to the reliable and competitive operation of the energy sector, which significantly contributes to the competitiveness of the entire economy. The research, innovation and competitiveness dimension also contribute significantly to the achievement of the objectives of the other four Energy Union dimensions. In Slovenia, in future, the main areas of energy research will be: **renewable energy sources, efficient use of energy in buildings, nuclear energy, electricity and electric power and electricity systems, heat and heating systems, the circular economy, etc.** We will also encourage the development of technologies in these areas, such as upgrading gasification and waste recovery technologies for energy purposes, power to X technologies, digitisation of energy, cybersecurity, nanotechnologies, energy storage, the capture of emissions, etc. In the area of transport, investment in alternative fuel technologies will be key.

The NEPN also aims to reinforce competitiveness and technological development capabilities in energy and develop new products, manufacturing processes, services and solutions that are suitable for transfer to the economy, especially with regard to EEU and RES and the climate-neutral and circular economy.

In December 2017, the Slovenian Government adopted **SRS 2030** which defines two objectives related to the research, innovation and competitiveness dimension in Slovenia:

- the sixth SRS 2030 objective is a 'competitive and socially responsible business and research sector', specifying, among other things, a focus on environmentally friendly technologies and eco-innovations, which, as an important factor in the competitiveness of companies, also contribute to reducing the environmental burden,

- the eighth SRS 2030 objective is ' transition to a low-carbon circular economy' as a priority development orientation for the whole economy, breaking the link between economic growth and the growth of raw material and non-renewable energy use and the associated increased environmental burden.

In September 2017 the Slovenian Government adopted the **Slovenian Smart Specialisation Strategy (S4)**[63], which is the implementation plan for the transition to a highly productive economy by enhancing innovation capacity, promoting the transformation and diversification of industries into new activities, and the growth of new fast-growing businesses. S4 identifies three priority pillars and nine areas of application where Slovenia achieves a critical mass of knowledge, capabilities and competences, thus possessing innovative potential for positioning on global markets:

I. ***Digital*** (1 - Smart cities and communities; 2 - Smart buildings and the wood-chain dwelling);

II. ***Circular*** (3 - Networks for transition to a circular economy; 4 - Sustainable food; 5 - Sustainable tourism);

III. ***(S) Industry 4.0*** (6 - Factories of the future; 7 - Health - medicine; 8 - Mobility; 9 - Materials as products).

In addition to cohesion funds, it is planned that the **Climate Change Fund** will play an important role in future in promoting research, innovation and competitiveness, its resources being used *inter alia* to fund R&D and demonstration projects to reduce emissions and adapt to climate change, including participation in European Strategic Energy Technology Plan initiatives (**the SET plan**) and European Technology Platforms (SET-Plan, 2018). The Climate Act will define the framework for the dedicated use of available R&D funds in the area of transition to a climate-neutral society. The Climate Act will also make the promotion of low-carbon energy sources an indispensable climate policy objective.

63 **S4 - Slovenian Smart Specialisation Strategy 2014-2020**, available at: http://www.svrk.gov.si/fileadmin/svrk.gov.si/pageuploads/Dokumenti_za_objavo_na_vstopni_strani/S4_strategija_V_Dec17.pdf.

# 3 POLICIES AND MEASURES

**Slovenia has already adopted numerous energy and climate policy measures. Achieving the objectives of the NEPN will require the continuation of the implementation of measures already taken, their upgrading and extension, and the adoption of additional measures. Particular attention will have to be paid to increasing implementation capacity, monitoring the implementation of actions and, on the basis of the findings, adjusting and improving the individual instruments accordingly.**

NEPN policies and measures for achieving the targets set are rationally classified and presented in separate dimensions so that they are not duplicated, even though some actions impact on multiple dimensions. Existing measures and policies are contained in action plans and other operational documents. The NEPN replaces some documents[64] and updates others, setting new guidelines and recommendations for achieving NEPN objectives. For convenience the instruments are listed alphabetically by their abbreviations in the table below, and they are indicated throughout this text where they represent the strategic basis for individual measures.

***Table 15: List of action plans and other operational documents included in the NEPN***

| Document | Abbreviation |
|---|---|
| Renewable Energy Action Plan [*Akcijski načrt za obnovljive vire energije*] | AN OVE |
| Update of the Renewable Energy Action Plan 2010-2020 – Draft [*Posodobitev akcijskega načrta za obnovljive vire energije za obdobje 2010–2020 –osnutek* ] | pAN OVE |
| Energy Efficiency Action Plan [*Akcijski načrt za učinkovito rabo energije*] | AN URE |
| Action programme for alternative fuels in transport [*Akcijski program za alternativna goriva v prometu*] | AP AGvP |
| Long-term strategy to encourage investment in the energy renovation of buildings [*Dolgoročna strategija za spodbujanje naložb v energetsko prenovo stavb*] | DSEPS |
| Operational Programme for the implementation of European cohesion policy 2014-2020 [*Operativni program za izvajanje evropske kohezijske politike v obdobju 2014–2020*] | OP EKP |
| Operational Programme for the implementation of the National Forest Programme [*Operativni program za izvajanje Nacionalnega gozdnega programa*] | OP NGP |
| Operational Programme of measures to reduce greenhouse gas emissions by the year 2020 [*Operativni program ukrepov za zmanjševanje emisij toplogrednih plinov do leta 2020*] | OP TGP |
| Waste prevention programme [*Program preprečevanja odpadkov*] | PPO |
| Rural Development Programme [*Program razvoja podeželja*] | PRP |
| Waste management programme [*Program ravnanja z odpadki*] | PRzO |
| Resolution on the National Program for the Development of Transport in the Republic of Slovenia up to 2030 [*Resolucija o nacionalnem programu razvoja prometa v RS za obdobje do leta 2030*] | ReNPRP30 |
| Strategy in the area of market development for the establishment of adequate infrastructure regarding alternative fuels in the transport sector in the Republic of Slovenia, 2017 [*Strategija na področju razvoja trga za vzpostavitev ustrezne infrastrukture v zvezi z alternativnimi gorivi v prometnem sektorju v Republiki Sloveniji, 2017*] | S AGvP |
| Smart specialisation strategy [*Strategija pametne specializacije*] | S4 |
| Spatial development strategy [*Strategija prostorskega razvoja*] | SPR |

64 The NEPN will replace the Renewable Energy Action Plan [AN OVE], the Energy Efficiency Action Plan [AN URE] and the Operational Programme of measures to reduce greenhouse gas emissions [OP TGP].

When implementing NEPN measures, the following sectoral legislation is respected and carried out: legislation on limiting emissions to air, water and soil, noise, electromagnetic radiation, light pollution, waste management, protection regimes and protected areas as well as environmental protection legislation and the applicable national environmental protection programme (*nacionalni program varstva okolja* - NPVO), which *inter alia* define: Natura 2000 sites, natural assets, protected areas, areas of ecological importance, agricultural land, water protection areas, floodplains and flood areas, bathing areas, forest reserves and protected woodland, cultural heritage and exceptional landscapes and landscapes of national prominence. Solar power plants are sited taking into consideration the restrictions and protection regimes of cultural heritage structures. In the renovation of cultural heritage assets, in addition to sectoral legislation, recommendations such as the Guidelines for the energy renovation of cultural heritage buildings are taken into account. In the case of financial incentives, cultural heritage consent is required in the event of encroachment on cultural heritage, where this is required under cultural heritage protection regulations. Additional loads in an already congested environment are not acceptable.

## 3.1 Decarbonisation Dimension

### 3.1.1 GHG emissions and renewals

#### Measures and policies in the LULUCF area

*Table 16: A review of existing instruments in the area of Land Use, Land Use Change and Forestry (LULUCF)*

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activity and deadlines |
|---|---|---|---|---|---|
| **Upgrading and implementation of forest inventory** | OP TGP | ✓ | monitoring and reporting | MKGP, MOP | **Improving the carbon footprint monitoring system (including agricultural and other land uses) [in 2022]:**<br>• an upgrade for international and domestic reporting;<br>• 'National Forest Inventory' is included in national forestry legislation and is provided with stable funding. |
| **Development of methodology for monitoring sinks** | OP TGP | ✓ | monitoring and reporting | MKGP, MOP | **Improving the QA/QC forest inventory and eliminating cross-sectoral discrepancies [by 2021]:**<br>• establish a robust system for monitoring emissions and sinks and a higher level of reporting (availability of quality data);<br>• establish data collection on the harvested wood products or use the FAOSTAT database in accordance with the IPCC guidelines;<br>• establish a single soil monitoring to monitor carbon stock and formally integrate it into sectoral legislation. |
| **Upgrading of measures to sector policy** | OP TGP | ✓ | regulations | MKGP | **Upgrade existing measures to address key outstanding issues in LULUCF and AFOL sectors in the second target period [in 2023].** |
| **FMA Forest Management Plans (2021-2030)** | OP NGP | | planning | MKGP/ZGS | **Set appropriate targets for the wood stock, felling and accumulation** (taking into account the adaptation of forests to the expected climate change to ensure timber stock, growth and carbon sinks) **in the guidelines for the preparation of the FMA plans 2021-2030 [in 2021].** |

| | | | | | |
|---|---|---|---|---|---|
| **State incentives for forest owners for forest care and protection** | PRP | | economic (financial incentives) | MKGP | **Ensure continuity of funding for State incentives for forest owners for forest care and forest protection [in 2020]:**<br>• it involves the restoration of forests following natural disasters, the implementation of forestry measures to increase the adaptive capacity of forests, investment in forest technology and the processing and use of wood. |
| **Training and workshops on sustainable forest management for forest owners** | | | training / informing | MKGP | **Ensure the continuity of education and workshops on sustainable forest management for forest owners in order to increase the realisation of planned forestry measures [in 2021].** |
| **Resolution 'Naša hrana, podeželje in naravni viri po 2021'** | | | resolution/planning | MKGP | **Strategic planning of agricultural policy after 2021 in line with the objectives set [in 2021].** |

Starting points for planning additional actions:

- Resolution 'Naša hrana, podeželje in naravni viri po 2021',[65]
- Strategic plan CAP 2021–2027,[66]
- Forest management and hunting management plans of the areas for the period 2021-2030.[67]

[65] The resolution defines the basic strategic framework for the functioning of agriculture, food and rural areas and is the basis for strategic planning beyond 2021. It also provides the basis for the preparation of the Strategic Plan for the implementation of the Common Agricultural Policy (CAP). It is a response to the specific CAP objectives, which are addressed in the document in four groups of objectives, namely:
• resilient and competitive food production and processing,
• sustainable management of natural resources and the provision of public goods,
• raising the quality of life and economic activity in rural areas,
• horizontal objective: enhancing knowledge design and transfer.

[66] The Member States will have to draw up strategic plans for the implementation of the CAP, which will cover the first pillar (direct payments, sectoral measures) and the second pillar (rural development measures The contents of the strategic plans will be laid down in regulation. One of the general objectives of the proposal for a regulation is also to strengthen efforts to achieve climate change (Proposal for a Regulation of the European Parliament and of the Council establishing rules on support for strategic plans to be drawn up by the Member States under the Common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulation (EU) No 1305/2013 of the European Parliament and of the Council and Regulation (EU) No 1307/2013 of the European Parliament and of the Council – Revised Presidency drafting suggestions, 7 June 2019).

[67] Based on the analysis of the state and development of forests and the assessment of forest management, the area plans identify the main problems in forest management. The objectives of forest management include, in particular, the fundamental effects (forest roles) that are to be achieved through forest management and are reflected in particular in increasing timber production, preserving biodiversity and nature conservation, securing CO2 sinks and enhancing the social role of forests in major cities and towns and cities and tourist resorts. The plans shall, as far as possible, take account of the guidelines of the national forest programme. The basic strategic orientations and priorities in forest management are, above all, to ensure the sustainability of forest yields and all their roles, to preserve forest biodiversity at landscape, ecosystem, species and genetic levels, to preserve the health and vitality of forests, to increase the utilisation of production potential of forest habitats, to increase openness of forests with forest roads and the introduction of modern technologies. The planned harvest is determined on the basis of stand conditions, the ratio of developmental stages, goals and cultivation conditions in the individual growing classes.

## Measures and policies in agriculture

***Table 17: A review of existing instruments in agriculture***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| PROMOTING THE REDUCTION OF GHG EMISSIONS IN THE AGRICULTURE SECTOR | | | | | |
| **Public advisory service** | OP TGP | ✓ | education/ training | MKGP/KGZS | **Continuation and upgrade of implementation [2020-2030]:**<br>• to increase the volume of work of the advisory service in the feeding of cattle and sheep and direct it to farms and categories of animals that are not yet achieving adequate results in the area of efficient breeding. |
| | PRP | | | | |
| **Training and counselling programmes and demonstration projects** | OP TGP | ✓ | education/ training | MKGP | **Continuation and upgrade of implementation [2020-2030]:**<br>• training agricultural advisers on the latest approaches in sustainable agriculture to support farmers in the transition to more sustainable forms of farming [in 2021]. |
| | PRP | ✓ | | | |
| **Research and innovation in agriculture** | OP TGP | ✓ | economic (financial incentives) | MKGP | **Continuation and upgrade of implementation:**<br>• in the context of European Innovation Partnership (EIP) projects, launch contents that will focus primarily on reducing GHG emissions [in 2021]. |
| | PRP | ✓ | | | |
| **Local action groups** | OP TGP | ✓ | economic (financial incentives) | MKGP | **Continuation and upgrade of implementation [2021-2030]** |
| | PRP | ✓ | | | |
| INCREASING THE EFFICIENCY OF ANIMAL BREEDING AND SHARES OF MINIMUM RELEASES AND THE PROMOTION OF A MORE EFFICIENT NITROGEN | | | | | |
| **Incentives to invest in fixed assets that improve the overall** | OP TGP | ✓ | economic (financial incentives) | MKGP | **Continuation and upgrade of implementation [in 2021]:** |

| | | | | | |
|---|---|---|---|---|---|
| **efficiency of the farm and in infrastructure related to the development and adaptation of agriculture** | PRP | ✓ | | | • provide additional incentives for the construction of small and micro biogas plants for the production of biogas from livestock manure;<br>• increase the volume of investment in low ammonia discharging equipment. |
| **Incentives for the implementation of premium farming methods that contribute to reducing nitrous oxide emissions** | OP TGP | ✓ | economic (financial incentives) | MKGP | **Continuation of implementation [2020-2030]:**<br>• to promote intensive fertilisation with low ammonia releases as part of a future rural development programme. |
| | PRP | ✓ | | | |
| **Incentives for implementing above-standard farming practices that contribute to reducing methane emissions** | OP TGP | ✓ | economic (financial incentives) | MKGP | **Continuation and upgrade of implementation:**<br>• provide incentives to improve the quality of feed and feed for cattle and small animals under the future rural development programme [in 2021]. |
| | PRP | ✓ | | | |
| **Implementation of a common basic breeding programme for cattle and sheep breeds** | OP TGP | ✓ | economic (financial incentives) | MKGP | **Continuation and upgrade of implementation [2020-2030]:**<br>• greater emphasis on selection for more efficient use of feed energy and on the search for direct selection to reduce methane emissions. |
| | PRP | | | | |

**Additional measures:**

***Table 18: A review of additional envisaged measures in agriculture***

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **Upgrading agricultural policy - integrating climate policy and adapting to climate change** | economic (financial incentives) | MKGP | • Upgrade agricultural policies and measures to reduce long-term GHG emissions in agriculture, in particular, to improve livestock production and restructuring, as livestock production is among the largest sources of GHG emissions from agriculture [in 2021];<br>• updating of the Slovenian agricultural policy/strategy, which envisages the reduction of (specifically) intensive livestock production and related intensive agriculture with measures to promote pasture, change of production species for use in human nutrition rather than feed, and promote seasonal, locally harvested products. Adaptation to expected climate change [in 2021] should also be taken into account *mutatis mutandis* when drawing up the new strategy;<br>• to formulate policies and measures to successfully adapt agriculture to climate change [in 2022];<br>• to formulate a policy to promote sustainable organic farming and to reduce the environmental burden and the consumption of natural resources [in 2021];<br>• reinforce market cooperation between organic producers and revitalise interest in local food production and processing to shorten the food supply chain [2021-2030];<br>• introduce advanced methods and new (green) agricultural technologies [2021-2030];<br>• to encourage investment in fixed assets that improve the overall efficiency of the farm and in infrastructure linked to the development and adaptation of agriculture [in 2022];<br>• promote the introduction of precision farming technology, accelerated investment in ICT infrastructure and digitisation of agriculture, including the generational renewal of the sector [2021-2030];<br>• provide incentives for the collection of agricultural biomass (crop residues, slurry, etc.) at the locations of major biogas plants [in 2022]. |

## Measures and policies in the area of waste

*Table 19: A review of existing instruments in the area of waste*

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Reducing the amount of waste generated and promoting re-use and recycling** | OP TGP | | informing/ promoting/ awareness, regulations, pricing policy | MOP, MGRT | **Continuation and upgrade of implementation [2020-2030]:**<br>• taking the utmost account of the objectives of the circular economy, especially in construction and industrial waste,<br>• revamp the waste management programme and the waste prevention programme. |
| | PPO | ✓ | | | |
| | PRzO | | | | |
| | EPA | | | | |
| **Construction of missing infrastructure (financing)** | OP TGP | ✓ | economic | municipalities, MOP | **Continued construction of infrastructure for municipal, industrial and hazardous waste management** to promote the use of recycled materials as raw materials (upcycling, etc.) [2020–2030], |
| | PPO | | | | |
| | PRzO | | | | |
| | EPA | | | | |
| **Promoting the reduction of GHG emissions through waste management regulations** | OP TGP | | regulations, information | MOP | **Continued implementation of a systematic review of regulations** to increase the share of separately collected fractions, proper management of separately collected fractions, efficient recovery of biodegradable waste, etc. |
| | PPO | | | | |
| | PRzO | | | | |
| | EPA | | | | |
| **Changes in the environmental levy on waste disposal** | OP TGP | ✓ | tax policy | MOP | **Continuation and upgrade of implementation in accordance with the current waste management programme and the waste prevention programme:**<br>• increasing the environmental levy to reduce the amount of landfilled waste to promote other waste management practices [in 2022]. |
| | PPO | | | | |
| | PRzO | ✓ | | | |
| | EPA | | | | |
| **Improvement of the packaging-waste collection system** | OP TGP | | regulations, tax policy | MOP | **Continuation and upgrade of implementation [2020-2030]:**<br>• study and transfer of good practices from abroad. |
| | PPO | | | | |
| | PRzO | ✓ | | | |
| | EPA | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Establishment of payment for waste disposal in accordance with the quantity of waste delivered** | OP TGP | | pricing policy | MOP, municipalities | **Continuation of implementation [2020-2030]:**<br>• updating the Decree on the methodology for pricing the services of mandatory municipal utilities to promote the reduction of waste generated. |
| | PPO | | | | |
| | PRzO | ✓ | | | |
| | EPA | | | | |
| **Securing conditions for the use of compost and digestate from waste treatment** | OP TGP | | regulations | MKGP, MOP | **Continuation of implementation [2020-2030]:**<br>• supervise the implementation of the Decree on the recovery of biodegradable waste and the use of compost or digest, the opening of the digest and compost market in the EU, etc. |
| | PPO | | | | |
| | PRzO | ✓ | | | |
| | EPA | | | | |
| **Capture and use of landfill gas** | OP TGP | | Regulation, incentives | MOP, MzI | **Continuation of implementation [2020-2030]:**<br>• incentives for cleaning and injecting gas into the gas network [in 2022]. |
| | PPO | | | | |
| | PRzO | | | | |
| | EPA | ✓ | | | |
| **Waste awareness projects** | OP TGP | ✓ | informing/ promoting/ raising awareness | MOP | **Continuation and upgrade of implementation:**<br>• promoting change in consumption patterns (pilot projects and tools to raise awareness of re-use, sharing, reduction of waste food, etc. – activities also under the LIFE C4C project) [in 2021]. |
| | PPO | ✓ | | | |
| | PRzO | ✓ | | | |
| | EPA | | | | |

### *Table 20: Additional measures in the area of waste*

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **Implementation aspects of energy waste utilisation in accordance with the Waste Management Program and the Waste Prevention Program (programme overhaul)** | strategic direction | MOP, MGRT, MzI, MIZŠ | • elaboration of a more detailed energy balance of waste in Slovenia and its energy potential [in 2020];<br>• support and implementation of at least two pilot projects for the processing of waste into synthetic fuels [2020 Climate Fund procurement];<br>• developing a vision for the development and application of new technologies for the production of synthetic recycled carbon fuels (production of synthetic fuels, hydrogen and synthetic gas from waste, etc.) [in 2022];<br>• make implementing decisions regarding the medium-term energy use of waste in Slovenia:<br>  ○ processing and production of synthetic fuels,<br>  ○ thermal treatment (industry, district heating systems, etc.) [in 2022];<br>• on the basis of the results of the pilot projects and the implementation decisions taken, the next NEPN update sets out indicative sectoral targets for the production of synthetic fuels (in transport, gas supply, etc.). [in 2024];<br>• review of the classification of waste from the wood processing industry and waste products with a view to its use as energy material and the utilisation of these materials in Slovenia [in 2020] |

## Measures and policies in the economy

### *Table 21: A review of existing instruments in industry and energy*

| Name of instrument | Strategic basis | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|
| EU-ETS Scheme | | | | |
| **GHG Emission Trading (EU-ETS)** | OP TGP | economic | MOP, Environmental Agency of the Republic of Slovenia [ARSO] | **Continuation and improvement of implementation:**<br>• implementation of the EU ETS scheme in Slovenia;<br>• informing companies of the latest developments in the implementation of the scheme and of state support offered by the State to reduce greenhouse gas emissions [2020-2030]. |

### *Table 22: Additional measures in industry and energy*

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **Non-refundable financial incentives measures to reduce process emissions in industry** | economic (financial incentives) and support activities | MGRT, Eco Fund, MOP | Preparation of a support scheme (possibly also in conjunction with incentives for demonstration projects). The measure targets the ETS and non-ETS sectors [in 2021]. |
| **Non-refundable financial incentives for industrial GHG mitigation measures through circular economy measures** | economic (financial incentives) and support activities | MGRT, SVRK, MOP | Draw up **an incentive scheme with non-refundable financial incentives for measures to move to a low carbon circular economy:**<br>• incorporate into the existing measures and instruments the criteria for circular management [in 2020];<br>• new incentives for measures to reduce GHG emissions through the transition to production by introducing new products (light products, products with longer life span, re-use of products or materials, waste reduction and recycling, replacement of natural gas by CNG/H2) [in 2023];<br>• support for the implementation of circular pilot projects [in 2021];<br>• other incentives to reduce industrial emissions in line with the new European Green Deal [in 2021].<br>The measure targets the ETS and non-ETS sectors [2020-2030]. |

***Table 23: A review of existing instruments in the area of green economy development***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| TAXES AND FEES | | | | | |
| **Environmental duty on carbon dioxide emissions from air pollution** | OP TGP | | tax policy | MOP, MF | **As the amount of the levy depends on the carbon intensity of the energy, the levy becomes one of the key tax instruments for the sustainable management of consumption of energy products:**<br>• the introduction of a gradual annual increase in the levy (taking into account the competitiveness impact assessment) to equalise the levy as soon as possible with the average price of allowances (up to at least EUR 30/$tCO_2$ by 2030 or in line with the allowance prices), which will reduce the competitiveness of fossil-based energy sources [in 2020]. |
| | AN URE | ✓ | | | |
| | OP EKP | | | | |
| | AN OVE | | | | |
| **Greening the national budget (Implementation of processes to design and accelerate the implementation of measures in the areas of taxes and fees)** | OP TGP | ✓ | tax policy, economic | MF, MOP, MKGP, MzI, MGRT | **Continuation and upgrading of national budget greening activities:**<br>• Intensive interdepartmental cooperation is being established to develop harmonised and effective tax and levy solutions in all sectors, in line with the planned changes to EU legislation (European Green Deal) and measures to achieve the climate neutrality targets set [from 2021]. |
| | AN URE | | | | |
| | OP EKP | | | | |
| | AN OVE | | | | |
| **Promoting energy efficiency and the exploitation of renewable energy sources under other energy charges** | OP TGP | ✓ | tax policy, incentives | MzI, MJU, MOP | **Continuation and targeted upgrade of the instrument:**<br>• upgrading the mandatory savings scheme and gradually increasing the energy efficiency contribution to provide the necessary dedicated resources to implement EEI and RES measures (taking into account the competitiveness impact of doubling the contribution amount) [in 2021];<br>• providing fiscal incentives in the form of investment facilitation [in 2022];<br>• reinforce staffing of the Eco fund [in 2020]; |
| | AN URE | | | | |
| | OP EKP | | | | |

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| | AN OVE | ✓ | | | • upgrade the system of exemptions from the contribution to provide support for the production of electricity from RES and CHP; from 2024, only undertakings that have their own generation of electricity or heat from RES (e.g. at least 5% of annual electricity demand) are eligible [in 2022]. |
| **Gradual reduction and elimination of incentives for fossil fuels** | OP TGP | ✓ | tax policy, economic, regulations | MF, MKGP, MzI, MOP, MGRT | **Ensure gradual reduction and elimination of environmentally harmful incentives:**<br>• draw up an impact analysis of the abandonment of incentives for fossil fuels in order to comprehensively examine the impact on different sectors and public finances [in 2021];<br>• progressive reduction of excise duty on energy products in industry by 2030 (in accordance with EU legislation) - the requirement for a refund from 2022 is certified in accordance with ISO 50.001 or ISO 14.001 [in 2021];<br>• the gradual reduction of the excise duty on transport fossil fuels in transport (complete abolition by 2025 or in accordance with EU legislation) [in 2021];<br>• The current stimulus budget is shifted from the impact analysis to the introduction of efficient green technologies, the development of business solutions and job creation (calls for incentives in transport, industry, agriculture, energy, etc.). [in 2021]. |
| | AN URE | | | | |
| | OP EKP | | | | |
| | AN OVE | | | | |
| **Upgrading the overall assessment of the effects, costs and benefits of implementing the planned policies and NEPN measures** | | | analytic, economic | MF, MzI, MOP | • Building an integrated impact assessment model for the broader environmental, economic, social and social policies by developing a project in cooperation with the European Commission under the EU Structural Reform Program. |

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| GREEN PUBLIC PROCUREMENT AND INNOVATION PUBLIC PROCUREMENT | | | | | |
| **Expanding and upgrading the green public procurement (GPP) system, including the introduction of public procurement for innovation** | OP TGP | ✓ | regulations | MOP, MzI, MGRT, MKGP, MJU | **Continuation and upgrade of the instrument:**<br>• continuous monitoring of improvements to green technologies (improvement of characteristics, new technologies, sustainable timber construction and change of definition of buildings, etc.);<br>• the gradual integration of renewable and recycled fuels [in 2023]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | AN OVE | ✓ | | | |

### 3.1.2 Renewable energy[68]

***Table 24: Overview of existing instruments for promoting electricity generation from RES***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Support scheme for the promotion of electricity generation from RES and CHP with high-efficiency** | OP TGP | ✓ | economic (financial incentives) | MzI, Energy Agency, Borzen | **Upgrading and improving implementation [2020-2021]:**<br>• improve the feasibility of notified projects (in particular wind energy, SHPP and large SPP above 1 MWe) and remove obstacles to the realisation of approved/selected projects;<br>• increase information and promotion of the scheme by target groups and support investors in applying (Borzen);<br>• amend the rules for calls for competition for the entry of CHP plants into wood biomass;<br>• upgrade the scheme to allow the purchase of statistical transfers of RES from the other EU Member States or payments to the Union mechanism for financing renewable energy sources in order to meet the national obligations of the RES share.<br>**Preparation of a new support scheme [2021-2023]:**<br>• comprehensively revamp and introduce new forms of incentives (including RES communities) to increase the effects of the scheme and prioritise incentives in RES units;<br>• Introduce a simplified procedure for smaller production facilities (premiums guaranteed, simplified procedures, etc.);<br>• the transition to investment grants for technologies close to competitiveness at the level of end-user prices (SPP, etc.);<br>• introduce concession schemes for the revitalisation of degraded areas and their use for energy purposes;<br>• to ensure greater stability and predictability of operation and proper management of the scheme and cooperation between all the institutions involved;<br>• upgrade the scheme to allow the purchase of statistical transfers of RES from the other EU Member States or payments to the Union mechanism for financing renewable energy sources in order to meet the national obligations of the RES share. |
| | AN URE | ✓ | | | |
| | AN OVE | ✓ | | | |
| | OP EKP | | | | |

[68] See also energy efficiency measures, which also include some measures on renewables.

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| **Investment incentives to promote electricity generation from RES** | OP TGP<br>AN URE<br>pAN OVE<br>OP EKP | <br><br>✓<br>✓ | economic (financial incentives) | MzI, SVRK, Eco fund, MOP | **Continue implementation, including in the next financial period:**<br>• promote investments in promising and commercially viable RES projects (wind, solar, geothermal, etc.) in companies, stimulate necessary research and innovation and raise public awareness of the importance of the transition to RES [in 2022]. |
| **Self-supply of electricity from RES** | OP TGP<br>AN URE<br>pAN OVE<br>OP EKP | <br><br>✓<br> | set of instruments (regulation, financial incentives) | MzI, EDP, Eco fund, MOP | **Continuation and upgrade of the instrument:**<br>• remove administrative barriers (simplify and accelerate approvals, etc. taking into account energy, environmental and tax legislation and technical regulations and guidelines) [in 2021];<br>• harmonise the instrument with EU legislation (costs and benefits of using networks, adjusting production and consumption, or sharing or damping surpluses, etc.) [in 2021];<br>• provide fiscal incentives in the form of incentives for self-sufficiency and RES investments [in 2022]. |
| **Promoting the construction of large HPP** | OP TGP<br>AN URE<br>AN OVE<br>OP EKP | <br><br>✓<br> | regulations, set of instruments (planning, financing) | MOP, MzI | **Continuation and upgrade:**<br>• supplement the regulations for more efficient (less administratively burdensome) and sustainable placement of facilities, including the possibility of making a positive decision at the strategic (planning) level on interventions that have a significant environmental impact, to enable such interventions overriding public benefits under the law [in 2021];<br>• to anticipate the continued use of hydro-electric power in Slovenia in water management plans and to ensure the implementation of a valid programme of water management measures for the construction and operation of hydro-electric power interventions [in 2021];<br>• to draw up an analysis of the alternatives and specificities of hydro-electric power and the necessity of its use in order to achieve the goal of climate-neutral Slovenia by 2050 [in 2021];<br>• align the rules governing the supremacy of public benefit in protected areas with EU law and EU case law [in 2021];<br>• continue the initiated pre-investment activities in the area of exploring the possibility of using RES;<br>• accelerate the preparation of spatial plans for multi-purpose strategic national infrastructure and energy projects: to draw up professional bases for the preparation of national spatial plans (DPNs) and management of siting procedures (even when the investor is not yet known);<br>• reinforce the capacity for project preparation and implementation; |

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| | | | | | • reinforce early public involvement in the preparation (participatory planning) and the implementation of projects. |
| **Noise protection due to the operation of wind farms** | pAN OVE | ✓ | regulation | MOP, MzI | **Continuation and upgrade:**<br>• examine and, if necessary, upgrade existing legislation on sound pollution by adopting regulations on the limits or distances of wind farms to the closest protected buildings (infra-red, low frequency and audible sound area) [in 2021];<br>• to determine the conditions and restrictions to be taken into account when placing WPP in the area [in 2022] in relation to noise. |
| **Technical criteria, procedures and tariffs for connection of RES units to the grid** | pAN OVE | ✓ | Technical regulation | SODN, MzI | **Continuation and upgrade:**<br>• distribution operator establishes investor routing to locations where no major network investment is required (location mapping, etc.) [in 2021];<br>• typing, transparency, simplifying procedures, and shortening the time required to complete the connection [in 2021];<br>• promote appropriate integration of RES into buildings, space and the energy system [in 2021];<br>• non-discriminatory calculation of network usage costs, proactive resolution of necessary network reinforcement problems, etc. [in 2022]. |

***Table 25: Review of existing instruments to promote the development of district heating and cooling systems for RES and surplus heat***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Effective district heating systems - the mandatory share of RES, CHP and surplus heat in district heating systems** | OP TGP | | regulations | MzI, Energy Agency | **Set ambitious binding targets by 2030 [in 2021]**<br>• to increase the share of RES and surplus heat by at least 1%, in accordance with Directive (EU) 2018/2001. |
| | AN URE | | | | |
| | OP EKP | | | | |
| | AN OVE | ✓ | | | |
| | PRP | | | | |
| **Promoting the development of DH systems on RES within the framework of the OP EKP** | OP TGP | | economic (financial incentives) | MzI, SVRK | **Provide the necessary funding for the sustainable overhaul of the DH systems [in 2021]:**<br>• increasing efficiency and competitiveness (optimisation of operations, expansions, etc.);<br>• increasing the use of RES and surplus heat ;<br>• promotion of CHP in DH systems;<br>• linking sectors (energy storage, power2heat, etc.) |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | pAN OVE | ✓ | | | |
| | PRP | | | | |
| **Promoting the development of DH systems on RES under the Rural development programme [PRP]** | OP TGP | | economic | MKGP | **Encourage the development of DH micro-systems on RES** (wood biomass, geothermal energy, surplus heat , etc.) [2020–2030]. |
| | AN URE | | | | |
| | OP EKP | | | | |
| | pAN OVE | ✓ | | | |
| | PRP | ✓ | | | |

*Table 26: Proposal for additional measures to promote electricity generation from RES*

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **The country's proactive role in identifying and locating environmentally friendly locations for hydro and wind energy and other RES** | set of instruments (planning, financing) | MzI, MOP | • With the participation of all key stakeholders, define criteria and locally identify areas for the more efficient deployment of RES generating facilities, including protected areas and the possibility of carrying out public benefit overriding processes:<br>○ determine the directions to be considered in planning;<br>○ produce a 'study of the potentials, suitability of exploitation and vulnerability of resources to identify optimal locations for RES use in the light of the latest data';<br>○ direct investment preparation in environmentally, socially and economically acceptable locations;<br>and the design of the study and the possible identification of sites for more efficient positioning does not preclude or withhold the use of other sites for this purpose, in accordance with the law [in 2021]<br>**Stakeholder training/information:**<br>• a review of EU good practices on spatial planning in protected areas and training of all stakeholders [in 2021].<br>**Improving legislation:**<br>• drafting guidelines for the implementation of public interest domination in the Slovenian legal order in practice with the technical assistance of the European Commission [2021];<br>• evaluation of environmental legislation with a purpose of simplifying spatial planning procedures [2020-2021]. |
| **Incentives for better network integration of RES generating devices and adaptation of consumption** | regulations | MzI | **Establishing appropriate incentives or economic signals for:**<br>• network integration of RES at locations with higher electricity consumption (all consumed at the site) or by connection to the MV network; |

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| | | | • local adaptation of production and consumption and participation in system services and establishment of a decentralised - local flexibility market (preferably integrated with other organised markets to maximise liquidity) on low and medium voltage networks (investment promotion and integration of energy storage systems in the flexibility market, dynamic network tariffing for feeders, including negative tariffs, etc.) [in 2021]. |
| **Promoting local energy communities** | economic | MzI, SVRK, MGRT | **Establishment of a scheme to promote the development of local energy communities (*inter alia* under the ERDF) [in 2022]**, including technical and human resources support for the implementation of the scheme and other projects at the local level |
| **Incentives for faster development of the RES community** | set of instruments (regulations, financing, awareness-raising) | MzI, Energy Agency, distribution companies with operator | • analysis and removal of legislative barriers;<br>• simplifying and speeding up the necessary procedures (one-stop-shops) [in 2021];<br>• financial instruments (green bonds, etc.) [in 2021];<br>• support for the preparation of major joint projects in high-power locations (all consumed on-site) [in 2021];<br>• promotion, raising awareness and training [in 2022]. |
| **Encouragement of investments and technologies for the conversion of electricity surplus from RES and the connection of networks for energy storage purposes** | economic | MzI, SVRK | **Establishment of an incentive scheme to encourage investment in technologies for the conversion of electricity surplus from RES and the integration of energy storage networks alongside conversion under the ERDF [in 2022]**. |
| **Reinvesting part of the profits of energy companies in sustainable energy projects and increasing the share of RES or increasing the capacity and expansion of the electricity distribution network for RES integration** | economic (government investment management) | MzI, MF | • preparation of the bases for the mandatory reinvestment of at least 15% of the net profit of the fiscal year of majority state-owned energy companies for the realisation of investment projects approved by the relevant managing authorities, for increasing the production of electricity from RES or for increasing the capacity and expansion of the electricity distribution network for RES integration. |
| **Promoting multi-purpose use of geothermal energy (GE)** | economic (financial incentives),regulations | SVRK, MOP, ARSO, MGRT, MKGP and MZI | **Formation of a working group (SVRK, MKGP, MOP, MZI and MGRT) to address the current issue of GE utilisation:** |

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| | | | • drafting the necessary legislative changes to remove obstacles [in 2021];<br>• creation of interactive maps of geothermal potential, on the basis of which priority areas for investment incentives could be identified;<br>• Investment incentives to build wells (including re-injections) by returning water to the aquifer as much as possible [in 2021];<br>• investment incentives for efficient GE cascading systems and the preparation of a pilot project for the use of GE for electricity production [in 2022];<br>• setting up monitoring of deep geothermal aquifers (including cooperation with neighbouring countries) and producing maps of sites suitable and unsuitable for GE exploitation [in 2022]. |

Other instruments for promoting RES are listed in the dimension of energy.

## 3.2 'Energy Efficiency' Dimension

### 3.2.1 Industry

*Table 27: Overview of existing instruments in industry*

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| PROMOTION OF EEU AND RES MEASURES IN INDUSTRY IN GENERAL | | | | | |
| **Financial incentives in the form of industry grants** | OP TGP | ✓ | economic (financial incentives) and support activities | Eco fund, MGRT, SID Bank, MOP | **Continuation and improvement of implementation:**<br>• further reinforcing the promotion of industrial action (BAT technologies, etc.) through grants; preparation of targeted support mechanisms, including for promoting energy contracting [2020-2030]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | pAN OVE | | | | |
| **Non-refundable financial incentives for EEU and RES measures in industry** | OP TGP | ✓ | economic (financial incentives) and support activities | Eco fund, MzI, MGRT, MOP | **Continuation and improvement of implementation:**<br>• further development of the EEU and RES incentive scheme in industry (BAT technologies, etc.) within the framework of the Eco fund incentives and EU funds; expanding the range of measures, increasing the volume of resources, supporting activities [2020-2030]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | pAN OVE | ✓ | | | |
| PROMOTION OF MEASURES FOR CERTAIN TARGETS OR TECHNOLOGIES | | | | | |
| **EEU and RES incentives for SME** | OP TGP | ✓ | economic (financial incentives) | SVRK, MGRT Eco fund, MOP | **Continuation and improvement of implementation:**<br>• develop a scheme to promote EEU and RES measures in SME, focusing in particular on removing obstacles to the implementation of SME-related measures [2020-2030]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | pAN OVE | | | | |
| **Incentives for the introduction of energy management systems** | OP TGP | ✓ | economic (financial incentives) and support activities | Energy Agency, Eco fund, MOP | **Continuation and improvement of implementation:**<br>• promoting the introduction of energy management systems [2020-2030]. |
| | AN URE | ✓ | | | |
| | OP EKP | | | | |
| | pAN OVE | | | | |
| NON-ETS INDUSTRY - PROCESS EMISSIONS | | | | | |
| **Reduction of F-gas emissions from stationary sources** | OP TGP | ✓ | regulations, training | MOP, ARSO | **Continuation and improvement of implementation:**<br>• Continue implementation of measures [2020-2030]. |
| | AN URE | | | | |
| | OP EKP | | | | |
| | pAN OVE | | | | |
| **Reduction of F-gas emissions from mobile air conditioners** | OP TGP | ✓ | regulations | MzI | **Continuation and improvement of implementation:** |
| | AN URE | | | | • Continue implementation of measures [2020-2030]. |

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| | OP EKP | | | | |
| | pAN OVE | | | | |

See also multi-sectoral and RES measures.

### 3.2.2 Buildings

**Instruments in the building sector will be supplemented and upgraded as appropriate in accordance with the new DSEPS.**

***Table 28: A review of existing instruments for the building sector***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| PROMOTING ENERGY EFFICIENCY AND RENEWABLE ENERGY USE IN BUILDINGS IN GENERAL | | | | | |
| **Amendments and supplements of regulations for the energy efficiency of buildings** | OP TGP<br>AN URE | ✓<br>✓ | regulation | MOP, MzI | **Continued implementation of the instrument:**<br>• ensure that the new Rules on efficient use of energy in buildings (PURES) are implemented as quickly as possible, also taking into account the guidelines in the new DSEPS [in 2020]. |
| **Renovation of cultural heritage buildings and other specific groups of buildings** | OP TGP<br>AN URE<br>OP EKP | ✓<br>✓<br>✓ | set of instruments | MzI, SVRK, MK | **Continuation and upgrade of implementation of the instrument:**<br>• to implement as soon as possible the full implementation of the measure from the new DSEPS and to develop criteria for determining the eligible costs for the sustainable energy renovation of these groups of buildings [in 2021];<br>• provide cohesion funding tailored to these target groups (e.g. also in separate calls for tender or calls) [in 2022];<br>• the energy renovation of cultural heritage buildings shall take due to the account of measures under the DSEPS to improve energy efficiency. |
| **Energy Contracting (EPO)** | OP TGP<br>AN URE<br>OP EKP | ✓<br>✓<br>✓ | economic | MzI, SVRK, SID Bank | **Continuation and upgrade of implementation of the instrument [in 2023]:**<br>• design appropriate financial products for EPO service providers;<br>• support the development of EPO through appropriate support measures, for example:<br>– training,<br>– additional expert and technical assistance in project preparation,<br>– quality assurance programme for EPO projects,<br>– preparation of tools for evaluation of EPO projects, etc.;<br>• extend the instrument from the public sector to other sectors, in particular, the housing sector; |

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| | | | | | • Establish a mechanism to promote the emergence of energy service companies, with particular attention to SME (SID Bank, etc.). |
| **Creating sustainable criteria for buildings** | AN URE | ✓ | planning | MOP, MzI | **Continuation and upgrade of implementation of the instrument [in 2023]:**<br>• establish an appropriate regulatory environment for the sustainable evaluation of buildings (establishment of a system, certification scheme, training, maintenance of systems, financing);<br>• to draw up the bases for the promotion and financing of sustainable renovation and the extension to the sustainable renovation of buildings (which, in addition to energy renovation, also takes into account all other important criteria for the renovation of buildings: earthquake and fire safety, radon issues, etc.);<br>• carry out model projects for the sustainable renovation of public buildings. |
| PROMOTING ENERGY EFFICIENCY AND RENEWABLE ENERGY USE IN BUILDINGS IN HOUSEHOLDS | | | | | |
| **Household energy efficiency aid scheme for vulnerable population groups** | OP TGP<br>AN URE<br>OP EKP | ✓<br>✓<br>✓ | economic (financial incentives) and support activities | MzI, Eco fund, ENSVET, MOP, MDDSZ [Ministry of Labour, Family & Social Affairs] | **Continuation and upgrade of implementation of the instrument [in 2023]:**<br>• to start promoting EEU measures as quickly as possible in 500 low-income households under the OP EKP [in 2020];<br>• improve the involvement of relevant institutions to improve the reach of the ZERO project;<br>• reinforce support activities that will increase the availability of incentives to the poorest households, including through intensive, high-incentive, replacement of old combustion plants with wood biomass and fossil resources;<br>• develop criteria for the selection of beneficiaries of financial incentives and extend their selection to recipients of emergency social assistance and social security benefits, where this has not yet been done, and to pensioners;<br>• to create a comprehensive energy efficiency improvement scheme, which would also be complemented by investment funds based on completed energy audits within the ZERO project;<br>• ensure the systematic involvement and coherence of energy poverty reduction instruments and their long-term implementation; |

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| | | | | | • improve monitoring of the implementation of energy poverty reduction instruments and their effects, including by simplifying and upgrading the impact assessment tool within the ZERO project;<br>• integrate energy poverty into the broader development and housing policy scheme. |
| **Financial incentives for energy efficiency and RES use in residential buildings** | OP TGP<br>AN URE<br>OP EKP<br>AN OVE | ✓<br>✓<br>✓<br>✓ | economic (financial incentives) | MzI, MOP, Eco fund, MKGP, MK | **Continuation and upgrade of implementation of the instrument (from 2021 to 2030):**<br>• draw up a financial plan for promoting household action, including identifying sources of funding, incentive mechanisms and measures to remove key barriers, and organising promotion and provision of assistance;<br>• provide incentives for project preparation in the housing sector (by encouraging applications for technical assistance from EU institutions or through a home scheme);<br>• launch demonstration projects; in this context, start as soon as possible the implementation of the project of comprehensive energy renovation of multifamily buildings in accordance with the criteria of near-energy renovation foreseen for co-financing under the OP EKP;<br>• to develop an instrument of fiscal incentives in the form of incentives to make investments in energy efficiency, reduction of energy end-use and RES supply, in accordance with the new DSEPS [in 2022];<br>• within the framework of the operation of the Eco fund:<br>– ensure that the planned measures are carried out as uniformly and in a targeted manner as possible,<br>– simplify administrative procedures for the allocation of incentives,<br>– identify other barriers for increasing the implementation of measures in households (e.g. level of incentive) and to draw up a response to them,<br>– analyse the potential for EEU and RES measures achievable through incentive mechanisms in this sector,<br>– in cooperation with MzI, develop and draw up new financial instruments for the housing sector,<br>– jointly with local energy agencies (LEA) and ENSVET develop new business models for the energy renovation of residential buildings, e.g. complete renovation of neighbourhoods, |

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| | | | | | – jointly with Borzen, ensure coordinated and targeted awareness-raising and information on RES and household use of RES;<br>• ensure that the Eco fund's incentives are also more targeted at achieving the target share of RES, thereby ensuring the additional generation of heat and cold from RES in the housing sector in line with RES objectives;<br>• develop a mechanism for RES subsidies in areas where the gas distribution network will not be implemented for several years [in 2022].<br>• other measures to increase efficiency. |
| **Renovation financing instruments for multi-owner buildings** | OP TGP<br>AN URE | ✓<br>✓ | economic regulations | Eco fund, MzI, SVRK, MOP | **Continuation and upgrade of the implementation of the instrument** (also within the framework of the C4C project):<br>• design and adopt a legislative framework for the implementation of the instrument; |
| | | | | | • to implement the necessary measures of the *Resolution on the National Housing Program* relating to obtaining consent for the implementation and crediting of energy renovation projects for multi-household buildings [from 2021]. |
| **Mandatory division and calculation of heat costs in multi-household buildings** | OP TGP<br>AN URE | ✓<br>✓ | regulation | MzI | **Continued implementation of the instrument:**<br>• an upgrade of the current regulation [in 2022]. |
| **Energy Advisory Network - ENSVET** | OP TGP<br>AN URE | ✓<br>✓ | informing/raising awareness | MzI, Eco fund, MOP | **Continuation and upgrade of implementation of the instrument:**<br>• developing the instrument to the extent of the new DSEPS and enhancing the operation of the ENSVET network, including the extension of corporate consultancy [from 2021]. |
| **Energy efficiency rebate schemes: Eco fund loans and incentives from other green home loan providers for the housing sector** | OP TGP<br>AN URE | ✓<br>✓ | economic | Eco fund, MOP, commercial banks | **Continued implementation of the instrument:** [from 2021]<br>• establishment of new financial instruments in accordance with the new DSEPS. |
| **Sharing incentives between owners and tenants in multi-household buildings** | AN URE | ✓ | regulation, incentives | MzI, MOP | **Ensure implementation of the instrument:**<br>• the establishment of an instrument in accordance with the new DSEPS [in 2022]. |
| **Establishment of a guarantee scheme** | AN URE | ✓ | economic (financial incentives) | Eco fund, MzI, SVRK, MOP | **Ensure implementation of the instrument:** |

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| | | | | | • setting up the instrument in accordance with the new DSEPS [in 2022]. |
| PROMOTING ENERGY EFFICIENCY AND RENEWABLE ENERGY USE IN PUBLIC SECTOR BUILDINGS | | | | | |
| **Energy management in the public sector** | OP TGP<br>AN URE | ✓<br>✓ | other (monitoring, reporting and support activities) | MzI, MJU, MP | **Upgrade the regulation and the public sector energy management system to:**<br>• ensure, in accordance with the requirements of the EZ-1, continuous monitoring of energy use and implementation of measures in the public sector, including the setting of targets at the level of a public building or institution;<br>• set ambitious targets for the use of RES in public buildings to be a 'public sector model' and provide the necessary incentives for faster development (financial, contracting, etc.). [in 2021].' |
| **Public sector energy efficiency return schemes** | OP TGP<br>AN URE | ✓<br>✓ | economic | Eco fund, MOP, MzI | **Continuation and upgrade of implementation of the instrument:**<br>• to improve the monitoring of the effects of loans received (Eco fund, etc.) to reduce energy use and GHG emissions and increase RES energy production [in 2023]. |
| **Non-repayable investment financial incentives for energy rehabilitation of public sector buildings aimed at increasing the share of projects implemented through energy contracting** | OP TGP<br>AN URE<br>OP EKP | ✓<br>✓<br>✓ | economic (financial incentives) | MzI | **Continuation of implementation of the instrument in accordance with the new DSEPS, *inter alia* [from 2021]:**<br>• ensure the continuity of grants to stimulate investments in the energy renovation of public buildings and, in this context, by properly planning tenders or inviting as smooth and predictable a timetable for the implementation of investments as possible, including advanced management of systems in and on buildings;<br>• Encourage project preparation within the ELENA international technical assistance funding for the energy renovation of buildings in the wider and wider public sector and reinforce the education and training activities of all those involved in the preparation and implementation of energy renovation projects for buildings;<br>• focus energy renovation of buildings more on comprehensive energy renovation and, in this context, explore the various possible organisational forms of a business entity (e.g. setting up a public energy services/energy contracting company) that will, in future, carry out comprehensive renovations in the public sector, including sustainable renovations. |
| | OP TGP | ✓ | set of instruments | | |

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| **Ensure quality of building energy renovation projects in the public sector** | AN URE | ✓ | | MzI, project office | **Upgrading of the building energy renovation quality assurance system** [since 2021]<br>• ensure upgrading of the building renovation quality assurance system in the framework of a structured stakeholder cooperation process, certification of contractors and processes, education or training of stakeholders, and ensuring the leading role of the public sector through the implementation of a quality system in public sector building renovation projects. |
| **Project office for energy renovation of public buildings** | AN URE<br>OP EKP<br>AN OVE | ✓<br>✓<br>✓ | other (organisational measure) | MzI | **Continuation and upgrading of the implementation of the instrument in accordance with the new DSEPS [in 2021]**<br>• provide adequate human and financial resources to perform additional office tasks;<br>• intensify the preparation of energy renovation projects for public buildings, especially state-owned buildings, by developing a scheme that will provide incentives for project preparation, as well as by raising awareness and training of those responsible for energy renovation at all levels of preparation and implementation projects in buildings of the narrower and wider public sector, founded by the Republic of Slovenia;<br>• incentives under the calls/invitations of the OP EKP to be more targeted also at achieving the target share of RES, thereby ensuring additional heat production from RES in the public sector in line with the RES objectives;<br>• consider whether additional incentives are needed to exploit RES in the public sector, e.g. within the framework of the Eco fund incentives and from the funds of the Climate Change Fund. |

### *Table 29: Additional instruments for the buildings sector*

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **Restricting the use of fossil fuels for heating in buildings** | regulations | MzI | **Preparation of a new instrument [in 2021]:**<br>• Prohibit fuel oil in new buildings in 2021 at the latest, and sell and install new fuel oil boilers in 2023;<br>• identify priorities for heating and cooling sources and technologies at NEPN next update, in accordance with the completed assessment of potentials for efficient heating and cooling (by the end of 2020 in accordance with Article 14 of the Energy Efficiency Directive) and the Heating and Cooling Strategy [in 2024]. |
| **Develop a financing plan for the sustainable renovation of buildings** | planning | MzI, MOP | **The plan will be made under the C4C project [in 2021]** |
| **Establishment of a portal of energy properties of buildings** | other (information platform) | MzI | **Preparation of a new instrument [in 2024]:**<br>• Establish a portal for the energy performance of buildings based on all available, including emission, data, which will provide comprehensive spatial insight into the state of buildings and the issues of emissions and enable quality planning of measures;<br>• monitor particulate matter emissions (PE10 and PE2.5) and ensure air quality. |

### 3.2.3 Transport

***Table 30: Overview of existing sustainable transport instruments - general measures[69]***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Integrated transport planning at the local and regional level with a regional level of mobility management** | OP TGP | ✓ | planning | MzI, MOP, Eco fund | The continuation and accelerated implementation of the instrument also in the coming financial period - upgrading integrated transport strategies (IPS) of municipalities into regional strategies with a focus on improving the organisation of public transport. [in 2021]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| **Mobility management measures** | OP EKP | ✓ | other (organisational) | MzI, municipalities | **Continuation and accelerated implementation of the instrument**<br>• carry out pilot projects under the Sustainable Parking Policy measure, urban traffic restriction and the use of modern mobility management technologies [in 2022]. |
| | ReNPRP30 | ✓ | | | |
| **Incentives to use modern technologies to effectively manage mobility** | OP EKP | ✓ | economic (financial incentives) | MzI | **The continuation and accelerated implementation of the instrument in the coming financial period, including the introduction of digitisation in transport** [2022-2025], including:<br>• single maritime window;<br>• digital road transport documents (EFTI Directive, e-CMR);<br>• electronic toll service etc.;<br>• the establishment of a multimodal route data system that would include, in addition to public passenger transport, alternative modes of transport in cities, including data on services designed or adapted for the handicapped and parking; establishment of urban traffic optimisation systems with public priority passenger transport, cyclists and pedestrians; establishing access systems for travel information for the user, including computerisation of parking management;<br>• establishment of records of public e-chargers in the spatial information system. |

69 Most of the actions will be analysed and upgraded as part of the activities of the LIFE C4C project.

| | | | | | |
|---|---|---|---|---|---|
| | AN URE | ✓ | | | |
| **Promoting a sustainable choice of transport in the context of the calculation of compensation for transport costs to work** | OP TGP | ✓ | economic | MDDSZ, MzI, MJU | **Finding an appropriate sustainable solution to the calculation of compensation for transport costs to work in dialogue with social partners and civic initiatives** to promote greater use of PPP and other forms of sustainable mobility [in 2020]. |
| | AN URE | ✓ | | | |
| **Promoting sustainable mobility measures/informing and raising public awareness** | OP TGP | ✓ | Informing /promoting /raising awareness | MzI | **Continue, reinforce and accelerate the implementation of the instrument** to reach the widest possible public and change travel habits [2020-2030]. |
| | AN URE | ✓ | | | |
| **Sustainable mobility in the context of spatial planning; Infrastructure for sustainable mobility at the regional level and in cities** | OP TGP | ✓ | planning | MOP | **Continued implementation of the instrument:**<br>• **integration of CPS and Municipal Spatial Plans** (MSP) with careful consideration of accessibility in spatial planning - integration at the regional level [in 2024];<br>• **reallocation or concentration of activities** to increase the use of PPP for commuting by 20%: enforce at the national level (SPRS), regions (regional plan) and municipalities (municipal plan and MSP); the key role of the Ministry of the Environment and Spatial Planning is within its competences (SPRS, national spatial order) and MzI (transport infrastructure planning) to simultaneously ensure accessibility of public transport [in 2025]. |
| | AN URE | ✓ | | | |
| **Coordination of sustainable mobility development** | OP TGP | ✓ | other (organisational measure) | MzI | **Improving the coordination of all actors to achieve greater synergies** [in 2020]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | ReNPRP30 | ✓ | | | |

***Table 31: Overview of existing instruments for promoting public passenger transport***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Subsidising public passenger transport services** | OP TGP | ✓ | economic (financial incentives) | MzI | **Continuation of the instrument for Increasing the Accessibility and Competitiveness of PPT [2020-2030].** |
| | AN URE | ✓ | | | |
| | ReNPRP30 | ✓ | | | |
| **Concessions for the provision of commercial, public passenger transport services** | OP TGP | ✓ | economic | MzI | **Further development and application of the concession model for the provision of public passenger transport services in the area of road and rail transport:**<br>• with a strategic approach to intermodality, promote coherence and coordination and thus the competitiveness of public transport in all concession areas in the Republic of Slovenia [in 2022]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | ReNPRP30 | ✓ | | | |
| **Integrated Public Passenger Transport System (IPPT)** | OP TGP | ✓ | other (organisational) | MzI | **Further development of IPPT:**<br>• **the creation of a public passenger transport system operator [in 2020];**<br>• establishing a single ticket throughout Slovenia's public transport area [in 2020];<br>• timetable adjustments [in 2021];<br>• setting up information platforms [in 2021]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | ReNPRP30 | ✓ | | | |
| **Incentives for the regulation of public passenger transport infrastructure** | OP TGP | ✓ | economic (financial incentives) | MzI, municipalities | **Intensive continuation and upgrade of the instrument:**<br>• to provide incentives for the arrangement of infrastructure for public passenger transport, covering renovations, upgrades and new constructions in the areas of rail and bus systems, multi-modal passenger hubs with the inclusion of micro-mobility [in 2022]. |

***Table 32: Overview of existing instruments for the promotion of sustainable rail and freight transport***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| PROMOTION OF SUSTAINABLE RAILWAY AND FREIGHT TRANSPORT | | | | | |
| **Improvement of railway infrastructure** | OP TGP<br>AN URE<br>OP EKP | ✓<br>✓<br>✓ | economic (financial incentives) | MzI | **More intensive investment in the development of the railway network to increase its use for passenger and freight transport**, in accordance with the current investment plan for transport and transport infrastructure: [2020–2030] |
| | ReNPRP30 | ✓ | | | • upgrade and increase of corridor capacity:<br>  ○ Kamnik–Ljubljana;<br>  ○ Kranj–Ljubljana;<br>  ○ the corridor south-east of Ljubljana;<br>  ○ connecting Ljubljana with the airport;<br>  ○ the area of Ljubljana railway stations (two-lane, Tivoli arch, the arrangement of the Ljubljana passenger centre);<br>• upgrading lines to meet TEN-T standards and increase capacity:<br>  ○ Koper–Ljubljana;<br>  ○ Divača–Sežana (ITA);<br>  ○ Postojna–Ilirska Bistrica–Spajane (CRO);<br>  ○ Maribor–Šentilj (AT) -> in production;<br>  ○ Pragersko–Maribor;<br>  ○ Zidani Most–Pragersko;<br>  ○ Ljubljana–Jesenice (AT);<br>  ○ Ljubljana–Zidani Most;<br>  ○ Zidani Most–Dobova (CRO);<br>  ○ Pragersko–Hodoš (HUN);<br>  ○ electrification of regional lines;<br>  ○ other lines (study);<br>• rolling stock renewal (passenger and freight);<br>• development of stations;<br>• draw up an action plan for electrification of rail transport, organisation of electrified rail transit;<br>• to set up a digital platform that integrates all public transport options and enables the efficient review and organisation of rail transport. |

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| **Other measures to promote co-modality** | AN URE<br>ReNPRP30<br>SDR | ✓<br>✓<br>✓ | set of instruments | MzI | **Continue and intensify implementation to increase the connectivity of all forms of transport:** [2020–2030]<br>• to include external costs in tolls and other freight charges [in 2024];<br>• promote the use of intermodal transport units;<br>• update and develop intermodal terminals, etc.;<br>• build P + R parking lots: Ljubljana (25–30), Maribor (6–10) [in 2025];<br>• the proactive involvement of actors in the various fields of transport, both road and rail infrastructure;<br>• to study and introduce new toll policies with a view to the operation of shifting traffic flows to railways and suburban PPT and relieving daily road traffic [in 2025]. |
| **Improving the efficiency of road freight transport** | AN URE<br>ReNPRP30 | ✓<br>✓ | set of instruments | MzI | **Continue implementation** - develop IT and other solutions to improve traffic management and road utilisation: [2025]<br>• the use of electronic toll collection for freight vehicles also as a traffic management tool (e.g. during peak times to reduce congestion and emissions, night time to reduce noise, etc.);<br>• examining and gradually charging external freight costs (as a potential source for the infrastructure fund) in accordance with EU law [in 2021];<br>• to introduce a stable source of financing and to establish an electronic toll-free traffic flow;<br>• increase the burden on trucks;<br>• to ensure an adequate standard of existing road infrastructure (including secondary and tertiary level road reconstruction). |
| INCENTIVES TO IMPROVE VEHICLES EFFICIENCY, DRIVING AND OCCUPANCY OF VEHICLES AND USE OF FUELS WITH LOW $CO_2$ EMISSIONS | | | | | |
| **Promoting the efficiency of vehicles and the use of low-emission fuels in the context of** | OP TGP | ✓ | tax policy | MF – tax on motor vehicles,<br>MZI – other charges | **Continuation and targeted updating of the instrument:**<br>• amend and supplement the Motor Vehicle Tax Act, updating it to a more progressive scale for CO2 taxation |

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| **motor vehicle tax and other charges** | AN URE | ✓ | | | rates and introducing progressiveness in the annual road use tax [in 2020];<br>• further, promote the replacement of the worst-performing vehicles and the selection of the most efficient new vehicles (redesign and more intensive implementation of instruments) [in 2021]. |
| **Vehicle fuel use and tire marking information** | OP TGP | ✓ | regulations, information/ raising awareness | MOP, MzI | **Continuation of implementation:**<br>• information on life-cycle impact assessment and vehicle-specific emissions reductions. |
| | AN URE | ✓ | | | |

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Promoting rational driving** | OP TGP | ✓ | training, education, information, promotion, raising awareness | MzI | **Continued implementation and development of new innovative approaches:** [in 2022]<br>• new mobile apps for performance monitoring,<br>• examining the possibility of lowering permitted speeds on motorways,<br>• incentives for insurance, deletion of penalties, etc. |
| | AN URE | ✓ | | | |
| **Mandatory share of renewable energy in motor transport** | OP TGP | ✓ | regulations, tax policy | MzI, MF | **Continuation of implementation:** [2020–2030]<br>• removal of all technical and other obstacles [in 2022];<br>• a sustainable orientation towards advanced biofuels and H2 (including on rail), including a change in the model of liquid fuel price regulation;<br>• sustainable orientation towards the introduction of RES gases in CNG and LNG filling stations. |
| | AN OVE | ✓ | | | |
| **Financial incentives for alternative fuels and e-mobility infrastructure** | OP TGP | ✓ | economic (financial incentives) | MzI, MOP, Eco fund | **Intensive continued implementation:**<br>• intensively implement AP AGvP measures [in 2020],<br>• to carry out a demonstration project or several projects for the construction of charging infrastructure for occupants of multi-household buildings [in 2020],<br>• to draw up [in 2021] and to adopt a regulation for embedding e-charging plants in condensed residential neighbourhoods and larger apartment blocks and towers,<br>• standardise connection standards and the development of advanced charging services [in 2022];<br>• directing investors to fast-charging infrastructure to locations where no major network investment is needed (possible mapping locations for fast charging stations) [in 2021]. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | AP AGvP | ✓ | | | |

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Financial incentives for low CO2 emission vehicles** | OP TGP | ✓ | economic (financial incentives) | MzI, MOP, Eco fund | **Intensively implement and adjust instruments to market conditions:**<br>• gradually lower vehicle incentives (2020-2025) annually and set an upper limit for the value of the vehicle for eligibility, incentives for the faster purchase and greater impact of the instrument [in 2020];<br>• additional incentives for decommissioning an old vehicle [in 2021];<br>• urban electrification incentives (PPT - buses, taxis) [2020];<br>• incentives for active sustainable mobility [in 2021]. |
| | AN URE | ✓ | | | |
| PROMOTION OF NON-MOTORISED FORMS OF TRANSPORT | | | | | |
| **Promoting the construction of cycling infrastructure** | OP TGP | ✓ | economic (financial incentives) | MzI, MOP, Eco fund | **Continued implementation in the next financial period:**<br>• priority for daily urban mobility and commuting. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | ReNPRP30 | ✓ | | | |
| **Promoting the construction of pedestrian infrastructure** | OP TGP | ✓ | economic (financial incentives) | MzI, municipalities | **Continued implementation in the forthcoming financial period** |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | ReNPRP30 | ✓ | | | |

*Table 33: Additional sustainable transport policy measures*

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **Provision of additional resources for faster and more intensive development of railway infrastructure - as a priority, before the expansion of the motorway network capacity.** | economic (budgetary and EU funds) | MZI, MF, SVRK | **Define a new concept for financing sustainable transport infrastructure** to provide the necessary public financial resources (e.g. infrastructure fund) for accelerated planning, positioning (preparation of DPN, etc.), and the construction of a modern rail and other sustainable transport infrastructure [in 2021]. |

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|---|---|---|---|
| **Faster development of sustainable mobility** | economic (financial incentives)regulations | MZI, Municipalities | • **Develop a strategy for the development of public passenger transport [in 2021];**<br>• **develop the national cycling strategy** [in 2022].<br>• **Draw up measures to encourage co-travel** - providing system support and increasing the occupancy rate of commuting vehicles by at least 30% ('park and drive together' parking lots, providing parking spaces for high occupancy vehicles, etc.) [in 2021];<br>• **update the concepts and schemes of urban passenger transport** (Ljubljana, other cities) to improve the quality and accessibility (tact etc.) [in 2020];<br>• **to introduce express buses on motorways** and roundabouts on the Ljubljana ring [in 2021];<br>• **provide incentives for the introduction of new public transport services** (upon request, etc.) - to provide PPT with new services in urban areas where there is insufficient demand for the introduction of scheduled services [in 2021];<br>• **establish changes to the concept of parking standards [in 2022]:**<br>– establish restrictions on the use of parking spaces (not a minimum but a maximum number of parking spaces is specified);<br>– limit long-term parking by increasing the cost of long-term parking, especially for work: higher prices (+ 30%), elimination of the possibility of extension from a distance, etc.);<br>• **introduce fees for entry into a city** where efficient public transport is in place: carry out a comprehensive survey of the introduction of 'increased costs for entry into the city', draw up appropriate legislative solutions, identify the recipient and the purpose of the funds raised [2025];<br>• **promote work from home:** make a comprehensive analysis and provide incentives for introducing work from home to reduce the way to work by at least 10% (legislative solutions, etc.) [in 2023];<br>• **promoting the creation of sustainable mobility plans** for public sector bodies and businesses promoting the use of PPT and reducing the use of passenger cars, including the abolition of free parking spaces for civil servants [in 2023];<br>• **to establish a digital platform** that will promote all possibilities of public passenger transport, forms of co-travel and the search and development of new sustainable mobility business models; |

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| | | | • arrange micro-mobile hubs on city gates. |
| **Development and production of cleaner energy sources and alternative fuels** | economic | MzI, SVRK | **Establish incentives in the next financial period for the production of advanced biofuels** (liquid and gaseous) from biomass and synthetic biofuels [in 2022]. |

### 3.2.4 Multi-sectoral measures for raising awareness and informing

***Table 34: Overview of implementation of other multi-sectoral measures***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Assessment of the potential of efficient heating and cooling** | AN URE | ✓ | planning | MzI | **Make a comprehensive assessment of the potential of efficient heating and cooling in accordance with the Energy Efficiency Directive** (Article 14 and the recast Annex VIII) **[by the end of 2020].** |
| **Heating and cooling strategy, the action plan for district heating and cooling, heat map** | AN URE | ✓ | planning | MzI | **Develop a comprehensive heating and cooling strategy in Slovenia based on the Assessment of Effective Heating and Cooling Potentials and the Care4climate Professional Basis:**<br>• clear medium and long-term goals and guidelines for heating and cooling [in 2020];<br>• identify measures for the area of heating and cooling based on a comprehensive heating and cooling strategy [in 2021];<br>• create a heat map and establish a uniform and up-to-date collection of databases and necessary tools to support local planning (LEK, SECAP, etc.) [in 2022];<br>• establish an information platform for building and renovation stakeholders that would significantly contribute to the successful implementation of a long-term renovation strategy and the reduction of energy poverty [in 2023]. |
| | OP TGP | ✓ | other (energy services) | | **Continuation and upgrade of implementation of the instrument:** |
| | AN URE | ✓ | | | |

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| **Obligations of energy suppliers to achieve final energy savings for final customers** | AN OVE | | | MZI, Energy Agency, energy suppliers | • continue to improve the monitoring of the implementation of the scheme and ensure the conditions for its stable functioning (improving the quality and availability of data reported by taxpayers, verifying taxpayers' reporting on savings, increasing the volume of transport savings, etc.);<br>• revise methods for calculating energy savings in real-time and eliminate irregularities that could lead to unrealistically high savings and therefore, their low price in the market, etc. [2020–2030]. |
| **Eco loans with a subsidised interest rate on environmental investments** | OP TGP<br>AN URE<br>AN OVE | ✓<br>✓ | economic | MOP, Eco fund | **Continuation and upgrade of implementation of the instrument:**<br>• improve the credit monitoring system to ensure that all necessary information on the effects of the investments made by sector and year is made available [in 2021]. |
| **Regulations in the fields of air protection and the use of best available techniques** | OP TGP<br>AN URE<br>AN OVE | | regulations | MOP | **Continuation and upgrade of implementation of the instrument:**<br>• improve conditions for the professional functioning of chimney sweeps, introduce professional supervision of chimney sweeps, prepare additional training for chimney sweeps [in 2022]. |
| **Spatial planning instruments for the transition to a climate-neutral society** | OP TGP<br>AN URE<br>AN OVE | ✓<br>✓ | planning, policy, regulations | MOP, MJU, MZI | **Continuation and upgrading** of activities related to the renewal of strategic documents, legislation and spatial planning procedures to reduce the need for mobility and efficient use of energy, etc.:<br>• preparation of the Spatial Development Strategy of Slovenia until 2050 (SPRS) [in 2021] and the Action Program for the Implementation of the SPRS;<br>• other local and regional planning legislation. |
| **Energy and environmental labelling and minimum standards for products and appliances** | OP TGP<br>AN URE<br>OP EKP<br>AN OVE | ✓<br>✓ | regulations | MZI, Market Inspectorate of the Republic of Slovenia, Infrastructure Inspectorate of the Republic of Slovenia | **Continuation and upgrade of implementation of the instrument:**<br>• Enhance the promotion, awareness and literacy of users (comprehensibility of data, effects over the lifetime of the product, etc.) [in 2021]. |

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| **Informing and raising awareness of the target public** | OP TGP | ✓ | informing, raising awareness | MZI, MKGP, MOP, MDDSZ | **Continue and improve implementation [2020-2030]:**<br>• **to draw up and carry out a comprehensive national promotion and literacy campaign on the importance and mode of transition to a climate-neutral society [in 2020], e.g.:**<br>  ○ themed ads on TV and web content,<br>  ○ organisation of thematic events (kindergartens, schools, universities, local communities, non-governmental organisations, etc.),<br>  ○ climate week (3rd week of October);<br>• periodically monitoring the awareness of different sectors and target groups and using the findings to upgrade policies and actions;<br>• better targeting activities (e.g. measures that are not implemented or are poorly implemented or have problems, for example, the absorption of some Eco fund resources) [in 2021],<br>• maintain the continuity of successful awareness and literacy campaigns (not just one-off campaigns),<br>• raising awareness and educating users of wood biomass plants about the right fuel and proper way of burning,<br>• raising awareness and training of RES and EEU vendors and installers, building managers, energy managers, etc.,<br>• thematic training of target occupational groups on EEU and RES technologies (fire-fighters, ambulances, chimneys, etc.). |
| **Monitoring the implementation of actions and policies** | | | monitoring | MZI, MOP, ARSO | **Continuation and upgrade of the implementation monitoring system:**<br>preparation of comprehensive reports on NEPN implementation [15 March 2023, then every two years],<br>• comprehensive reporting of GHG emissions policies, measures and projections [15 March 2021, then every two years],<br>• regular preparation, upgrading and establishment of new energy management indicators [in 2021]. |

## 3.3 Energy Security Dimension

***Table 35: Proposal for additional instruments in the area of energy security***

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **Creating energy and climate council** | government advisory body | MOP, MzI | **Monitor implementation and strategic decision making in the transition to a climate-neutral society [in 2020]:**<br>• monitor the implementation of the NEPN, i.e. achievement of the objectives and implementation of the set policies and instruments of NEPN,<br>• submit positions and make recommendations to the Government of the Republic of Slovenia regarding the improvement of the implementation of the NEPN,<br>• the functioning of the world is properly aligned with climate policies. |
| **Preparation of an Act on the closure of PV** [Velenje Coal Mine] **and an Act on region restructuring** | legislation | MZI, MOP, MGRT | • Draw up a long-term national strategy, including a roadmap for a just plan for the early closure of the Velenje Coal Mine (PV) and the abandonment of coal at Šoštanj TPP, and the restructuring and development transition of the coal regions [in 2020];<br>• to draw up a law on the closure of the Velenje Coal Mine (PV) and a law on the restructuring of the region [in 2021];<br>• to examine the possibilities for Slovenia's inclusion in the Modernisation Fund, in accordance with the ETS Directive and for access to more favourable financing conditions with the European Investment Bank and other international financial institutions [in 2021]. |

## 3.4 Internal Energy Market Dimension

***Table 36: Proposal for additional instruments in the area of energy infrastructure, energy transmission infrastructure, market integration and energy poverty***

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **Providing conditions for further integration of markets and construction of necessary infrastructure** | Economic, legislative | MZI, MOP, Energy Agency, ELES, distribution companies with operator, Gas pipelines | • Actively support the acquisition of funding and the implementation of planned and new cross-border projects [2021-2030];<br>• to reinforce participation in European research projects in the area of new advanced technologies, the market, quality assurance of infrastructure, energy storage, positioning, staff training, participatory planning, etc. [2021–2030];<br>• Encourage the involvement of stakeholders to undertake joint demonstration projects ('Power2Gas', biomass gasification, energy storage, advanced system services, etc.) [2021–2030];<br>• promoting the development of national platforms for regulating the stability of electricity supply as a result of the integration of a number of new RES, the provision of self-supporting connections, the involvement of numerous aggregators [2021-2030];<br>• creation of a national platform for stable electricity grid by connecting local smart grids at the national level, which will enable monitoring and insight into the actual current generation and consumption of Slovenia's electricity at all times [2021-2030];<br>• developing a national approach to integrating thermal infrastructure and integrating into other sectors at the local and national level [in 2022];<br>• to explore the possibilities of simplifying the positioning procedures for the accelerated development of the electricity distribution network [in 2021]. |
| **Ensuring conditions for effective market development** | Economic incentives, elimination of normative barriers | MZI, Borzen, distribution companies with operator, Energy Agency, Eco fund, MOP | • Developing the Flexibility Market by introducing pilot platforms for Flexibility Trading and producing studies of integrating the new market with existing organised markets [in 2021];<br>• development, testing and deployment of new business models and services in connection with new roles in the |

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| | | | market (active customer, aggregator), in particular with regard to controlling the operation of the distribution network: development of services for the implementation of non-frequency system services on distribution networks (independent aggregation) [in 2021];<br>• to revise the NMS deployment plan by 2025 by taking into account the requirements of EU legislation and technological development [in 2021] and to implement the NMS on the basis of an updated plan [in 2023];<br>• encourage investment in certain advanced client devices (advanced bottling firms, storage tanks, etc.) [in 2020];<br>• launch campaigns to raise customer awareness of their more active role [2020-2025];<br>• ensure the establishment of centralised, standardised data services based on measurement data from NMS in B2B and B2C domains (national data hub) to promote the competitiveness and participation of active customers in the energy market. |
| **Ensuring the conditions for accelerated development of the electricity distribution network** | economic | MZI, Energy Agency, distribution companies with operator, SVRK | • Establish targeting of RES investments and electric vehicle charging stations in areas where no major additional investments are needed in the network (mapping of areas with options for generating electricity from RES and for on-site consumption, proximity to TS and DTS, etc.). [in 2020];<br>• promote RES investments in combination with local storage of adequate capacity in PDS areas where RES integration is problematic [in 2020];<br>• upgrade the methodological approach to distribution network planning and carry out a study on a new approach to the construction of medium- and low-voltage networks [in 2021];<br>• determine, where appropriate, financial resources to increase investments in the electricity distribution network, e.g. in the form of a specific contribution to the adaptation of the distribution network for the transition to a climate-neutral society, to integrate more heat pumps, accelerate the deployment of e-mobility and integrate renewable electricity generation facilities;<br>• a renewed regulatory framework for development-oriented networking that will provide sufficient resources to cover all eligible operating and maintenance costs and an adequate |

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| | | | regulated return on the assets that make up electricity infrastructure [in 2021];<br>• a renewed regulatory framework for network charging that will adequately support the development and achievement of climate targets [in 2021];<br>• to provide the conditions or the enabling environment for the transition from pilot or demonstration projects (or research and innovation) to the phase of investment in new technologies, due to the above activities in connection with the new approach to planning and action plans [in 2022];<br>• encourage the involvement of electricity distribution companies, transmission and distribution operators in order to establish effective coordination mechanisms for efficient market purchasing of flexibility (system services) [in 2022]; |

| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| | | | • amending the statutory provision to allow the EDP management and control bodies to create more other reserves from profits, which would mean even more of the company's own resources earmarked for additional investments in electricity infrastructure [in 2021];<br>• provide access to 'green' EU funds (under the cohesion policy of the 2021-2027 financial period) to adapt the electricity distribution network to the transition to a climate-neutral society [in 2022]. |
| **Development incentives for decarbonisation of gas supply** | legislative, economic | MZI, Borzen, Energy Agency | • Encourage early implementation of pilot projects (Power 2 gas, biogas injection, etc.) for the construction of renewable gas production units in the natural gas network [in 2021];<br>• analyse and implement incentive tax and excise policies to promote decarbonisation in gas supply [in 2021];<br>• prepare a regulatory and support environment for renewable gas in the natural gas network [in 2022];<br>• determine the target shares of RES gas in the grid by 2030 in the next NEPN update based on an analysis of the results of pilot projects, market developments and market conditions and the regulatory and supportive environment for the supply of renewable gas to the gas network [in 2024]. |
| **A supportive environment for alleviating energy poverty** | the legislature, action plan | MDDSZ, MZI, SVRK, MOP | • To define energy poverty and the obligation to periodically measure the energy poverty dimension (estimates of the number of energy-poor households in the country) by 2021 [in 2021];<br>• define clearly how energy poverty is measured based on the definition of energy poverty - define an operational definition to statistically measure the phenomenon that will enable the measurement of energy poverty and set a measurable target in future [in 2021];<br>• based on the measured indicator in the baseline year, to set energy indicators for the future in the area of energy poverty, with the aim of not increasing energy poverty despite the planned measures in the energy and climate field [in 2021]; |

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|---|---|---|---|
| | | | • keep under review whether existing general social and housing policies and targeted energy poverty measures are meeting the target;<br>• Develop an action plan to tackle energy poverty, improve and increase the range of instruments available and, if necessary, identify additional measures [in 2022]. |

## 3.5 Research, Innovation and Competitiveness Dimension

***Table 37: Overview of the implementation of instruments in companies***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| NON-REFUNDABLE FINANCIAL INCENTIVES FOR RESEARCH AND INNOVATION AND THE MARKET SALES OF LOW-CARBON TECHNOLOGIES AND PRODUCTS | | | | | |
| **Promoting research and innovation for the transition to a climate-neutral society** | OP TGP | ✓ | economic (financial incentives), demonstration | MGRT, SVRK, MIZŠ, SID bank | **Continue and improve implementation [2020-2030]:**<br>• more targeted research and innovation (including in the humanities, social sciences and social sciences) that contribute to the achievement of long-term climate goals;<br>• increase the volume of funds and provide them also in the forthcoming financial period (predictability and continuity of instruments) and continue development of various financial instruments (e.g. SID Bank);<br>• encourage Slovenian companies to apply for research and innovation projects;<br>• Consider supporting Slovenia's cooperation with the EIT Climate - KIC in the Deep Demonstration project. |
| | AN URE | | | | |
| | OP EKP | ✓ | | | |
| | AN OVE | | | | |
| **Encouraging companies to move to a climate-neutral society** | OP TGP | ✓ | economic (financial incentives) | SVRK, MGRT | **Continue and improve implementation [2020-2030]:**<br>• to plan and coordinate planned actions to achieve long-term climate goals (development of new targeted instruments monitoring implementation);<br>• to support the introduction of new green technologies and technological restructuring of enterprises developmentally;<br>• increase the volume of funds and provide them in the next financial period (predictability and continuity of instruments);<br>• to support further cooperation of companies in the Slovenian-Japanese partnership in the area of smart grids and smart communities with the Agency for New Energy and Industrial Technologies NEDH. |
| | AN URE | | | | |
| | OP EKP | ✓ | | | |
| | AN OVE | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Financial incentives for demonstration projects** | OP TGP | ✓ | economic (financial incentives) | MGRT, MOP, MZI | **Improving implementation [2020-2030]:**<br>develop a scheme to promote innovation and demonstration projects in the fields of EEU, RES, solutions for the transition to a climate-neutral and circular economy and other measures to reduce GHG emissions in industry; in this context, priority should be given to projects promoting the use of surplus heat , the production and use of low-carbon fuels (synthetic gas, H2, recycled carbon fuels, etc.), the generation of geothermal electricity, cascading use of heat and cold, EEU measures, smart grids, and communities, measures to improve the material efficiency of RES used in industry;<br>• to consider appropriate organisational forms of successful implementation of demonstration projects;<br>• to establish incentives for Slovenian companies to apply for EU tenders for development and demonstration projects. |
| | AN URE | ✓ | | | |
| | OP EKP | ✓ | | | |
| | AN OVE | | | | |

***Table 38: Overview of implementation of training and education instruments***

| Name of instrument | Strategic basis | | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|---|---|
| **Promoting training and staffing** | OP TGP | ✓ | training | SVRK, MZI, MKGP, MOP, MGRT, Eco fund, MIZŠ, MDDSZ | **Continue and improve implementation [2020-2030]:**<br>• systematically monitor the implementation of appropriate training for company employees and develop a single evaluation system or a single methodology for assessing the effects of such training;<br>• to reinforce and train the staff of the competent ministries, public funds and agencies responsible for project monitoring, in particular by recruiting new staff with the relevant skills needed to move to a climate-neutral society. When planning new employment, the Law on the Implementation of the Budgets of the Republic of Slovenia is taken into account;<br>• to include MIZŠ and educational institutions (universities, etc.). |
| | AN URE | ✓ | | | |
| | AN URE | ✓ | | | |
| | OP TGP | ✓ | education, training | | **Continue and improve implementation [2020-2030]:** |

| | | | | | |
|---|---|---|---|---|---|
| **Planning and developing training for the transition to a climate-neutral society** | AN URE | | | MOP and relevant ministries | • reinforce the promotion of the transition to a climate-neutral and circular economy by focusing on the necessary skills and quality jobs that create higher added value, significantly reduce adverse environmental impacts, provide adequate conditions for adequate pay and a quality working environment - in particular in the areas of:<br>○ raising awareness and educating civil servants on opportunities to promote a climate-neutral and circular economy and create quality jobs;<br>○ transfer of good state promotion practices from other countries;<br>○ providing an example of public administration and actively promoting it with the ZeJN (Public Procurement Act);<br>○ systematic updating of school and study programmes to improve knowledge relevant for the transition to climate-neutral and circular economy;<br>○ to train, within the educational process, staff who will have the relevant skills needed to move to a climate-neutral society, with an emphasis on technical and natural sciences, where the biggest gap is between supply and demand for such personnel while integrating with social sciences;<br>○ other activities within the Care4climate project for specific audiences. |
| | | | | | ○ move to a climate-neutral society, with an emphasis on technical and natural sciences, where the biggest gap is between supply and demand for such personnel while integrating with the social sciences;<br>○ other activities within the Care4climate project for specific audiences. |

| | | | | | |
|---|---|---|---|---|---|
| **Integrating climate content into the wider process of education and care development** | OP TGP | ✓ | education, training | MIZŠ | **Continue and upgrade implementation [2020-2030]**<br>• motivating and changing behaviours and consumer habits;<br>• sustainable climate development of society, etc. |

### *Table 39: Proposal of additional instruments in the area of basic and applied research*

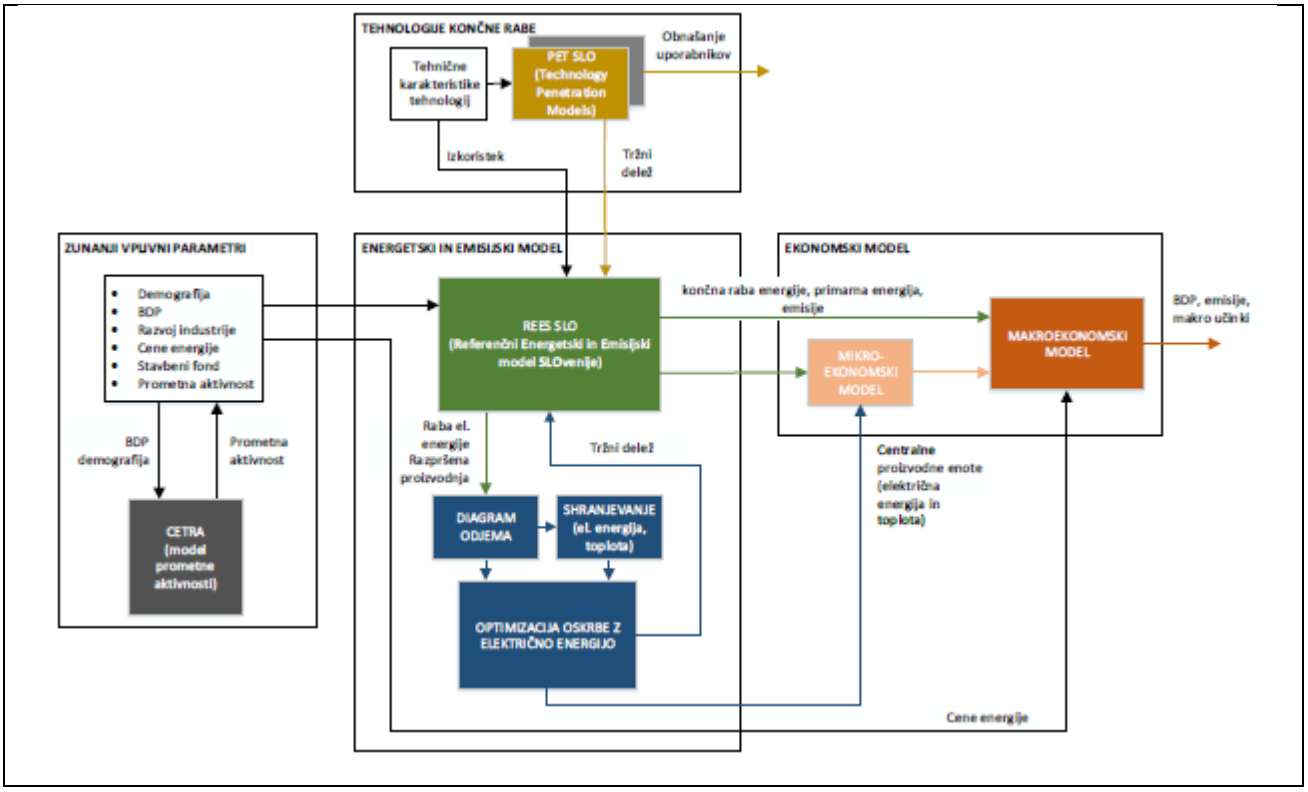
| Name and description of the instrument | Type of instrument | Responsibility | Activities and deadlines |
|---|---|---|---|
| **Increasing R&D funding to support the transition to a low-carbon society (RES and EEU and other low-carbon technologies, energy storage, smart grids, recycling, material efficiency, etc.)** | economic (financial resources, incentives, tax policy) | MIZŠ, MOP, MZI, MF, SVRK, ARRS, MGRT | **Increase public R&D spending to at least 1% of GDP by 2030** with a particular focus on supporting the transition to a climate-neutral society:<br>• **at least double (if possible) ARRS funds for the implementation of targeted research projects (TRP) by 2023;**<br>• **to draw up a long-term targeted research programme to support the transition to a climate-neutral society** [MOP], which will ensure continuous implementation of TRP and support to ministries in the fields of energy, low-carbon technologies, the circular economy, sustainable agriculture and forestry, social sciences, etc. (co-financing is also programmed from the Climate Fund - at least 1% annually) [in 2021];<br>• **increase the scope of ARRS multidisciplinary research** programmes on the transition to a climate-neutral society [in 2021];<br>• **at least 4% of the climate fund funds (annual inflows) in each programme are earmarked for research into the transition to a climate-neutral society,** which also includes reinforcing the institutions responsible for the distribution of these funds - the guidelines, priorities and areas are specified by the Ministry of the Environment and Spatial Planning (MOP), then as per the MOP guidelines the money is distributed by the ARSS according to its rules [in 2021];<br>• **to draw up a new Research and Innovation Strategy of Slovenia (RISS), taking into account the achievement of the goals of a climate-neutral society**, which will identify key research priorities and ensure stable and long-term financing of research (MZI, MOP, MIZŠ) [in 2023];<br>• **to develop new instruments for accelerated cooperation between R&D institutions and the economy** (public and private sector R&D and the creation of competitive conditions for innovative research in public enterprises) and joint involvement in international projects [in 2023];<br>• **further, encourage state-owned companies with knowledge and experience in project management to take the lead in establishing R&D polygons/platforms.** Polygons/platforms are run by state-owned companies and bring together universities, research institutions and agencies. Joint projects generate targeted innovations that change technologies, train new staff, etc. [in 2021]. |

# SECTION B: ANALYTICAL BASIS

## 4. CURRENT SITUATION AND PROJECTIONS WITH EXISTING POLICIES AND MEASURES

The central tool used in this analysis to calculate energy balances, emissions and costs of energy use and supply in Slovenia is a reference energy-ecological model called REES-SLO, created in the MESAP environment in the form of a linear network model of processes and interconnections, which enables consistent modelling of energy consumption based on energy service needs and calculations of sectoral energy, economic, environmental and other impacts. A reference model of an energy system is essentially a set of programmes and tools that mathematically describe an individual subsystem in the interdependence of all the variables that affect such a subsystem, and then integrate those subsystems into an appropriate whole that represents the real energy system. Modern energy system models, as represented by the REES-SLO model, use an integrated approach, combining the characteristics of specific and general models so that sectoral energy, economic and environmental impacts can be assessed. A schematic illustration of the overall concept and interconnections of the individual models used to calculate the 2030 climate and energy targets is shown in the figure below.

***Figure 14: Schematic representation of the whole concept and the interactions of each model for calculating climate and energy targets for 2030***



# 4.1 Expected development of the main exogenous factors affecting the energy system and GHG emission trends

## i. Macro-economic projections (GDP and population growth)

### Economic development

In the period before the economic crisis, Slovenia achieved relatively high rates of economic growth. Between 2000 and 2003, the average GDP growth rate was 3.5%, while in the period 2004-2008, it was 4.9%. With the economic crisis, GDP growth already slowed down in 2008 and contracted sharply in 2009 (-7.5%). The rapid deterioration of the situation in the national and international environment was most evident in the decline in exports and investment, which have been key drivers of economic growth in recent years. After modest GDP growth in 2010 and stagnation in 2011, Slovenia again entered a period of negative growth in 2012, which continued in 2013. From 2014 to 2019, positive values of GDP growth were once again recorded, mainly due to increased exports. The average GDP growth rate in the period 2014-2018 was 3.4%.

***Table 40: Annual change in the volume of gross domestic product per year in the period 2005 - 2018***

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Annual change in volume (%)** | 3.8 | 5.7 | 7.0 | 3.5 | -7.5 | 1.3 | 0.9 | -2.6 | -1.0 | 2.8 | 2.2 | 3.1 | 4.8 | 4.1 |

With high rates of economic growth, in the pre-crisis period Slovenia was coming gradually closer to the average EU development level as measured by GDP per capita in purchasing power, and in 2008 it was only 10% behind the EU-28 average. From the start of the economic crisis in 2008, Slovenia was in the group of the EU Member States whose GDP per capita fell the most. In Slovenia, in 2018, it was 87% of the EU-28 average, or two percentage points more than in 2017. The last time the indicator was at this level was in 2007. In terms of this indicator in 2018, the Czech Republic and Cyprus were closest to Slovenia, at 10% or 11% below the EU-28 average.

In the structure of GDP, the share of services is slowly increasing due to the declining share of industry. The share of industry, which accounted for around 27% of GDP in 2000-2008, dropped below 24% over the next five years, in particular due to the sharp decline in construction, but rose slightly again by 2018. In 2016, the share of industry was 24.7% of GDP (manufacturing 20.2% and construction 4.5%).

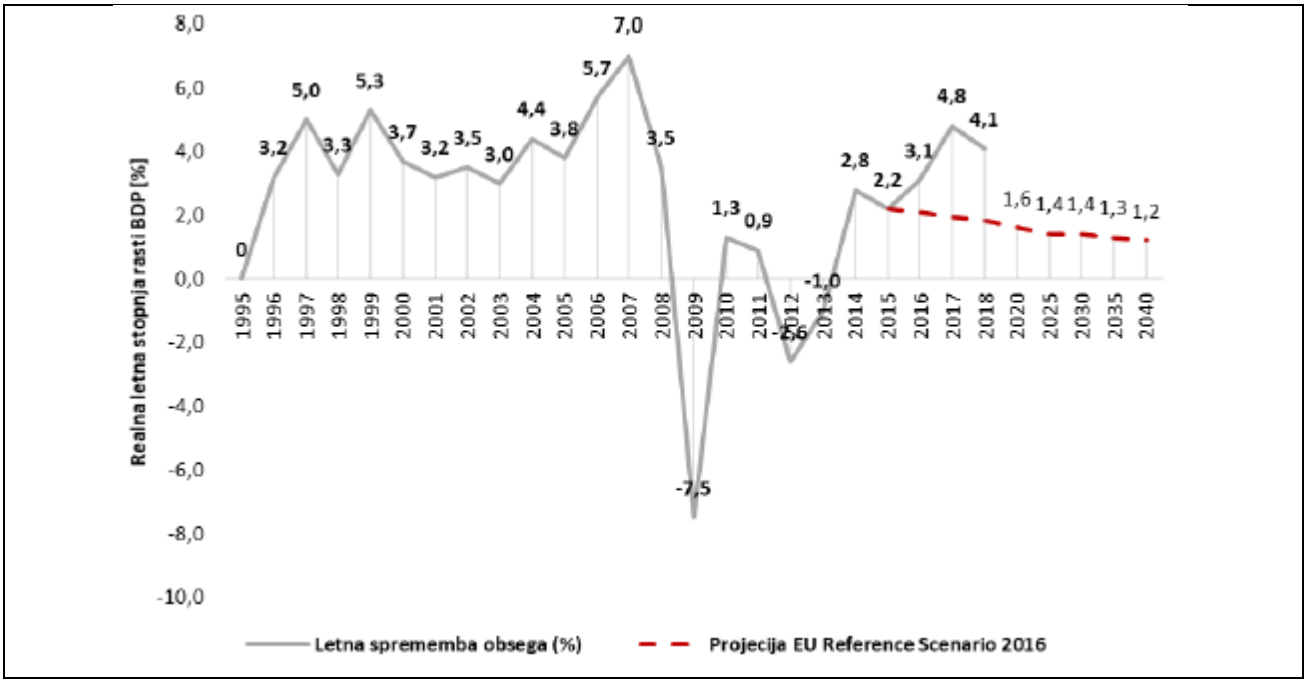
In the baseline year 2017, GDP amounted to EUR 40.132 million (constant prices, reference year 2010), with an average annual change in volume of 4.8% this year. Manufacturing generated EUR 8 867 million in added value (current prices), which is 20.6% of GDP in this year.

GDP amounted to EUR 41 784 million in 2018 (constant prices, reference year 2010), with an average annual change in volume of 4.1% this year. In 2018, the share of industry was 25.4 % of GDP (manufacturing 20.4 % and construction 5.0 %).

For the calculations of energy and emission balances up to 2030, 2040 and 2050 respectively, the results of GDP projections were taken into account using the GEM-E3 model in the reference scenario also used by the Commission[70]. In line with the economic growth projections, the average annual GDP growth in the target scenario for the analysed period up to 2050 is shown in the figure below.

[70] P. Capros et al., EU Reference Scenario 2016: Energy, transport and GHG emissions: Trends to 2050, European Commission, 2016. (available at: https://ec.europa.eu/energy/sites/ener/files/documents/20160713%20draft_publication_REF2016_v13.pdf).

***Figure 15: Real GDP growth rates, source: SORS and projections***




Key to Figure 15:

| | |
|---|---|
| Realna letna stopnja rasti BDP | Real annual GDP growth rate |
| Letna sprememba obsega, | Annual change in volume (%) |
| Projekcija EU Reference Scenario | EU Reference Scenario Projection |

Source:
P. Capros et al, EU Reference Scenario 2016 Energy, transport and GHG emissions Trends to 2050

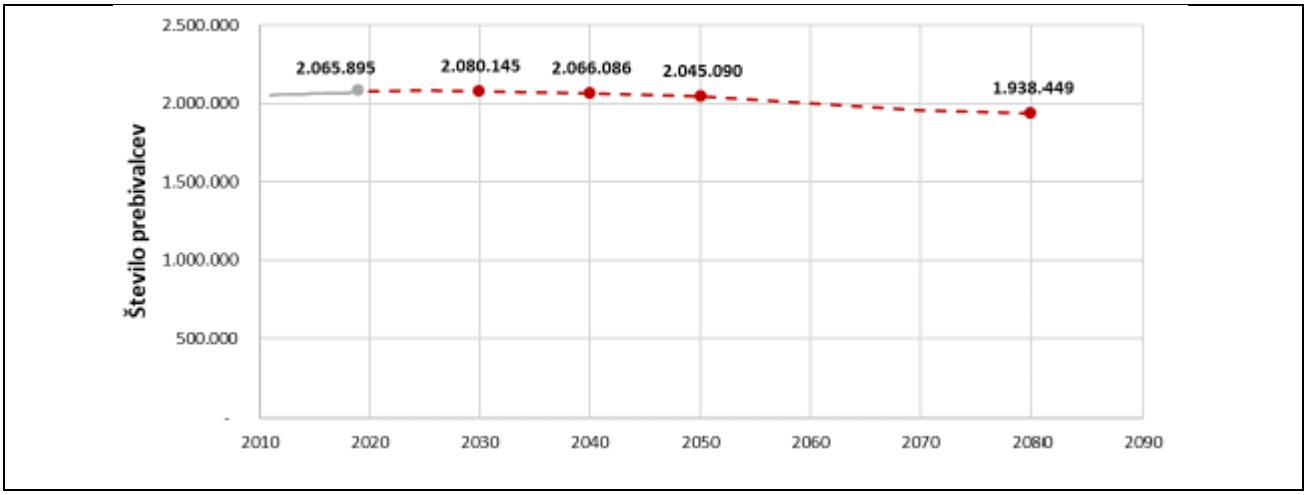
For the calculation of the scenarios, we used the recommended values of the annual volume changes in the analysis, i.e. the values given by the EU Reference Scenario 2016.

## Population

In cooperation with Eurostat and national statistical offices, population projections were made for Slovenia up to 2080[71]. The population of Slovenia is expected to increase by 2025 (to about 2 083 000) and then the population will begin to decline slowly. According to EUROSTAT, Slovenia is expected to have a population of about 1 938 000 in 2080, which is 6% less than in the initial year of these projections i.e. in 2015 (see figure below). In 2017, Slovenia had a population of 2 065 895. Population projections in the analysis influence the need for new housing. Thus, in 2030 there would be 2 089 092 inhabitants in Slovenia, while in 2040 there is already a decrease, as in accordance with the projection in Slovenia there will be 2 066 086 inhabitants.

71 https://ec.europa.eu/eurostat/data/database.

***Figure 16: Population projection in Slovenia***




Key to Figure 2: Population

Source: Eurostat, 2015

## ii. Sectoral changes expected to affect the energy system and GHG emissions

The reasons for the major sectoral changes that will affect the energy system and GHG emissions, which are also taken into account in the design of energy use models for the calculation of energy and emission balances, are mainly:

- priority consideration of the principle of energy efficiency in all sectors considered;
- the transition to electricity (where it is technologically feasible and sustainable in the long term);
- increasing use of RES (where it is technologically feasible and sustainable in the long term).

The following are the leading parameters for the sectors concerned, namely for buildings, transport and industry, and briefly summarise the current situation.

### Buildings

According to SORS data, in January 2018, there were 2 028 084 inhabitants in 824 618 private households in Slovenia. The number of collective households increased (from 435 to 497), but the population numbers living in them are not significant (35 439). Most lived in homes for the elderly (18 000), student housing (10 700) and social welfare institutions for children, young persons and the elderly (4 400).

As population growth declines after 2025, the average size of households will also begin to decline, although the total number of households will continue to increase. In the baseline year 2017, average household size was 2.51 members per household, while in 2030 it will be 2.42. Ten years later, in 2040, it will be further reduced to 2.33, with 860 141 households in 695 560 inhabited dwellings. There were 800 780 households in the baseline year 2017 and 833 964 are projected for 2030.

The surface area of buildings and their overall growth is key to understanding the energy performance of building stock. The floor area of apartments being heated is taken into account. Building stock is divided into single- and multi-household buildings. It is anticipated that the growth of new housing will continue at the same level as in previous years up to 2030, and then decline slightly by 2040. The total floor area of apartments will thus amount to almost 68 million $m^2$ in 2030.

The total area of non-residential building stock was 23.5 million $m^2$ in 2017. Growth in the area of buildings up to 2030 and 2040 is projected to be about the same as it was previously according to statistics and real estate register data. The total area of buildings will thus be 27.6 million $m^2$ in 2030 and 30.3 million $m^2$ in 2040.

## Transport

The projection for transport depends on various factors that stimulate transport. These factors can be external or internal, and the individual factors are also influenced by the policies and strategies adopted. External factors are: population numbers and age structure, the level of motorisation, patterns of settlement, employment, growth of gross domestic product, job numbers and geographic distribution, domestic and international trade, domestic and international tourism. In addition, freight traffic is also affected by the projected increase in throughput in the ports of Koper, Trieste and Rijeka, as well as the expected future number of passengers at Fraport Slovenia airport. The projection of demand in the transport model is mainly based on future European socio-economic conditions.

Domestic transport depends, on the one hand, on the conditions influenced by Slovenian regional centres in connection with their gravitational hinterland or specific Slovenian characteristics, and on the other hand, on global processes that also affect Slovenia. As a country whose territory is small, Slovenia is even more dependent on the external environment than others. Therefore, the internal transport model includes both the territory of Slovenia and its area of direct influence. External transport depends mainly on globalisation processes and the European characteristics covered by the external model. The internal and external models are strategic and include the interdependence between settlements, socio-economic and transport conditions as well as between the parts of the transport system.

The above factors contribute to an increase in transport activity since it has not yet been possible to separate economic growth and transport growth. Transport growth measures are presented in passenger kilometres for passenger transport and tonne-kilometres for freight. The table below shows projections up to 2040 showing the movement of vehicle transport activities (road and rail). The existing measures scenario envisages a continuation of the past trend, while the scenario with additional measures envisages a significant increase in cycling and pedestrian traffic, and additionally it is envisaged that circular economy measures will reduce the need for raw materials and products, impacting on reduced freight transport. Providing transport for the necessary transport activities represents a further opportunity to reduce energy consumption and GHG emissions through increased use of public passenger transport, increased occupancy of vehicles, use of alternative vehicles, etc.

## Industry

We used data on production to date as the leading input parameter of the model for industry (baseline year 2017). The projection was drawn up in accordance with forecasts based on the current development of industrial sectors, the situation in the baseline year 2017 and past trends. Manufacturers' expectations of future trends were also taken into account, as well as guidelines and trends drawn from professional literature and international studies. For energy-intensive industries, we prepared projections of the physical product in physical units (kt) for the following sectors: C17 - production of paper and paper products, C23 - production of non-metallic mineral products and C24 – production of metals, excluding sector C20 – the production of chemicals and chemical products, said projections being calculated in monetary units (value-added). Other industrial sectors were considered in aggregated form, the leading parameter being added value in monetary units.

The table below shows the main influencing parameters in the REES-SLO energy sector reference model by sector. For all sectors, except for the transport sector, we used the same leading model parameters for both scenarios, i.e. the existing measures [EM] and NEPN scenarios, while in transport we changed the transport activity (passenger- and tonne-kilometres), adjusting the level of activity in the more demanding NEPN scenario with additional measures.

*Table 41: Main influencing parameters of the REES-SLO reference energy emission model by sector*

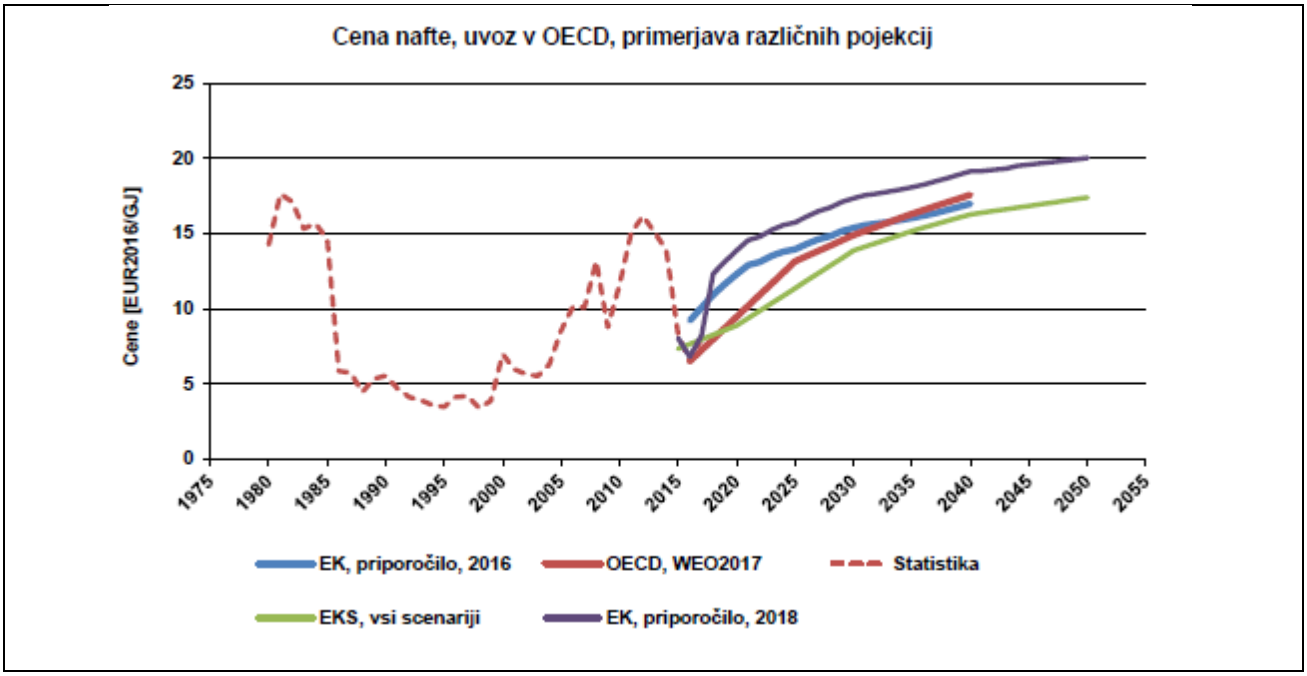
| | Unit | 2017 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| **Buildings** | | | | | | | |
| Number of households | [] | 800 780 | 802 531 | 820 052 | 833 964 | 846 906 | 860 141 |
| Area | [million m2] | 87.23 | 89.70 | 91.98 | 94.60 | 96.22 | 97.80 |
| Households | [million m2] | 63.74 | 64.65 | 65.82 | 66.97 | 67.22 | 67.47 |
| Services | [million m2] | 23.49 | 25.05 | 26.16 | 27.63 | 29.01 | 30.34 |
| **Transport: EM scenario** | | | | | | | |
| Pkm | [mil. pkm] | 47 790 | 49 610 | 52 982 | 56 354 | 59 285 | 62 373 |
| Domestic vehicles | [mil. pkm] | 29 715 | 31 732 | 33 968 | 36 204 | 38 108 | 40 116 |
| Foreign vehicles | [mil. pkm] | 18 075 | 17 878 | 19 014 | 20 149 | 21 177 | 22 257 |
| Tkm | [miL. tkm] | 56 629 | 60 334 | 72 897 | 85 460 | 94 355 | 104 175 |
| Domestic vehicles | [mil. tkm] | 37 755 | 38 890 | 47 111 | 55 332 | 61 092 | 67 450 |
| Foreign vehicles | [mil. tkm] | 18 874 | 21 444 | 25 786 | 30 127 | 33 263 | 36 725 |
| **Transport: NEPN scenario** | | | | | | | |
| Pkm | [mil. pkm] | 47 790 | 49 126 | 52 099 | 55 075 | 55 635 | 56 300 |
| Domestic vehicles | [mil. pkm] | 29 715 | 31 732 | 33 968 | 36 204 | 38 108 | 40 116 |
| Foreign vehicles | [miL.pkm] | 18 075 | 17 688 | 18 633 | 19 578 | 19 578 | 19 578 |
| Tkm | [million tkm] | 56 629 | 59 501 | 71 230 | 82 959 | 87 191 | 91 639 |
| Domestic vehicles | [million tkm] | 37 755 | 38 458 | 46 248 | 54 037 | 56 793 | 59 690 |
| Foreign vehicles | [million tkm] | 18 874 | 21 043 | 24 982 | 28 922 | 30 398 | 31 948 |
| **Industry** | | | | | | | |
| **A physical product** | | | | | | | |
| C17 | 2017=1 | 1.00 | 1.02 | 1.03 | 1.05 | 1.06 | 1.08 |
| C23 - cement | 2017=1 | 1.00 | 1.01 | 1.03 | 1.05 | 1.07 | 1.09 |
| C24 | 2017=1 | 1.00 | 1.03 | 1.07 | 1.08 | 1.09 | 1.10 |
| Primary aluminium | 2017=1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Secondary aluminium | 2017=1 | 1.00 | 1.10 | 1.21 | 1.34 | 1.53 | 1.63 |
| **Added value** | 2017=1 | | | | | | |
| C20 | 2017=1 | 1.00 | 1.01 | 1.02 | 1.04 | 1.07 | 1.09 |
| C23 - Other | 2017=1 | 1.00 | 1.00 | 1.06 | 1.13 | 1.18 | 1.23 |
| C - other | 2017=1 | 1.00 | 1.03 | 1.08 | 1.17 | 1.26 | 1.34 |

## iii. Global energy trends, international fossil fuel prices, carbon price in the EU ETS

### Energy product prices

The variation in energy prices on international markets is a very important factor that also influences future energy supply trends in Slovenia. Slovenia is dependent on imports for more than half of its primary energy, and developments on external energy markets are decisive for the competitiveness of the energy supply in Slovenia. Regardless of the fact that a significant proportion of supplies are delivered under medium- and long-term contracts, delivery prices will be tied to market prices, especially in a long-term perspective (the period up to 2040 and 2050 respectively). Integration into the EU internal market for energy and other energy markets is important for security of supply and the positioning of Slovenian producers on export markets. Future energy prices in the international arena are very uncertain. When drawing up the NEPN and the long-term climate strategy, energy price projections are needed to enable decisions to be taken in uncertain circumstances. The figure below shows the results of different projections of oil price movements used for various strategic analyses in Slovenia and abroad.

*Figure 17: Past trends and different forecasts for future oil prices on the global market*




Key to Figure 17:

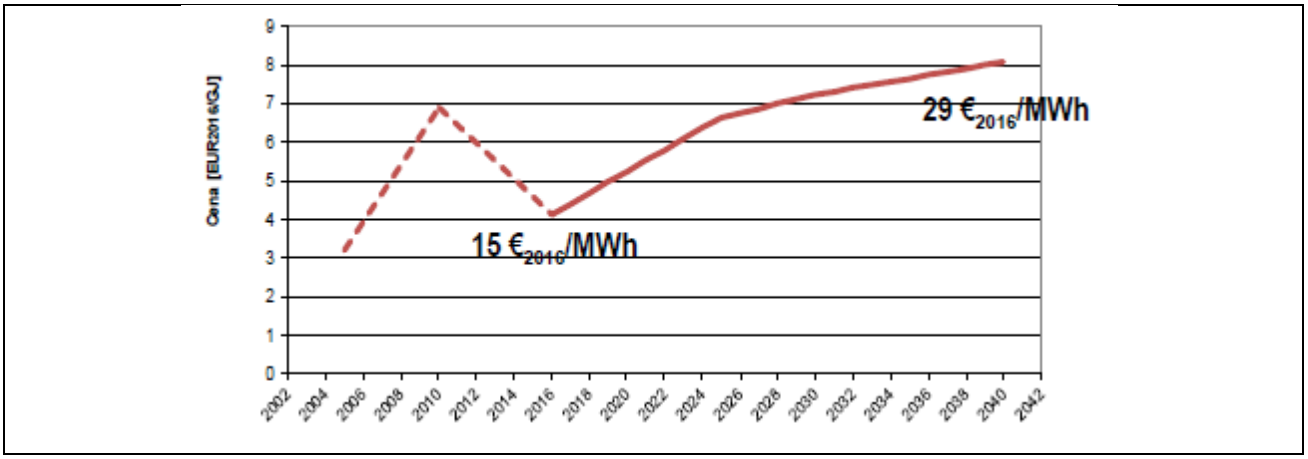
| | | |
|---|---|---|
| Oil price, OECD imports, comparison of different projections | | |
| Prices | ▪ EC recommendation, 2016<br>▪ OECD, WEO2017<br>▪ Statistics | ▪ ECS, all scenarios<br>▪ EC recommendation, 2018 |

For the purposes of the NEPN, the forecasts of future oil and petroleum product prices take account of the projections and recommendations of the International Energy Agency, which is the undisputed authority in forecasting energy market trends (indicated in the figure above as OECD, WEO 2017 (*World Energy Outlook 2017*)). The international oil price projections used are a good basis for long-term planning.

In accordance with the targets set in the Paris Agreement, it was estimated that Slovenia would gradually phase out its use of domestic and imported coal for energy purposes and no price projection was therefore made. Domestic coal is used for energy purposes at the Šoštanj thermal power plant. Imported coal with low sulphur and ash content is used at the Ljubljana thermal power plant.

According to the IEA forecasts (WEO 2017), the link between the price of oil and gas in Europe remains strong up to 2030, due to long-term gas supply contracts linked to the global oil price and competition between petroleum products and gas at the level of end consumers. The figure below presents the IEA World Energy Outlook 2017 projection of natural gas prices on the European market that was taken into account. This future price forecast predicted that the drop in price due to the financial crisis was only temporary and that, by 2027, the price of gas would again reach the 2008 level.

***Figure 18: Past trends and forecasts for the price of natural gas on the European market***




Source: IEA, World Energy Outlook 2017, OECD

Key to Figure 18:
cena = price

At European level, there is still uncertainty regarding the effects of the potential extraction of natural gas from unconventional sources and regarding liquefied natural gas (LNG) delivery routes, mainly on account of the impact of new sources and supply routes on lowering prices. On the other hand, potential new unconventional LNG sources and supply routes will increase the strategic security of the natural gas supply in the EU.

The updated emissions trading system is fundamentally changing the market and has a significant impact on future developments. Emission allowance prices on the European market are affected by several factors, in particular EU emissions trading regulations and the broader international market. The present-day situation already suggests that the future price of allowances will be very uncertain. Technological development, on which the costs of individual emission reduction technologies will depend, will also be an important influence. The following technologies are expected to have the greatest impact on emission allowance prices: accelerated use of renewable energy, new technologies in transport, and carbon capture and storage. If emission allowance prices rise significantly (i.e. between $EUR_{2016}$ 40 and 60/t $CO_2$) and if electricity demand is not replaced by renewable, nuclear or gas power plants, then carbon capture and storage (CCS) technologies will become commercially interesting, but this is not expected before 2040. We took the emission allowance projections from the Commission's analyses and compared them with the international reference analyses (WEO 2017, Point Carbon, etc.). The figure below shows the results of the projections of emission allowance prices resulting from our own calculations and the results of an individual consultation with Commission representatives.

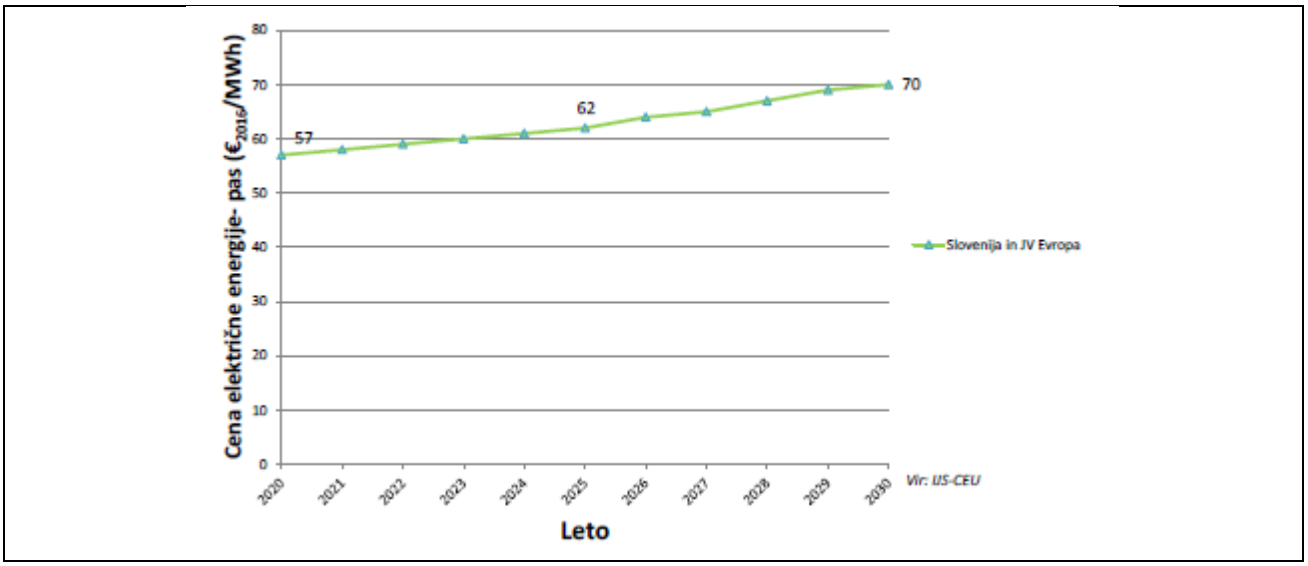
***Figure 19: Forecast of emission allowances on the European market***


Source: Our own calculations and individual consultation with the European Commission, 2018.

Key to Figure 19:
Price [EUR2016/tCO2eq.]
EC, recommendation, 2018, with the exception of 2020

While reference projections of international fuel prices and emission allowances are regularly drawn up and updated by established international institutions, there are no such bases for projecting electricity prices. Although prices are increasingly converging, in the near future there is no expectation of uniform electricity prices in the EU. In the period up to 2030, in addition to emission allowance prices, electricity prices in Slovenia will be influenced mostly by developments in the region. The development of new connections (Slovenia-Hungary, Italy-Montenegro, etc.) and new production capacities will have a significant impact on price developments in the region. We expect electricity prices to fluctuate significantly over time. Although electricity prices are still today determined by the prices of coal, natural gas and emission coupons, renewable (solar) electricity generation has a very significant impact on the hourly rate. It is expected that these impacts (low daytime prices in summer) will continue to increase throughout the EU, a phenomenon on which Slovenia does not have a significant influence. The accelerated construction of solar power plants is changing established practices, leading to the expectation that in summer time Italy will become an electricity exporter, which will have a significant impact on prices in the wider region. Nonetheless, electricity prices are expected to continue rising up to 2030, partly driven by increased demand and accelerated electrification in all areas. In most EU countries, stock market prices do not cover the full costs of production, making investment in new generation capacity difficult. Considering trends in other energy product prices, we expect that average annual baseload electricity prices will fluctuate between $EUR_{2016}$ 57/MWh in 2020 and $EUR_{2016}$ 70/MWh in 2030 (see figure below). The final electricity price is also directly influenced by the State, which takes fiscal and environmental objectives into account when determining the level of taxation on energy products. The price of electricity for the final customer will also be influenced in future by electricity network upgrading needs, especially for distribution networks, and, not least, the increased costs of providing system services (frequency containment reserve (FCR) and automatic frequency restoration reserve (aFRR)) due to the expected increase in the inclusion of intermittent RES in the Slovenian electricity system (EES).

***Figure 20: Baseload electricity price forecasts for Slovenia and South-Eastern Europe***




Source: IJS-CEU own calculations

Key to figure 20:
Baseload Electricity Price (€2016/MWh)
Year

## iv. Technological development costs

Below, we outline the costs of technology and technological development for various technologies, focusing on the renovation of buildings and dispersed production technologies, and provide an assessment of investment in the implementation of a carbon capture and storage system.

### Buildings

Specific investment in the energy renovation of buildings depends on the type of building, the extent of the renovation and, in the case of residential buildings, also the period of construction. From an energy point of view, a building is rated with an energy classification reflecting its real condition. In the event of energy renovation, a building is reclassified as its energy efficiency improves. The scope of energy renovation may be different and the following renovation types are defined: standard renovation, improvement renovation and low-energy renovation. A building which has never undergone energy renovation can therefore be renovated in three different ways in terms of scope, with its energy class being improved accordingly. The value of the energy class of an individual building depends on the type of building, the extent of renovation and the age of the building.

The tables below show the average specific investments in energy renovation for different types of buildings in residential and non-residential sectors, as several different measures can be considered as partial renovations, which can vary greatly after an investment, e.g. replacement of windows, energy renovation of the roof, installation of mechanical ventilation, etc.

In the residential sector, special investment is generally more expensive in single-dwelling buildings due to the smaller heated floor space. In the non-residential sector, comprehensive renovations are in the range of EUR 108-180/m2. Specific investments do not change by 2020, but up to 2030 and 2040 they gradually increase as material and labour costs increase. The financial aspects of building renovation will be analysed in more detail as part of a long-term strategy to promote the energy renovation of buildings.

***Table 42: Specific investment in partial and comprehensive energy renovation for single- and multi-household buildings according to the period when the building was constructed***

| Building type | Construction period | Partial renovation [EUR/m2] | | | Complete renovation [EUR/m2] | | |
|---|---|---|---|---|---|---|---|
| | | 2017 | 2030 | 2040 | 2017 | 2030 | 2040 |
| Single-dwelling residential buildings | before 1945 | 75 | 83 | 92 | 222 | 247 | 273 |
| | 1946–1970 | 102 | 114 | 126 | 222 | 248 | 274 |
| | 1971-1980 | 105 | 117 | 129 | 192 | 214 | 236 |
| | 1981-2002 | 95 | 106 | 118 | 180 | 200 | 220 |
| | 2003-2008 | 167 | 187 | 206 | - | - | - |
| | After 2008 | 298 | 332 | 366 | - | - | - |
| Multi-dwelling residential buildings | before 1945 | 72 | 80 | 88 | 99 | 110 | 121 |
| | 1946-1970 | 77 | 85 | 94 | 104 | 116 | 127 |
| | 1971-1980 | 48 | 54 | 59 | 122 | 136 | 150 |
| | 1981-2002 | 66 | 73 | 81 | 98 | 110 | 121 |
| | 2003-2008 | 106 | 119 | 130 | - | - | - |
| | After 2008 | 165 | 184 | 203 | - | - | - |

***Table 43: Specific investment in partial and comprehensive energy renovation for different types of non-residential buildings***

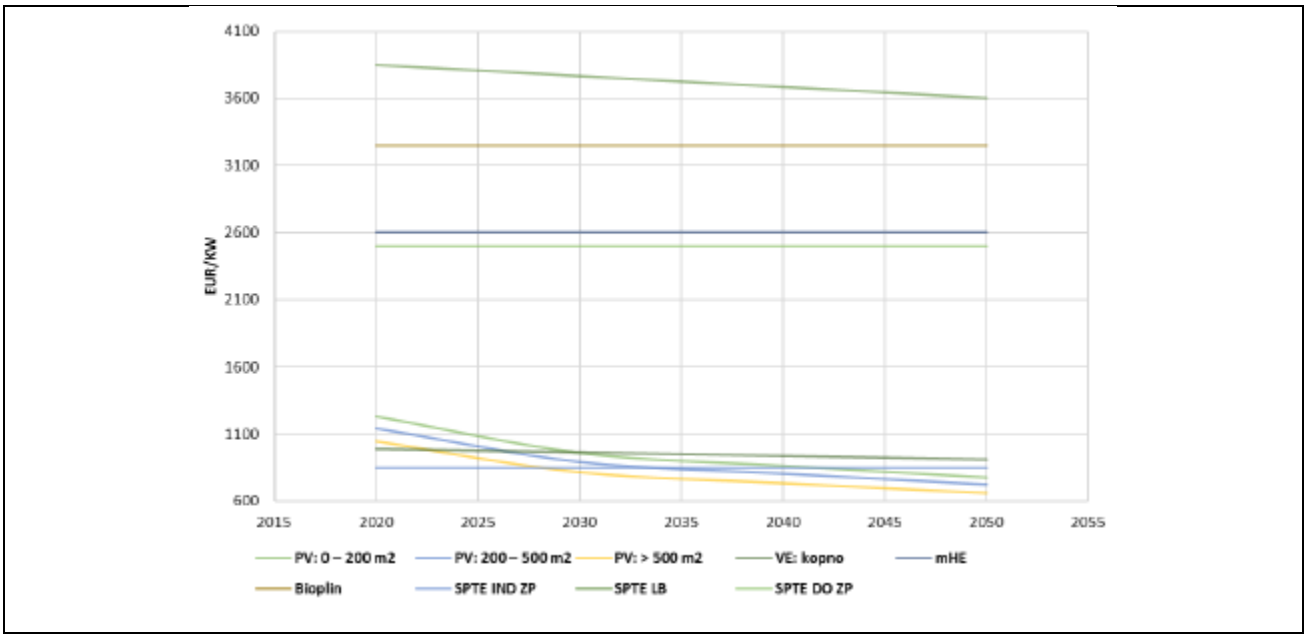
| Group of non-residential buildings | Partial renovation [EUR/m2] | | | Complete renovation [EUR/m2] | | |
|---|---|---|---|---|---|---|
| | 2017 | 2030 | 2040 | 2017 | 2030 | 2040 |
| Residential buildings for special social groups, hotels | 51 | 57 | 63 | 146 | 148 | 163 |
| Catering buildings, museums and libraries, educational and scientific research buildings | 45 | 47 | 50 | 129 | 130 | 143 |
| Public administration and administrative and office buildings | 122 | 123 | 136 | 155 | 157 | 173 |
| Shops and buildings for culture and entertainment | 89 | 90 | 99 | 180 | 182 | 200 |
| Health care buildings | 106 | 107 | 118 | 144 | 146 | 161 |
| Sports halls | 57 | 57 | 64 | 108 | 109 | 120 |

## Dispersed production

The figure below shows the specific investment costs for dispersed production technologies and expected trends up to 2050. We used the investment costs for individual technologies separately per technology in the scenario analyses, but in the graph below for some technologies, especially CHP, we show average investment costs. We combined CHP technologies, i.e. gas turbines (estimated specific investment of EUR 1 000/kW) and gas engines (estimated specific investment of EUR 700/kW). Wood biomass-based CHP technologies and specifically wood biomass gasification (estimated specific investment between 4 500 and 4 000/kW) and ORC technologies (specific

investment estimated at EUR 3 200/kW) are also shown in a similar way. More detailed information on specific investment costs is given in the table below.

***Figure 21: Specific investments in dispersed energy production technologies***




PV = Premogovnika Velenje - Velenje coal mine

***Table 44: Specific investments in dispersed energy production technologies***

| Technology | | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| PV: 0 – 200 m2 | EUR/kW | 1 234 | 963 | 867 | 780 |
| PV: 200 – 500 m2 | EUR/kW | 1 147 | 895 | 806 | 725 |
| PV: > 500 m2 | EUR/kW | 1 048 | 818 | 737 | 663 |
| Wind power plant: on land [VE: kopno] | EUR/kW | 990 | 968 | 941 | 915 |
| Small hydro-electric power plant [mHE] | EUR/kW | 2 600 | 2 600 | 2 600 | 2 600 |
| Biogas [Bioplin] | EUR/kW | 3 250 | 3 250 | 3 250 | 3 250 |
| Fuel cells | EUR/kW | 10 000 | 5 000 | 3 000 | 2 000 |
| CHP IND gas turbines [SPTE IND pl. turbine] | EUR/kW | 1 000 | 1 000 | 1 000 | 1 000 |
| CHP IND gas engines [SPTE IND pl. motorji] | EUR/kW | 700 | 700 | 700 | 700 |
| CHP IND wood biomass [SPTE IND LB] | EUR/kW | 3 850 | 3 767 | 3 683 | 3 600 |
| CHP district heating - natural gas [SPTE DO ZP] | EUR/kW | 2 500 | 2 500 | 2 500 | 2 500 |
| CHP district heating - gasification | EUR/kW | 4 500 | 4 333 | 4 167 | 4 000 |
| CHP ORC | EUR/kW | 3 200 | 3 200 | 3 200 | 3 200 |

## Carbon Capture and Storage (CCS)

The CCS process was one of the EU's environmental priorities. A large-scale demonstration programme was established to speed up the commercial programme. The target was to launch 12 carbon capture and storage projects by 2015. At present, implementation has significantly slowed down or stalled. Regardless of the current status of the introduction of CCS technologies, such technologies represent an opportunity to significantly reduce $CO_2$ emissions not only in the power generation sector but also in other $CO_2$-intensive industrial sectors.

In Slovenia, too, there are possibilities for CCS at existing power sites and also in energy-intensive industry. We would here highlight industrial sectors that emit process emissions. At the same time, it should be emphasised that, under the current legislation (Article 166a of the Environmental Protection Act and Article 6 of the Mining Act), the injection and storage of carbon dioxide is prohibited in Slovenia.

The TEŠ unit B4 is expected to be used in electricity and heat production by 2020 at the latest and the environmentally-friendly unit B5 by 2030. It does not make sense to carry out CCS measures on these two units during this period. In the long term there is scope to reduce $CO_2$ emissions from unit B6 using CCS technology between 2035 and 2050, at the end of the unit's lifetime. By 2030, the projected $CO_2$ emissions from B6 are 3 000 kt and, by 2050, 2 000 kt if the strategy of burning only domestic coal is implemented, otherwise it could be even higher (around 2 500 kt). The amount could be reduced at least about 1 800 (2 250) kt $CO_2$, assuming a 90% $CO_2$ capture.

***Table 45: Assessment of investment in the implementation of the $CO_2$ capture and compression system[72]***

| Investment grade estimate (CCS B6) - constant 2012 prices | | |
|---|---|---|
| Coal dust unit with retrofit CO2 capture and compression | 50% clean-up, 2035 | EUR 280 million |
| | 50% clean-up, 2040 | EUR 260 million |
| | 90% clean-up, 2035 | EUR 400 million |
| | 90% clean-up, 2040 | EUR 375 million |

[72] The estimate does not include transport costs to the place of storage and other costs.

# 4.2 Decarbonisation Dimension

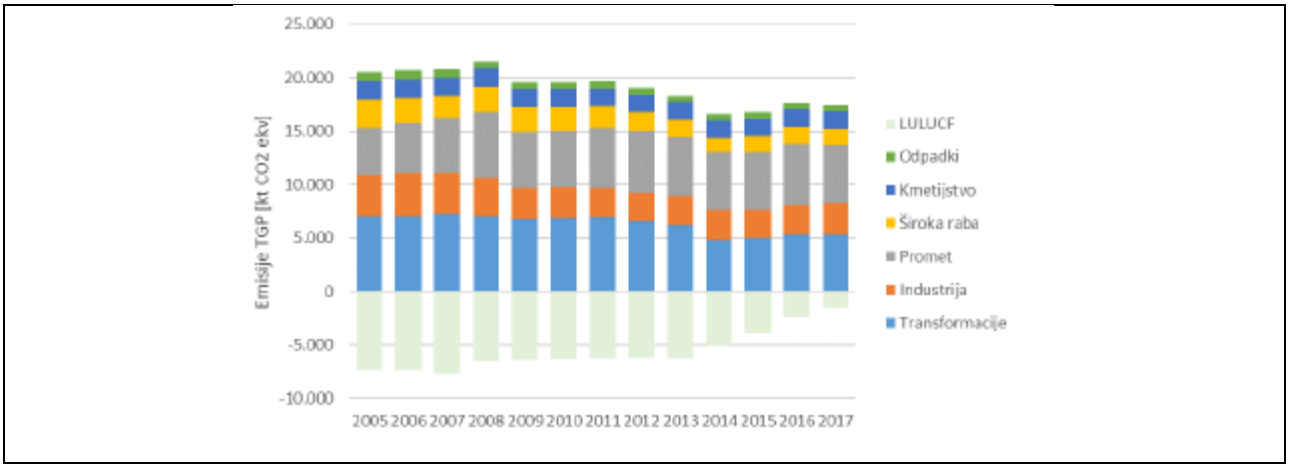
## 4.2.1 GHG emissions and renewals

### i. Trends of current GHG emissions and removals in EU ETS, distribution of effort and LULUCF sector and different energy sectors

#### Total emissions

The total GHG emissions since 2005 for each sector are shown in the figure below. In Slovenia, we emitted 17 453 kt $CO_2$ eq in 2017. Transport is the largest sector with 32%, followed by the transformation sector with 31%, industry with 17% (industry and construction and industrial processes), agriculture with 10%, general consumption with 8% and waste with 3%. Sinks from LULUCF accounted for 9% of total emissions in 2017.

***Figure 22: Trend of GHG emissions in the period 2005-2017***




Key to Figure 22:

| | | |
|---|---|---|
| GHG emissions | ▪ LULUCF<br>▪ Waste<br>▪ Agriculture<br>▪ General consumption | ▪ Transport<br>▪ Industry<br>▪ Transformations |

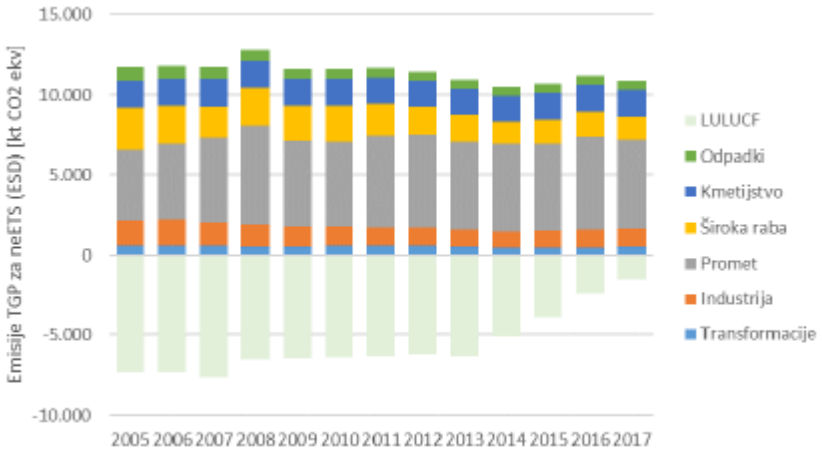
#### ESD emissions (non-ETS)

Decision No 406/2009/EC imposed an obligation on Slovenia not to increase its GHG emissions from the ESD sectors (non-ETS emissions) by 2020 by more than 4% compared to the 2005 level. In addition to the final target, the Decision also lays down a method for determining annual emission allocations (target values) for the initial year of the period 2013-2020 and the intervening years (proposal of the third annual report on the implementation of OP TGP 2020).

Slovenia is meeting its annual targets. Emissions from ESD sectors in 2017 amounted to 10 883 kt $CO_2$ eq., which is 11% less than the limit value. These emissions accounted for 62% of total GHG emissions, the remaining 38% are emissions from sources included in the allowance trading scheme (the EU-ETS system).

The third annual report on the implementation of OP TGP 2020 indicates that the volume of sinks has remained at approximately the same level in the recent period. Since a forest inventory was carried out in 2018, the third annual report is, of course, linked to past trends. Sinks have fallen sharply in the last five years, to almost zero, mainly due to increased sanitary felling.

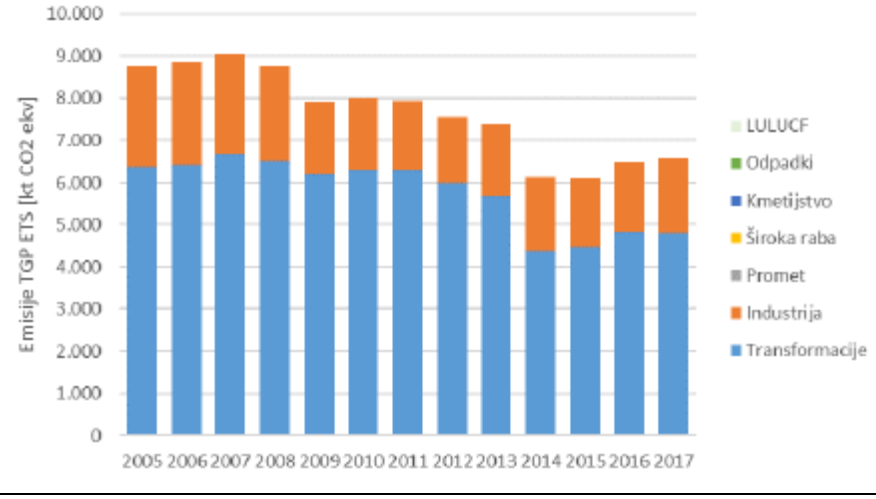
***Figure 23: Trends in emissions from ESD sectors (non-ETS) over the period 2005-2017***




Key to Figure 23:

| | | |
|---|---|---|
| GHG emissions for non-ETS (ESD) | ▪ LULUCF<br>▪ Waste<br>▪ Agriculture<br>▪ General consumption | ▪ Transport<br>▪ Industry<br>▪ Transformations |

***Figure 24: ETS sector emissions trends 2005-2017***




Key to Figure 24:

| | | |
|---|---|---|
| GHG ETS emissions | ▪ LULUCF<br>▪ Waste<br>▪ Agriculture<br>▪ General consumption | ▪ Transport<br>▪ Industry<br>▪ Transformations |

## ETS emissions

The greenhouse gas (GHG) emissions covered by the EU-ETS scheme increased by 1.4% in 2017 compared to 2016 and were down 24.9% compared to 2005. The upward trend was seen again after years of decline in 2016. Industry (industry and construction; energy use of fuels and industrial processes) accounts for about 27% of all ETS emissions, the rest (73%) is attributed to transformations with fugitive emissions.

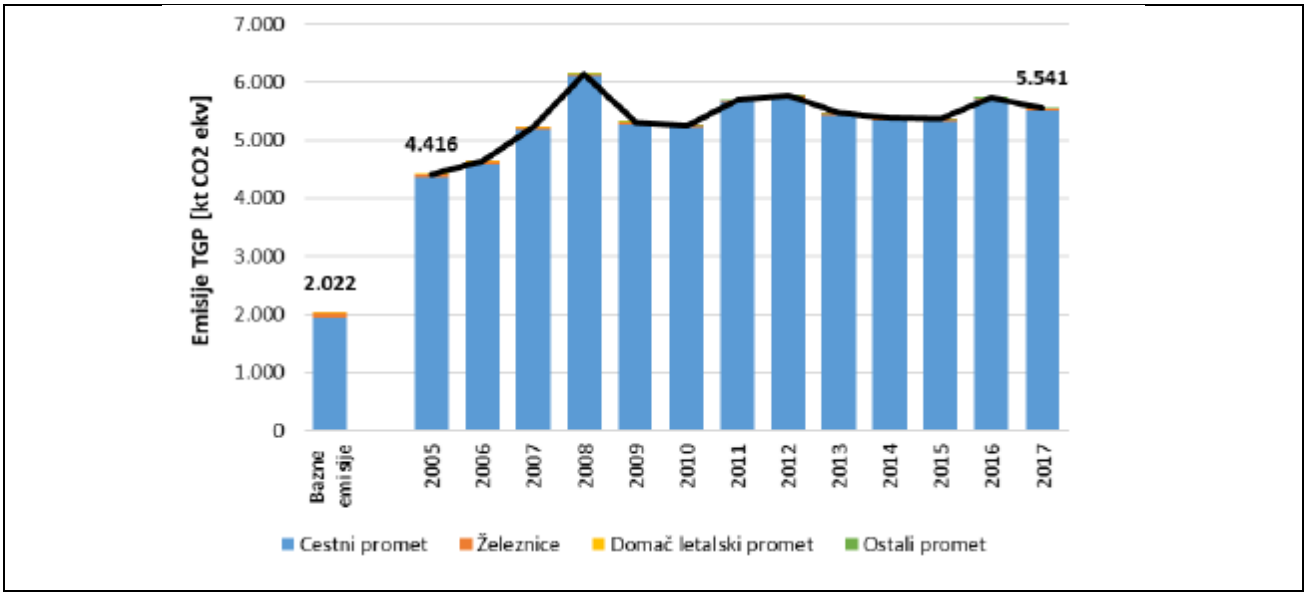
GHG emissions not covered by the EU-ETS scheme (ESD emissions) decreased by 2.8% in 2017 compared to 2016 and were down 10.8% compared to 2005. After three years of decline, the upward trend was seen again in 2015. Transport accounts for around 51% of total emissions from ESD sectors. The annual sectoral fluctuations observed in the total emission balance are reflected only in

transport, the reason being that, except for transport, no other ESD sector represents more than 16% in the balance.

## Transport

Total GHG emissions in 2017 amounted to 5 541 kt $CO_2$ eq[73]. In the period 1986–2017, emissions increased by 174%. In 2017, road transport emissions accounted for 99.3% of all emissions in the transport sector, while other forms of transport (rail, aviation, other) represented less than 1% of transport emissions. In 2017, emissions decreased by 3.4% compared to the previous year, despite increased activity in the sector - an increase in passenger and freight kilometres, therefore the reason for the decrease lies in particular in the reduced volume of sales of vehicle fuel in Slovenia, as vehicle fuel prices were some of the highest among the neighbouring countries.

***Figure 25: Analysis of the evolution of GHG emissions in transport during the period 1986-2017***




Key to Figure 25:

| | | |
|---|---|---|
| Y-axis: GHG emissions | ▪ Road transport | ▪ Domestic air transport |
| X-axis: Base emissions | ▪ Railways | ▪ Other transport |

## Industry

In 2017, GHG emissions from the combustion of fuel in manufacturing, construction and industrial processes totalled 2 887 kt $CO_2$ eq[74]. In the period 1986-2017, emissions decreased by 50%, with combustion emissions reduced by 62% and process emissions by 10%. In 2017, process emissions accounted for 42% of total emissions from the manufacturing and construction sectors. The reduction of GHG emissions is the result of various factors, notably environmental commitments, carbon levy and emissions trading, implementation of energy efficiency measures, use of renewable sources, improvements in industrial production processes and restructuring within individual industries.

The figure below shows the downward trend in GHG emissions in manufacturing and construction in the period 1986-2017.

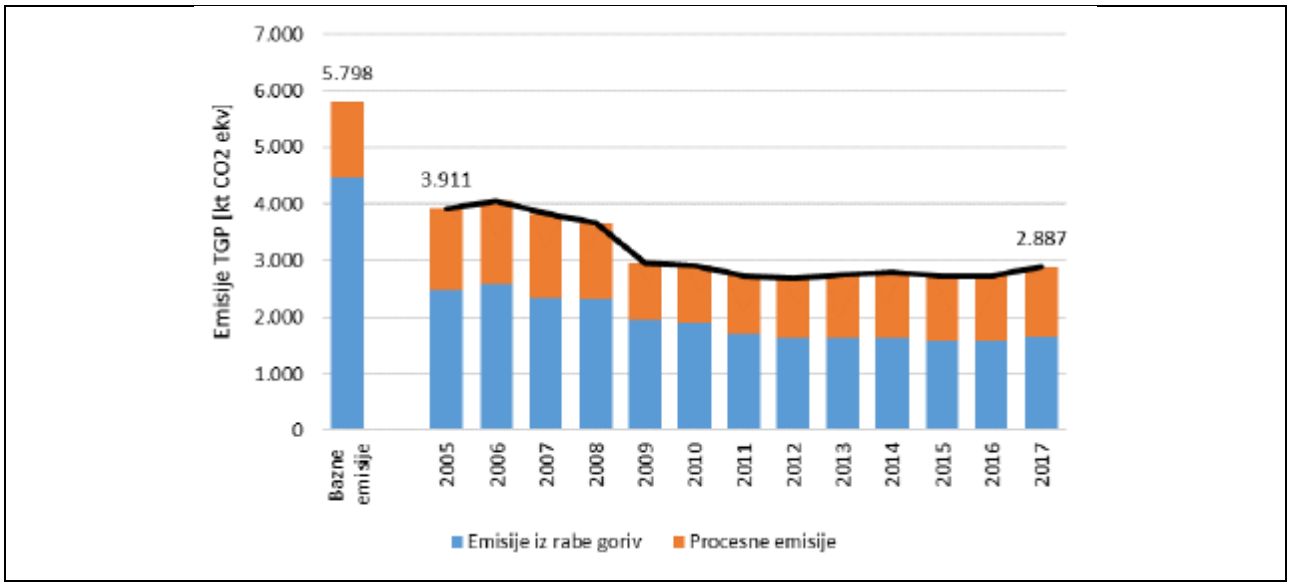
The figure below shows a breakdown of energy consumption and $CO_2$ emissions (excluding indirect emissions from electricity consumption) in manufacturing by sector for 2017. The outer ring shows

73 National GHG inventories - Greenhouse gas emissions by major source group, source: ARSO, 2018. http://okolje.arso.gov.si/onesnazevanje_zraka/vsebine/toplogredni-plini.

74 National GHG inventories - Greenhouse gas emissions by major source group, source: ARSO, 2018. http://okolje.arso.gov.si/onesnazevanje_zraka/vsebine/toplogredni-plini.

each sector's share of energy consumption and the inner ring shows its share of $CO_2$ emissions. We can see that the largest share of final energy consumption results from the manufacture of basic metals (C24, 28%), manufacture of paper and paper products (C17, 13%), manufacture of other non-metallic mineral products (C23, 13%), and manufacture of chemicals and chemical products (C20, 9%), with other sectors accounting for around 37%.

***Figure 26: Analysis of GHG emission trends in manufacturing and construction in the period 1986-2017***

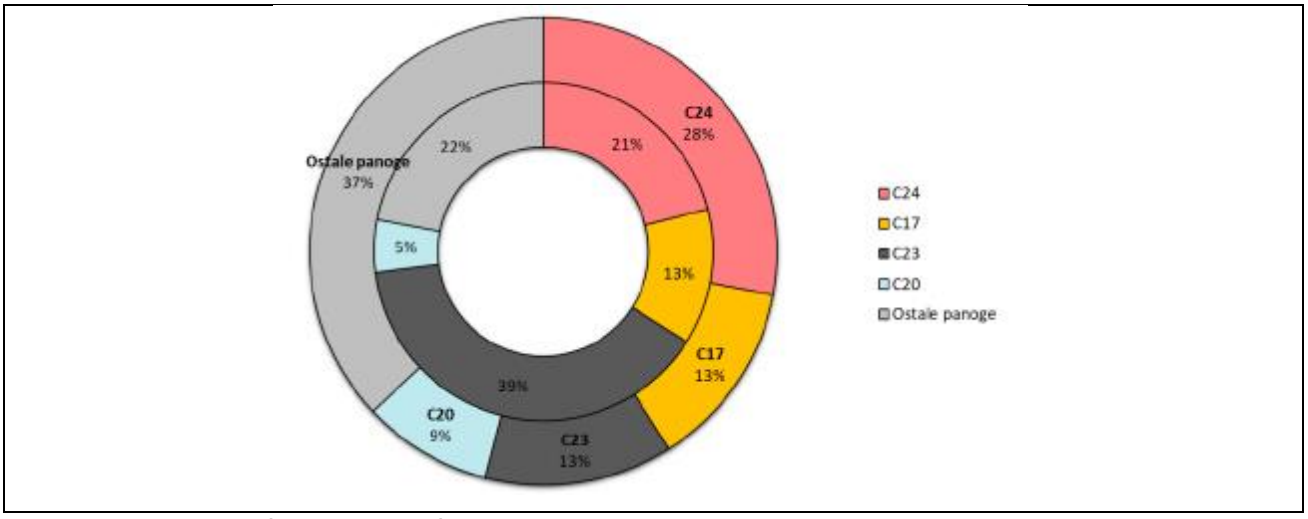



Key to Figure 26:

| | |
|---|---|
| Y-axis: GHG emissions | ▪ Emissions from fuel use |
| X-axis: Base emissions | ▪ Process emissions |

The largest share of $CO_2$ emissions in manufacturing and construction (excluding indirect emissions from electricity consumption) results from the manufacture of other non-metallic mineral products (39%), manufacture of basic metals (21%), manufacture of paper and paper products (13%) and manufacture of chemicals and chemical products (5%). Other sectors combined account for around 22% of emissions in manufacturing and construction.

***Figure 27: Breakdown of energy consumption and $CO_2$ emissions (excluding indirect emissions from electricity consumption) in manufacturing by sector for 2017 (outer ring: energy, inner ring: emissions)***

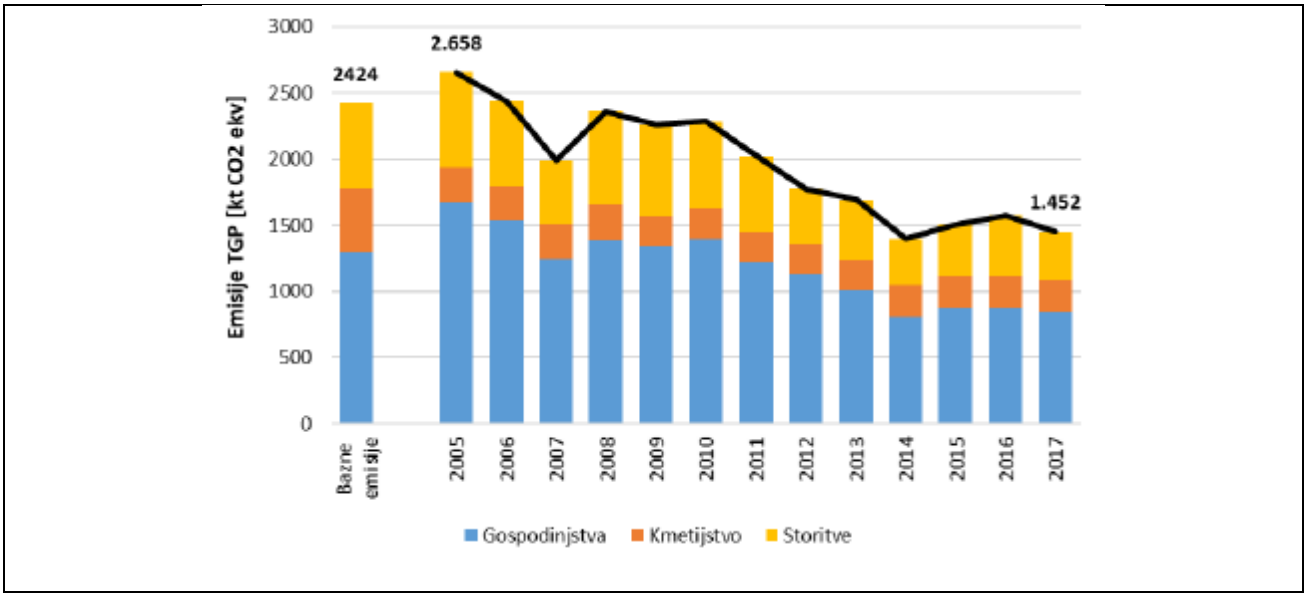



Key to Figure 27: Ostale panoge - Other sectors

### General consumption

In 2017, GHG emissions from the combustion of fuels in the general consumption sector (in households, agriculture and services) totalled 1452 kt $CO_2$ eq [75]. In the period 1986-2017, emissions decreased by 40%, with emissions from services decreasing by 44%, those from households by 35% and those from agriculture by 50%. In 2017, emissions in services represented 25% of total emissions in the buildings sector, households 58% and agriculture 17%. The reduction in GHG emissions is the result of various factors, in particular environmental commitments, imposition of the carbon levy and emissions trading as well as the implementation of energy efficiency measures, the use of renewables, improvements in industrial production processes and restructuring of individual industrial sectors. Compared to 2016, emissions fell by 8.2% in 2017. In the period 2005-2017, general consumption emissions decreased mainly due to investments in improving the thermal characteristics of buildings and other energy efficiency measures, as well as the replacement of fuel oil.

***Figure 28: Analysis of the evolution of GHG emissions in the building sector in the period 1986-2017***




Key to Figure 28:

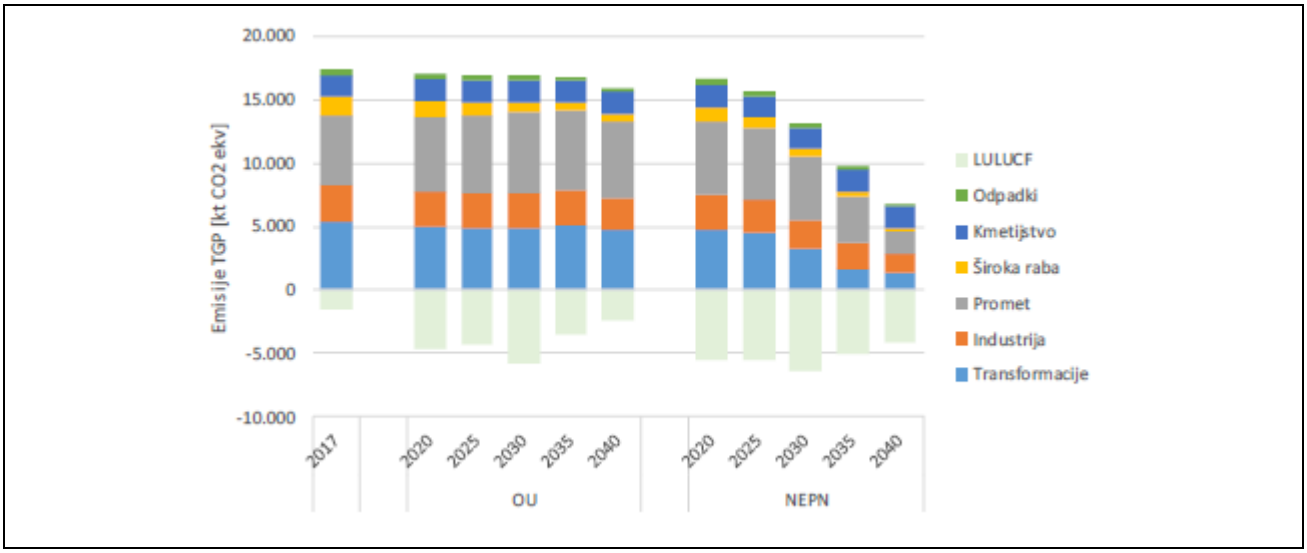
| GHG emissions | | | | | | |
|---|---|---|---|---|---|---|
| Base emissions | ▪ | Households | ▪ | Agriculture | ▪ | Services |

## ii. Projections of developments in sectors with existing national policies and measures and Union policies and measures until at least 2040 (including 2030)

The total GHG emissions in the projections in both scenarios are lower. In the existing measures scenario, they are minimally reduced after 2017, with a reduction of 18% in 2030 compared to 2005, and, in the ambitious NEPN scenario with additional measures, emissions are reduced by 36%. Compared to the baseline emissions used for the Kyoto Protocol, emissions are reduced by 17% in the EM scenario by 2030 and by 36% in the NEPN scenario. In 2040, in the NEPN scenario, emissions are reduced by 67% or 69%, depending on the scenario. There are fewer emissions in the nuclear development scenario and more in the synthetic gas development scenario. Below, only the results of the synthetic gas development scenario are shown for 2035 and 2040 because there are more emissions.

[75] National GHG inventories - Greenhouse gas emissions by major source group, source: ARSO, 2018. http://okolje.arso.gov.si/onesnazevanje_zraka/vsebine/toplogredni-plini.

***Figure 29: Projection of total GHG emissions by 2040 for the existing measures scenario and for the NEPN scenario***




Key to Figure 29:

| | | |
|---|---|---|
| GHG emissions [kt CO2 | ▪ LULUCF<br>▪ Waste<br>▪ Agriculture<br>▪ Wide use | ▪ Transport<br>▪ Industry<br>▪ Transformations |

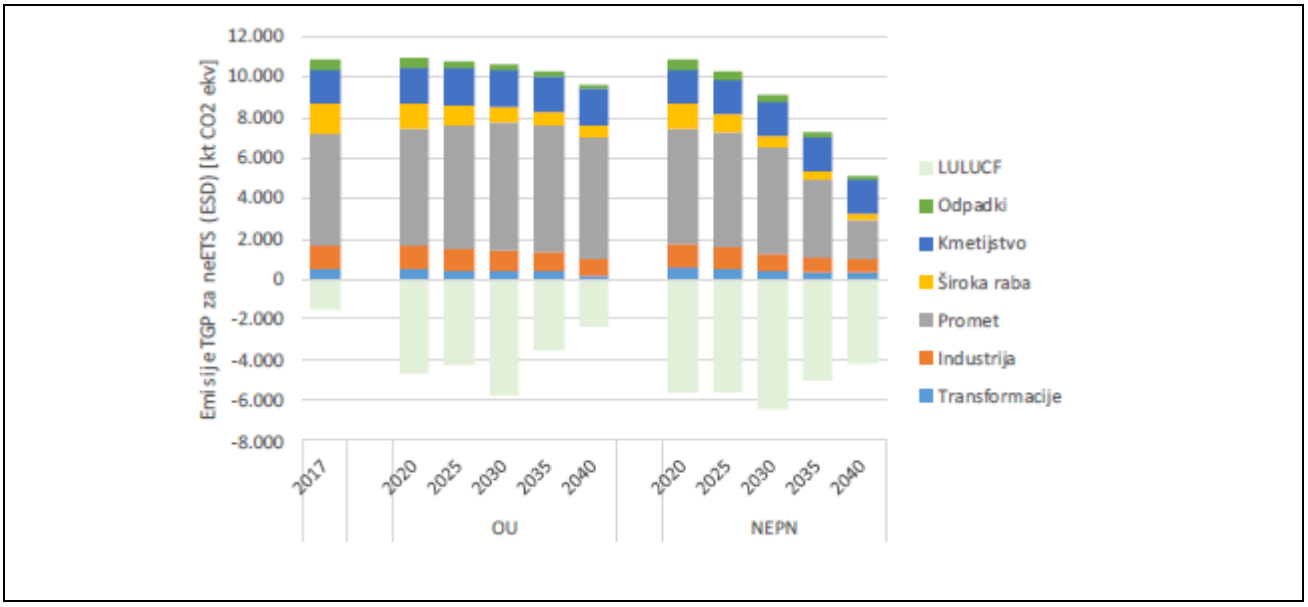
***Table 46: Total GHG emissions in Slovenia by 2030 by scenarios***

| | | 2005 | 2017 | 2020 | 2025 | 2030 | Reduction 2005 |
|---|---|---|---|---|---|---|---|
| EM | [kt CO2 eq] | 20 519 | 17 453 | 17 084 | 16 904 | 16 860 | -18% |
| NEPN | [kt CO2 eq] | | 17 453 | 16 660 | 15 719 | 13 089 | -36% |

Non-ETS emissions follow a similar course to total emissions, except that the reduction is less. The main source of emissions is transport, which contributes to more than half of the total emissions. By 2030, this share increases to 60% under the EM scenario and 56% under the NEPN scenario. In 2030, in accordance with the EM scenario, emissions are reduced by 10% compared to 2005 and, in accordance with the NEPN scenario, by 25%.

The Regulation on binding annual greenhouse gas emission reductions by Member States in the period 2021-2030 sets a 20% reduction target for Slovenia for 2030; this is achieved and exceeded by the NEPN scenario.

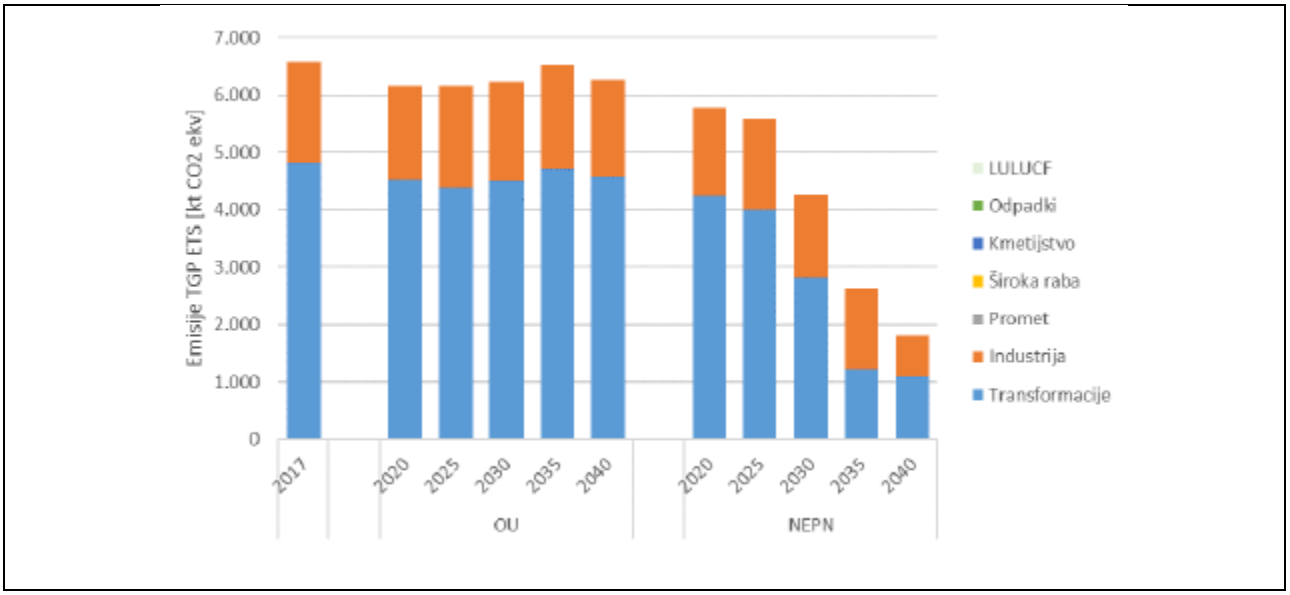
***Figure 30: ESD (non-ETS) projection of GHG emissions by 2040 for the existing measures scenario and the NEPN scenario***




Key to Figure 30:

| | | |
|---|---|---|
| GHG emissions for non-ETS (ESD) [kt CO2 | ▪ LULUCF<br>▪ Waste<br>▪ Agriculture<br>▪ General consumption | ▪ Transport<br>▪ Industry<br>▪ Transformations |

***Figure 31: Projection of ETS sector GHG emissions by 2040 for the existing measures scenario and the NEPN scenario***



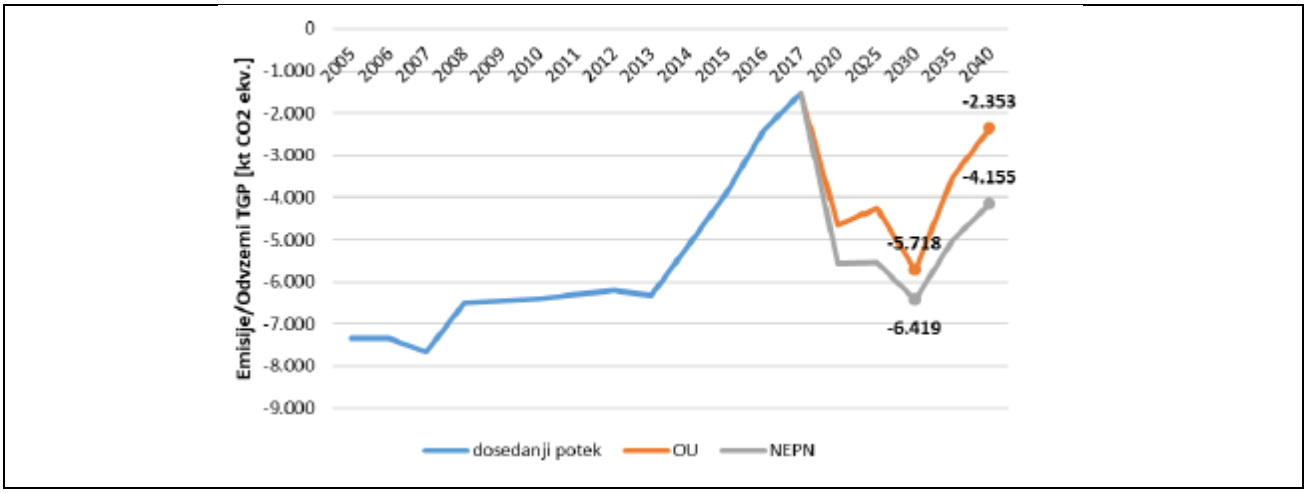

Key to Figure 31:

| | | |
|---|---|---|
| GHG ETS emissions [kt CO2 | ▪ LULUCF<br>▪ Waste<br>▪ Agriculture<br>▪ General consumption | ▪ Transport<br>▪ Industry<br>▪ Transformations |

Emissions in the ETS sector under the EM scenario increase up to 2035, mainly due to the increase in emissions in the transformation sector. By 2030, in the existing measures scenario, ETS sector emissions are reduced by 28%. In the NEPN scenario, they are reduced by 51% by 2030 thanks to TEŠ unit 5 ceasing operation and by 79% by 2040 thanks to the possible introduction of CCS technologies at TEŠ unit 6 after 2035.

Below we provide projections for the land use, land-use change and forestry (LULUCF) sector. The EM scenario covers the measures and policies adopted at the time of projection, assuming that they are implemented at a similar rate of development up to 2050. The maximum forestry felling value is gradually increasing, reaching at least 6.5 million $m^3$ in 2020. The remediation of forests damaged in natural disasters and due to bark beetle predation in 2014-2018 is expected to be completed in 2023. The scenario envisages the implementation of measures in accordance with the strategies adopted for the LULUCF sector (e.g. NGP, AN OVE, AN URE, SDS, PRP, etc.). The demand for timber and the quantity and composition of harvested timber products corresponds to the trends of previous years. It seems that timber market stakeholders do not change their habits. The rate of overgrowth due to the abandonment of agricultural activity is approximately equal to the rate of deforestation, which means that the forest area remains unchanged. Land-use trends remain the same as in previous years. While mechanisation in agriculture is gradually increasing, no significant impact on the reduction of emissions due to technological advances is expected in future. Common agricultural policy measures and world market prices are major drivers of the LULUCF sector.

***Figure 32: Past net emissions and projection of net emissions in the LULUCF sector for the two scenarios (EM and NEPN)***




Key to Figure 32:

| | |
|---|---|
| GHG emissions and removals | ▪ Actual development<br>▪ EM<br>▪ NEPN |

In the NEPN scenario, active forest management continues, but greater investment is needed in forest regeneration and tree composition changes. The share of spruce is decreasing, especially in areas of beech habitat, and the share of artificial restoration is increasing. Production periods of key tree species are becoming shorter, and forests rejuvenation periods are becoming shorter. The trend of population growth, economic growth and productivity continues. Food self-sufficiency is increasing, mainly due to the increase in the agricultural area utilised. At regional and local level, there is a greater emphasis on efficient land use and optimisation of spatial plans. The state is devoting more resources to investing in innovation and technological development. Some additional measures relevant to reducing emissions in the sector are under preparation.

***Table 47: Sources of GHG emissions in Slovenia not included in ETS by 2030 according to scenarios***

| | | 2005 | 2017 | 2020 | | 2030 | |
|---|---|---|---|---|---|---|---|
| | | | | EM | NEPN | EM | NEPN |
| **Transport** | [kt $CO_2$eq] | 4 416 | 5 541 | 5 781 | 5 700 | 6 357 | 4 965 |
| **General consumption** | [kt $CO_2$eq] | 2 661 | 1 456 | 1 267 | 1 186 | 784 | 620 |
| **Agriculture** | [kt $CO_2$eq] | 1 709 | 1 688 | 1 747 | 1 730 | 1 796 | 1 695 |
| **Waste management** | [kt $CO_2$eq] | 848 | 557 | 460 | 460 | 275 | 275 |
| **Industry** | [kt $CO_2$eq] | 1 542 | 1 132 | 1 185 | 1 218 | 985 | 875 |
| **Energy** | [kt $CO_2$eq] | 591 | 509 | 456 | 569 | 405 | 401 |
| **Total** | [kt $CO_2$eq] | **11 767** | **10 883** | **10 895** | **10 863** | **10 602** | **8 830** |
| | | | | | | | |

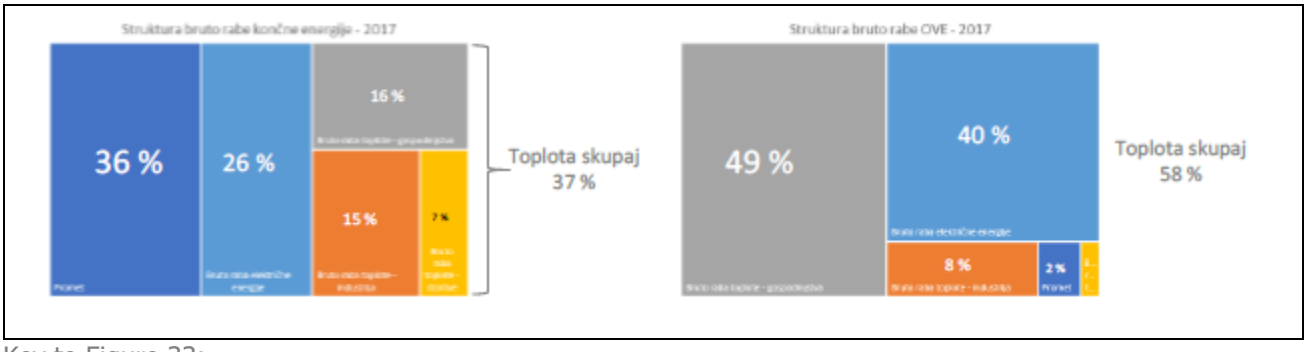
### 4.2.2 Renewable energy

In the area of RES development, Slovenia is required to achieve the specified targets for both 2020 and 2030 which will contribute to increasing the security of the energy supply, to reducing environmental impacts, to economic growth, job creation and employment.

#### i. The 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 these sectors

Slovenia achieved a 21.04% share of renewables in 2017 and a 21.14% share in 2018, falling short of the target. The share of renewables, amounting to 1 085 ktoe (12 617 GWh), was chiefly the result of the use of renewables for the production of heat (58%), renewable electricity generation (40%) and the use of biofuels in transport (2%). The share of households in renewable heat production amounted to 85%, the share of industry to 14% and the service sector to only 2%. Gross final energy consumption in 2017 was 5 051 ktoe (58 742 GWh). The largest share of gross consumption was in the transport sector (36%), 37% in the heating sector and 26% in gross electricity consumption.

***Figure 33: Structure of gross final energy consumption and RES in 2017***




Key to Figure 33:

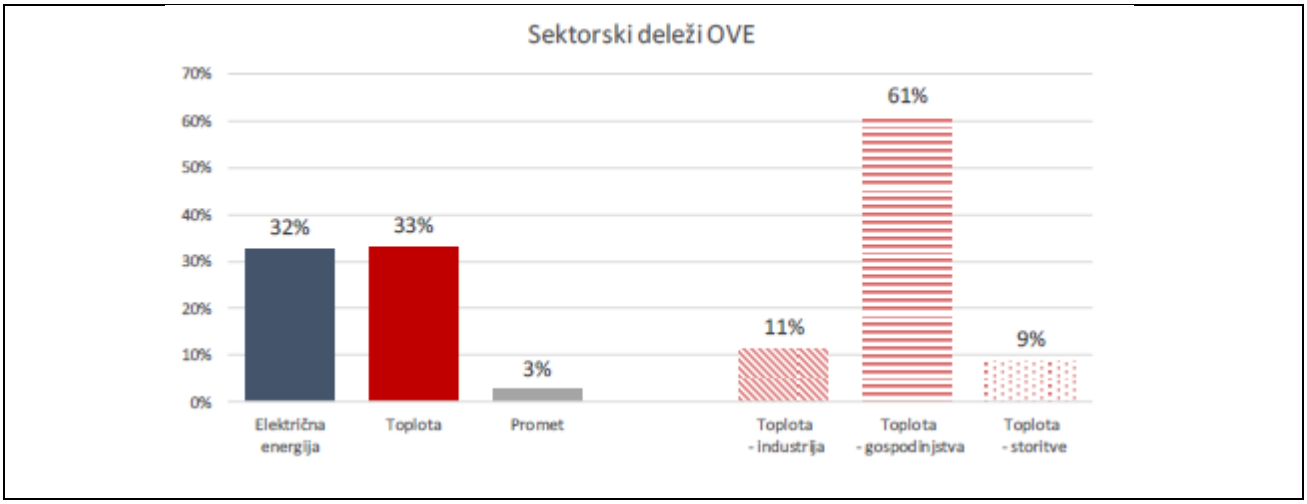
| Structure of the gross consumption of final energy | | Structure of gross RES use | |
|---|---|---|---|
| Transport | | Gross heat consumption – households | |
| Gross electricity consumption | | Gross electricity consumption | |
| Gross heat consumption – households | | Transport | |
| Gross heat consumption – industry | | Gross heat consumption | |
| Gross heat consumption – services | Total heat 37% | | Total heat 58% |

Sectoral shares in 2017 were:

- 32.4% share of RES in gross electricity consumption,
- 33.2% share of RES in gross heat consumption,
- 2.6% share of RES in transport.

The share of RES in electricity and heat production is therefore very similar and the share of RES in transport is significantly smaller, which means that the faster increase in energy use in transport compared to the other two sectors reduces the total share of RES in gross final energy consumption. In the heat sector, there are significant differences in the share of RES for industry, households and services. The share of RES in industry is 11.3%, in households 60.7% and in the services sector 8.8%.

***Figure 34: Sectoral shares of RES for 2017***




Key to Figure 34:

| | | |
|---|---|---|
| RES sectoral shares | Electricity<br>Heat<br>Transport | Heat - industry<br>Heat - households<br>Heat - services |

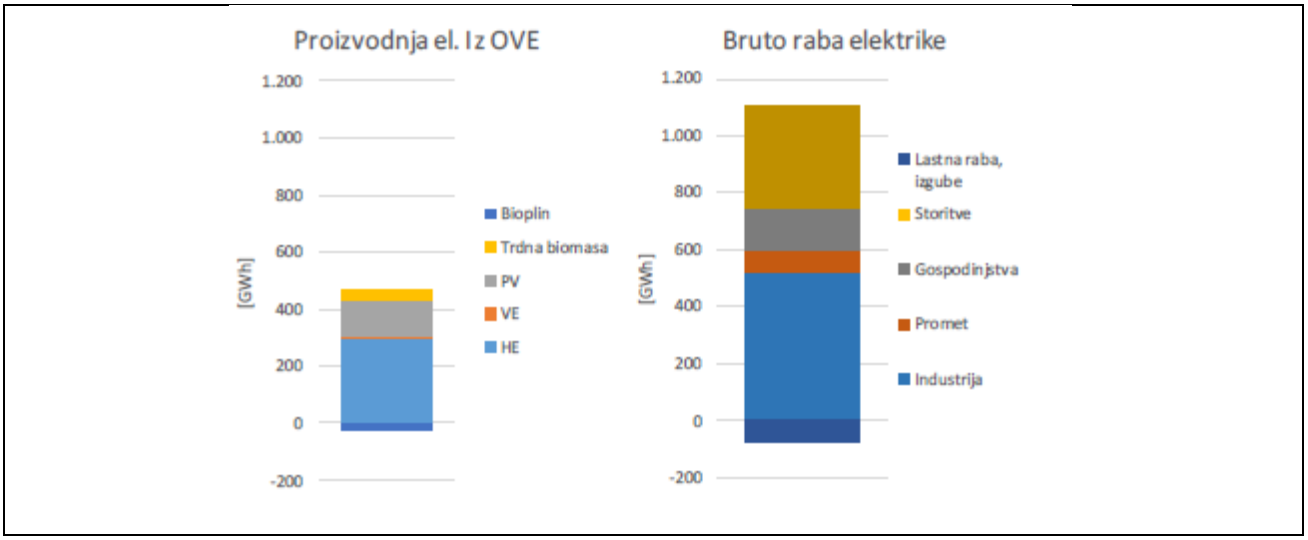
In transport, renewable electricity use contributes 33% to the share of RES, the remainder coming from the use of biofuels. The 2.6% share of renewables in transport is calculated using multipliers as defined in Directive (EU) 2015/1513 (the ILUC Directive).

In the period 2012-2017, renewable electricity generation increased by 449 GWh. This was mainly due to the construction of two new hydro-electric power plants on the lower Sava River (Krško and Brežice), which resulted in a normalised production increase of 304 GWh, while during this period the 15-year average of operating hours decreased by 1.2%.

The increase in the capacity of solar power plants during this period led to a 121 GWh increase in renewable electricity generation. There were also increases in electricity generation from wind power (6 GWh) and wood biomass (41 GWh), while generation from biogas decreased by 23 GWh.

As renewable electricity generation increased, at the same time gross electricity consumption also increased, specifically by 1 029 GWh in the period 2012-2017. Growth in industry (524 GWh) and in the service sector (356 GWh) contributed most to this. The share of renewable electricity increased from 31.6% to 32.4%.

***Figure 35: Comparison of change in RES electricity production (left) and gross electricity consumption (right) in 2012–2017***



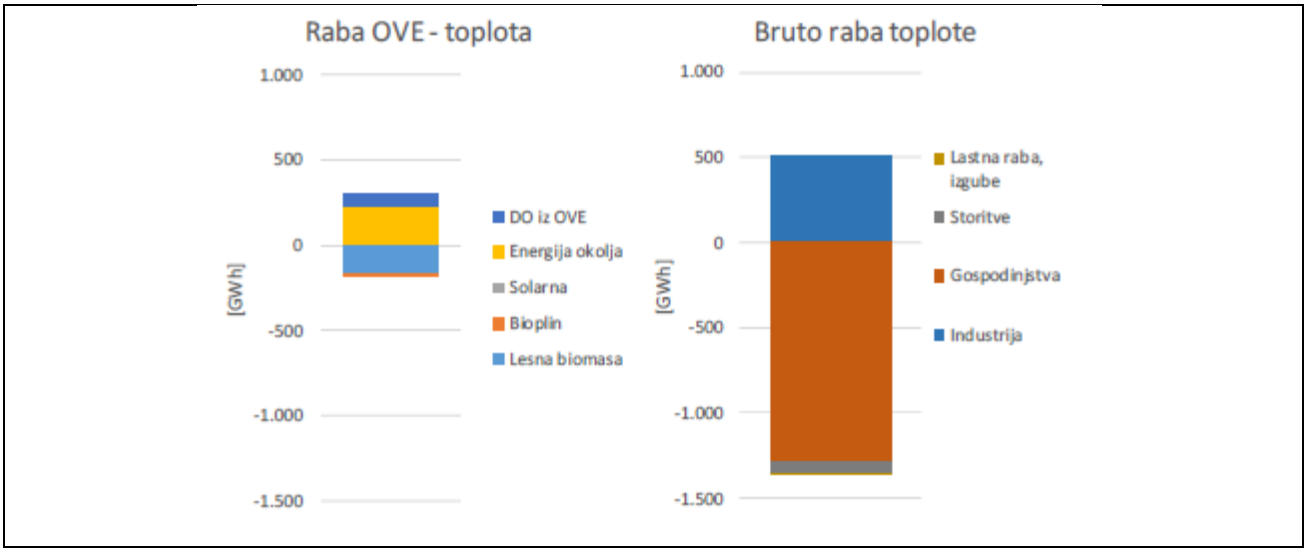

Key to Figure 35:

| Electricity production from RES | Gross electricity consumption |
|---|---|
| ▪ Biogas<br>▪ Solid biomass<br>▪ PV<br>▪ Wind power plants [VE]<br>▪ Hydro-electric power plants [HE] | ▪ Own use, losses<br>▪ Services<br>▪ Households<br>▪ Transport<br>▪ Industry |

In the period 2012-2017, the use of renewables in the heat sector increased by 123 GWh. Wood biomass consumption in industry rose by 332 GWh while, on the other hand, wood biomass consumption in households fell by 497 GWh as a result of energy efficiency measures in buildings. There was, however, an increase (of 211 GWh) in the use of environmental energy in households due to an increase in the use of heat pumps replacing fossil fuel boilers and wood biomass boilers. In households, the use of solar energy by means of solar collectors also increased (by 14 GWh). In the services sector, statistics cover only the use of biogas, which in the period monitored decreased (by 15 GWh), and direct use of geothermal energy, which increased by 2 GWh. The use of renewables increased by 333 GWh in industry, fell by 273 GWh in households and fell by 12 GWh in services. District heating production from RES increased by 75 GWh.

In the period 2012-2017, gross heat consumption decreased by 858 GWh. The largest contribution to this came from the household sector, where heat consumption decreased by 1 293 GWh, while in services it decreased by 67 GWh and in industry increased by 503 GWh. Own use and losses were minimally reduced (by 1 GWh). With regard to the data for the service sector, it should be noted that the statistics for this sector are incomplete, as – with the exception of biogas and the direct use of geothermal energy – the use of renewables is not recorded, which means that the observed decrease in energy use for heat in the period monitored may be overestimated and be due to the replacement of fossil fuels with RES. The share of RES in heat increased from 31.5% in 2012 to 33.2% in 2017.

***Figure 36: Comparison of changes in RES use in the heat sector (left) and gross consumption heat (right) in 2012-2017***



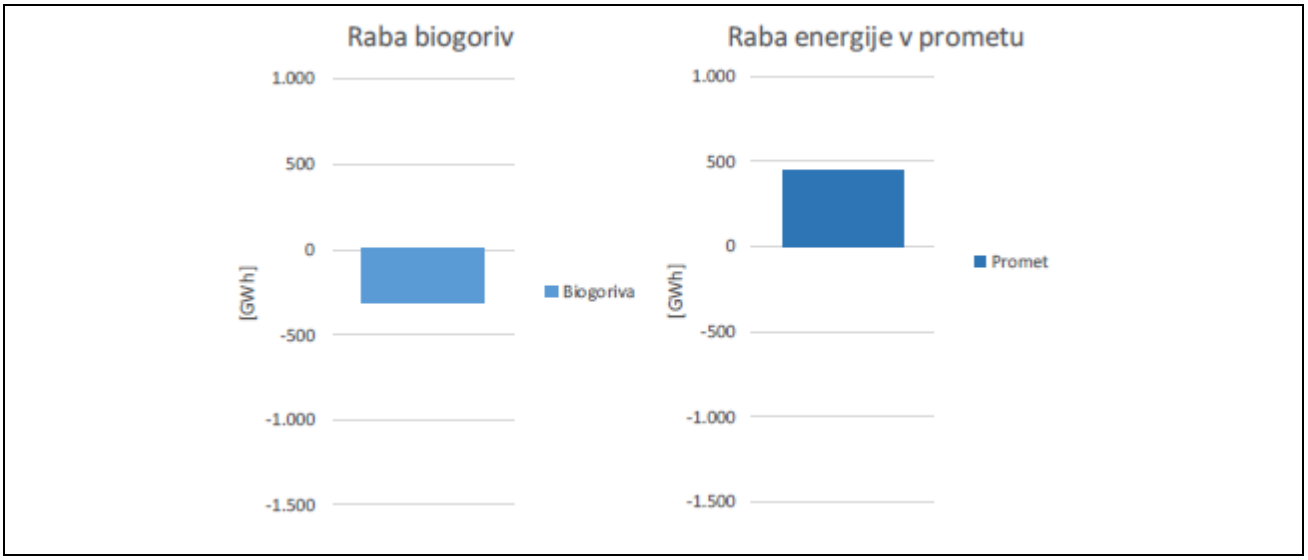

Key to Figure 36:

| Renewable heating consumption | Gross heating consumption |
|---|---|
| ▪ DH from RES | ▪ Own use, losses |
| ▪ Environmental Energy | ▪ Services |
| ▪ Solar | ▪ Households |
| ▪ Biogas | ▪ Industry |
| ▪ Wood biomass | |

In the period 2012-2017, the use of liquid biofuels in transport dropped by 312 GWh, mainly due to the lower percentage of biofuels blended into petrol and diesel. In the mixed fossil and bio fuel components of petrol and diesel, biofuels accounted for 2.7% in 2012 and only 1.2% in 2017. Total energy consumption in transport increased by 448 GWh.

In addition to biofuels, the use of electricity in transport is taken into account when the share of RES in transport is calculated. The statistics showed that electricity was used in rail and cable car transport and, in 2017, the consumption of electricity in road transport started to be monitored. Renewable electricity consumption increased by 25 GWh in the period 2012-2017. The total share of RES in transport, taking into consideration some multiples of RES consumption, dropped from 3.3% in 2012 to 2.6% in 2017.

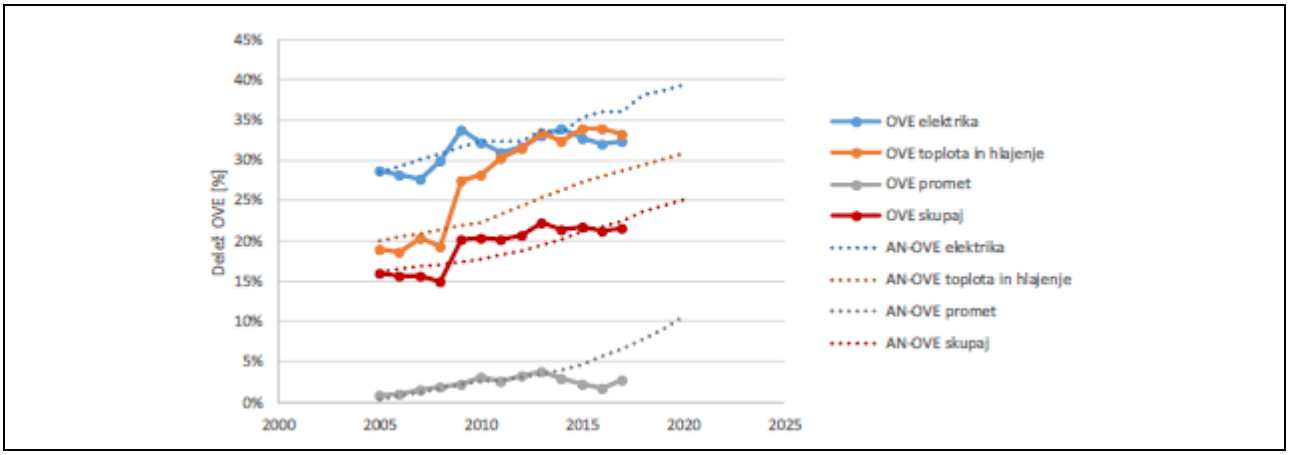
***Figure 37: Comparison of change in liquid biofuel consumption in transport (left side) and energy consumption in transport (right side) in the period 2012-2017***




Key to Figure 37:

| Biofuel consumption | Energy consumption in transport |
|---|---|
| ▪ Biofuels | ▪ Transport |

***Figure 38: Comparison of shares of RES per sector with the development scenarios indicated in the Renewable Energy Action Plan [AN-OVE] in the year 2010***




Key to Figure 38:

| RES share [%] | | |
|---|---|---|
| | ▪ RES - Electricity | ▪ Electricity - AN OVE |
| | ▪ RES - Heat and cooling | ▪ Heat and cooling - AN OVE |
| | ▪ RES - Transport | ▪ Transport - AN OVE |
| | ▪ RES - Total | ▪ Total - AN OVE |

Comparison of the sectoral shares of renewables [RES] and the total share of renewables with the projected development indicated in the 2010 Renewable Energy Action Plan [AN-OVE] shows that in 2017 only the share of renewables in heat and cooling exceeds the predicted development, while all other shares are less than predicted. The share of renewables in heating and cooling is significantly higher than the projected development due to improvement of the statistical monitoring of RES consumption in households, whereby it was found that the use of RES in households is significantly higher than estimated. The share of renewable electricity was below the trajectory in 2015, when electricity consumption started to increase but renewable electricity generation did not. The share of renewables in transport started to decline in 2014 when the subsidisation of biofuels was discontinued. As from 2017, distributors are entitled to a supplement to the price of fuel for blending,

and a new Decree on renewable energy sources in transport (*Uradni List RS* ([UL RS; Official Gazette of the Republic of Slovenia] No 64/16) has been adopted which defines methods and action to comply and check compliance with the obligations of fuel distributors in terms of placing biofuels and other RES on the market. Article 4 of the Decree requires fuel distributors, in the sale of fuel and electricity for use in transport in a given calendar year, to achieve the renewable energy share in transport specified in the Renewable Energy Action Plan 2010-2020, the total renewable energy shares in transport per individual years being as follows: at least 6.20% in 2017, at least 7.00% in 2018, at least 8.40%in 2019 and at least 10.00% in 2020.

## ii. Indicative projections of developments with existing policies for 2030 (with outlook until 2040)

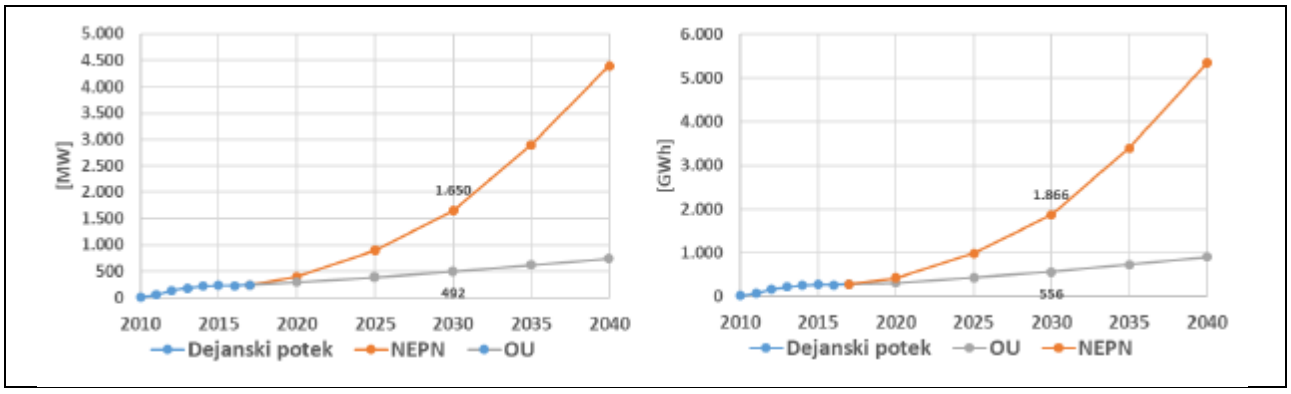
Dispersed renewable electricity generation is an important pillar of future sustainable and self-sufficient electricity generation which will complement production in larger generation facilities on the transmission network.

### Solar energy

The generation of electricity in solar power plants (SPP) represents the greatest developmental and environmentally acceptable potential for increasing renewable electricity generation in Slovenia. In terms of sustainable use of space, it is rational to steer future development towards the priority of integrating solar energy into buildings, where technical electricity generation potential with regard to the available surface area is estimated at more than 20 TWh, the key limitation being the capacity to integrate solar power into the electricity grid, which, apart from the costs of power plants, is a crucial economic criterion for the development of solar power plants[76].

In the solar power plant development scenarios studied, different intensities of SPP development are analysed, which increase electricity generation from solar power plants to between 0.6 and 1.9 TWh (between 492 MW and 1 650 MW) by 2030 and to between 0.9 and 5.4 TWh (between 742 MW and 4 400 MW) by 2040. Up to 2030, this would require from 20 to 125 MW of SPP capacity to be installed annually, including approximately 80% are medium- and large-sized solar power plants (100 and 600 kW, a smaller proportion of free-standing SPPs of 1 000 kW on degraded or industrial sites), with the remainder being SPPs for self-supply in households.

***Figure 39: Development of solar power plants [SPP] - installed capacity and electricity generation for the existing measures scenario and the NEPN scenario***




Key to Figure 39:

| | | |
|---|---|---|
| ▪ Actual development | ▪ NEPN | ▪ EM |

[76] From the network perspective, it is far easier to incorporate larger solar power units at locations with higher electricity consumption (all consumed on-site) or by connecting to the medium-voltage network.

The table below gives an overview of the generation of electricity in solar power plants (SPP) by year for the period 2017-2040.

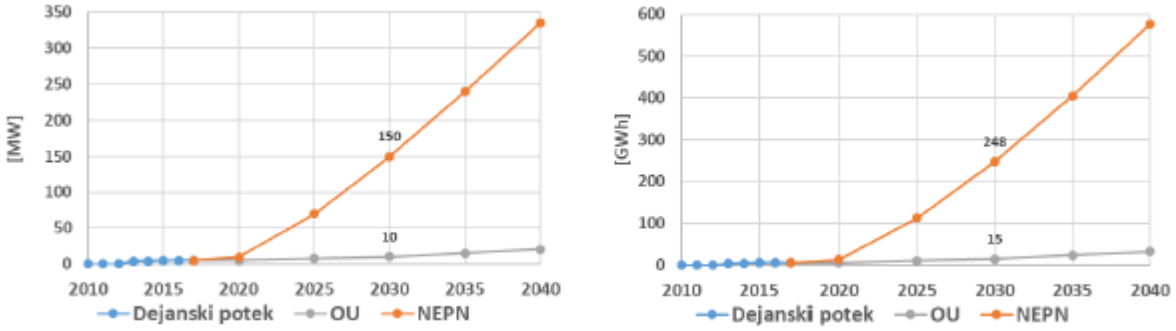
***Table 48: Generation of electricity in solar power plants (SPP) in the period 2017-2040***

| | Unit | 2017 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| **EM scenario** | GWh | 284 | 306 | 427 | 556 | 724 | 904 |
| **NEPN scenario** | GWh | 284 | 420 | 981 | 1 866 | 3 404 | 5 361 |

## Wind energy

With regard to wind power plants, we have the problem of siting them spatially (areas classified as secured, protected and endangered areas) and in terms of social acceptability (due to dispersed settlement, there is a limited number of locations with appropriate wind conditions where in the vicinity there are no people or noise issues). Consequently, in the wind power development scenarios analysed, we remain within the potential of 415 MW, as estimated when the Renewable Energy Sources Action Plan [AN-OVE] was revised in 2015[77].

***Figure 40: WPP development - installed capacity and electricity generation for the scenario with existing NEPN measures and scenario***




Key to Figure 40:

- Actual development
- NEPN
- EM

The table below gives an overview of wind power generation in wind power plants (WPP) by years for the period 2017 to 2040. Advanced technologies and operating systems that minimise noise and impact on birds and bats will be promoted.

***Table 49: Electricity generation in wind power plants (WPP) in the period 2017–2040***

| | Unit | 2017 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| **EM scenario** | GWh | 6.3 | 6 | 10 | 15 | 23 | 32 |
| **NEPN scenario** | GWh | 6.3 | 13 | 112 | 248 | 405 | 577 |

## Hydro energy

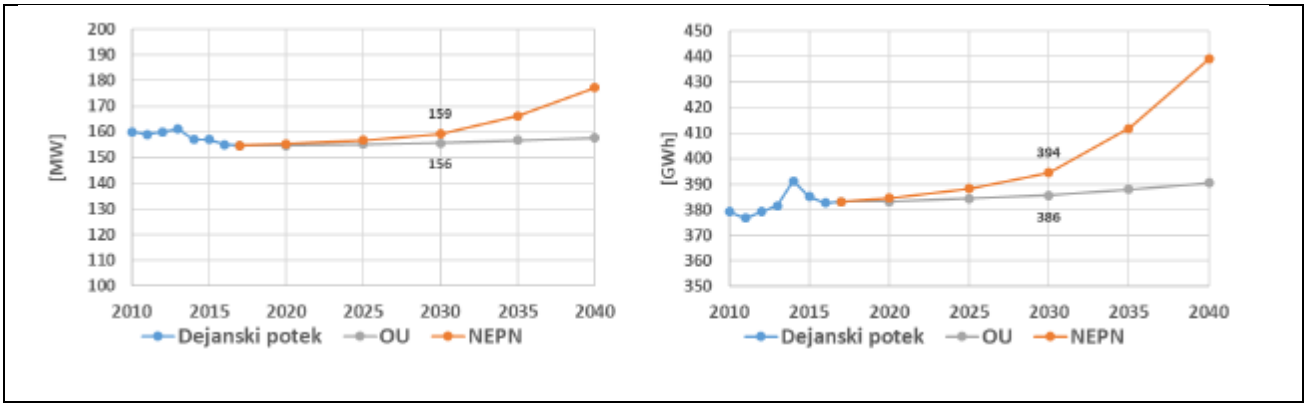
By means of **small hydro-electric power plants** (sHPP), traditionally, water flows are used to produce electricity throughout the country. Here too, for nature protection considerations (qualifying

[77] *Celovit pregled potencialno ustreznih območij za izkoriščanje vetrne energije* [Comprehensive review of potentially relevant wind energy use areas], the expert basis for revision of the Renewable Energy Action Plan (2010-2020), Aquarius, August 2015.

aquatic and riparian organisms and Natura 2000 habitat types, natural assets associated with water and protected watercourse areas) there are restrictions on the locations where hydro plants may be sited. The NEPN therefore adheres to the Aquarius[78] study guidance that, with a view to minimising negative impacts on nature, the small hydro-electric power plant network should, as far as possible, be developed by prioritising the upgrading and modernising of existing, already functioning sHPPs and the revitalisation of existing, non-functioning sHPPs in preference to the installation of new sHPPs, which should be linked to existing structures (dams and barriers) on watercourses.

In the small hydro-electric power plant development scenarios analysed, existing capacity (155 MWe) is expanded to a lesser extent[79] to 159 MWe by 2030 and to 177 MWe by 2040. This would represent an increase in current electricity production (383 GWh in 2017) to around 395 GWh in 2030 and up to 440 GWh in 2040, which is within the planned range indicated in the revised Renewable Energy Action Plan [AN-OVE].

***Figure 41: Small hydro-electric power plant development - installed capacity and electricity generation for the existing measures and NEPN scenarios***




Key to Figure 413:

- Actual development
- NEPN
- EM

The table below shows the production of electricity in small hydro-electric power plants (sHPP) by years for the period 2017-2040.

***Table 50: Electricity production in small hydro-electric power plants (sHPP) in the period 2017–2040***

| | Unit | 2017 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| **EM scenario** | GWh | 383 | 383 | 384 | 386 | 388 | 391 |
| **NEPN scenario** | GWh | 383 | 385 | 388 | 394 | 412 | 439 |

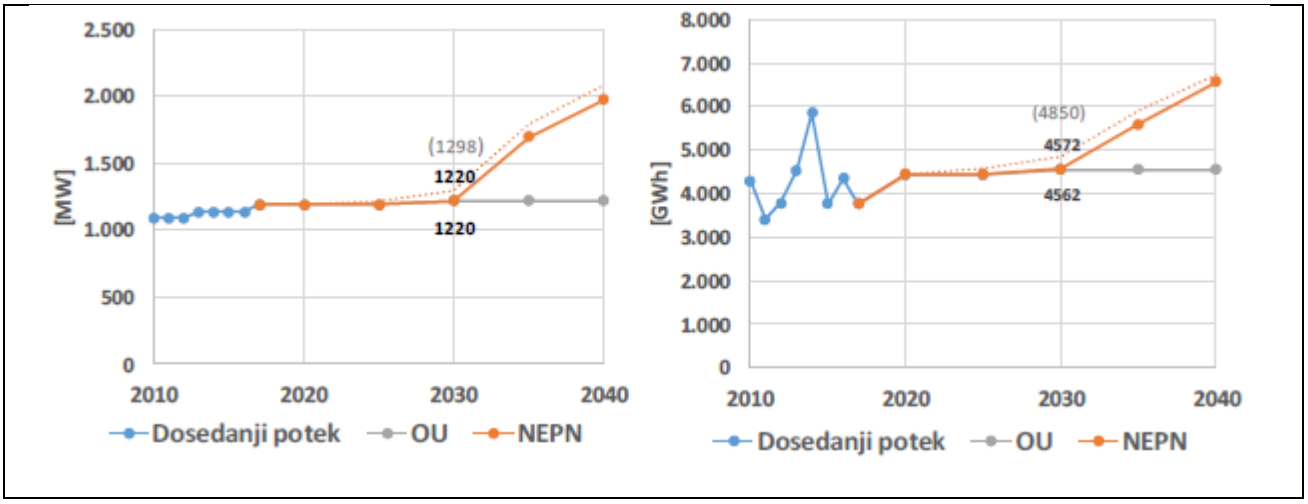
The generation of electricity and power in **large hydro-electric power plants (HPP)** in line with the existing measures scenario and the NEPN scenario is shown in the figures below. According to the existing measures scenario, in the 2030s and 2040, large hydro-electric plants (including pumped HPP) are projected to produce 4 562 GWh of electricity on the generator. According to the NEPN scenario, we produce 4 572 GWh on the generator in 2030 and 6 575 GWh in 2040. According to the existing measures scenario, the installed power of large hydro-electric plants (including pumped

78 *Analiza omejitev umeščanja malih hidroelektrarn z vidika varstva narave z usmeritvami za nadaljnje načrtovanje* [Analysis of the constraints on small hydropower plant siting from the nature conservation perspective with guidance for further planning], expert basis for revision of the Renewable Energy Action Plan (2010-2020), Aquarius, August 2015.

79 In order to speed up the pace of development, it is necessary to regulate legislation in advance and to ensure the ongoing implementation of the procedures, which, in view of the current unregulated situation, requires more time.

systems) is 1 220 MW in the 2030s and 2040; in the NEPN scenario, it is 1 220 MW in 2030 and 1 979 MW in 2040. The increase in hydro-electric power in the NEPN figures up to 2030 envisages an increase in the generation of electricity at existing and other permitted sites in line with legislation.

***Figure 42: Development of hydro-electric power plants [HPPs] and pumped HPP s- installed capacity and electricity production on the generator[80]***




Key to Figure 424:

- Actual development
- EM
- NEPN

The table below shows electricity production on the generator in large hydro-electric power plants (HPP) by years for the period 2017-2040.

***Table 51: Electricity production on the generator in large hydro-electric power plants (HPP) in the period 2017-2040***

| | Unit | 2017 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| **EM scenario** | GWh | 3 777 | 4 442 | 4 442 | 4 562 | 4 562 | 4 562 |
| **NEPN scenario** | GWh | 3 777 | 4 452 | 4 452 | 4 572 | 5 598 | 6 575 |

For the sake of appropriate water management, which is of key strategic importance for the Republic of Slovenia in the process of adapting to climate change, for the transition to a climate-neutral society and for achieving targets in the area of self-supply and food, the positive effects of multifunctional strategic state infrastructure and energy facilities on watercourses should be taken into account.

## Wood biomass

The exploitation of sustainably available wood biomass (preferably wood processing industry residues, logging residues, etc.) is focused primarily on the gasification of wood biomass for the production of synthetic gas and hydrogen and injection into the gas pipeline network in order to minimise the number of energy conversions and minimise losses of available biomass potential, and co-generation of electricity and heat in industry, district heating systems and services, where by utilising the available heat we can achieve maximum total yields.

The Slovenian Forest Service estimates that , in 2020, logging of lower quality wood (excluding logs) will amount to 3 800 000 $m^3$, including 2 200 000 $m^3$ deciduous wood and 1 600 000 $m^3$ conifer wood This wood is suitable for energy use, and poor-quality round wood can also be used for the production of particle boards and fibre boards, mechanical pulp, insulation boards and chemical products. Given

[80] The dotted line shows the possible development of the exploitation of hydro potential.

the strategic orientations that give absolute priority to the processing of wood into products, it will be possible to use only part of this potential for energy production. The needs of the wood processing industry for low-quality round wood are expected to increase to 1 098 000 $m^3$ by 2020, including 360 000 $m^3$ of deciduous wood and 738 000 $m^3$ of coniferous wood (net volume). In 2017, according to the latest estimates (source: GIS), we used 980 000 $m^3$ of wood (net volume) for these purposes. Based on the data on possible logging of poor-quality wood (excluding round wood) and on the basis of the estimated needs for poor quality round wood, it was estimated that 2 300 000 $m^3$ of forest biomass could be used in 2020, including 1 800 000 m3 deciduous wood and 500 000 $m^3$ of coniferous wood. The estimated quantities are more than 70% higher than estimated in the Renewable Energy Action Plan [AN OVE]. The latter calculates that, in 2020, the direct supply of wood mass from forests will be 1 338 000 $m^3$, which is only about 20 000 $m^3$ more than in 2006.

The potential to generate energy from forest biomass is estimated at 6 598 GWh of heat and 326 GWh of electricity. This will contribute most of the heat (over 90%) and about a third of the electricity from agriculture and forestry. In the distribution of energy to thermal and electrical, the same ratio was observed as in the Renewable Energy Action Plan (94.9: 5.1). Promoting co-generation while providing useful use of the heat is one of the measures necessary for the more efficient use of wood biomass.

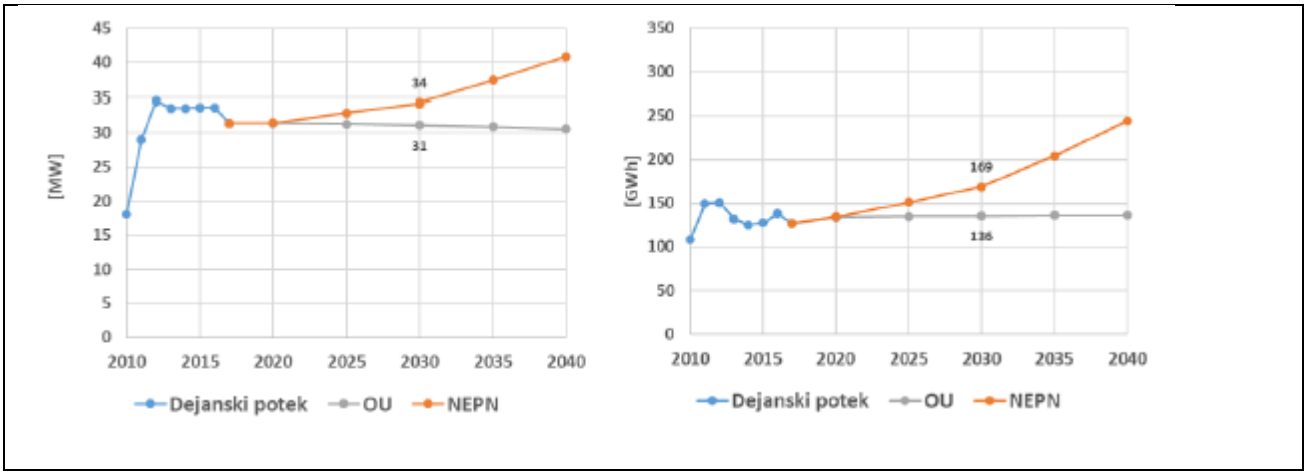
In large thermal power plants, biomass is used in addition to the basic energy source; wood chips as a renewable source are used in the production of heat and electricity. Annual biomass consumption for these purposes fluctuates and reached 96 kt in 2017, generating up to 190 GWh of thermal energy and up to 50 GWh of electricity. Biomass is becoming competitive with imported coal for heat and electricity production, but its use is limited to co-incineration on an existing coal plant and not on its own.

### Biogas

Due to the relatively well-developed livestock breeding, livestock manure presents considerable potential for biogas production. A theoretical calculation shows that 315 GWh of electricity and 245 GWh of heat could be produced from the manure of cattle, pigs and poultry, and this raw material is also suitable for the production of biogas, which is a renewable gas and, in purified form, suitable for injection into gas networks and, as such, able to replace natural gas. Because farms are relatively small and geographically spread out, only about one-third of this potential is technically usable and, currently, rough estimates suggest that 0.2% of cattle manure potential, 13.8% of pig manure potential and 5.8% of poultry manure potential are used.

In the analysed scenarios for the development of electricity production from all types of biogas, the existing capacity (31 MWe) is increased to a smaller extent - up to 34 MWe by 2030 and up to 41 MWe by 2040. This would represent an increase from the current electricity production (127 GWh in 2017) to up to 170 GWh in 2030 and up to 245 GWh in 2040. These could be biogas production sites or biogas gas purification and injection and production in another location, it being especially necessary to utilise the available heat where and to the extent possible. The total biogas production potential is thus around 480 GWh in 2030 and up to 700 GWh in 2040. This includes biogas production from sewage treatment plants, waste treatment and landfill gas capture and agricultural gas production, with the main crops not being used, being aware that agricultural land is intended for food production.

***Figure 43: Development of exploitation of biogas (from agriculture, waste water treatment, waste and landfill gas) - installed capacity and electricity generation under the EM and NEPN scenarios***




Key to Figure 435:

- Actual development
- EM
- NEPN

The table below shows electricity production from biogas by years for the period 2017-2040.

***Table 52: Electricity production from biogas in the period 2017-2040***

| | Unit | 2017 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| **EM scenario** | GWh | 127 | 134 | 135 | 136 | 136 | 137 |
| **NEPN scenario** | GWh | 127 | 135 | 151 | 169 | 204 | 244 |

The potential for obtaining second-generation biofuels and the potential of agricultural biomass for energy recovery by incineration is not assessed in this document. This involves harvesting residues, wood biomass of permanent crops and wood biomass of borders between parcels and overgrown agricultural land. The potential presented therefore does not include energy from wood waste and waste wood products. Nor does it assess the potential for bioethanol production, which - in terms of raw materials - is in direct competition with biogas. If bioethanol production were to be planned, the production of electricity and heat from biogas would have to be reduced. The fact that the potential of these renewable energy sources is not evaluated does not mean that they may not be the recipients of incentives.

## 4.3 Energy Efficiency Dimension

This chapter presents the results of the scenarios for the transport, industry and general consumption sectors. The general consumption sector includes households, agriculture and forestry and other uses, which also includes the services sector. The scenarios used when drafting the NEPN are in line with the findings of the LIFE Climate Path 2050 project and will also be harmonised as appropriate with the long-term climate strategy.

### i. Current primary and final energy use in the economy and individual sectors (including industrial, residential, service and transport sectors)

In 2017, the energy supply amounted to 6 838 ktoe, or 6 788 ktoe excluding non-energy use. The largest share, i.e. 71%, was final energy use, amounting to 4 859 ktoe. Transformation losses due to conversion to electricity and heat amounted to 1 718 ktoe or 25%, transmission and distribution losses accounted for 2% and energy sector use and own use in transformation accounted for 1%. With regard to final energy use, the greatest amount of energy is consumed in transport (38% of final energy use) and manufacturing and construction (27%). Households consume 23% of final energy with other uses accounting for 12%.

### ii. Current possibilities for using high-efficiency cogeneration and efficient district heating and cooling

#### Projection results for the district heating sector and potential for high-efficiency cogeneration

District heating is an efficient system for the distribution of heat produced in a centralised location. It is at a low level in comparison with more developed European countries (e.g. Iceland, Denmark, Sweden) as only 7.6% of energy use is from district heating systems, mainly due to dispersed settlement patterns in Slovenia. In the EU, district heating systems are recognised as one of the key technologies in achieving reductions in greenhouse gas emissions and in energy consumption. One of the priority targets is also energy efficiency in all sectors, which means reduced energy consumption in buildings. Slovenia has district heating mainly in cities. Various fossil fuels, whose reserves are limited, are used as the energy source for the most part.

In densely populated areas, district heating systems have been shown to play a key role in decarbonisation of the heating and cooling sector. An important role will be played by fourth-generation systems characterised by low operating temperatures, flexibility of operation, the possibility of cogeneration of heat and electricity, heat storage, integration with electricity generation sectors, transport, and the integration of RES and surplus heat .

Energy consumption in district systems is expected to decline steadily in both the existing measures scenario and the NEPN scenario. In 2020, energy consumption will be higher due to planned new systems.

In 2030, in accordance with the EM scenario, energy consumption is reduced by 24% compared to 2017 and amounts to 261 ktoe; it is reduced by a further six percentage points by 2040 and amounts to 240 ktoe. The projected reduction in energy consumption is the result of established existing instruments that promote energy renovation of buildings and connections to district systems.

In the existing measures scenario, the main impact is from efficient energy use in buildings, given the large number of energy renovation projects – and reduced energy as a result – but relatively few new connections to systems.

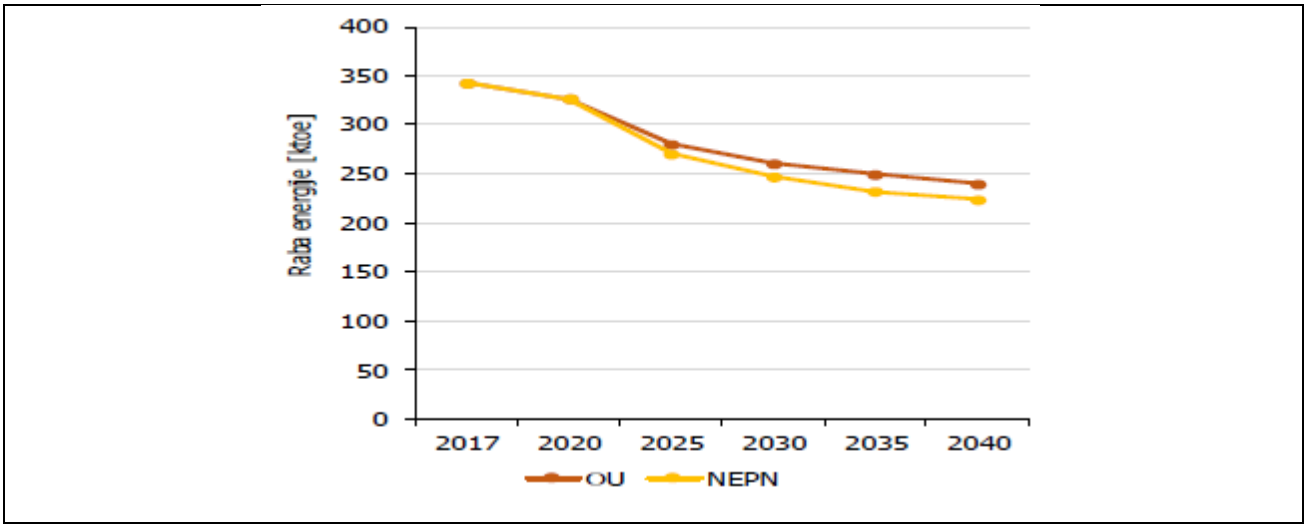
In the NEPN scenario, by 2030 energy consumption is reduced to 247 ktoe – by 28% in relation to the 2017 baseline. By 2040 it is reduced by a further seven percentage points to 224 ktoe. The chief

difference for the significant reduction in energy consumption under the NEPN scenario compared to the EM scenario is not only more extensive implementation of energy renovation of buildings but also more intensive encouragement to connect buildings to district systems, focusing on multi-dwelling and service sector buildings.

The structure of technologies and fuels in district heating systems complies with the guidance for decarbonisation of the sector. Fossil fuel use is being reduced and the use of renewables and the share of more efficient technologies - CHP and heat pumps - are being increased.

Compared to the baseline year 2017, under the existing measures scenario, energy consumption will be reduced most significantly in solid-fuel CHP systems, namely from 200 ktoe to 77 ktoe in 2030 and to 43 ktoe in 2040. This share is reduced to a greater extent under the NEPN scenario, with consumption down to 40 ktoe in 2030 and 34 ktoe in 2040. The projections take into consideration an increase in boilers using wood biomass – a 14% increase in 2030 and a 20% increase in relation the baseline year 2017 under the EM scenario. The NEPN scenario also envisages the wider use of these systems than in the baseline year but, given the general orientations, energy consumption will not increase as much as under the existing measures scenario. Thus, the NEPN scenario anticipates a 17% increase in the energy consumption of these boilers in 2030 and, in 2040, a further 4% increase in relation to the baseline year 2017, specifically achieved through the promotion of other systems. The projections envisage the widespread expansion of renewable CHP systems.

***Figure 44: Energy projection for the district heating sector for the existing measures scenario and the NEPN scenario***




Key to Figure 446:

| | | | | |
|---|---|---|---|---|
| Energy consumption [ktoe] | ▪ | EM | ▪ | NEPN |

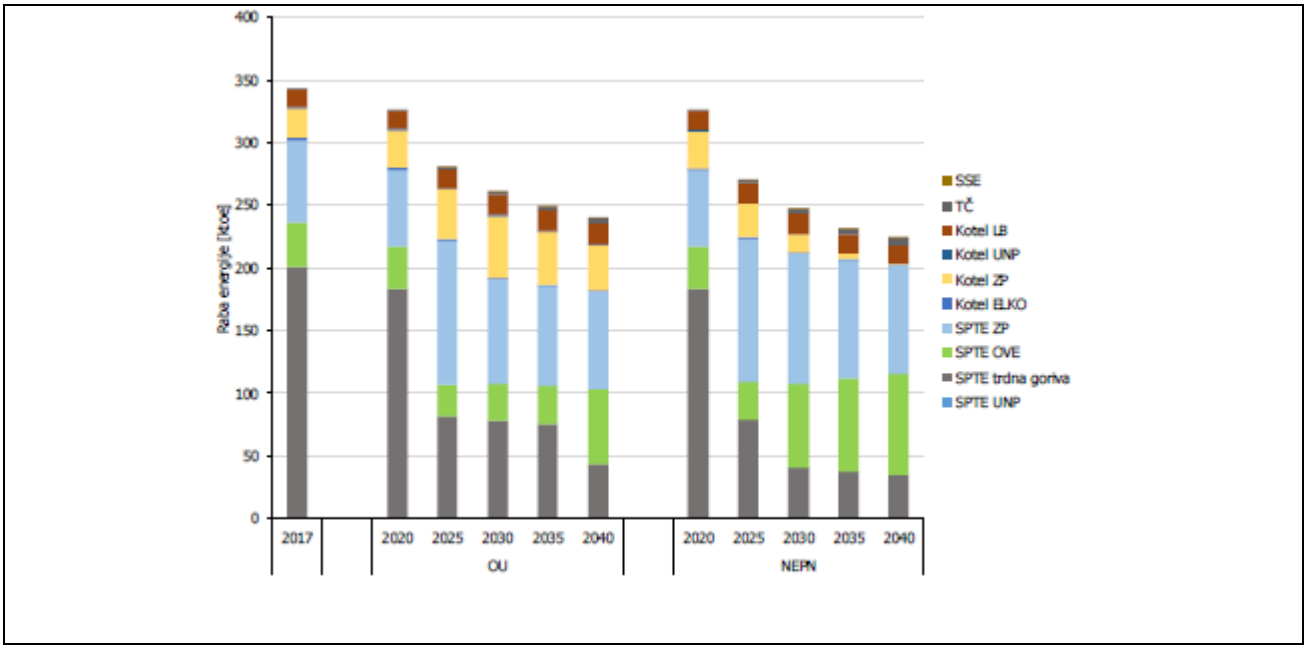
In the EM scenario, energy consumption is expected to fall by 14% from 35 ktoe in the baseline year 2017 to 30 ktoe in 2030. Then, in 2040 consumption is expected to increase by 71% compared to 60 ktoe in the baseline year. The NEPN scenario indicates increased consumption in relation to the baseline year 2017 of 91% (67 ktoe) by 2030 and 130% (81 ktoe) by 2040.

Heat generation in district systems totalled 213 ktoe in the baseline year 2017. In both scenarios energy consumption is reduced. In the existing measures scenario, the reduction is 9% (193 ktoe) by 2030 and 15% (180 ktoe) in 2040 relative to the baseline year 2017. There is a further reduction in energy consumption in the NEPN scenario – by 16% (178 ktoe) by 2030 and by a further 22% (to 168 ktoe) by 2040.

### *Table 53: Heat production in district heating systems according to technology for the existing measures scenario and the NEPN scenario*

| EM | Unit | 2017 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| CHP | ktoe | 171.0 | 163.8 | 143.4 | 130.5 | 127.7 | 126.6 |
| Boilers | ktoe | 40.9 | 41.9 | 50.9 | 59.8 | 53.7 | 47.8 |
| Heat pumps | ktoe | 0.9 | 0.9 | 2.1 | 3.1 | 4.4 | 5.6 |
| Solar collectors | ktoe | 0.0 | 0.0 | 0.1 | 0.3 | 0.4 | 0.4 |
| **NEPN** | **Unit** | **2017** | **2020** | **2025** | **2030** | **2035** | **2040** |
| CHP | ktoe | 171.0 | 163.7 | 148.2 | 143.6 | 145.2 | 142.9 |
| Boilers | ktoe | 40.9 | 42.0 | 39.6 | 27.6 | 17.4 | 13.4 |
| Heat pumps | ktoe | 0.9 | 1.1 | 4.1 | 6.3 | 8.7 | 11.1 |
| Solar collectors | ktoe | 0.0 | 0.0 | 0.2 | 0.5 | 0.6 | 0.7 |

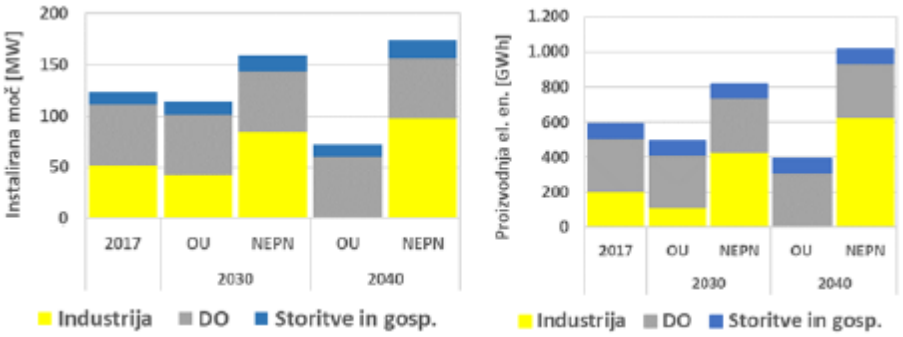
### *Figure 45: Projection of energy consumption and structure of technologies and fuels for the sector district heating for the existing measures scenario and the NEPN scenario*




Key to Figure 45:

| Energy consumption [ktoe] | EM (Existing measures) | NEPN |
|---|---|---|
| ▪ Solar collectors | ▪ Boiler LB (wood biomass) | ▪ CHP ZP (natural gas) |
| ▪ Heat pump | ▪ Boiler UNP (LPG) | ▪ CHP RES |
| | ▪ Boiler ZP (natural gas) | ▪ CHP solid fuel |
| | ▪ Boiler ELKO | ▪ CHP UNP (LPG) |

***Figure 46: Projection of installed power and electricity generation in CHP systems for the existing measures scenario and the NEPN scenario***




Key to Figure 46

| | | |
|---|---|---|
| Installed power [MW] | Electricity production [GWh] | ▪ Industry<br>▪ DH<br>▪ Services and households |

## iii. Projections in terms of existing energy efficiency policies, measures and programmes for the use of primary and final energy for each sector until at least 2040 (including for 2030)

This chapter describes the situation concerning energy consumption and greenhouse gas emissions in 2017 and presents the results of model projections for the existing measures scenario (EM scenario) and the scenario with additional ambitious measures, i.e. the NEPN scenario.

### Transport

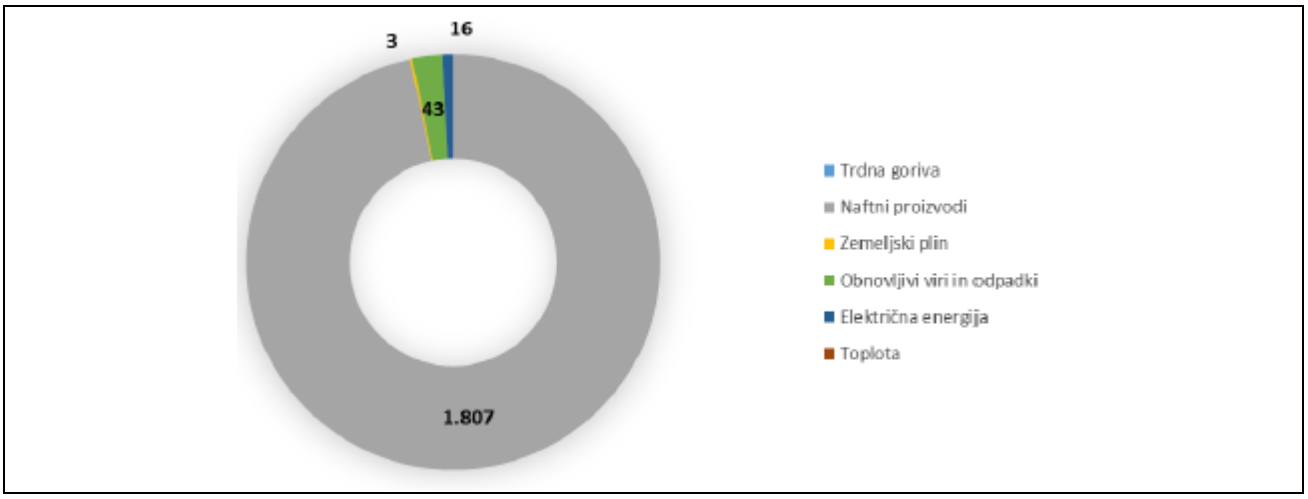
Transport is a sector that has a great impact on energy consumption and hence on the attainment of energy and environment policy targets in Slovenia, especially in terms of achieving the targeted share of renewables in gross final energy use. We face considerable challenges in transport: from e-mobility, improving public transport, transport sharing opportunities, increasing freight transport, developing rail transport, changing habits to new transport-related social and business models.

Several scenarios for the development of transport activity and the development of energy consumption in transport were analysed in the preparation of the NEPN. Below we present the results or model scenarios, namely the existing measures scenario and the NEPN scenario.

Status

In 2017, transport in Slovenia accounted for 1 870 ktoe or 38% of the final energy in the country. The key energy products in this sector are petroleum products; they represented 97% of the total energy in transport in 2017. Other energy sources include renewables and waste (biofuels) at 2%, electricity at 0.9% and natural gas at 0.1%.

***Figure 47: Breakdown of fuel consumption in transport in 2017 [ktoe]***




Key to Figure 47:

- Solid fuels
- Petroleum products
- Natural gas
- Renewables and waste
- Electricity
- Heat

Results of projections in the transport sector

In accordance with the scenario, energy use in passenger transport has varied greatly since 2020. In the existing measures scenario, energy consumption increases up to 2030, when, excluding aviation, it represents 60.4 PJ and is 6% higher than in 2017 or 43% higher than in 2005. Up to 2040, compared to 2030, energy consumption will drop by 8% to 55.5 PJ. In 2030, the main fuel used is diesel at 61%, with petrol at 29%, biofuels at 6% and electricity at 2%, with trains and road transport each contributing half and LPG and natural gas each 1%. Energy consumption per passenger kilometre unit is reduced from 2017 to 2030 by 10% and up to 2040 by 25%. Aviation fuel represents 1.1 PJ in 2017, 1.9 PJ in 2030 and 2.3 PJ in 2040. The air traffic projection is the same in all scenarios.

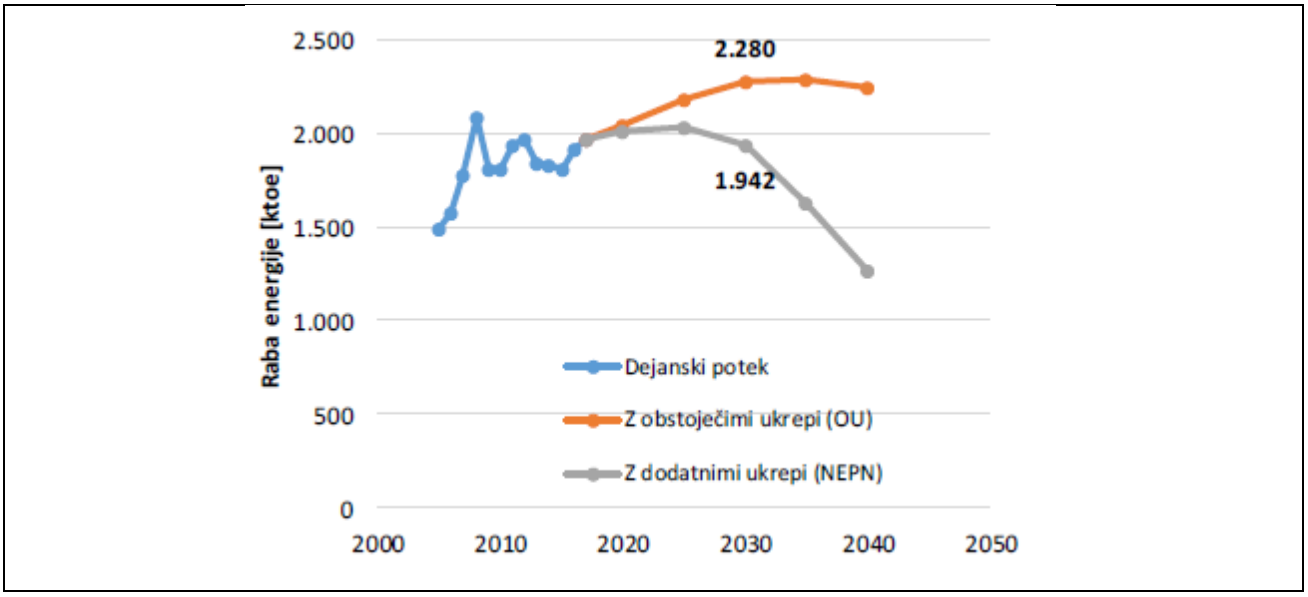
In the ambitious scenario with additional measures (NEPN), energy consumption drops as from 2020, in particular thanks to the accelerated introduction of alternative means of propulsion in private motor vehicles. In 2030, energy consumption excluding aviation at 50.8 PJ is 11% less than in 2017. Up to 2040 the reduction in energy consumption continues at a fast pace, reaching 26.2 PJ or 54% less than in 2017. In this scenario, energy consumption per passenger kilometre is 0.92 MJ/pkm in 2030, and only 0.46 MJ/pkm in 2030.

In both scenarios, energy consumption in freight transport rises up to 2030. In the existing measures (EM) scenario, it continues to increase after 2030. In the scenario with ambitious additional measures – the NEPN, however, it decreases after 2030. The EM scenario indicates energy consumption of 33.2 PJ in 2030, i.e. 36% more than in 2017 and 73% more than in 2005. By 2040, energy consumption increases by a further 9% compared to 2030. In the NEPN scenario, consumption in 2030 at 28.6 PJ is 17% higher than in 2017, while in 2040 at 24.6 PJ it is 14% less than in 2030.

In 2030, there is no substantial difference in the fuel structures in the various scenarios, and diesel has the greatest share across the board: especially in the existing measures scenario (at 86%), while in the NEPN scenario it is at 75%. Second place in the existing measures scenario is held by biofuels with 7% and natural gas with 4%. Petrol has a 1% share. In the NEPN scenario, biofuels have a 10% share and natural gas an 8% share. Electricity represents 3% in the existing measures scenario and 4% in the NEPN scenario. In the NEPN scenario, petrol accounts for only 0.5% of fuel consumption. By 2040, in the NEPN scenario, the share of natural gas is increased to 33%, meanwhile the share of diesel is reduced to 26%. In the EM scenario, diesel has a share very similar proportion to the 2030 value, at 85%, because the conversion of heavy goods vehicles to natural gas is not planned. The

share of electricity is 4% in the EM scenario and 12% in the NEPN scenario, while the share of biofuels is 6% in the EM scenario and 8% in the NEPN scenario.

***Figure 48: Total energy consumption in transport for the existing measures scenario and the NEPN scenario up to 2040***




Key to Figure 48:

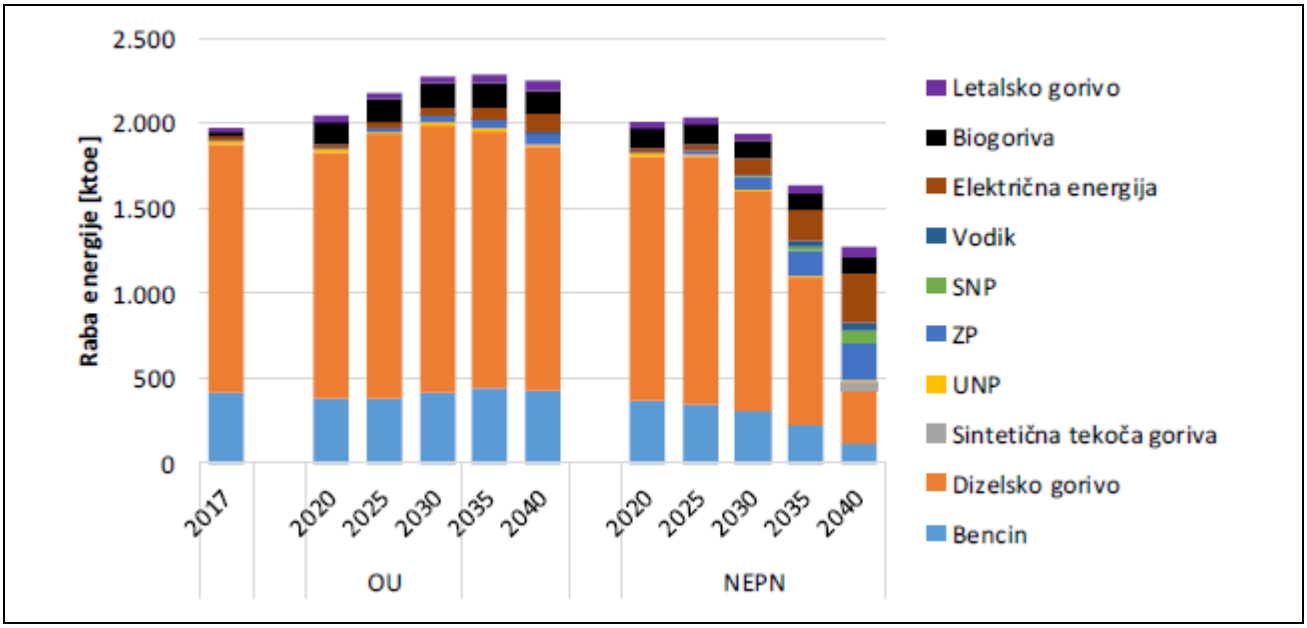
| | |
|---|---|
| Energy consumption [ktoe] | ▪ Actual development<br>▪ With existing measures (EM)<br>▪ With additional measures (NEPN) |

Energy consumption per tonne-kilometre unit is 0.43 MJ/tkm in 2017. In 2030, it falls to 0.39 MJ/tkm in the EM scenario and to 0.35 MJ/tkm in the NEPN scenario. Significantly smaller reductions in specific energy consumption per transport work carried out are achieved in freight transport than in passenger transport, anticipating no replacement of propulsion technologies but only incremental improvement of internal combustion engines, other drive assemblies and aerodynamics.

Total energy consumption in the EM scenario rises until 2035. In 2030 it reaches 95.4 PJ, which is 16% more than in 2017 and 53% more than in 2005. In 2040, total energy consumption is 94.0 PJ. In the NEPN scenario, energy consumption rises until 2025, after which the trend reverses and energy consumption starts to fall, decreasing more intensively after 2030. Total energy consumption in 2030 is 81.3 PJ, which is 1% less than in 2017, and in 2040 it is 53.1 PJ, which is 36% less than in 2017.

The share of RES in transport, determined in accordance with the calculation method laid down in the RES Directive of 2018, reaches 13% in 2030 in the EM scenario. Biofuels make the largest contribution to this share. In the NEPN scenario, the share of RES in transport comes to 21% in 2030, with biofuels contributing most.

***Figure 49: Projection of end-use of energy and fuel structure for the transport sector for the existing measures scenario and the NEPN scenario up to 2040***




Key to Figure 49:

| | | |
|---|---|---|
| Energy consumption [ktoe] | ▪ Aviation fuel<br>▪ Biofuels<br>▪ Electricity<br>▪ Hydrogen<br>▪ CNG | ▪ ZP<br>▪ UNP<br>▪ Synthetic liquid fuels<br>▪ Diesel Fuel<br>▪ Petrol |

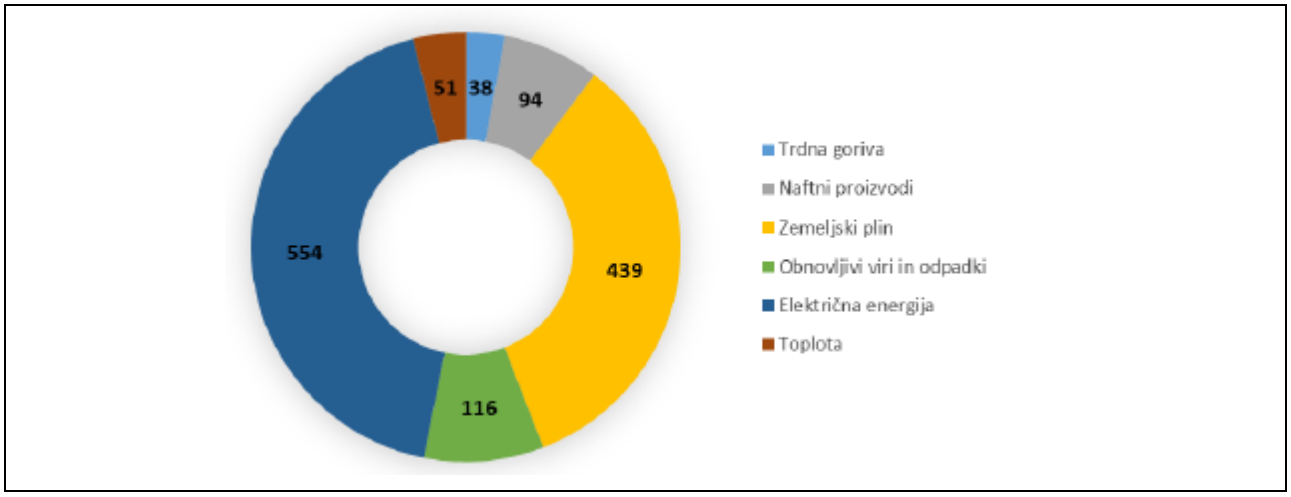
## Industry

The projection of energy consumption and emissions in industry is a particular challenge as we are today on the threshold a new industrial era, the era of 'new industrial paradigms', Industry 4.0, based on information and communication technologies (ICT) and universal device connectivity (the 'internet of things'). Decarbonisation of the industrial sector represents a particular challenge, given the high share of natural gas consumption in manufacturing, especially in energy-intensive activities (manufacture of paper, cement, steel, aluminium and chemicals). The integration and implementation of substantial efficiency measures that are crucial for the transition to a circular economy represent an extremely important and topical developmental trend in industry.

Status

In 2017 manufacturing and construction in Slovenia consumed 1 293 ktoe of energy, which is 26% of final energy in Slovenia. The key energy products in this sector are electricity and natural gas, which in 2017 together accounted for as much as 77% of total energy in manufacturing and construction (see figure below), with electricity representing 43% and natural gas 34%, while renewable energy sources made up 9% (wood biomass, biogas, environmental energy, solar energy), petroleum products 7%, district heat 4% and solid fuels 3%.

***Figure 50: Breakdown of fuel consumption in manufacturing and construction in 2017 [ktoe]***




Key to Figure 50:

- Solid fuels
- Petroleum products
- Natural gas
- Renewables and waste
- Electricity
- Heat

Results of projections for the industry sector

In the EM scenario, with existing measures, energy consumption in manufacturing increases. In 2030, it amounts to 1 403 ktoe, a 9% increase compared to 2017, and in 2040 it amounts to 1 481 ktoe, an increase of a further 15% in relation to the baseline year.

In the NEPN scenario, however, energy consumption in manufacturing and construction is reduced, thanks chiefly to energy efficiency measures (utilisation of surplus heat, etc.). In 2030, energy consumption in manufacturing is 1% less than the baseline 2017 value and, in 2040, 2% less. In 2030, consumption amounts to 1 283 ktoe. In 2030, utilisation of 33 ktoe of surplus heat is expected and, in 2040, 61 ktoe.

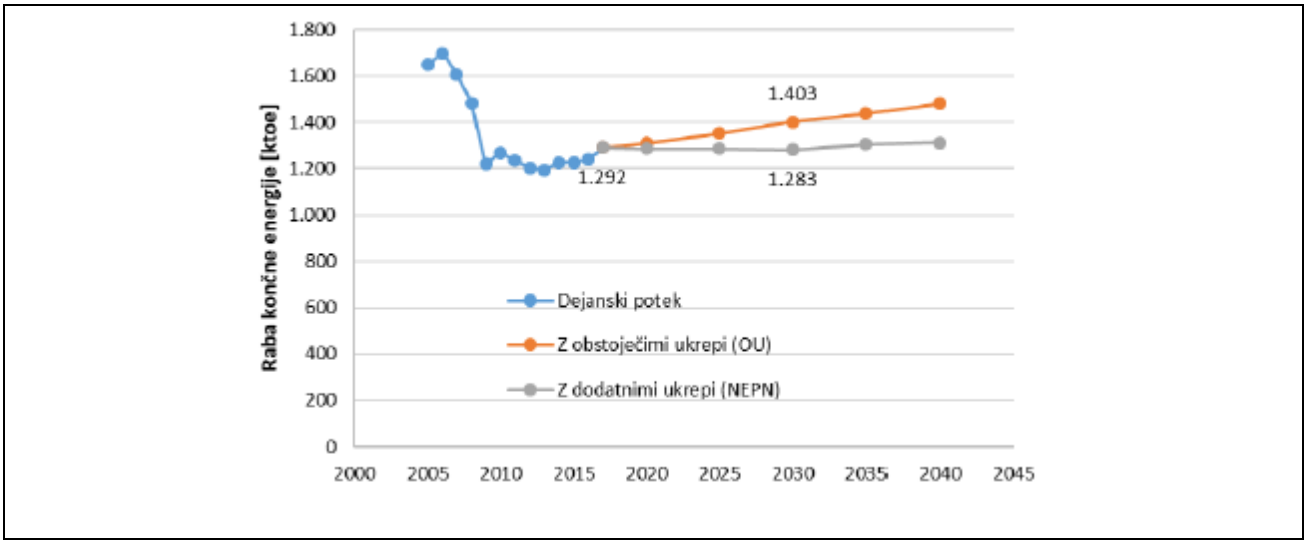
While, in the EM scenario, with existing measures, the share of renewables[81] is 10% in 2030 and 8% in 2040, the NEPN scenario assumes a 30% share of renewables by 2030 and a 37% share by 2040. It should be emphasised at this point that the NEPN scenario anticipates the use of synthetic gas as early as 2030, a 10% share in 2030 and a 25% share in 2040.

Electricity consumption, amounting to 554 ktoe in 2017, is on the increase and increases further in the existing measures scenario to 602 ktoe, or 9%, by 2030 and to 643 ktoe or 16% by 2040. In the NEPN scenario, electricity consumption increases by 5% to 584 ktoe by 2030 and by 14% to 634 ktoe by 2040.

The energy end-use trends and fuel structure for both scenarios up to 2040 are shown in the figure below.

81 The share is determined as the ratio of the sum of renewable fuels (wood biomass, other renewables and surplus heat ) to the sum of heating fuels (excluding district heat).

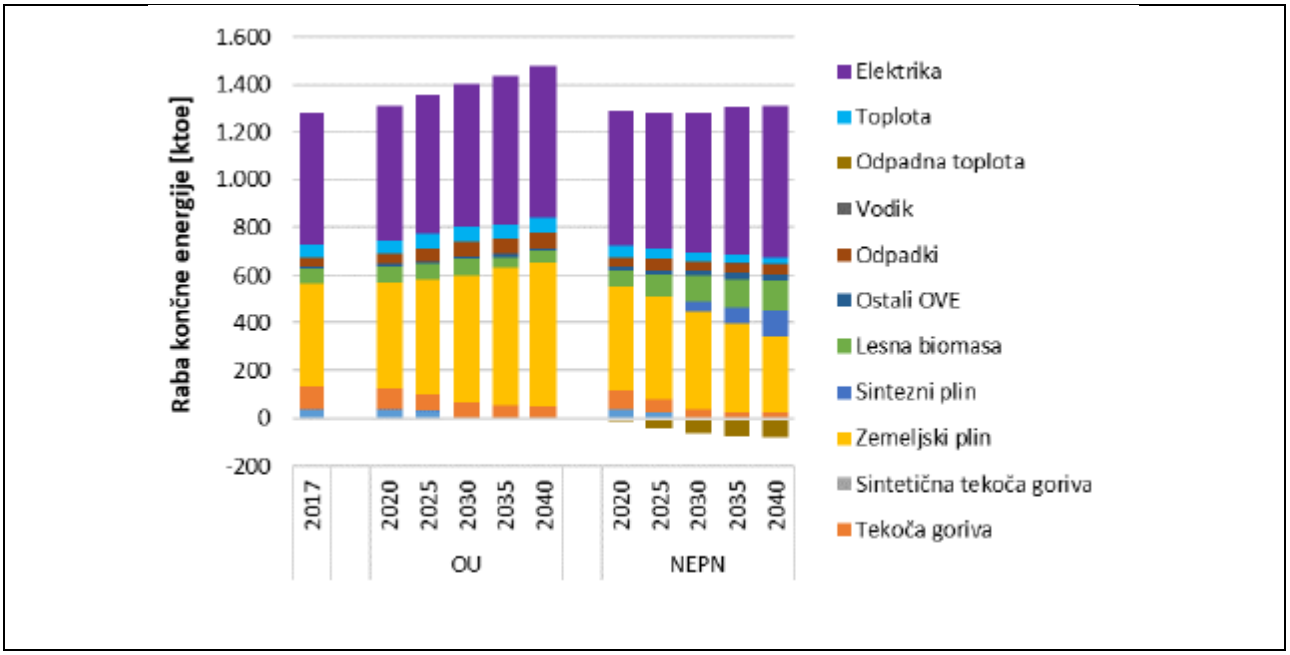
***Figure 51: Projection of energy end-use for the manufacturing and construction sectors for the existing measures scenario and the NEPN scenario***




Key to Figure 51:

| | |
|---|---|
| Final energy consumption | ▪ Actual development<br>▪ With existing measures (EM)<br>▪ With additional measures (NEPN) |

***Figure 52: Projection of energy end-use and fuel structure for the manufacturing and construction sectors for the existing measures scenario and the NEPN scenario***




Key to Figure 52:

| | | |
|---|---|---|
| Final energy consumption; | ▪ Electricity<br>▪ Heat<br>▪ Waste heat<br>▪ Hydrogen<br>▪ Waste<br>▪ Other RES | ▪ Wood biomass<br>▪ Synthetic gas<br>▪ Natural gas<br>▪ Synthetic liquid fuels<br>▪ Liquid fuels |

Cogeneration of heat and electricity in industry

We also envisaged the use of cogeneration technologies (CHP) in industry. In 2017, 126 ktoe of fuel was used for heat production purposes: 26 ktoe of brown coal, 37 ktoe of biomass, 62 ktoe of natural gas, 1 ktoe of biogas and 0.1 ktoe of fuel oil. In the baseline year 2017, 85 ktoe of heat and 201 GWh of electricity were produced in the units.

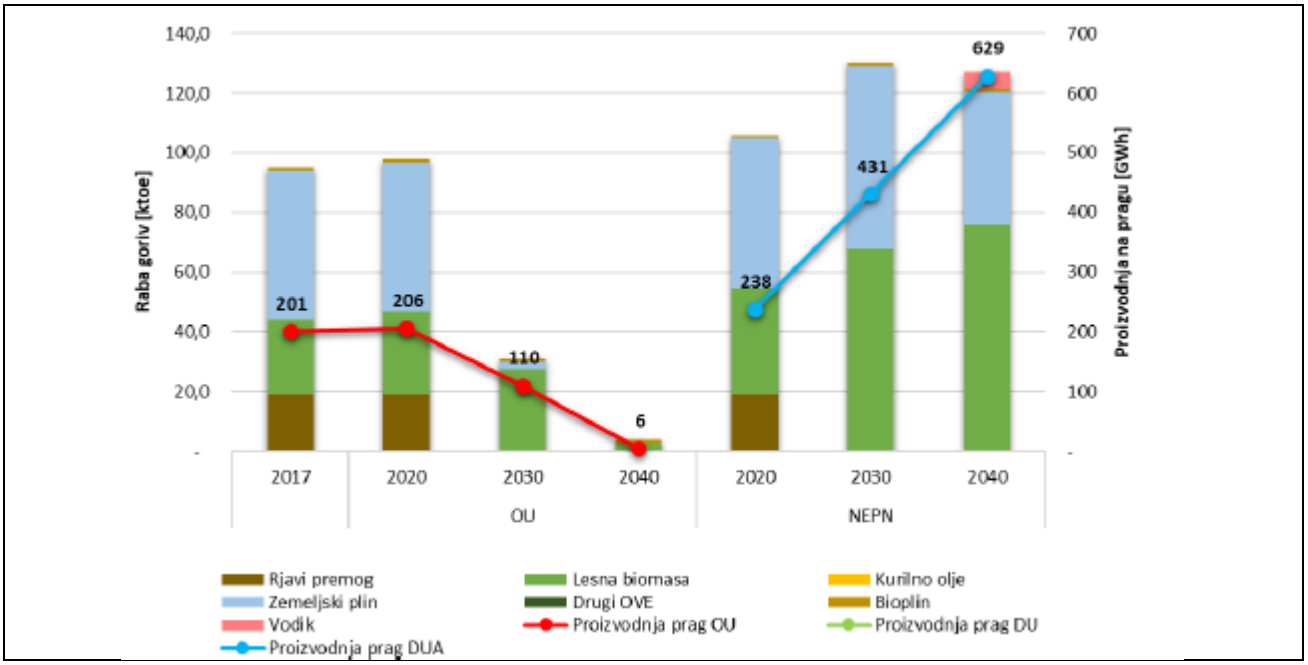
The existing measures scenario expects the existing situation to be maintained in 2030 and does not anticipate any new CHP installations in 2040. The NEPN scenario is more ambitious in this area, expecting capacity to be increased to 85 MW (431 GWh electricity generation) by 2030 and 97 MW (629 GWh electricity generation) by 2040.

The figure below shows the consumption of heat generation fuels by CHP plants in industry by scenario and threshold electricity generation. The columns show the final consumption of fuels used for heat generation in CHP units. In the existing measures scenario, the existing installations operate until 2030 and no new installations are foreseen after 2030 due to non-stimulating incentives.

The ambitious NEPN scenario envisages more intensive penetration of CHP technologies on wood biomass (a 52% share of fuel consumption in 2030 and a 53% share in 2040). Natural gas accounts for 47% of fuel consumption in 2030 and 40% of fuel consumption in 2040. The share of hydrogen is increasing, at 12 ktoe accounting for about 7% of fuel use in 2040.

In accordance with the data reporting and collection methodology, the use of fuels for electricity generation in cogeneration units is attributed to the transformation sector.

***Figure 53: Energy end-use and electricity generation in CHP units in industry according to scenarios***




Key to Figure 53:

| | | | |
|---|---|---|---|
| Fuel use | ▪ Brown coal | ▪ wood biomass | ▪ Fuel oil |
| | ▪ Natural gas | ▪ Other RES | ▪ Biogas |
| Threshold production | ▪ Hydrogen | ○ Threshold production, EM (existing measures) | ○ Threshold production, DU (additional measures) |
| | ○ Threshold production DUA (additional measures, ambitious) | | |

The production of electricity in CHP installations will undoubtedly play an important supplementary role in securing electricity supply, especially in terms of the wider use of renewable sources and their stochastic nature.

***Table 54: Capacity and generation of electricity in CHP technologies in industry according to scenarios***

| Capacity [MW] | 2017 | 2020 | 2030 | 2040 |
|---|---|---|---|---|
| EM scenario | 51 | 52 | 42 | 1 |
| NEPN scenario | 51 | 58 | 85 | 97 |
| Threshold electricity production [GWh] | | | | |
| EM scenario | 201 | 206 | 110 | 6 |
| NEPN scenario | 201 | 238 | 431 | 629 |

## General consumption (households, agriculture and forestry and other consumption)

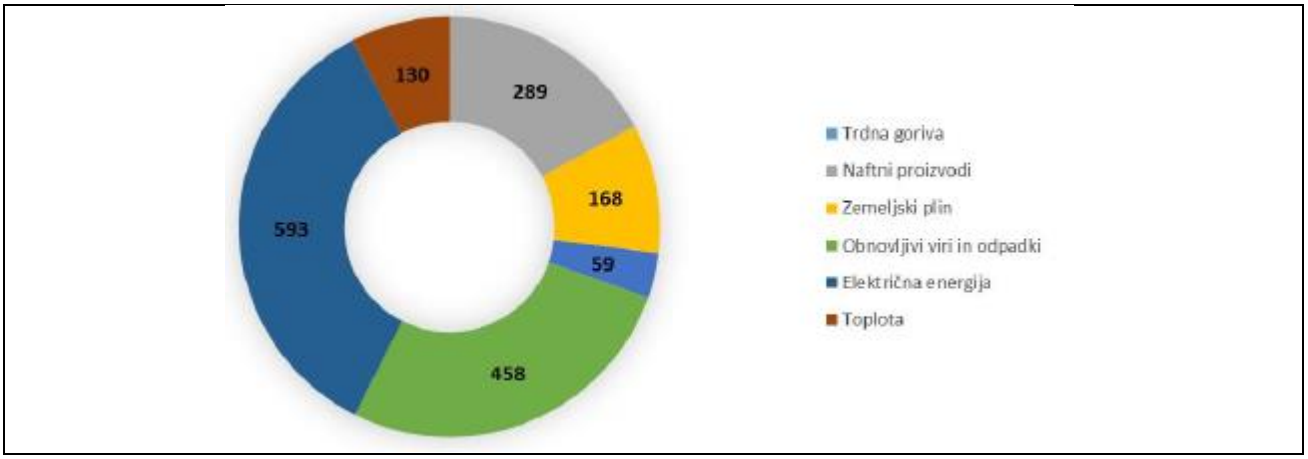
By 2050, in order to fulfil the greenhouse gas emissions targets imposed, net-zero emissions will have to be achieved in the consumer sector (households, agriculture and forestry and other consumption, of which the service sector is also part). The objective is extremely ambitious and, in order to achieve it, it will be necessary to continue with the energy renovation of buildings and promote technologies using RES and centralised systems. By 2030 and beyond, it will be necessary to maintain a rate of integrated energy renovations of over 2% per year. This will be a major challenge, especially for the public sector, as it more demanding cases of reconstruction for economic, technical and other reasons will follow. The construction design and renovation process will be supported by mandatory building information modelling, which will increase design efficiency, reduce investment and shorten construction time.

Regulations on the construction of new buildings will be further tightened up. Tightening of energy efficiency regulations in buildings and sustainable evaluation of buildings is expected, which is likely to affect the number of renovations and energy efficiency of buildings. Starting in 2018, new buildings in the public sector must be nearly zero energy, which means that they must be extremely energy efficient and must use renewable energy sources. From 2021 this applies to all buildings. Most of the buildings in Slovenia were built in the 1960-1990 period, and the reduction of GHG emissions up to 2030 and 2050 will also need to take into account other aspects of renovation, such as, for instance, seismic, flood and fire protection, etc. This will be done in the context of a long-term strategy to promote investment in the energy renovation of buildings, which will identify additional instruments for the renovation of buildings and a phased approach to the comprehensive phased renovation of buildings.

Status

Energy consumption in the consumer sector (households, agriculture and forestry and other consumption) amounted to 1 697 ktoe in 2017, which represents 34% of final energy in Slovenia. The key energy sources in the sector concerned are electricity (35%), renewables (30%) and petroleum products (17%), with natural gas accounting for 10% of energy consumption in the sector.

***Figure 54: Breakdown of fuel consumption in the buildings sector in 2017 [ktoe]***




Key to Figure 54:

| | |
|---|---|
| ▪ Solid fuels | ▪ Renewables and waste |
| ▪ Petroleum products | ▪ Electricity |
| ▪ Natural gas | ▪ Heat |

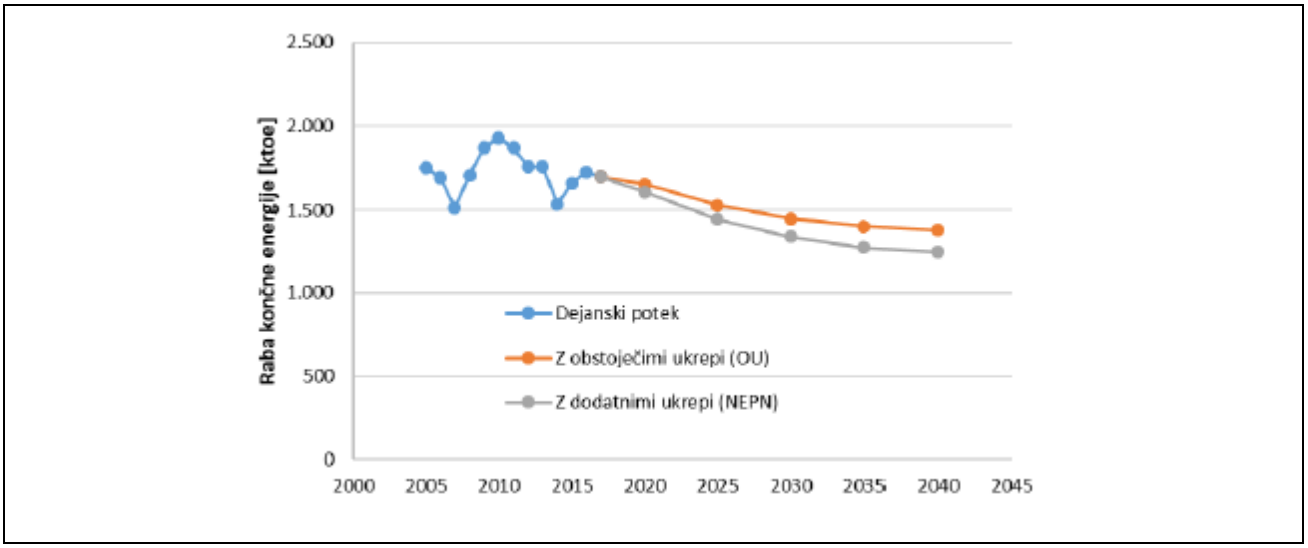
The focus is, within buildings, to dramatically reduce the use of fossil fuels and to maximise the use of district heating systems that enable greater flexibility and connectivity to other sectors – electricity generation through heat storage, and elsewhere renewable energy sources. A detailed spatial analysis was also undertaken addressing the possibility of expanding existing district heating systems and identifying new areas where micro and large district heating systems would be economically viable today and in 2030 and 2040 when heat demand will be reduced because buildings will be more energy efficient. Thus, in accordance with the various scenarios, the actual possibility of connection to district heating systems for single and multi-dwelling buildings, public buildings and other service sectors was identified.

Result of projections for the general consumption sector

In accordance with the existing measures (EM) scenario, energy consumption in the general consumption sector is decreasing, as shown in the figure below. Compared to the baseline year 2017, consumption is down 15% to 1 448 ktoe in 2030, dropping by a further 4 percentage points to 1 381 ktoe by 2040.

Compared to the existing measures scenario, the NEPN scenario provides for even more energy renovations, greater emphasis on renewable technologies for heating and hot water preparation, and more connections to district heating systems as well as a significant increase in their number in economically justified areas. In the NEPN scenario, final energy use is reduced by 21% to 1 339 ktoe in 2030, while in 2040 it is reduced by 26% compared to 2017 to 1 249 ktoe.

***Figure 55: Total energy use in the general consumption sector under the existing measures scenario and under the NEPN scenario by 2040***



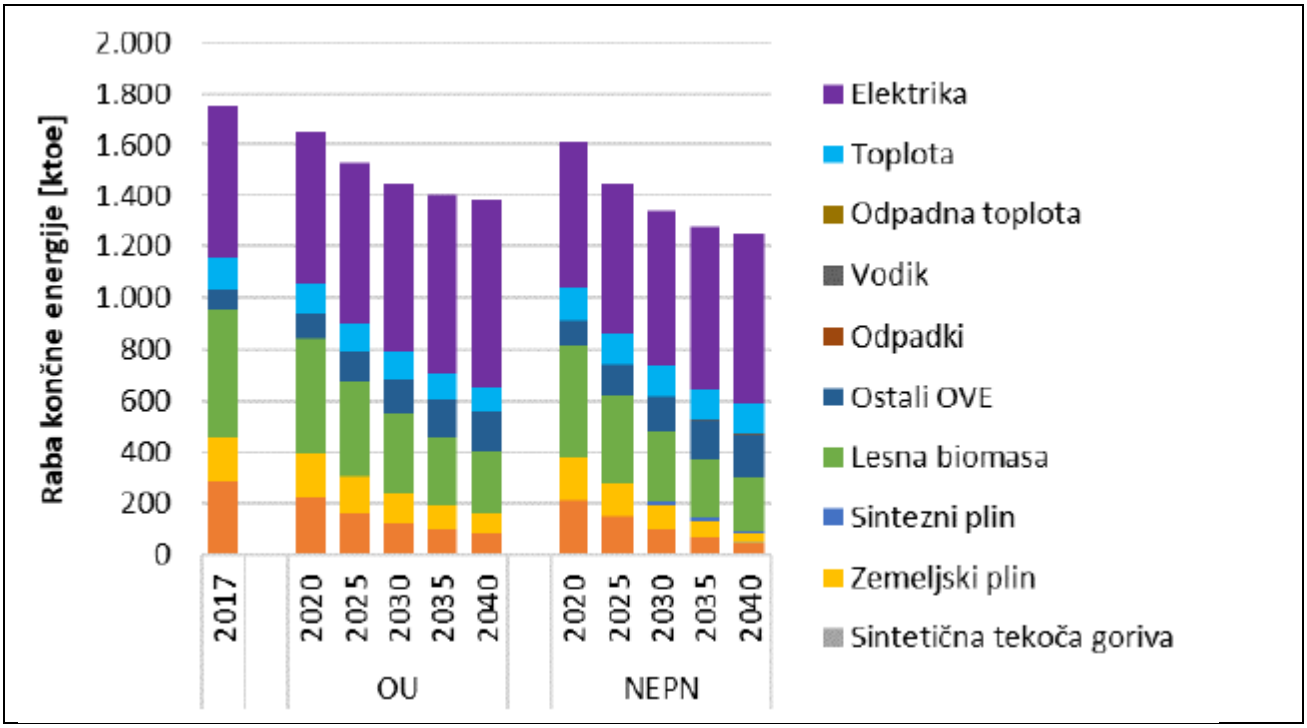

Key to Figure 55:

| | |
|---|---|
| Final energy consumption | ▪ Actual development<br>▪ Existing measures (EM)<br>▪ Additional measures (NEPN) |

Targets for net-zero emissions in buildings by 2050 lead to significant changes in fuel structures. Technologies using fossil fuels will be replaced by either technology using renewables, or by heat stations and connections to district heating systems. In the existing measures scenario, the final energy consumption of liquid fuels is projected to be 123 ktoe in 2030, a reduction of 57% compared to 2017. It is further reduced by 24% to 83 ktoe by 2040. In the NEPN scenario, the projected reduction of final energy consumption is 65% (99 ktoe) in 2030 and 85% (42 ktoe) in 2040 compared to the baseline year 2017.

The projections take into account an increase in final electricity consumption due to (1) an increase in the share of heat pumps as heating technologies in buildings in new constructions and replacements of old, inefficient systems, (2) an increase in the electricity consumption of other technical systems in buildings (lighting, cooling) and (3) an increase in the electricity consumption of interior fittings, where the major consumer is the services sector. In the existing measures scenario, an increase of 11% to 656 ktoe is expected in 2030, while final energy consumption increases by a further 11% to 723 ktoe by 2040. The NEPN scenario also envisages more replacements and greater use of heat pumps, as well as more efficient lighting, more economical use of interior fittings, etc. Final energy consumption is therefore 601 ktoe in 2030, an increase of only 2% compared to 2017, while increasing to 654 ktoe in 2040, a 10% increase in relation to the baseline year.

***Figure 56: Projection of energy end-use and fuel structure for the general consumption sector for the existing measures scenario and the NEPN scenario up to 2040***




Key to Figure 56:

| | | | |
|---|---|---|---|
| Final energy consumption | | ▪ Electricity | ▪ Other RES |
| | | ▪ Heat | ▪ Wood biomass |
| EM | NEPN | ▪ Waste heat | ▪ Synthetic gas |
| (existing measures) | | ▪ Hydrogen | ▪ Natural gas |
| | | ▪ Waste | ▪ Synthetic liquid fuels |

## Energy end-use projections and balance

The table below shows the results of projections for all energy end-use sectors by energy group.

***Table 55: Final energy balance for 2005 and 2017 and projections for 2020, 2030 and 2040 according to the EM and NEPN scenarios***

| | | | | EM | | | NEPN | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **2005** | **2017** | **2020** | **2030** | **2040** | **2020** | **2030** | **2040** |
| **Final energy consumption** | [ktoe] | **4 869** | **4 859** | **5 007** | **5 131** | **5 110** | **4 909** | **4 565** | **3 832** |
| Solid fuels | [ktoe] | 80 | 38 | 35 | 5 | 0 | 35 | 3 | 0 |
| Liquid fuels | [ktoe] | 2 381 | 2 191 | 2 197 | 2 238 | 2 070 | 2 157 | 1 716 | 610 |
| Gaseous fuels | [ktoe] | 665 | 610 | 624 | 691 | 740 | 600 | 632 | 756 |
| RES and waste | [ktoe] | 451 | 676 | 792 | 725 | 651 | 787 | 769 | 669 |
| Electricity | [ktoe] | 1 096 | 1 163 | 1 182 | 1 305 | 1 476 | 1 154 | 1 279 | 1 585 |
| Heat | [ktoe] | 196 | 181 | 176 | 166 | 155 | 177 | 155 | 148 |
| Hydrogen | [ktoe] | | | 0 | 2 | 17 | 0 | 10 | 63 |
| **Industry** | [ktoe] | **1 647** | **1 292** | **1 310** | **1 403** | **1 481** | **1 287** | **1 283** | **1 313** |
| Solid fuels | [ktoe] | 80 | 38 | 35 | 5 | 0 | 35 | 3 | 0 |
| Liquid fuels | [ktoe] | 222 | 94 | 91 | 62 | 48 | 86 | 35 | 24 |

| | | | | EM | | | NEPN | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **2005** | **2017** | **2020** | **2030** | **2040** | **2020** | **2030** | **2040** |
| Gaseous fuels | [ktoe] | 541 | 439 | 445 | 535 | 609 | 427 | 451 | 427 |
| RES and waste | [ktoe] | 125 | 116 | 120 | 138 | 124 | 128 | 171 | 192 |
| Electricity | [ktoe] | 617 | 554 | 564 | 602 | 643 | 561 | 584 | 634 |
| Heat | [ktoe] | 62 | 51 | 55 | 61 | 58 | 51 | 39 | 31 |
| Hydrogen | [ktoe] | | | 0 | 0 | 0 | 0 | 0 | 5 |
| **Transport** | [ktoe] | **1 469** | **1 870** | **2 041** | **2 280** | **2 246** | **2 014** | **1 942** | **1 269** |
| Solid fuels | [ktoe] | | | | | | | | |
| Liquid fuels | [ktoe] | 1,452 | 1,807 | 1,885 | 2,051 | 1,938 | 1,859 | 1,581 | 539 |
| Gaseous fuels | [ktoe] | 0 | 3 | 6 | 41 | 50 | 6 | 78 | 282 |
| RES and waste | [ktoe] | 0 | 43 | 127 | 139 | 131 | 126 | 180 | 99 |
| Electricity | [ktoe] | 17 | 16 | 23 | 46 | 110 | 23 | 93 | 297 |
| Heat | [ktoe] | | | | | | | | |
| Hydrogen | [ktoe] | | | 0 | 2 | 17 | 0 | 10 | 51 |
| **General consumption** | [ktoe] | **1 753** | **1 697** | **1 655** | **1 449** | **1 383** | **1 607** | **1 340** | **1 250** |
| Solid fuels | [ktoe] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquid fuels | [ktoe] | 707 | 289 | 222 | 125 | 84 | 211 | 100 | 47 |
| Gaseous fuels | [ktoe] | 124 | 168 | 172 | 115 | 81 | 167 | 103 | 46 |
| RES and waste | [ktoe] | 326 | 517 | 545 | 448 | 397 | 533 | 419 | 379 |
| Electricity | [ktoe] | 462 | 593 | 595 | 656 | 723 | 569 | 602 | 654 |
| Heat | [ktoe] | 134 | 130 | 121 | 105 | 98 | 126 | 116 | 118 |
| Hydrogen | [ktoe] | | | 0 | 0 | 0 | 0 | 0 | 7 |

## iv. Cost-optimal levels of minimum energy performance resulting from national calculations in accordance with Article 5 of Directive 2010/31/EU

The minimum energy performance requirements for buildings are governed by the Rules on efficient use of energy in buildings. This act is expected to be updated in 2020 in line with the requirements stemming from Article 5 of Directive 2010/31/EU and the establishment of minimum requirements for nearly zero-energy buildings. Accordingly, after 2020, all buildings will be constructed and renovated as nearly zero-energy buildings in line with the rules on efficient energy use in buildings. The requirements will be established at three levels, namely (1) heat required to heat the building, (2) non-renewable primary energy and (3) the share of renewables in the total energy balance of the building. Different types of buildings will be subject to different minimum requirements, and a more detailed energy treatment will be required for some types of buildings. Cost-effective approaches and optimal levels will also be specified in more detail in a long-term strategy to encourage investment in the energy renovation of buildings.

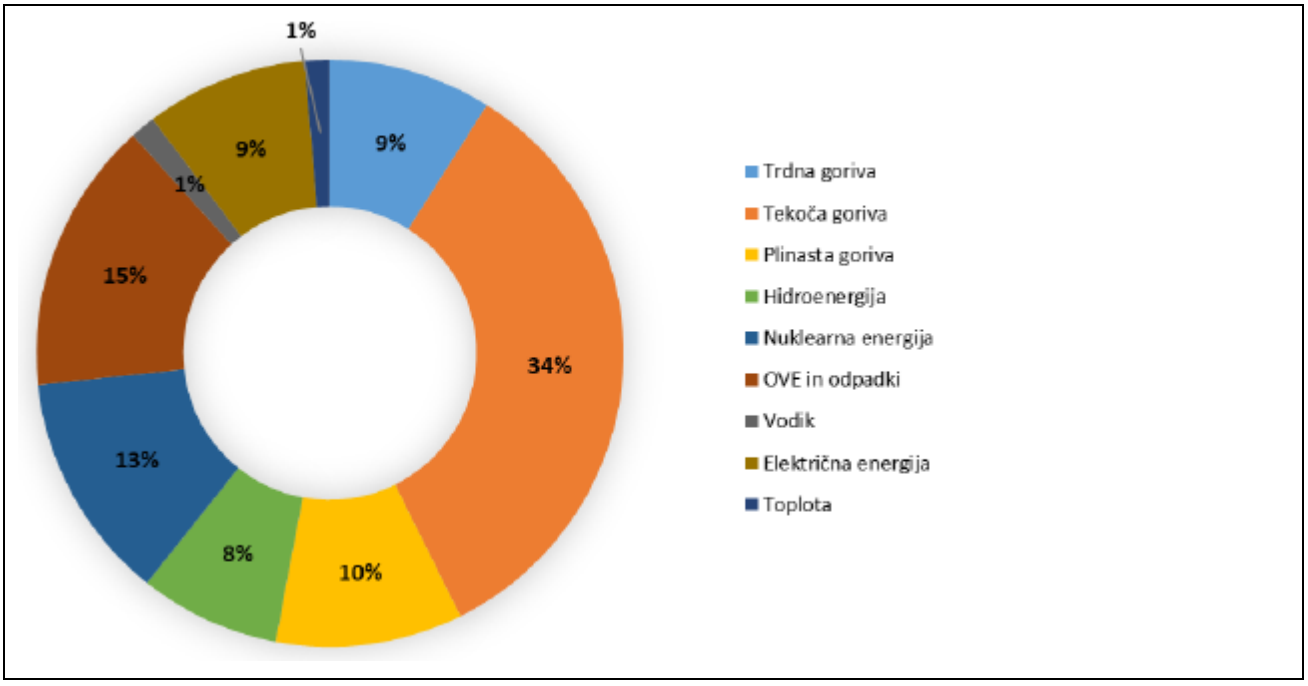
## 4.4 Energy Security Dimension

### i. The current mix of energy sources, domestic energy sources, dependency on imports, including related risks

#### The current mix of energy sources

Energy supply in 2017 is dominated by liquid fuels representing a share of 34%, with RES and waste at 15%, nuclear energy at 13%, gas fuels at 10%, electricity and solid fuels with a 9% share, hydro-electric power with a 8% share, while other fuels have a less than 1% share.

***Figure 57: Energy supply structure in 2017***




Key to Figure 57:

- Solid fuels
- Liquid fuels
- Gaseous fuels
- Hydro-electric power
- Nuclear energy
- RES and waste
- Hydrogen
- Electricity
- Heat

The table below shows the energy supply structure by energy product for 2017 and the projections for both the existing measures (EM) scenario and the scenario with additional measures (NEPN) for 2030 and 2040. Liquid fuels dominate throughout the whole period, but consumption of these is already discernibly reduced by 2030, in particular in the NEPN scenario with additional measures thanks to the intensive electrification of transport.

In the existing measures scenario, final energy consumption will increase by 2030, in particular on account of transport. In addition to transport, energy consumption increases in industry as well as in other uses on account of economic growth in these sectors. The only sector where energy consumption is reduced is households. The NEPN projections envisage the intensive implementation of EEU measures.

***Table 56: Structure of energy supply by energy sources for 2017 and projection according to the EM and NEPN scenarios for 2030 and 2040***

| | | EM | | | NEPN | | |
|---|---|---|---|---|---|---|---|
| | | 2017 | 2030 | 2040 | 2030 | 2040 SintP | 2040 nuclear |
| **Energy supply excluding non-energy use** | **[ktoe]** | **6 788** | **6 917** | **6 901** | **6 117** | **5 601** | **6 940** |
| Solid fuels | [ktoe] | 1 133 | 780 | 552 | 568 | 560 | 555 |
| Liquid fuels | [ktoe] | 2 199 | 2 241 | 2 073 | 1 717 | 612 | 612 |
| of which synthetic fuels | [ktoe] | 0 | 0 | 0 | 0 | 53 | 53 |
| Gaseous fuels | [ktoe] | 733 | 1 228 | 1 599 | 897 | 1 273 | 1 006 |
| of which synthetic fuels | [ktoe] | 0 | 0 | 0 | 90 | 318 | 252 |
| **Hydro-electric power** | [ktoe] | 333 | 392 | 393 | 394 | 458 | 458 |
| **Nuclear energy** | [ktoe] | 1 638 | 1 450 | 1 451 | 1 466 | 1 467 | 3 628 |
| **RES and waste** | [ktoe] | 796 | 856 | 830 | 1 099 | 1 358 | 1 348 |
| **Hydrogen** | [ktoe] | 0 | 2 | 17 | 10 | 70 | 70 |
| **Net electricity imports** | [ktoe] | -44 | -49 | -33 | -34 | -203 | -744 |
| **Final energy consumption** | **[ktoe]** | **4 859** | **5 132** | **5 110** | **4 565** | **3 832** | **3 832** |
| Solid fuels | [ktoe] | 38 | 5 | 0 | 3 | 0 | 0 |
| Liquid fuels | [ktoe] | 2 191 | 2 238 | 2 070 | 1 715 | 610 | 610 |
| of which synthetic fuels | [ktoe] | 0 | 0 | 0 | 0 | 53 | 53 |
| Gaseous fuels | [ktoe] | 610 | 691 | 740 | 632 | 756 | 756 |
| of which synthetic fuels | [ktoe] | 0 | 0 | 0 | 63 | 189 | 189 |
| RES and waste | [ktoe] | 676 | 725 | 651 | 772 | 669 | 669 |
| Hydrogen | [ktoe] | 0 | 2 | 17 | 10 | 63 | 63 |
| Electricity | [ktoe] | 1 163 | 1 305 | 1 476 | 1 279 | 1 586 | 1 585 |
| Heat | [ktoe] | 181 | 166 | 155 | 155 | 148 | 148 |

## Domestic energy sources (three pillars of energy security)

The production of electricity in Slovenia for the most part uses domestic sources, which are the foundation of security of the energy or electricity supply. This involves use of the following:

- renewable energy sources, the share being ensured by large hydro-electric installations,
- domestic coal and lignite and
- nuclear energy.

Thus, in 2017, the three pillars of electricity security provided 14 984 GWh of electricity, which represents 104% of final customers' electricity consumption. Once Croatia's 50% share in the Krško nuclear power plant is taken into account, domestic production covered 83% of electricity consumption in 2017[82]. Using domestic sources ensures a reliable high-quality electricity supply.

[82] Source: AGEN RS, Report on the Energy Situation in Slovenia in 2017 and 2018.

Electricity balance

In the past, Slovenia has almost always had a positive electricity balance, although it has fluctuated significantly over the years, mainly due to high dependence on hydrological conditions and, not least, the cost competitiveness of domestic production sources in conditions in which electricity prices on the market fall to levels that mean that production is not economically viable. Electricity is imported or exported in response to differences between domestic consumption and electricity production. When there is a deficit from domestic production sources, electricity is imported. Taking account of physical conditions alone, Slovenia is a net exporter. It should be noted that half of the production from the Krško NPP is intended for export to Croatia in the long term. When consumption on the grid is higher, Slovenia covers a large part of its needs through imports, while in times of lower consumption it is still able to produce surplus electricity for export to foreign markets[83].

In 2017 the transmission and distribution system in Slovenia took 14 984 GWh of electricity, 249 GWh less than in 2016. The take up of electricity from renewable production facilities was 4 479 GWh, or 616 GWh less than the previous year, while power plants using fossil fuels contributed 4 539 GWh, or 176 GWh less than in 2016. Krško NPP supplied the transmission system with 5 966 GWh of electricity, 543 GWh more than the previous year. The quantities of energy are taken from the accounts of electricity system operators on the basis of physical flows.[84]

In 2017, 1 032 GWh of electricity from generation facilities connected to the distribution system was taken into the distribution system (which also includes closed distribution systems). In addition, customers' internal networks consumed a further 353 GWh of electricity, or 25% of all electricity produced in generation facilities connected to the distribution system (and closed distribution systems), which is 2% more than in 2016.

Taking into account the half-share of production from the Krško NPP, domestic energy sources contributed 12 001 GWh of electricity to the Slovenian electricity system, while final customers consumed 14 468 GWh of electricity, not counting 90 GWh – the quantity of electricity exported to Italy via DTS Vrtojba and DTS Sežana. In 2017, we covered 82.9% of electricity consumption in Slovenia with domestic sources of production, and dependency on imports, taking the exportation of half of the production from the Krško NPP into consideration, amounted to 17.1%.

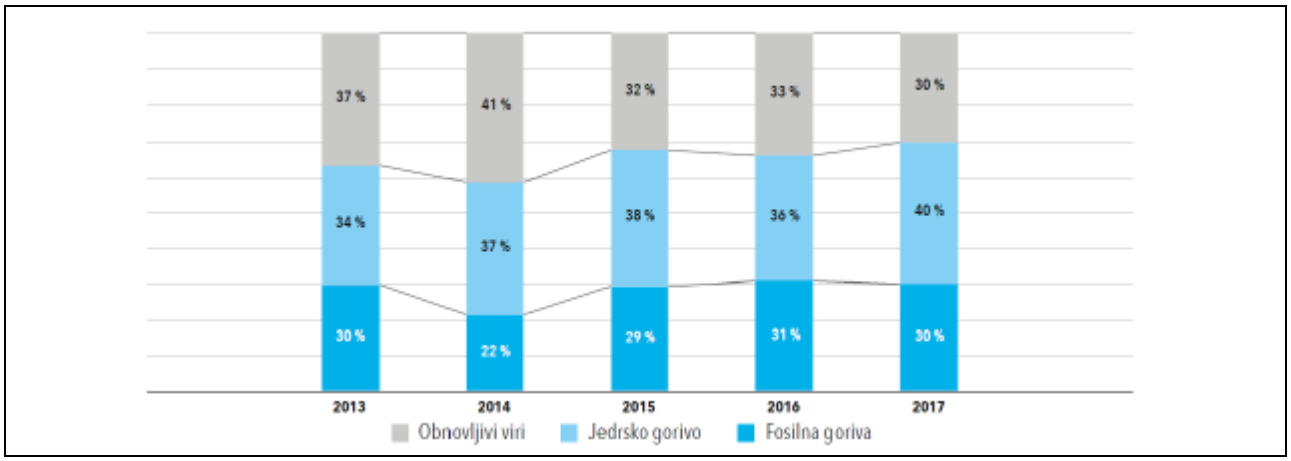
New generation capacity amounting to 18 MW was incorporated into the Slovenian electricity system (in 2017), with power plants connected to the distribution system contributing 17 MW and power plants connected to closed distribution systems contributing 1 MW. New and renovated hydro-electric power plants contributed most to the increase with a total capacity of 11.1 MW. New solar power plants also played a significant role in increasing production capacity, contributing 4.7 MW, while combined heat and power (CHP) units added 1 MW. In 2017, there were no major shutdowns of existing production facilities.

The share of electricity produced in hydro-electric and other renewable power plants varies annually depending on hydrological and other conditions and also on the volume of investments in the construction of renewable production units. In 2017, this share amounted to approximately 30% of all electricity produced in Slovenia, which is 3% less than the year before. Fossil-fuel power plants contributed about 30% to total production, down one percentage point from the previous year, and the nuclear power plant to 40% of all electricity produced.

83 Development plan of the transmission system of the Republic of Slovenia 2017 to 2026, available at: https://www.eles.si/Portals/0/Publikacije/Razvojni%20nacrt%202017-2026.pdf.

84 Report on the energy situation in Slovenia in 2017, available at: https://www.agen-rs.si/documents/10926/38704/Poročilo-o-stanju-na-področju-energetike-v-Sloveniji-v-letu-2017/f9f4df2c-810f-4e12-acdd-943104dd3b66.

***Figure 58: Shares of primary sources for electricity production in 2013-2017***




Source: Report on the Energy Sector in Slovenia in 2017, p. 17

Key to Figure 58:

◆ Renewables, ◆ Nuclear fuel, ◆ Fossil fuels

In 2018 nine companies operated electricity generation plants with an installed capacity of more than 10 MW, representing a total installed capacity of 3 320 MW. All large power plants are connected to the transmission network in Slovenia.

On the other hand, there is an even greater number of smaller dispersed power producers using different technologies, representing a total 612 MW of installed capacity. Most of these power plants are connected to the distribution network (575 MW) and only a handful (37 MW) to the transmission network. The group of power plants smaller than 10 MW is dominated by solar power plants, followed by small hydro-electric power plants.

Large generating plants with installed capacity exceeding 10 MW produced a total 13 959 GWh of electricity, while small sources added 1 364 GWh. Half of the electricity produced in the Krško NPP was exported to neighbouring Croatia. In 2018, the largest electricity generation company in the country provided 46.5% of all electricity produced in Slovenia.

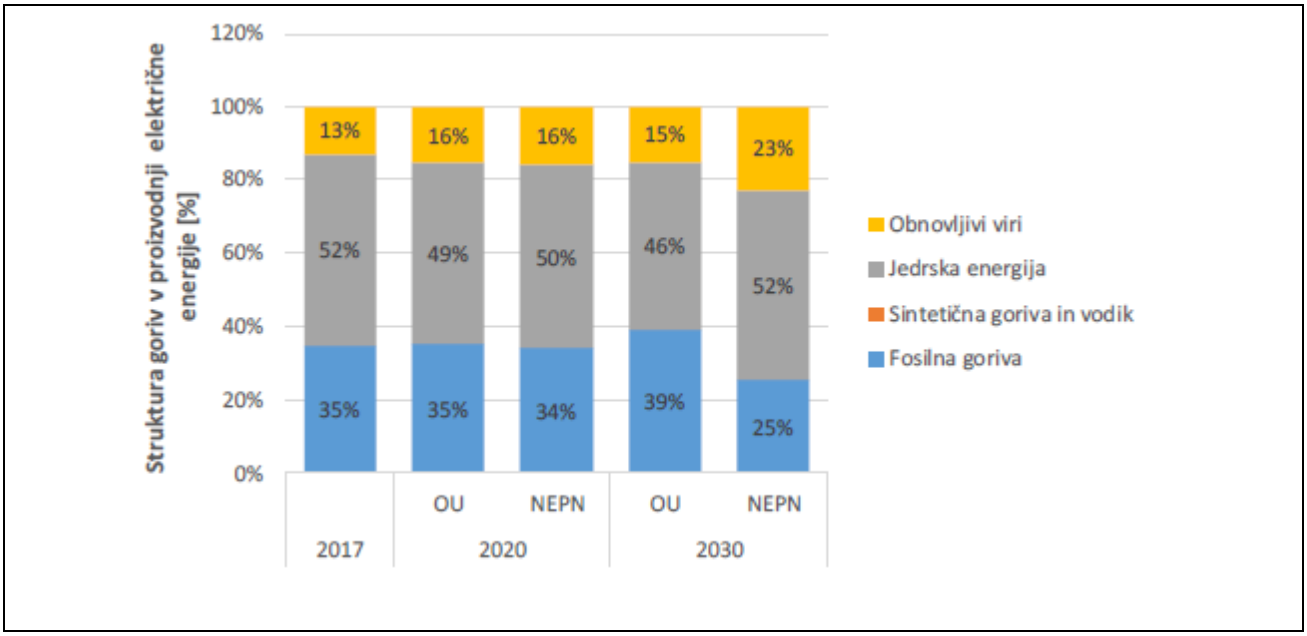
Total electricity consumption in Slovenia in 2018 amounted to 14 616 GWh and was 0.4% more than in the previous year. Business customers consumed 10 116 GWh, while household consumption was 3 368 GWh. The remaining consumption came from losses in the transmission and distribution network (880 GWh) and the operation of pumped hydro-electric systems (252 GWh).

Peak load on the transmission network in 2018 was recorded at the beginning of March, which is exceptional as this normally occurs in winter; it amounted to 2 228 MW, or 4.5% more than in 2017.

Most consumption was covered by power plants located on Slovenian territory. The remainder was provided by imports.

In future, based on projections in the existing measures scenario, due to the standstill in investments in renewable energy sources, the production of electricity from fossil-fuel products (gas) is expected to increase, while the NEPN scenario with additional measures envisages an increased volume of investment in production facilities that use all renewable energy sources (solar, water and wind power), resulting in a significant increase in the share of electricity produced from RES and a decrease in the share of fossil fuels.

***Figure 59: Shares of primary sources for electricity production for 2020 and 2030 according to scenarios***




Key to Figure 57:

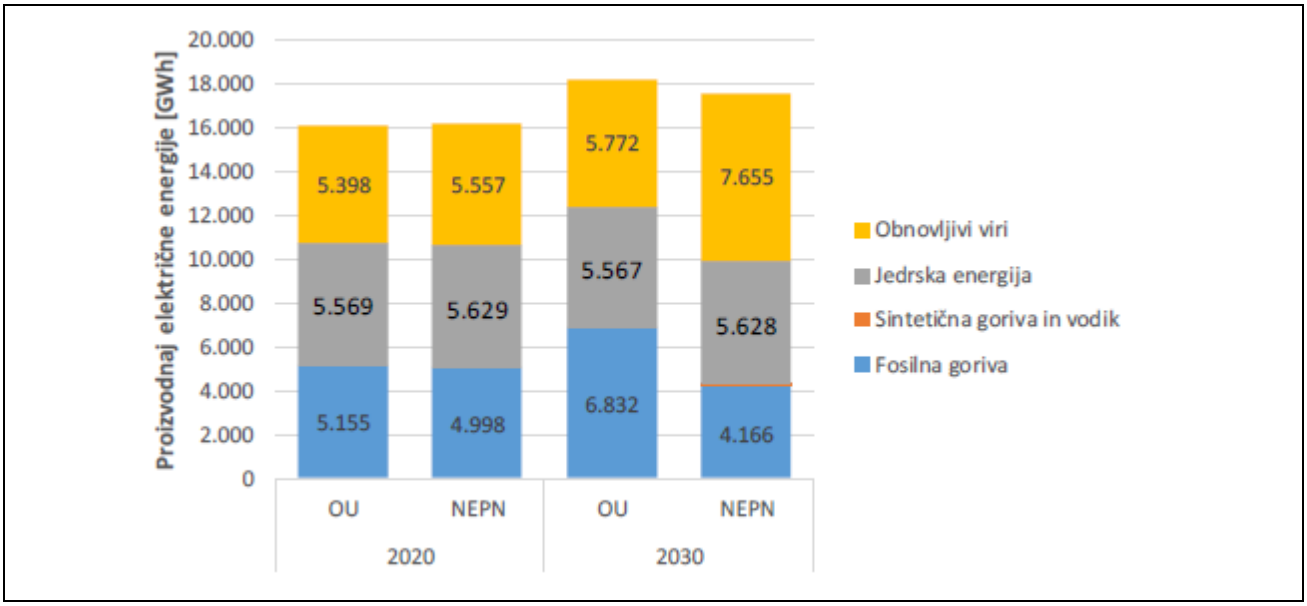
| | |
|---|---|
| Structure of fuels in the production of electrical energy [%] | ▪ Renewable resources<br>▪ Nuclear energy<br>▪ Synthetic fuels and hydrogen<br>▪ Fossil fuels |

Until 2018, natural gas in Slovenia was used to a lesser extent for the production of electricity in thermal power plants - Šoštanj (TEŠ) and Brestanica (TEB). It is expected to be used continuously and more extensively for the first time in the coming years (up to 2022) for the production of heat and electricity at Energetika Ljubljana.

Most investments in large installations in the past have been aimed at replacing old coal plants with the most up-to-date best available technology (BAT) options, significantly improving efficiency gains and reducing environmental burden.

The replacement of old plants will continue in future, with a continued increase in renewable production.

***Figure 60: Production of electricity in hydro-electric, thermal and nuclear power plants in 2020 and 2030 according to scenarios***




Key to Figure 57:

| | |
|---|---|
| Electricity generation [GWh] | ▪ Renewable resources<br>▪ Nuclear energy<br>▪ Synthetic fuels and hydrogen<br>▪ Fossil fuels |

## Slovenia's natural gas supply and access to resources

Due to the lack of own resources, the supply of the Slovenian natural gas market is entirely dependent on imports. The supply of natural gas to Slovenia comes from Russia and individual nodes of the European gas market.

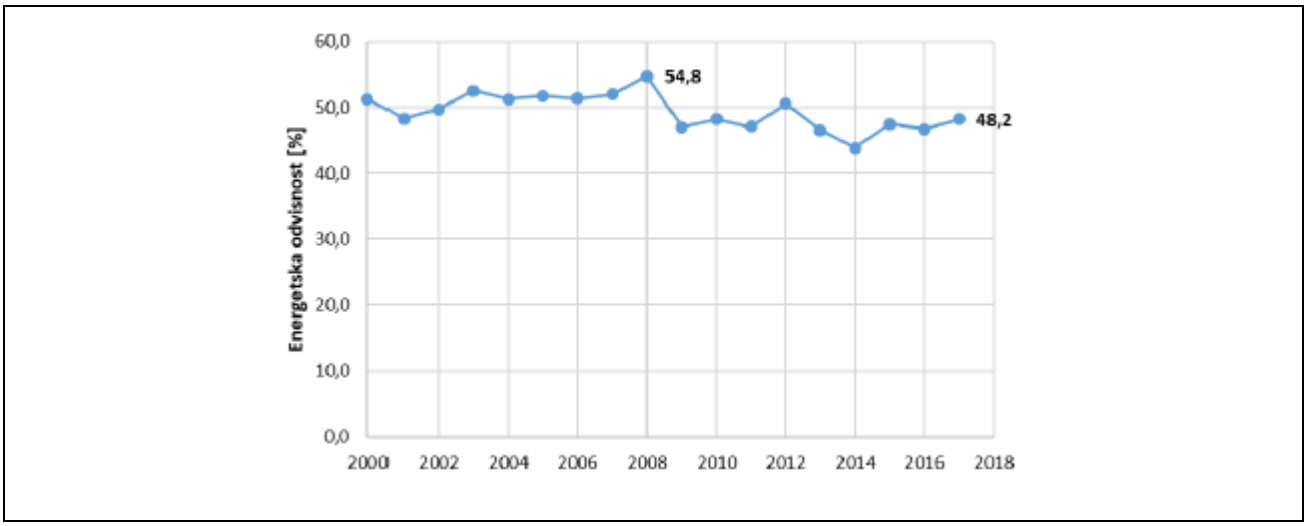
The Slovenian transmission pipeline system is embedded in the European and global international environment and enables users to make choices. The selection system is connected through interconnection points to neighbouring countries' transmission pipelines managed by different transmission system operators (TSO). The border interconnection points where Slovenian TSOs interface with neighbouring transmission systems are:

- the connection with the Austrian TSO, Gas Connect Austria, at the Ceršak interconnection point,
- the connection with the Italian TSO, Snam Rete Gas, at the Šempeter interconnection point and
- the connection with the Croatian TSO, Plinacro, at the Rogatec interconnection point.

## Import dependency

In 2017, the total amount of domestic energy sources in Slovenia was 3.7 million toe (=153 PJ), which is 2% more than in 2016. The increase was mainly in the amount of nuclear energy (by 10%) and geothermal and solar energy (by 2%). In 2017, Slovenia met 52% of its energy needs from domestic energy sources. The remaining quantity needed was provided from imports, with the petroleum product supply being secured in its entirety from imports (SORS, 2019).

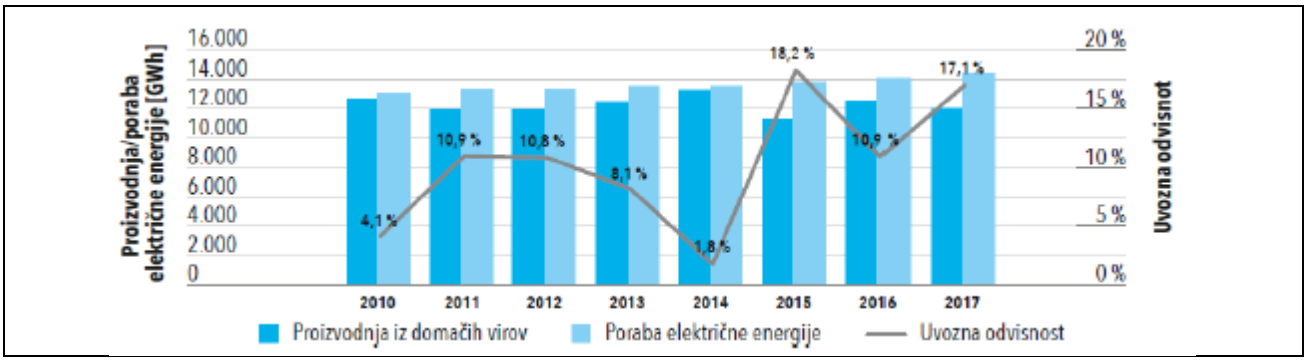
### *Figure 61: Energy dependency, Slovenia, source: SORS, 2019*




Source: SORS, 2019

Key to Figure 61:
Energy dependence

### *Figure 62: Production, use and coverage of electricity supply 2010-2017*




Source: Report on the Energy Sector in Slovenia in 2017, p. 23

Key to Figure 62:

| | | |
|---|---|---|
| Electricity generation/consumption [GWh] | ▪ Production from domestic sources<br>▪ Electricity consumption<br>▪ Import dependency | Import dependency |

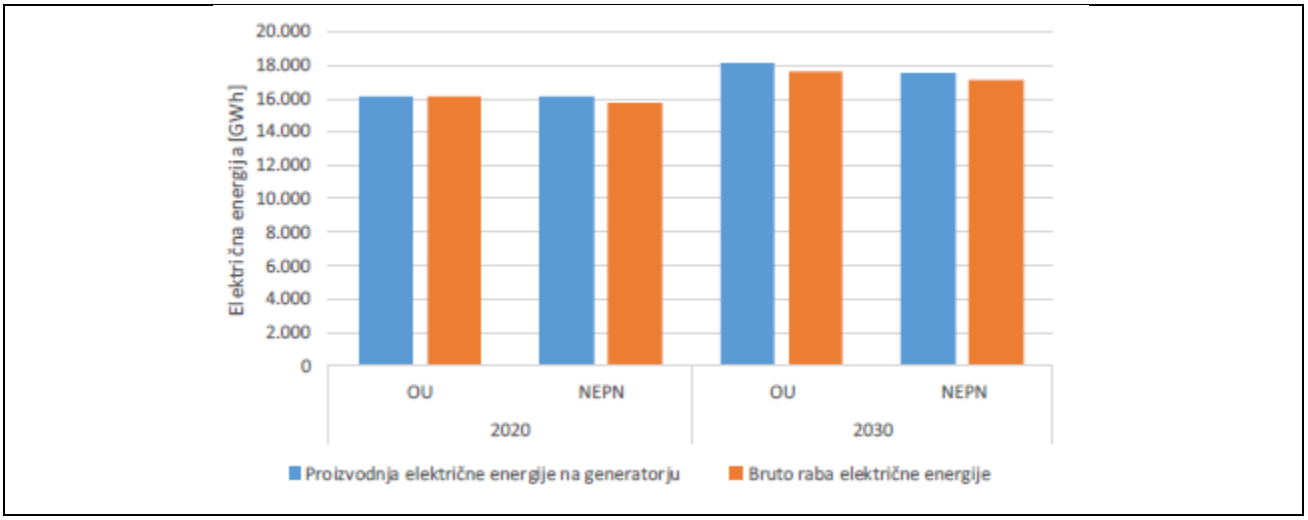
The figure above shows the coverage of domestic electricity consumption by domestic production sources. The production of electricity from domestic sources is assured by large hydro-electric power plants, thermal power plants and one nuclear power plant[85], which in Slovenia are connected to the electricity transmission system. A small part of the production from domestic sources is connected to the electricity distribution system. Due to the significant share of electricity production from hydro-electric power plants, the total production from domestic sources is highly dependent on hydrological conditions in each period.

For the calculation of import dependency, the total electricity consumption takes account - in addition to the consumption of final customers on the transmission and distribution system - of losses on the whole electricity system, deducting the electricity exported to Italy via the distribution system from the Vrtojba and Sežana substations. In the electricity balance chapter, these quantities are treated as direct consumption on the transmission system.

85 Only half of the electricity generated by Krško nuclear power plant is taken into account.

The coverage of consumption with electricity produced in Slovenia is determined on the basis of the relationship between electricity production in Slovenia and total electricity consumption. In the observed period 2010-2017, import dependency varied considerably and, in addition to the change in production from domestic sources, it was directly influenced by the change in electricity consumption. In the observed period, coverage of the electricity supply was highest in 2014, when, due to extremely favourable hydrological conditions, electricity production from hydro-electric power plants was at its highest while total consumption was less than the previous year. In 2017, there was less coverage of the electricity supply on account of reduced production from domestic sources (especially hydro-electric power plants) at the same time as increased electricity consumption.

***Figure 63: Electricity production and consumption in Slovenia for 2020 and 2030 according to scenario (including all electricity produced by Krško nuclear power plant)***




Key to Figure 63:

| Electricity [GWh] | ▪ Generation of electricity on generator | ▪ Gross electricity consumption |
|---|---|---|

The scenarios envisage that electricity demand in Slovenia will in future be covered by domestic production to the same extent as previously, as shown in the figure above.

### Risks and services to maintain stable and safe operation of the Slovenian electricity system (EES)

An electricity supply crisis can arise for a number of reasons, such as extreme weather conditions, malicious attacks or fuel shortages. Crisis conditions often have a cross-border effect. Major events, such as periods of severe cold, heat waves or cyberattacks, can affect several EU countries at the same time.

Regulation (EU) 2019/941 on risk-preparedness in the electricity sector provides for the preparation of a methodology for defining regional scenarios for electricity supply crises with regard to system adequacy, system security and fuel security and for evaluating the seasonal and short-term adequacy (monthly, week-ahead and day-ahead adequacy) of the power system in the event of extreme weather conditions. The methodology is prepared by the European Network of Transmission System Operators for Electricity (ENTSO-E); a draft was drawn up in January 2020.

In accordance with Regulation (EU) 2019/941 on risk-preparedness in the electricity sector, the methodology for identifying regional electricity supply crisis scenarios should take account of at least the following risks: rare and extreme natural hazards, accidental hazards, consequential hazards, including the consequences of malicious attacks and fuel shortages.

In accordance with Regulation (EU) 2019/941, the methodology should include at least the following: consideration of all national and regional circumstances, interaction and correlation of risks across borders, simulations of simultaneous electricity supply crisis scenarios, ranking of risks according to

their impact and probability, principles on how to handle sensitive information while ensuring transparency.

System services

System operators use system services, especially services related to voltage and frequency regulation, to maintain stable and safe operation of the Slovenian electricity system [EES]. The system services cover all the technical support processes that ensure support for electricity transmission between producers and customers in the EES. The undisrupted transmission of electricity is closely linked to the safe operation of the EES at local, national and European interconnection levels. The most important part of system services are the frequency services - frequency and load control services that compensate for lack of balance between generation and consumption and maintain interconnection stability in the event of disruptions and major outages.

The frequency containment reserve (FCR) is a reserve designed to respond quickly to a change in frequency at an interconnection. To this end, when a frequency deviation of 200 mHz occurs in Europe, power of approximately 3 000 MW is automatically activated or deactivated so as to stabilise the frequency. In 2020, the Slovenian system operator is obliged to provide ±15 MW of FCR. Until 2019, this service has been compulsory in the Slovenian electricity system for all aggregates connected to the transmission network, and from 2020 onwards the service will become payable in accordance with amendments to the Energy Act (EZ-1), while at the same time in 2020 Slovenia is expect to join the FCR cooperation in which several European countries take part.

The automatic frequency restoration reserve (aFRR) ensures consistency between actual exchanges within the control area and the schedules. In 2020, the TSO will purchase ±60 MW of regulatory reserves of this kind. Such services are assured mainly by conventional generators, and it is expected that in the coming years a considerable share will be taken over by the provision of reserves from storage units, especially batteries. The increased share of renewables is expected to boost the need for the aFRR.

The manual frequency restoration reserve (mFRR), together with the aFRR, makes up the energy shortfall in the event of a production or consumer unit failure. Under the Agreement on the operation of the block comprising Slovenia, Croatia and Bosnia and Herzegovina (BiH), ELES is required to provide 250 MW positive and 71 MW negative mFRR.

The level of this in the Slovenian electricity system [EES] is conditional upon the size of the largest unit in operation. The share of the reserve in relation to the total threshold power of production facilities in the EES in Slovenia is almost 16%, which is one of the largest shares in the countries of the EU. The reasons are the large size of the facilities and the small size of the EES. Because of this and because of the more expensive sources - gas turbines - that for the most part ensure this service, particular attention should be paid to this area in future. The transmission system operator has ensured part (37%) of the required reserve volume through agreements with the neighbouring countries participating in the regulatory block and the remainder through various products within the EES. The system balancing service products are designed on the basis of the rules for system balancing providers to enable the involvement of aggregators with sources and loads (including demand-side management (DSM))[86].

All subsystems contribute to the overall security of electricity supply. This is achieved by investing in the operational reliability of individual parts and further automation and digitisation of processes. In order to relieve the activation of system services, as early as 2013 the transmission system operator started implementing a mechanism to net imbalances between system operators, first jointly with the

[86] In accordance with Article 2 of the Decree on measures and procedures for the introduction and connectivity of advanced electricity metering systems (UL RS No 79/15), DSM is a system that acts on electricity consumption or production by grid users in such a way as to reduce the need to reinforce the grid on account of consumption or production by network users.

Austrian TSO and then more widely (International Grid Control Cooperation, IGCC), thereby reducing the need for energy balancing to be activated in the system by more than 30%.

When monitoring existing measures, there are no significant changes in the provision of system services.

Flexibility and storage of electricity

Recent decades were characterised by the construction of the first pumped hydro-electric power plant, which significantly increased the Slovenian electricity system's operational flexibility. The large storage unit, which operated on the electricity market and was established on market principles, contributed to improving the speed and scope of system services and generally increasing the flexibility of operation of large coal-based plants. In terms of the overall costs (positive and negative) of operating within the EES, the facility operated in a neutral manner and was thus exempt from paying the network charge in consumer mode.

Taking existing measures into account, we anticipate an increase in the share of large storage units in the Slovenian electricity system (EES) by 2030. The use of DSM has an increasingly important role to play. It is successfully used to provide system services, especially for the manual frequency restoration reserve product. If existing measures are pursued, DSM will be conserved up to 2030 as a successful provider.

## ii. Projected developments with existing policies and measures until at least 2040 (including 2030) and with additional NEPN policies and measures

In the ambitious scenario, the electricity and heat production sector must become carbon-free by 2050. Achieving carbon-free electricity generation by 2050 will require major changes before 2030, with particular emphasis on speeding up development of the electricity distribution network. Some technologies that will enable transition to a climate-neutral society are still under development and some are already commercially available.

The scenarios are designed separately with regard to: large electricity generation structures, dispersed electricity generation, and district heating and cooling systems. Large electricity generation structures are key to ensuring a secure electricity supply, as they cover the difference between production from dispersed sources and the production level necessary to ensure security of supply.

*The existing measures scenario* is comparative in nature and provides for minimal additional investment in large installations. It envisages the completion of the hydro-electric power plant chain on the lower Sava River but does not envisage any other investments in renewables. It is also assumed that the existing Krško nuclear power plant will operate up to the end of its extended lifespan (in 2043) upon obtaining the appropriate environmental permit.

At the Šostanj thermal power plant [TEŠ], unit B5 will cease to operate in 2035, while unit B6 will continue to operate until 2054.

Energetika Ljubljana plans to set up a gas-steam unit [PPE] by 2022 to replace units B1 and B2 and, after 2035, will replace B3 with a biomass-fuelled fluidised bed combustion (FBC) unit.

At the Brestanica thermal power plant [TEB], the older existing units are being upgraded and replaced. On account of additional increased electricity demand, there are plans to build one additional larger gas-steam unit [PPE] by 2030 and one more after 2040. It is assumed that consumption will be covered by production at the present - 2017 - level.

*The NEPN scenario*, which is development-oriented, envisages increased production of electricity from hydro-electric power, as well as wind and solar power – classed as dispersed sources, in combination with energy storage units. The existing Krško nuclear power plant will remain operational until 2043, subject to obtaining the appropriate environmental permit.

At the Šostanj thermal power plant [TEŠ], unit B5 will operate up to 2030 at the latest, while B6 may be upgraded with CCS/CCU by 2035. It is envisaged that the use of domestic and imported coal for energy purposes will be phased out or reduced by at least 30% by 2030 and a decision on discontinuing the use of coal in Slovenia in accordance with the just transition principle is expected by 2021. The exact timetable for abandoning coal use in Slovenia will be determined by a strategy for abandoning coal use and restructuring of coal regions in accordance with the just transition principle which will be adopted by 2021 at the latest.

At Energetika Ljubljana, gas-steam units [PPE] replace the older units B1 and B2 in 2022, while new biomass-fuelled fluidised bed combustion (FBC) unit replaces unit B3 by 2030.

At the Brestanica thermal power plant [TEB], the existing older units are being replaced by new, more flexible units, which all serve as reserve power sources for the Slovenian electricity system [EES].

After 2030, the development of large electricity generation facilities can proceed in two alternative directions - one is the continued use of nuclear energy with the construction of a new unit, the other is the construction of larger gas-steam units [PPE] in combination with the use of natural or synthetic gas. It is expected that synthetic gas will also gradually be introduced in other power plants that use natural gas as their primary source. It is assumed that production will continue to cover consumption at the existing – 2017 - level.

Production is expected to increase in future from all dispersed sources. The increase envisaged is up to the capacity available in Slovenia, considering that, in the case of solar power plants, development is restricted to locations on buildings or degraded areas.

***Table 57: Design of scenarios for the supply of electricity from dispersed sources of production (RES and CHP)***

| | EM scenario | NEPN scenario |
|---|---|---|
| Solar power plants | Current development dynamics | Full use of locations Connection to seasonal energy storage |
| Wind power plants | | Utilisation of environmentally friendly sites |
| Small hydro-electric power plants | | Full utilisation of environmentally friendly sites |
| Wood biomass power plants | | Accelerated development in connection with heat consumption in DH systems and industry |
| Biogas power plants | | Utilisation of biogas potential: treatment plants, industry, waste, agriculture (residues) |

In future, the district energy sector will play a greater role than today, serving as a connecting factor between the heating sector and the electricity generation sector and, through electricity, with other sectors too, such as transport, for the purpose of managing increasingly complex dynamics of electricity production and consumption. Consequently, the scenarios with additional measures envisage the expansion of district heating and cooling networks, connection to the electricity system and the significant reduction of greenhouse gas emissions from heat production, and the more demanding scenario anticipates complete decarbonisation.

***Table 58: Design of scenarios for district heat and cooling production systems***

| | With existing measures EM | With additional measures - NEPN |
|---|---|---|
| **Expanding the district heating and cooling (DHC) network** | Current development dynamics | Expansion wherever the heat and cold consumption criterion (taking additional benefits into account) is met, low-temperature networks |

| | | |
|---|---|---|
| **RES and surplus heat** | Fulfilment of Energy Act [EZ-1] obligations | 100% RES and surplus heat |
| **Connecting to the EES: heat storage, 'power to heat'** | Current development dynamics | Maximum support for the EES, including seasonal storage (reducing pressure on the electricity grid in winter) |
| **CHP on LP and SP** | Fulfilment of EZ-1 obligations | Synthetic gas |

# 4.5 Internal Energy Market Dimension

## 4.5.1 Electricity interconnectivity

### i. Current level of interconnection and main interconnectors

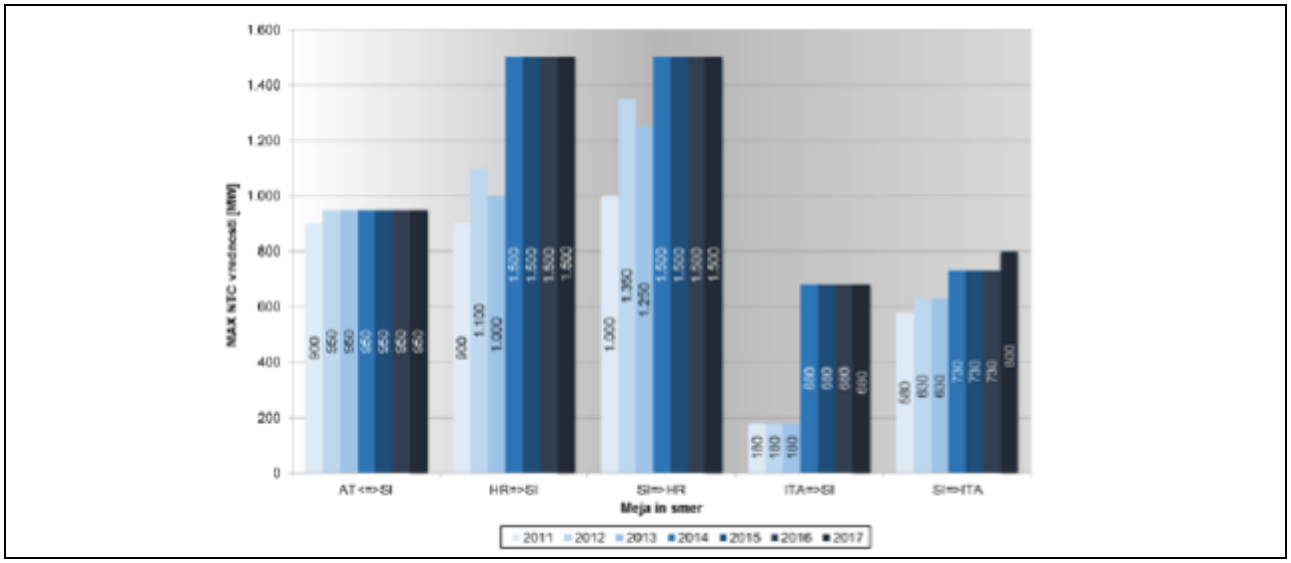
Slovenia's electricity connectivity[87] was 83.6% in 2017, significantly exceeding the 10% target for 2020 and the 15% target for 2030. Slovenia is connected with Austria by means of two 400 kV interconnectors (2x400 kV Maribor-Kainachtal) and one 220 kV interconnector (220 kV Podlog-Na Selu (Obersielach)), with Italy by a 400 kV interconnector (400 kV Divača-Sredipolje (Redipuglia)) and a 220 kV interconnector (220 kV Divača-Padriče (Padriciano)), with Croatia by means of three 400 kV interconnectors (2x400 kV Krško-Tumbri interconnectors and the 400 kV Divača-Melina interconnector), two 220 kV interconnectors (220 kV Cirkovce-Žerjavinec and 220 Divača-Pehlin) and three 110 kV interconnector (110 kV Koper- Buje, 110 kV Ilirska Bistrica-Matulji and 110 kV Formin-Nedeljanec), while the connection to Hungary (2 x 400 kV Cirkovce-Pince) is still being prepared[88].

The Slovenian electricity market is part of the Multi-Regional Coupling (MRC) system, which uses a single PCR (Price Coupling of Regions) to calculate its daily market price, and which integrates the daily markets of Austria, Belgium, Croatia, Denmark, Estonia, Finland, France, Germany, United Kingdom, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland (via SwePol), Portugal, Slovenia, Spain and Sweden. In practice, this makes it possible to simultaneously calculate the price of electricity and commercial cross-border day-ahead flows for all the above markets. This translates into a direct benefit for final customers, as better coordination between electricity markets enables more efficient use of the transmission network, and in particular cross-border interconnections, which is of utmost importance in the face of increasing operational uncertainty and pressure to curb cross-border trade. Given the above, the Slovenian transmission system operator (ELES) has already largely met the requirements of Commission Regulation (EU) 2015/1222 [54] regarding the allocation of cross-border transmission capacity (CBTC) for the day ahead.

As can be seen from the figure below, ELES, in cooperation with neighbouring system operators, has significantly increased maximum net transfer capacity (NTC) values in recent years, especially in 2014 at the Slovenian-Italian and Slovenian-Croatian borders in both directions. The reason for the increase of maximum values in the Slovenia-to-Italy direction in 2017 is the new procedure for the coordinated calculation of NTC for the day ahead at northern Italian borders.

87 Source: Slovenia: Energy Union factsheet, 2017, p. 5–6.
88 Source: Development plan of the transmission system of the Republic of Slovenia: 2019 to 2028.

***Figure 64: Average daily value of net transfer capacity (NTC) in the period 2011-2017***



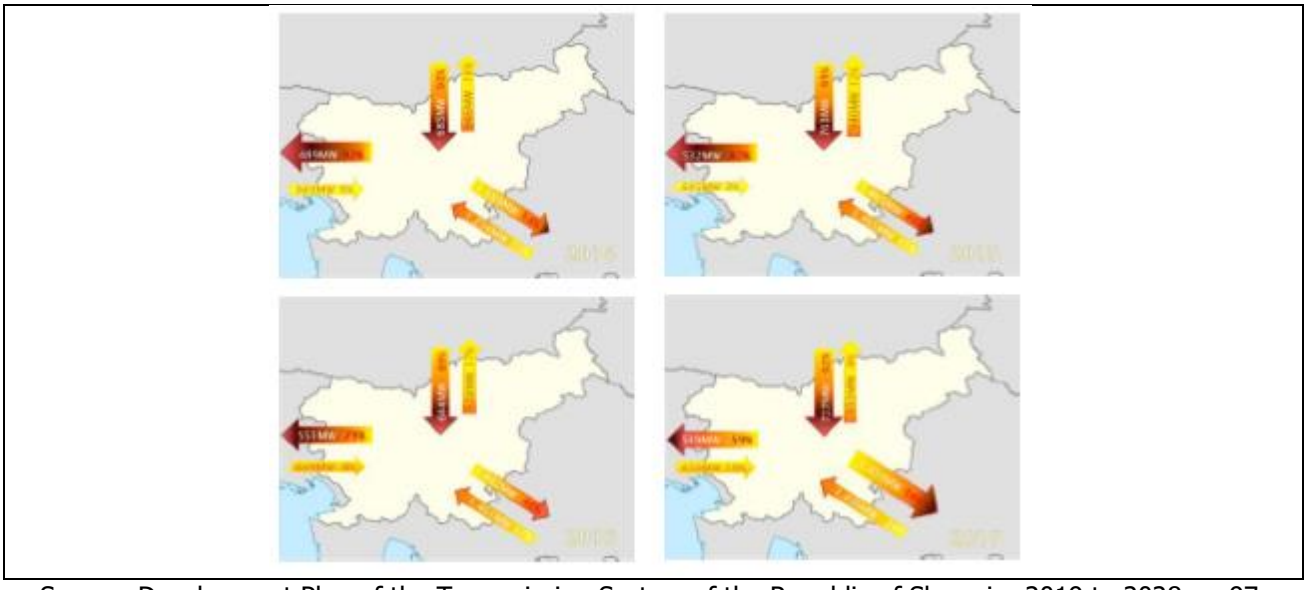

Source: Development Plan of the Transmission System of the Republic of Slovenia: 2019 to 2028, p. 95.

Key to Figure 64:

| Max NTC value; Border and direction |
|---|

The average utilisation of NTC at the individual borders and the average commercial flow over the 2014-2017 period are shown in the figure below.

***Figure 65: Average values of NTC and utilisation thereof between 2014 and 2017***



Source: Development Plan of the Transmission System of the Republic of Slovenia: 2019 to 2028, p. 97.

## ii. Projections of network expansion requirements by at least 2040 (including 2030)

The most important reinforcement of the transmission network in the coming years will be the construction of the 400 kV Cirkovce-Pince interconnector, which will significantly increase the import capacity of Slovenia's transmission system and enable the importation of potential surplus electricity from the eastern part of Europe.

The following is a list of the most important investments at 400 kV and 220 kV voltage levels to be made between 2024 and 2028, i.e. in the second half of the next decade, in order to ensure the safe and reliable operation of the transmission network of Slovenia.

400 kV and 220 kV voltage level:

- TR 220/110 kV in the Podlog substation (replacement of TR 212);
- TR 220/110 kV in the Kleče substation (replacement of TR 211).

In the context of development of the 400 kV network, the question of deploying the Kozjak HPP remains open. If this project proves economically viable and the investor chooses to implement it, it will mean the construction of an additional 400 kV connection to connect the Kozjak hydro-electric power plant. In all the NEPN scenarios analysed, the deployment of Kozjak hydro-electric power station is not foreseen until 2030.

Based on the results of the development analyses carried out by the transmission system operator, the following is a list of the most important investments that must be made by 2023 in order to ensure the safe and reliable operation of the Slovenian transmission network or to enable the involvement of new users of the energy network[89]. By 2040, the issue of providing 220 kV network capacity will also need to be addressed.

400 kV and 220 kV voltage level:

- IC 2 x 400 kV Cirkovce-Pince with Cirkovce substation and 2 x TR 400/110 kV in Cirkovce substation;
- IC 2 x 220 kV Zagrad-Ravne with substation Ravne and TR 220/110 kV in substation Ravne;
- TR 400/110 kV in Divača substation;
- TR 400/110 kV in Beričevo substation (new TR 411);
- TR 400/110 kV in Maribor substation (replacement of TR 41);
- TR 220/110 kV in Divača substation (replacement of TR 211);
- installation of voltage compensating devices in Divača, Beričevo and Cirkovce RTS.

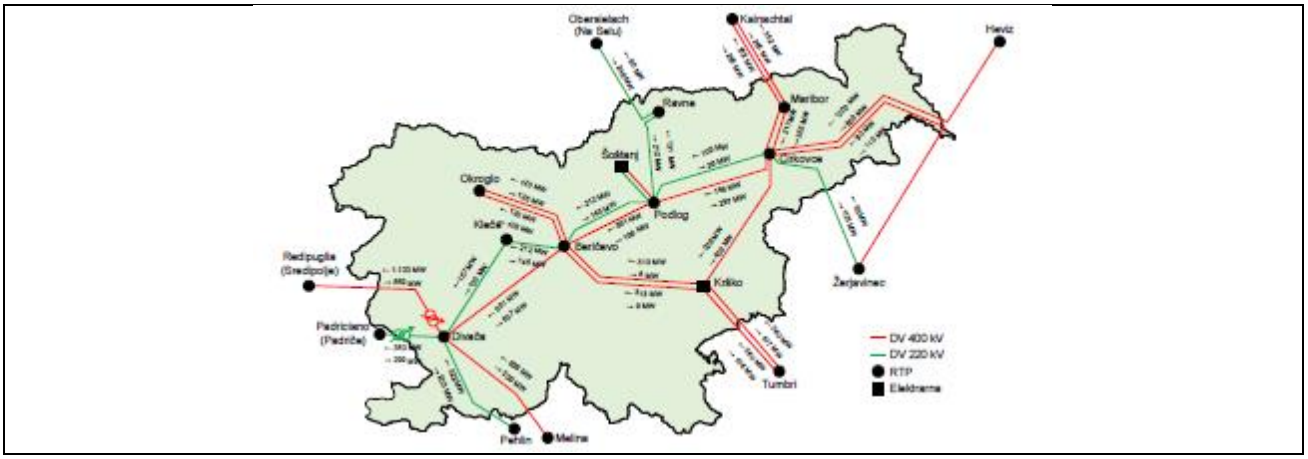
110 kV voltage level:

- IC 2 x 110 kV Divača-Gorica (Renče);
- IC 2 x 110 kV Kamnik-Visoko
- kbV 110 kV PCL-TE-TOL;
- kbV 110 kV Center-TE-TOL
- kbV 110 kV Koper-Izola;
- kbV 110 kV Izola-Lucija;
- IC 2 x 110 kV Dravograd-Velenje;
- kbV 110 kV DTS 220/110 kV Ravne- Ravne Ironworks;
- IC 2 x 110 kV Murska Sobota-Lendava;
- IC 2 x 110 kV Lenart-Radenci;
- 110 kV RTS Brežice-HPP Mokrice;
- other parts at 110 kV voltage level in accordance with the development plan of the transmission system of the Republic of Slovenia.

If in future it turns out that building up RES in neighbouring countries is increasing at a faster rate than was predicted, timely action will need to be taken in the Slovenian transmission network to increase transmission capacities, for the most part in the western part of the high-voltage network.

89 Source: Development Plan of the Transmission System of the Republic of Slovenia from 2019 to 2028, p. 104.

***Figure 66: Slovenia's transmission network in 2028***




Source: Development Plan of the Transmission System of the Republic of Slovenia from 2019 to 2028, p. 107 Energy Transmission and Distribution Infrastructure.

### 4.5.2 Energy Transmission Infrastructure

Slovenia has a relatively small electricity system with high availability of existing generating units, the good transmission network integration into international connections and a high degree of transmission network operation reliability and thus a reliable high-level electricity supply. The latter is made possible by active modernisation of the transmission network after carrying out many investments and important international projects (FutureFlow, SINCRO.GRID, etc.), while at the same time, through the projects, the transmission system operator is looking for answers and modern approaches to the challenges of accelerated introduction of production from renewable energy sources and the requirements of ensuring flexibility. Thus, in accordance with comparative studies and in comparison with other European transmission system operators, Slovenia's transmission network is currently a leader in terms of cost-effective maintenance and operation.

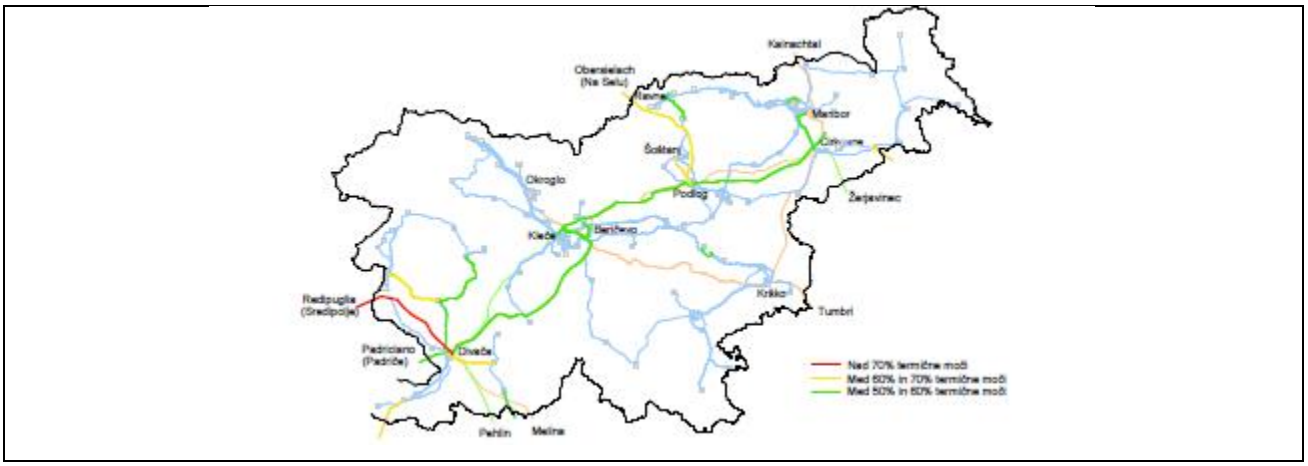
#### i. Key features of existing electricity and gas transmission infrastructure

##### Electricity Transmission Infrastructure

At the end of 2017, the total length of the 400 kV interconnector system was 669 km, that of the 220 kV interconnector system was 328 km, and that of the 110 kV interconnector system was 2 723 km, of which 1 886 km were owned by ELES. There are four different types of transformer stations in the Slovenian network, i.e. effecting 400/110 kV, 400/220 kV, 220/110 kV and 110/35 kV transformations. The 400/400 kV phase-shifter transformer rated 2 x 600 MVA located in Divača substation was incorporated into the Slovenian electricity system in 2010.

The figure below shows the busiest transmission lines with respect to the 95% probability limit. The situation shows that there are not many emergencies in the system.

### *Figure 67: The busiest transmission lines with respect to the 95% probability limit*




Source: Development Plan of the Transmission System of the Republic of Slovenia from 2019 to 2029, p. 48.

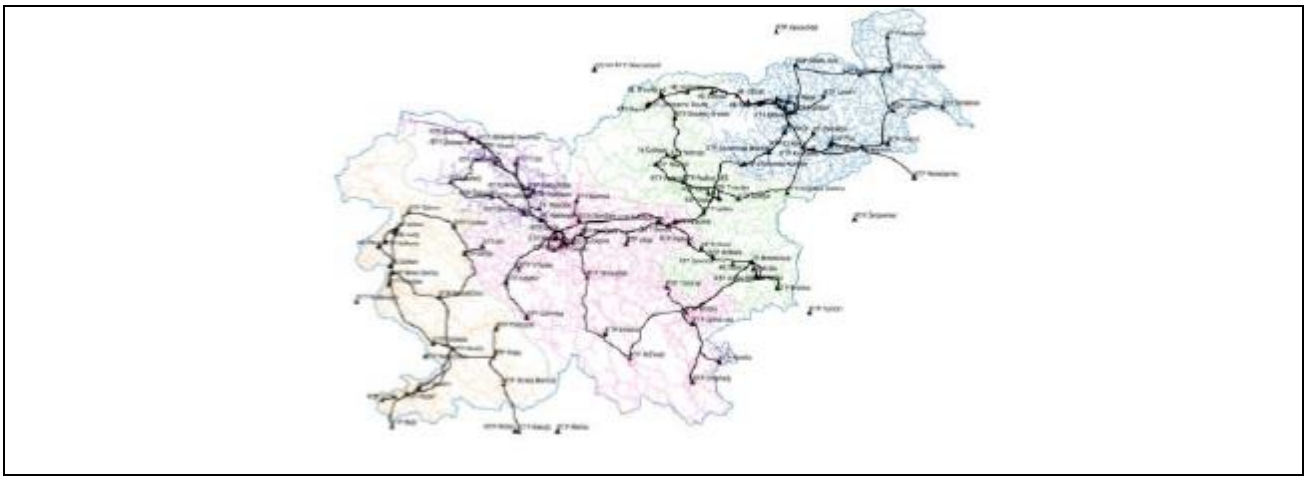
Key to Figure 67

| | | |
|---|---|---|
| ▪ Over 70% thermal power | ▪ Between 60% and 70% thermal power | ▪ Between 50% and 60% thermal power |

## Electricity distribution infrastructure

Distribution networks account for practically 95% of all electricity networks in Slovenia; the figure below shows the layout of the 110 kV and medium-voltage networks in Slovenia.

### *Figure 68: Layout of 110 kV and medium voltage networks in Slovenia*



Source: EIMV, 2019.

In 2018, the Slovenian electricity distribution network comprised 840 km of 110 kV, 17 672 km of medium-voltage and 45 518 km of low-voltage network, 98 distribution transformer stations, 80 distribution stations, 16 359 MV/LV transformer stations, with 6 380 dispersed sources with a total power of 572 MW connected to the network. In 2018, the peak power of individual EDPs was: 727 MW (Elektro Ljubljana), 441 MW (Elektro Maribor), 341 MW (Elektro Celje), 302 MW (Elektro Primorska) and 205 MW (Elektro Gorenjska). The total EDP peak power in 2018 was 2 032 MW and the minimum power was 689 MW. The majority of users, end consumers and electricity producers are connected to the electricity distribution network, so the role of the distribution operator is crucial in two respects, the distribution of electricity and the provision of services to users connected to the distribution network.

## Natural gas transmission infrastructure

The Slovenian transmission pipeline system comprises almost 1 174 km of gas pipelines, compressor stations at Kidričevo and Ajdovščina, as well as 247 metering-regulating or other stations. Equipment is installed at key points of the transmission pipeline system that allows the system to be monitored and maintained. District control and command functions are implemented through an information and telemetry system. The transmission pipeline system connects most of Slovenia's industrial and urban centres, except the Obalna kraška region, Bela krajina and parts of the Notranjska and Dolenjska regions. The transmission pipeline system is monitored and managed from the dispatching centre, which is connected to the dispatching centres of the transmission system operators of neighbouring countries, as well as to the system operators of distribution networks and major natural gas customers. Most of the existing transmission pipeline network is over 30 years old.

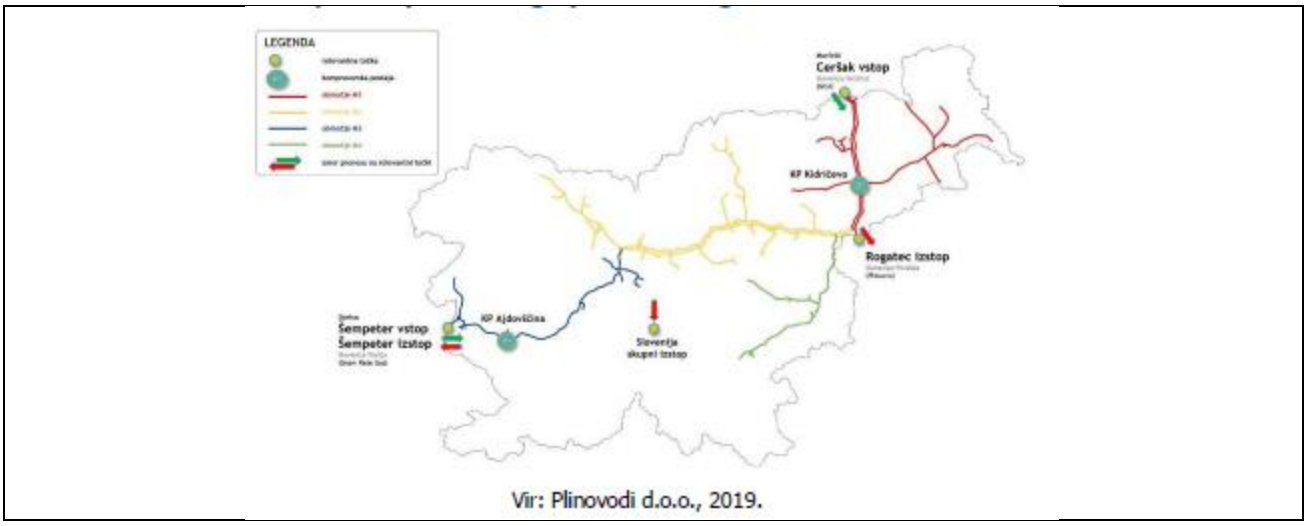
The Slovenian transmission pipeline system is connected through the border interconnection points to the transmission pipelines of neighbouring countries, which are managed by different TSOs.

The cross-border interconnection points between the Slovenian transmission system operator and neighbouring transmission systems are as follows:

- with the Austrian TSO, Gas Connect Austria, at the Ceršak interconnection point,
- with the Italian TSO, Snam Rete Gas, at the Šempeter interconnection point and
- with the Croatian TSO, Plinacro, at the Rogatec interconnection point;
- interconnection with the Hungarian TSO is also envisaged.

The entry points where natural gas enters the transmission system and the exit points where natural gas leaves the transmission system are an integral part of the transmission pipeline system. The key entry and exit points of the transmission system are called 'relevant points' and are confirmed by the Energy Agency. The TSO publishes data regarding transmission pipeline system capacity of these points, as shown in the figure below. Five points are shown, four of which are border crossing points, which are relevant points for the publication of data, and the fifth relevant point is aggregate exit/transfer data for users in the Republic of Slovenia.

***Figure 69: Schematic representation of the transmission pipeline system with 'relevant points'***




Source: Plinovodi d.o.o., 2019.

Key to Figure 69:

| | | | |
|---|---|---|---|
| vstop | entry | ▪ relevantna točka | ▪ relevant point |
| izstop | exit | ▪ kompresorska postaja | ▪ compressor station |
| Slovenija skupni izstop | Slovenia total exit | ▪ območje M1-M4 | ▪ area M1- M4 |
| | | ▪ smer prenosa na relevantni točki | ▪ transmission direction at the relevant point |

## ii. Projections of network expansion requirements up to at least 2040 (including 2030)

### Electricity transmission

The development plan of the transmission system of the Republic of Slovenia up to 2028 has been drawn up on the basis of studies of demand for new transmission infrastructure. The status of the network, the need for technological renovation of transmission system facilities, the needs of electricity producers and customers, criteria for the reliable and safe operation of the transmission system and international agreements and contracts are taken into account. General guidelines to be taken into account when making new and renewable investments include: connecting with neighbouring electricity systems, controlling power flows and ensuring appropriate voltage conditions throughout the Slovenian electricity system, ensuring reliable and safe operation in accordance with ENTSO-E recommendations and criteria, and the deployment of smart grids to make better use of existing infrastructure and to achieve appropriate stability and efficiency in the context of meeting European energy requirements. In connection with the latter, the implementation of the international smart grid project SINCRO.GRID will continue, in which the system and distribution operators of Slovenia and Croatia have taken up the challenges of managing the voltage in the transmission network and reducing the required capacity for the secondary reserve. Trial operation and optimisation of all systems developed under the SINCRO.GRID project is scheduled for 2021.

### Electricity distribution

The development plan of the electricity distribution network in the Republic of Slovenia for the ten-year period 2019-2028[90] defines the amount of infrastructure that must first be built or updated in order to ensure a reliable, safe and efficient Slovenian electricity distribution system in the long term. We conclude that the current applicable development plan does not meet the expected additional needs in the area of electricity distribution. In order to achieve the ambitious energy and climate policy targets, Slovenia will have to provide better conditions for the accelerated development of the electricity distribution network, which is the basis for the future transition to a low carbon society and enables accelerated integration of renewable energy production facilities, greater involvement of heat pumps and compliance with requirements for the accelerated deployment of e-mobility. The aim is to boost capacity, resistance to disruption, future development potential and exploitation of flexibility in terms of sources and burdens of the electricity distribution network in accordance with the sustainable needs of distribution system users.

In the development plan of the distribution operator, special attention is paid to the construction of a new network and reconstruction of the existing medium- and low-voltage network, since these are the weakest links in the EES from the point of view of the continuity of supply, especially in the above-ground implementation. In new construction and reconstruction projects, underground network construction predominates.

In order to speed up development of the electricity distribution network, which will enable the inclusion of heat pumps, accelerate the deployment of e-mobility and the integration of RES generators, we will ensure substantially more financial and human resources. In all the NEPN scenarios analysed, we expect in the next decade to achieve the necessary social changes and related changes in financial flows, which will significantly accelerate the much-needed investments in upgrading and reinforcing the electricity distribution network with a view to ensuring the conditions for achieving the NEPN targets. The regulator must ensure an appropriate ratio of items for the transmission and distribution systems and introduce advanced billing systems that will:

[90] Development Plan of the Electricity Distribution Network in the Republic of Slovenia available at: https://www.sodo.si/_files/5746/RN_2019_2028_SODH_nov_2018_del50.pdf.

- reflect the actual costs incurred on the network, with manufacturers also having to contribute a fair share to the use of the network;
- prevent individualisation of benefits and cost collectivisation,
- be non-discriminatory, transparent and user-friendly.

### Smart or advanced distribution networks

The introduction of smart or advanced networks in the electricity transmission and distribution system requires the accelerated digitisation of transmission and electricity distribution networks. Digitisation means connecting all energy elements of the transmission and distribution network with digital energy and service platforms. Energy and digital services must be available 24 hours a day and seven days a week (24/7).

Today, energy services which used to be in the exclusive domain of transmission networks are also moving to distribution networks. Digitised energy networks will enable near-real-time monitoring of energy networks and response and implementation of near-real-time measures. We need the right energy services to respond properly, based on the open supply and demand of the energy market and the digitised network.

The transmission system operator is active and successful in obtaining EU funds for the implementation of advanced projects and, in recent years, has led and participated (or is still participating) in several different EU projects directly related to the technological areas of smart grid management. Slovenian power distribution companies are also successfully involved in international projects. All this gives Slovenia a leading position in the introduction of modern technologies in the wider region and the EU. In future, though, there is a need to further develop platforms that will connect local smart grids at the national level and guarantee security, network stability and electricity supply.

### Development of the advanced measurement system in Slovenia

The installation of advanced measuring devices in Slovenia is also proceeding at an intensive rate. At the end of 2018, 61% of users on the distribution system were equipped with advanced measuring devices. This data places Slovenia among the leading European countries in the area of advanced metering. Continuing this trend, Slovenia is expected to move closer to the European Directive target stipulating that 80% of users should be equipped with advanced measuring devices by 2020. In accordance with the Decree on measures and procedures for the introduction and interoperability of advanced metering systems (UL RS No 79/15), by 2025 system meters should be installed which will enable operation and control of the distribution system using advanced systems[91].

Already in 2017, Slovenian electricity companies started installing meters with G3 communication technology, which provides system users with advanced services. G3 technology is also much more appropriate in terms of robustness, communication throughput, cybersecurity and the protection of personal data. This will certainly not end the development and, above all, the use of advanced measurement systems. In future, more attention will need to be paid to the effort to provide technically simple and affordable (near) real-time measurement data to all those stakeholders on the energy markets, including the upcoming flexibility market, who will have a legal basis to access user metrics. Using such metering data will increase the possibility of developing new innovative energy services for both end-users and network operators, and will enable users to graphically represent their electricity consumption (access to data).

[91] Advanced systems and the meaning of terms are defined in Article 2 of the Decree on measures and procedures for the introduction and connectivity of advanced metering systems (UL RS No 79/15).

### Development of telecommunications infrastructure

In order to support the operation of the electricity distribution network and development of the internal electricity market, appropriate development of telecommunications infrastructure also plays an important role. In future, it will be necessary to ensure the establishment of dedicated machine-to-machine (M2M) networks for distribution telecommunications infrastructure throughout Slovenia. A dedicated network for this purpose means a closed network that provides electronic communications services to M2M and does not share resources or provide services to end-users.

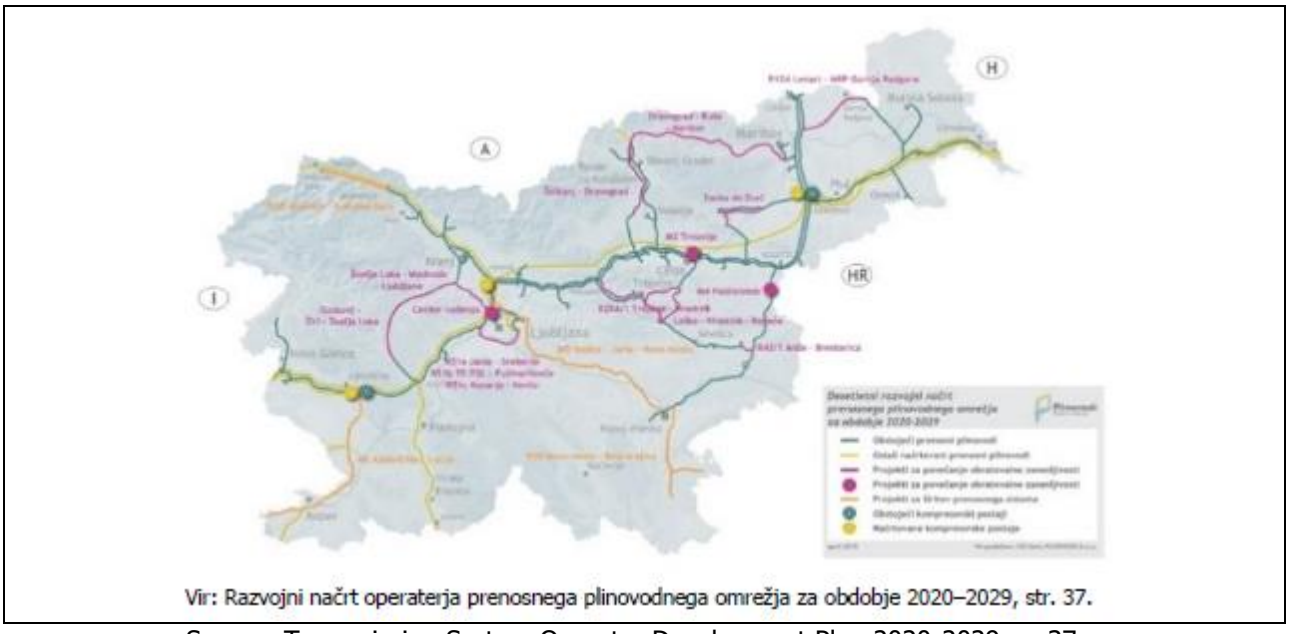
### Investments in the natural gas transmission system

Depending on the purpose of the planned infrastructure, there are three groups of projects:

- projects to increase operational reliability and expand the transmission system,
- connecting new natural gas customers and
- establishment of interconnection points with neighbouring operators.

Projects that help increase operational reliability and expand the transmission system include energy loops, relocation of pipeline sections due to specific settlement adjustments and landslide prevention. In several cases, these projects can also be used to expand and connect new municipalities.

***Figure 70: Projects to increase operational reliability***




Vir: Razvojni načrt operaterja prenosnega plinovodnega omrežja za obdobje 2020–2029, str. 37.

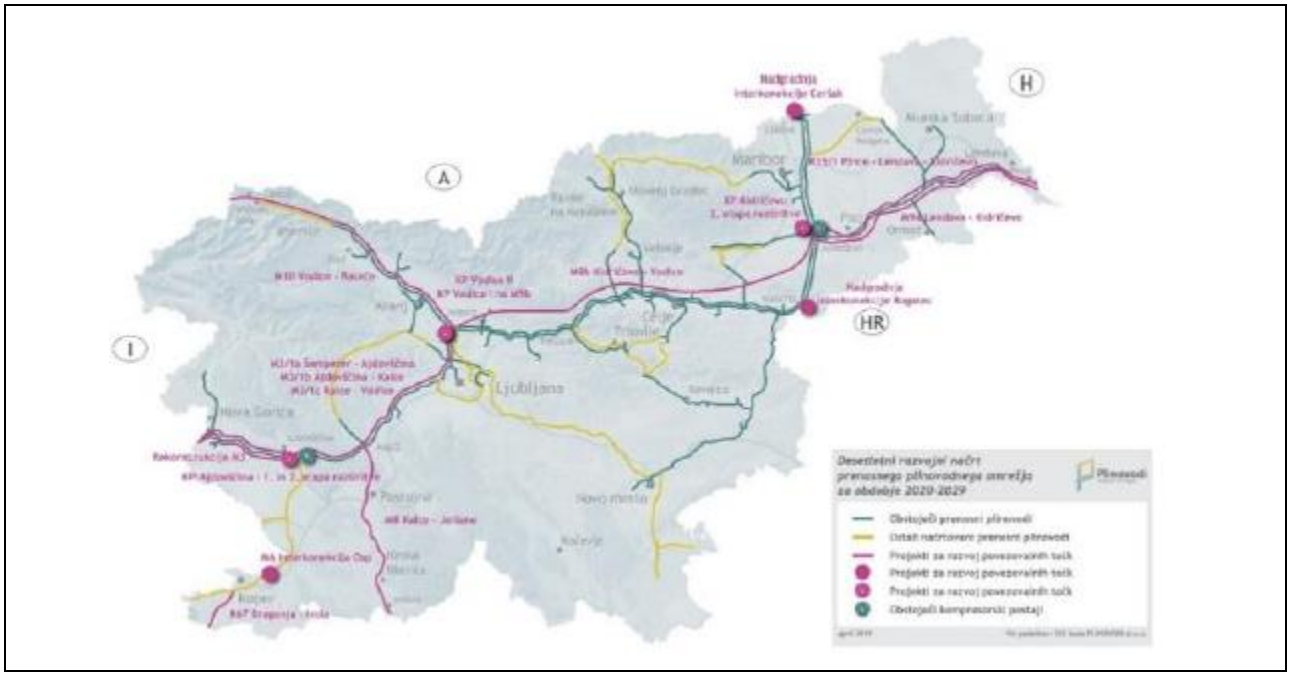
Source: Transmission System Operator Development Plan 2020-2029, p. 37.

Key to Figure 70:

| | |
|---|---|
| Desetletni razvojni načrt prenosnega plinovodnega omrežja za obdobje 2020-2029;<br>▪ Obstoječi prenosni plinovodi,<br>▪ Ostali načrtovani prenosni plinovodi,<br>▪ Projekti za povečanje obratovalne zanesljivosti,<br>▪ Projekti za povečanje obratovalne zanesljivosti,<br>▪ Projekti za širitev prenosnega sistema,<br>▪ Obstoječe kompresorske postaje,<br>▪ Načrtovane kompresorske postaje | Ten-year transmission pipeline network development plan for 2020-2029;<br>▪ Existing transmission pipelines,<br>▪ Other planned transmission pipelines,<br>▪ Projects for increasing operational reliability,<br>▪ Projects for increasing operational reliability,<br>▪ Projects for expanding the transmission system,<br>▪ Existing compressor stations,<br>▪ Scheduled compressor stations |

Projects to establish interconnection points with neighbouring transmission systems are aimed at establishing new interconnection points with neighbouring systems, increasing already existing transmission capacities, creating return flows and meeting the N-1 infrastructure standard.

***Figure 71: Projects for the development of interconnection points with neighbouring transmission systems***




Source: Transmission System Operator Development Plan 2020-2029, p. 44.

Key to Figure 71:

| | |
|---|---|
| Desetletni razvojni načrt prenosnega plinovodnega omrežja za obdobje 2020-2029; | Ten-year transmission pipeline network development plan for 2020-2029; |
| ▪ Obstoječi prenosni plinovodi, | ▪ Existing transmission pipelines, |
| ▪ Ostali načrtovani prenosni plinovodi, | ▪ Other planned transmission pipelines, |
| ▪ Projekti za razvoj povezovalnih točk, | ▪ Projects for the development of connecting points, |
| ▪ Projekti za razvoj povezovalnih točk, | ▪ Projects for the development of connecting points, |
| ▪ Projekti za razvoj povezovalnih točk, | ▪ Projects for the development of connecting points, |
| ▪ Obstoječe kompresorske postaje | ▪ Existing compressor stations) |

Challenges in the area of gasification and production of synthetic gas

Synthetic methane gasification and production technologies have been in use for a long time, and various gasification technologies have been developed for both biomass gasification and coal and plastic waste. These technologies are commercially available and are suitable for the implementation higher rated power levels. Biomass gasification plants with a rated capacity of more than 100 MW are already operating in Europe and beyond. Synthetic methane production technology has already been developed and is available in a number of implementations, both in catalytic reactors and in biological reactors which are commercially available and suitable for use in higher rated power installations.

Gasification and methanation technologies have already been tested in various pilot projects in Europe and beyond, where the technology has proven to be suitable and mature enough for wider commercial use at higher power plants, comparable to the rated power of larger existing thermal power plants. As the decarbonisation of the gas sector is expected in future in order to achieve climate targets and the integration of the electricity and gas sectors, and as the demand for storage of excess RES will increase, as well as the volumes of renewable gas in gas networks, further research and integration solutions are needed to incorporate gasification and methanation technologies into energy systems. These include the gas as well as the electricity sector ('power-to-gas' technologies), and, in particular, further research into the effects of the increasing proportion of hydrogen and synthetic natural gas (SNG) on parts of the gas pipeline network and on the related security of supply will be of vital importance. Synthetic gas and hydrogen have different effects on parts of the network due to their

different composition and chemical and physical properties. Gas network components must, therefore, be monitored and further defined and investigated in order to continue to fully utilise the pipeline infrastructure in the carbon-free future, since the gas sector offers the possibility of seasonally storing electricity surplus from RES and transporting $CO_2$ neutral gas at minimal cost since no construction of new transmission and distribution infrastructure will be needed, removing some burden from the electricity sector.

Research and development in the area of production and use of renewable gases in gas pipeline systems should be prioritised to analyse the impact of different components of renewable gases on gas pipelines and different types of end-users. Wider use requires an integrated view of how the whole sector works. At the same time, this is the basis for active work in determining the criteria, proportions and acceptable compositions of renewable gases in systems.

### 4.5.3 Electricity and gas market, energy prices

#### i. The current market situation for electricity and gas, including energy prices

**The electricity market**

The Slovenian electricity market is at the intersection of three major European markets, the German-Austrian, Italian and South-East European markets. As the liquid electricity exchanges do not yet operate on the fragmented markets of South-East Europe, we maintain that the markets of Germany, Austria, Italy and South-Eastern Europe have the greatest influence on the Slovenian market. In the first two, in recent years, production in wind and solar power plants, which are among the unpredictable and weather-dependent energy sources, has increased rapidly. An additional impact on the market situation was the fact that most wind and solar power generation plants are covered by national support schemes and can, therefore, offer very low electricity prices on the market. As a result, prices have fallen in recent years, which for some reasons, stopped and reversed in 2017.

The market situation is also significantly influenced by the merging of day ahead markets. Until 2018, the Slovenian market was included in the multi-regional coordination of day-ahead markets at borders with Austria, Italy and Croatia. By the end of 2019, implicit day-to-day coupling at all borders had taken place. In the coming years, due to the gradual introduction of European regulations laying down guidelines for the establishment of network rules, the introduction of day-to-day and intra-day market coupling at all European borders is expected. In addition, balancing energy will be exchanged between countries. The markets of Slovenia and Hungary are also expected to connect in 2022.

Wholesale market

The wholesale market in Slovenia is fully open and liberalised. Generators, traders and suppliers of electricity come into contact on the market.

Borzen d.o.o. performs the role of the electricity market operator and records all electricity transactions or contracts. Thus, all contractually agreed obligations in which electricity is bought or sold in Slovenia or energy is transferred across the border of the regulatory area are recorded. Individual participants can conclude deals bilaterally or on energy exchanges in Slovenia or abroad.

The electricity exchange in Slovenia is operated by BSP Energetska Borza d.o.o. Day-ahead and intra-day trading is carried out on the exchange. It is also possible to register transactions in the OTC clearing and settlement system. BSP is the designated operator of the electricity market (NEMO).

The Energy Agency (AE) monitors the performance of the wholesale market in Slovenia. The AE implements *inter alia* market transparency controls based on REMIT, which is the key basis for ensuring the integrity and transparency of the energy market and an integrated regulatory framework for monitoring and controlling the European wholesale electricity market.

Market concentration

In 2018, 26 domestic and foreign companies traded on the BSP, which is less than the year before and in previous years. The total market share of three traders as an indicator of the level of concentration - CR3 was 50.4%, and the total market share of five traders - CR5 was 63.4%. The Herfindahl-Hirschman Index (HHI) stood at 1 357 in 2018, indicating a moderate concentration in the wholesale market and was higher than in 2017, when it was 1 077.

Bilateral market

Bilateral trading takes place outside the organised stock market. It is carried out between two parties who determine the terms of purchase or sale. As the content of the bilateral agreement is mutually agreed, it is the most common form of trading. The contracts are closed, and the records are kept by the market operator. In 2018, the market operator recorded 109 113 closed contracts and operational forecasts with a total volume of 83 063 190 MWh. Compared to the previous year, the total number of recorded closed contracts and operational forecasts decreased by 4.7% in 2018, while the volume of trading decreased as the total amount of energy covered by the contracts decreased by 5.2%.[92]

Day-ahead trading on the exchange

Day-ahead trading is carried out in the manner of auction trading through the trading application. Products in this market segment are limited by price range and minimum quantity interval. Multiregional Market Coupling (MMC) is also included in trading, which also allocates available interconnection capacity [MPZ].

The total trading volume in 2018 for the day ahead was 7 42 GWh, which is more than the year before. Twenty-five market participants participated in this market segment.

Intra-day trading on the exchange

The volume of auction trading through implicit intra-day auctions was 200 GWh. Bids worth a total of 4 133 GWh were handled, of which 2 581 GWh were for purchases and 1 553 GWh for sales.

Intra-day trading also includes the balancing market section, which allows an electricity grid system operator to purchase electricity to balance the system. The balancing market is traded on a regular basis. For ease of operation, the Slovenian balancing market is linked to the intra-day market.

The total volume of intra-day trading decreased in 2018 compared to 2017, reaching 131 GWh, of which the balancing market volume was 129 GWh and the remaining volume of intra-day trading was only 2 GWh.

The volume of intra-day trading in 2018 represented only 4.3% of the total trading on the Slovenian electricity exchange.

Wholesale market liquidity

Wholesale market liquidity is determined by the Energy Agency on the basis of calculation of the Churn factor. In 2018, the value of the index decreased slightly compared to the values of previous years, amounting to 3.06. The index shows that the Slovenian wholesale electricity market is well developed and provides a high level of liquidity. At the end of 2018, the final average price of electricity supplied for business consumption was EUR 86.6/MWh, which is 7.3% more than in the previous year. Business consumption prices went up in all customer groups, but by different rates.

When indicating figures, we summarised Eurostat's analysis comparing two business customers in the group with annual consumption between 20 and 500 MWh/year and in the group 20 to 70 GWh/year.

92 Source: AGEN RS, Report on the State of Energy in Slovenia in 2018, p. 76.

In the first- group with electricity consumed between 20 and 500 MWh/year, the total final price was 129 EUR/MWh, with the price without fees and taxes amounting to 88.3 EUR/MWh and the fees and taxes amounting to 40.7 EUR/MWh.

In the second-mentioned group with electricity consumption between 20 and 70 GWh/year, the total final price was 75.8 EUR/MWh, with the price excluding fees and taxes amounting to 54.3 EUR/MWh and fees and taxes amounting to 21.5 EUR/MWh.

Although prices had generally risen in 2018, they are on average still below EU average prices.

Retail market

The retail market is fully liberalised, and there is no regulation of retail prices. The data in the table below shows that the Slovenian retail electricity market is well developed and that there are no systemic obstacles to its operation. The number of electricity suppliers is large in number and is gradually increasing. The market concentration (HHI) is reasonably small and has been decreasing in recent years (HHI in 2016: 1 413; in 2017: 1 281). Data on the situation in the electricity market are publicly available on the AE website, which further contributes to the transparency of the operation of the electricity market in Slovenia.

***Table 59: Basic information on the operation of the retail electricity market in Slovenia (data for 2018, source: Energy Agency report)***

| Parameter | 2018 |
|---|---|
| Number of customers (household and business customers) | 955 925 |
| Average annual consumption of a typical household customer (kWh/year) | 3 973 |
| Number of all electricity suppliers | 23 |
| Number of suppliers to household customers | 18 |
| The proportion of change of supplier (household and business customers) | 2.85 % |
| Share of customers with regulated electricity price | 0 % |
| The proportion of household electricity customers with a socially adjusted electricity price | 0 % |
| Consumption of electricity by business customers with regulated electricity price (GWh) | 0 % |
| HHI - market concentration index for electricity household and commercial customers | 1 179 |
| Market share of the three largest suppliers to household and commercial customers | 57.6 % |
| The proportion of modern measuring devices [NMI]; projected 100% by 2025 | 58 % |
| Number and proportion of suppliers offering contracts with dynamic electricity prices | 0 |
| Total number of aggregators in the retail electricity market | 0 |
| Volume and proportion of peak load that can be activated as an active off-take | no data |
| Prosumers (consumers and producers at the same time - self-supply) | 0.23 % |

## The natural gas market

As Slovenia does not have its own natural gas sources, natural gas storage facilities or LNG terminals, the wholesale natural gas market in Slovenia is limited by the import of natural gas through neighbouring natural gas transmission systems. Traders, who are also natural gas importers, deliver it via neighbouring transmission systems to the Slovenian transmission system. Natural gas traded on the wholesale gas market comes from transmission systems from neighbouring countries that have their own natural gas sources. The Slovenian wholesale market can be supplied with gas from Austria, Italy and Croatia.[93]

[93] Under normal conditions, supply from Croatia is not (yet) possible due to having too low pressure in the transmission system. In the event of an emergency in Slovenia (and in the event of deliveries to Croatia via Hungary) this would be possible. In 2019, the possibility of return flow from Croatia to Slovenia was envisaged.

Liberalisation of the market entails a decrease in the number of long-term contracts concluded directly with natural gas producers from Russia. They have been replaced by short-term contracts concluded at gas hubs, stock exchanges and other points in the EU. In 2018, 61.2% of natural gas was purchased under short-term contracts. This is slightly lower compared to 2017, when the percentage of short-term natural gas contracts was 62.5%. The duration of contracts or the ratio of short-term and long-term contracts can affect the security of supply since insufficient supply could result in gas shortages if the required quantities could not be purchased on current markets.

The distribution of natural gas is carried out as an optional local public service (public service obligation) comprising distribution system operator activity to supply general consumption consumers in urban areas and settlements and as distribution to industrial and commercial customers in closed distribution system areas. According to the Energy Agency[94], in 2018, the distribution of natural gas in the form of CPS was carried out in 81 municipalities in most of the urban areas of Slovenia, except for Primorska. The number of distribution system operators decreased to 13 due to the merger of the two companies.

Status of the wholesale natural gas market

**Wholesale natural gas market**

The natural gas market in Slovenia is open and liberalised. There is no natural gas exchange in Slovenia, intra-day and day-ahead products are traded via a virtual point service offered to market participants by the natural gas transmission system operator.

**Natural Gas Market Concentration**

There are 18 companies in Slovenia that transport gas into the country. The market share of the company with the largest share of natural gas imports to Slovenia is 52.6%. Eight companies with the largest market shares provide 95% of all-natural gas imports to Slovenia, and 60% of all imports are covered by just the two companies with the highest market share.

Twenty-one companies supply natural gas to system users. The largest market share of an individual company is 43.7%. Of the total consumer off-take 95% is supplied by the nine largest companies and 60% by the three largest companies.

The market share of the four largest gas companies on the market (Four-Firm Concentration Ratio - CR4) is 77.5%.

**Natural gas market liquidity**

On the virtual point through which natural gas trading takes place, 12 traders participate. In 2018, trading volumes on the virtual point came to 1.13 TWh, while there was no trading of amounts through the brokerage platform. The Churn factor for 2018 is 1.01.

**Import and export**

In 2018, 13.3 TWh of natural gas was imported into Slovenia while exports amounted to 3.8 TWh. Imports to Slovenia are possible via three border points and exports via two. The technical capacity in MWh/day is shown in the table below.

***Table 60: Basic information on the technical capacity of natural gas imports and exports to Slovenia***

| Border point | Input technical capacity in MWh/day | Output technical capacity in MWh/day |
|---|---|---|
| Ceršak (Austria/Slovenia) | 139 155 | / |
| Rogatec (Slovenia/Croatia) | 7 731 | 68 289 |
| Šempeter (Slovenia/Italy) | 28 316 | 25 742 |

94 Source: AGEN RS, Report on the State of the Energy Sector in Slovenia in 2018.

### Demand and supply

In 2018, the demand for natural gas in Slovenia was 9.45 TWh. The total quantity was imported from abroad, namely 70% from Austria, 29.5% from Russia and 0.5% from Italy. Slovenia does not have its own natural gas production units, so production for 2018 amounted to 0 TWh. In Slovenia, there are also no biogas, hydrogen or synthetic gas production units connected to the gas pipeline network and the production of gas from renewable sources was 0 TWh.

Natural gas storage facilities and LNG production facilities are also not available in Slovenia.

### Other important factors

The transmission system operator shall provide certain support mechanisms to promote the use of renewable gas and alternative fuels in transport:

- in order to promote the use of gas from renewable sources, the transmission system operator shall take into account the renewable factor in the calculation of the network charge and shall take it as a discount in the calculation of the network charge;
- in order to promote alternative use of gas in transport, the transmission system operator shall take into account the compressed natural gas factor in the calculation of the network charge and shall take it as a discount in the calculation of the network charge.

Situation on the natural gas retail market

The Slovenian retail market comprises end consumers on the distribution and transmission systems. Retail market prices are unregulated for all types of customers. The distribution system comprises 120 228 household customers, 29 customers in closed distribution systems and 14 246 public utilities. There are 139 commercial customers connected to the transmission system. The average consumption of household customers is 9 615 kWh per year. The Herfindahl-Hirschman Index for the natural gas market stands at 2410. The market share of the three largest suppliers is 67%. The share of customers switching to a natural gas supplier is 3.2%.

The supply to customers on the gas distribution system is mainly measured by classic gas meters, which are read at least once a year by the distribution system operator, while the customer has the opportunity to report meter readings to the distribution system operator or supplier at any time. The proportion of smart meters is negligible.

### Natural gas market development targets

In order to achieve climate agreement targets, Slovenia will also comply with the guidelines and recommendations of the European Commission and ENTSO-G for the gradual replacement of the share of natural gas with renewable gas, such as synthetic natural gas, hydrogen and biomethane. Adequate penetration of renewable gases into the energy balance will require the development of a renewable gas market, which may exist within the natural gas market or as a standalone market. The commercially available renewable gases will be made available to suppliers who will supply renewable gases to final customers in different sectors, thereby contributing to the decarbonisation of each sector and reducing the carbon footprint of each final customer. The development of a liquid market for renewable gas will contribute to increasing the share of renewable gas in natural gas and thus reduce the price of such gas, making the production of renewable gas more commercially attractive. This will increase the potential for the development of domestic production of renewable gas as a commercial activity for domestic non-regulated energy companies.

The transmission system operator will continue to contribute to the development of the renewable gas market by taking into account the network discount in the case of renewable gas transmission. The gas system operator will only be able to participate in pilot projects for the production of renewable gas with the consent of the Energy Agency. Such pilot projects will seek answers to questions regarding the conditions for connection of larger production facilities to the pipeline system, which will be built by unregulated companies after the market breakthrough of renewable gas. This

will allow gas system operators to continue to ensure a secure and reliable supply of natural gas with varying proportions of renewable gas.

### ii. Projections of developments with existing policies and measures until at least 2040 (including 2030)

Projections of energy prices are given in Section 4.1. Estimated development of major external factors affecting the energy system and greenhouse gas emission trends, subsection iii. Global energy trends, international fossil fuel prices, the carbon price in EU-ETS. It should be borne in mind that, on the basis of the planned new European directive on energy taxation, energy price ratios will change fundamentally.

## 4.6 Research, Innovation and Competitiveness Dimension

### i. The current situation in the low-carbon technology sector and, as far as possible, its position on the global market (Union or global analysis required)

#### Promoting the transition to a climate-neutral society (CNS)

In order to reduce GHG emissions and increase energy efficiency and the use of renewable energy sources, a number of operational programmes have been adopted in Slovenia envisaging various measures to encourage companies to transition to a climate-neutral society. The key instruments for green economic growth are: promoting research and innovation for the transition to CNS, promoting entrepreneurship for the transition to CNS and demonstration projects.

The financial incentives for research and innovation used to achieve climate change targets are planned under the OP EKP (Operational Program for implementing European Cohesion Policy 2014-2020), priority axis: 1 International competitiveness for research, innovation and technological development in line with smart specialisation for increased competitiveness and greening of the economy, priority investment 1.2 Encouraging enterprise investment in research and innovation, and establishing links and synergies between enterprises, R&D centres and the higher education sector.

The financial incentives for entrepreneurship development used for the climate change objectives are planned under the OP EKP Priority Axis 3. Dynamic and competitive entrepreneurship for green economic growth, priority investments 3.1. Promoting entrepreneurship, in particular by facilitating the economic exploitation of new ideas and promoting the creation of new businesses, including business incubators.

The OP TGP (Operational Program for GHG Emission Reduction Operations by 2020) plans financial incentives for the implementation of demonstration projects in the area of GHG emission reduction in industry, and the Action Plan for Efficient Energy contains a development scheme and other incentives for the economy to market green energy products.

Financial incentives for demonstration projects were announced by the Ministry of Economic Development and Technology in 2016/2017. In this context, the ministry launched a public tender procedure in the priority area of the Slovenian Smart Specialisation Strategy 'Smart Cities and Communities', target area 'Energy Conversion, Distribution and Management'. The tender procedure was for co-financing of the implementation of pilot demonstration projects of companies or consortia of companies, the result of which must be new or improved products, processes or services, developed to the degree that they are endorsed and tested for use in a real environment. The result of the projects must also be a demonstration of their use in a real environment to obtain references from companies for commercialisation.

#### Promoting clean energy innovation and the Innovation Fund

The European Parliament, in its resolution of 6 February 2018 on promoting clean energy innovation (2017/2084 (INI)), notes that clean energy research, development and innovation crucially depend on a stable market and the predictability and certainty of a regulatory framework. A stable regulatory framework, however, requires an ambitious and deliverable long-term policy vision, including energy- and climate-related goals and commitments, sustained targeted incentives and patient-equity capital in order to create a level playing field among technologies, thus facilitating innovation, easing energy supply, lowering market entry barriers and making it easier for clean energy innovation to attain the critical mass necessary for market deployment.

The resolution stresses the need for greater prioritisation of cross-cutting, cross-sectoral, systemic innovation in energy, as well as the promotion of education and entrepreneurship, since innovation is not only technology-driven. The European Parliament resolution envisages the development of a

systemic approach to be able to effectively integrate different solutions available or under development, particularly with regard to energy efficiency and the integration of renewables, and calls for European technology and innovation platforms to be used to help identify prospective clean energy innovation meriting targeted support.

In 2018, the amended EU Emission Trading System (ETS) Directive (Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments and Decision (EU) 2015/1814 (OJ L 76, 19.3.2018, p.3)) provided the legal basis for a new Innovation Fund to provide funding for innovative low-carbon industrial and energy technologies up to 2030. Technologies receiving support from the Innovation Fund should be able to produce breakthrough solutions or be mature enough for pre-commercial demonstration.

Innovative energy projects that contribute to the EU's transition to low-carbon energy require a better investment environment. In this context, the proposed Regulation on the Governance of the Energy Union provides that Member States will draw up and submit to the Commission national long-term development strategies for a low carbon economy, supported by stable policies and regulations to promote and support the use of renewable energy and further reduce emissions.

For major innovative low carbon energy demonstration projects in line with the recommendations of the ECA[95] Special Report, the Commission should, in cases where – in the context of the proposed Innovation Fund and other relevant centrally managed EU funding programmes – large, capital-intensive projects are put forward which need a combination of national and EU support, assess their compliance with national climate and energy plans and obtain clear and transparent commitments from the Member States before allocating EU funds.

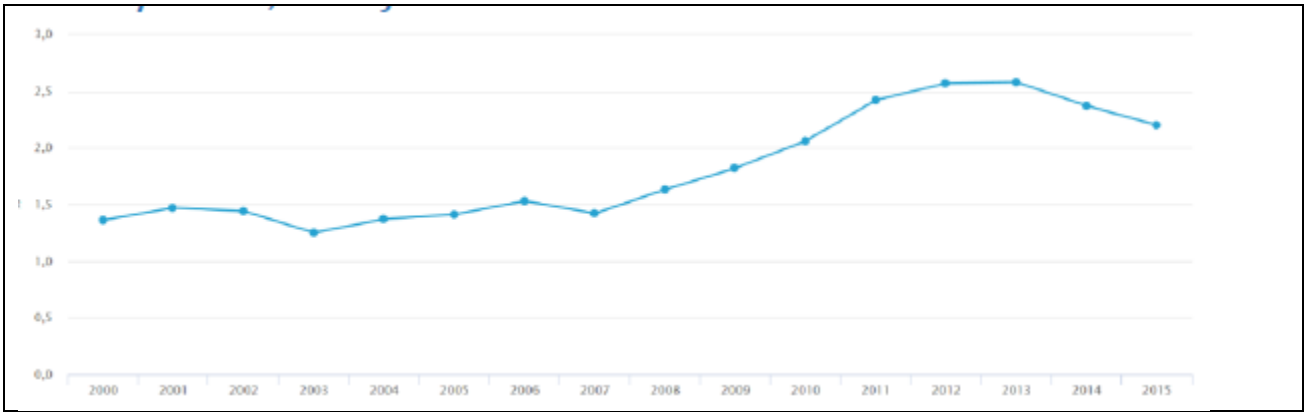
### ii. Current level of public and (where available) private research and innovation spending on low-carbon-technologies, current number of patents, and current number of researchers

The 2016 data on research and development activity (R&D) show that, combining all sectors where research and development was carried out, R&D in Slovenia received a total of EUR 812 million or 2.01% of GDP in 2016. Compared with the figure of EUR 853.1 million for the previous year (2015), the amount was 4.8% or EUR 41.1 million less in nominal terms or, expressed as a percentage of GDP, 0.19 percentage points less. In absolute terms the amount of R&D funding has declined most markedly in the business sector (which otherwise spends the most on R&D); nominally, R&D funding in the business sector was EUR 35.9 million or 5.5% less than in the previous year (SORS, 2018).[96]

95 European Court of Auditors' Special Report: Demonstration of commercial capture and storage of carbon dioxide and innovative renewable energy in the EU: No progress has been made in the past decade, 2018.

96 SORS, 2018, Research and Development Activity, 2016, available at: https://www.stat.si/StatWeb/News/Index/7277.

### *Figure 72: Share of gross domestic expenditure for research and development in GDP, Slovenia*




Source: SORS, 2018

The table below, which shows gross domestic expenditure on R&D by source of funding in 2016, shows that the largest share of R&D is spent by companies (almost 70%), State sources and foreign sources (mostly EU funds).

### *Table 61: Gross domestic expenditure on R&D by the source of financing in 2016*

| *(in EUR 1000)* | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | % in |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Funding Sources - TOTAL | 500508 | 616949 | 656882 | 745942 | 894213 | 928306 | 935006 | 890231 | 853067 | 811953 | 100.00% |
| Companies | 291636 | 387494 | 380884 | 435450 | 547505 | 577610 | 596981 | 608828 | 590398 | 562259 | 69.25% |
| State resources | 178210 | 193101 | 234241 | 263077 | 281764 | 266190 | 251263 | 193930 | 169644 | 163940 | 20.19% |
| Higher education | 1783 | 1801 | 1889 | 2118 | 2062 | 4021 | 3236 | 4572 | 2893 | 3204 | 0.39% |
| Private non-profit | 62 | 73 | 203 | 459 | 97 | 994 | 194 | 422 | 66 | 46 | 0.01% |
| Resources from abroad | 28817 | 34480 | 39665 | 44838 | 62785 | 79491 | 83330 | 82479 | 90066 | 82505 | 10.16% |

Source: SORS, 2018

The table below, which shows gross domestic expenditure on R&D in Slovenia coming from State sources in the period 2007-2016, shows that from 2007 the share of State sources in gross domestic expenditure on R&D declined until 2015 when it stabilised. Then it began to increase gradually.

### *Table 62: Gross domestic expenditure on R&D in Slovenia coming from State sources in the period 2007-2016*

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Funding Sources - TOTAL | 500508 | 616949 | 656882 | 745942 | 894213 | 928306 | 935006 | 890231 | 853067 | 811953 |
| State resources | 178210 | 193101 | 234241 | 263077 | 281764 | 266190 | 251263 | 193930 | 169644 | 163940 |
| % | 35.61% | 31.30% | 35.66% | 35.27% | 31.51% | 28.67% | 26.87% | 21.78% | 19.89% | 20.19% |

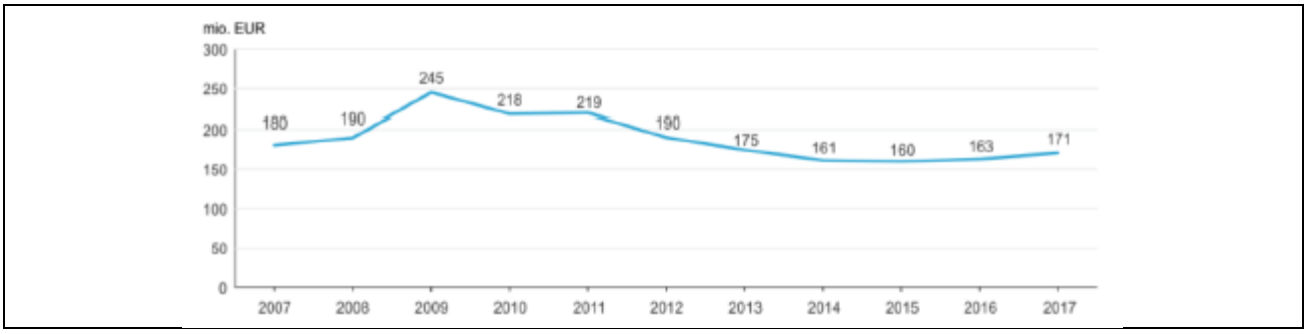
Source: SORS, 2018

According to the final budget, in 2017 Slovenia allocated EUR 170.5 million to the State budget for R&D, i.e. EUR 7.8 million or 4.8% more than in the previous year. This was the second consecutive increase. The share of State budgetary resources for R&D in GDP remained unchanged in 2017 compared to 2016, amounting to 0.40% of Slovenia's GDP. The initial budget for 2018 makes provision for more resources for R&D than planned and spent in 2017. Initial funding from the State budget foreseen for the implementation of R&D in 2018 is EUR 199.4 million, which is EUR 28.9 million more than the State actually allocated to R&D in 2017 (SORS, 2018b).[97]

[97] SORS, 2018, State Budget for Research and Development increased for the second year in a row, Available at: https://www.stat.si/StatWeb/News/Index/7681.

Of the national budget allocated to R&D in 2017, half (49.8%) was for general advancement of knowledge. As in the previous year, the next highest allocation was in industrial production and technology (10.8%) and health (10.5%). The structure of R&D funds planned for 2018 is – in terms of socio-economic targets – roughly the same as the structure of funds disbursed in 2017. The vast majority of the State R&D budget for 2017, specifically 91.7%, was earmarked for the implementation of R&D in the State and higher education sectors; 54.3% was received by the State sector and 37.4% by the higher education sector. The remaining tenth of R&D funding in 2017 was allocated to the business sector (6.6%) and the private non-profit sector (0.9%) and abroad (0.7%) (SORS, 2018b).

***Figure 73: State budget appropriations for R&D (final budget), Slovenia***




Source: SORS, 2018b

In 2016, of all 20 022 natural persons regularly employed in R&D, 11 282 (or 56%) were researchers of both sexes. If the volume of R&D work performed by full-time and part-time employees in 2016 is expressed in full-time equivalents (FTE) to prevent under- or over-estimation of data on R&D workers, we can see that the work done by all the persons who worked in R&D was the same as would be done by 14 403 full-time equivalents, 8 119 of whom would be researchers of both sexes (56%) (SORS, 2018).

The data also show that women are still in the minority among researchers. Of all researchers actively working in 2016 (counted as natural persons), 35% were women. If the volume of R&D work carried out in 2016 by researchers and research associates is expressed in FTE, then 33% of all researchers were women. If we look at the distribution of female and male researchers in 2016 in the three most important sectors, we see that it is the same as in previous years: the highest percentage of female researchers was in the government sector, at 50%, while female researchers in the higher education sector accounted for 42%; however, the share of women researchers in the business sector – at 24% - was again extremely low (SORS, 2018).

Slovenia does not have accurate data on the number of patents in the area of low carbon technologies. The following is only some of the partial information that is publicly available.

The EIO Country Profile for Slovenia for 2017 through the 'Eco-Innovation Output' component reveals that media coverage in the area of eco-innovation (in terms of the number of electronic media) significantly increased in 2017 and 2016 compared to 2015 and that it was higher than the EU average. Similarly, compared to 2015, the number of publications on eco-innovation (per million inhabitants) increased in 2017 and exceeded the EU average. On the other hand, the number of eco-innovation patents is still small and does not reach the EU average (EIO, 2017).[98]

[98] EIO, 2017, Eco-innovation in Slovenia, available at: https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-.files/slovenia_eio_country_profile_2016-2017_1.pdf.

***Table 63: Number of patents, media coverage and publications in the area of eco-innovation in Slovenia in the period 2010-2017***

| | Number of eco patents per million population (original data) | Number of publications per million population (original data) | Electronic Media hits (Original Data) |
|---|---|---|---|
| **EU AVERAGE** | 18.34 | 20.53 | 1.00 |
| **Slovenia 2017** | **9.82** | **45.54** | **1.47** |
| Slovenia 2016 | 17.89 | 25.21 | 1.24 |
| Slovenia 2015 | 10.31 | 29.60 | 0.18 |
| Slovenia 2014 | 10.00 | 18.94 | 0.10 |
| Slovenia 2013 | 2.56 | 17.03 | 0.05 |
| Slovenia 2012 | 1.99 | 11.22 | 0.04 |
| Slovenia 2011 | 1.99 | 2.44 | 0.05 |
| Slovenia 2010 | 0.00 | | |

Source: EIO, 2017.

## iii. Breakdown of current price elements that make up the three main price components (energy, network, taxes/charges)

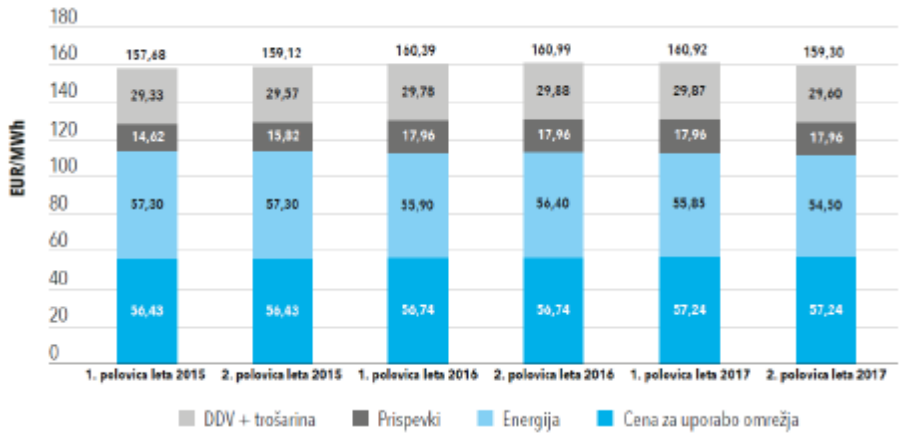
### Electricity price structure

The electricity market is open and competitive, so final electricity prices are influenced by market conditions and factors. The Energy Agency constantly monitors prices on the markets of household and small business customers, obtaining data on prices or offers on the retail market from suppliers on a monthly basis. The Agency analyses the market for large business customers on a semi-annual and annual basis based on data from the EPOS system (e-reporting system for data from energy providers) operated by the Ministry of Infrastructure.

The figure below shows an analysis of the structure of the final prices of electricity supplied to typical household customers. The final amount for the payment of electricity supplied to the customer consists of the following (Report on the Energy Sector in Slovenia in 2017, p. 87):

- prices of freely generated electricity on the market;
- network charges (transmission network charges and distribution network charges);
- contributions (contribution to support the production of electricity in high-efficiency cogeneration and RES, contribution to energy efficiency and contribution to the functioning of the market operator);
- excise duties on electricity and value-added tax (VAT).

***Figure 74: Fluctuations in the final electricity price in Slovenia for a typical household customer (Dc - from 2 500 to 5 000 kWh per year) in the period 2015-2017***




Source: Report on the situation in the Energy Sector in Slovenia in 2017, 87.

Key to Figure 74:

1st semester - 2nd semester 2015/ 1st semester - 2nd semester 2016/ 1st semester - 2nd semester 2017
◆ VAT + excise duty, ◆ Contributions, ◆ Energy, ◆ Price for using the network

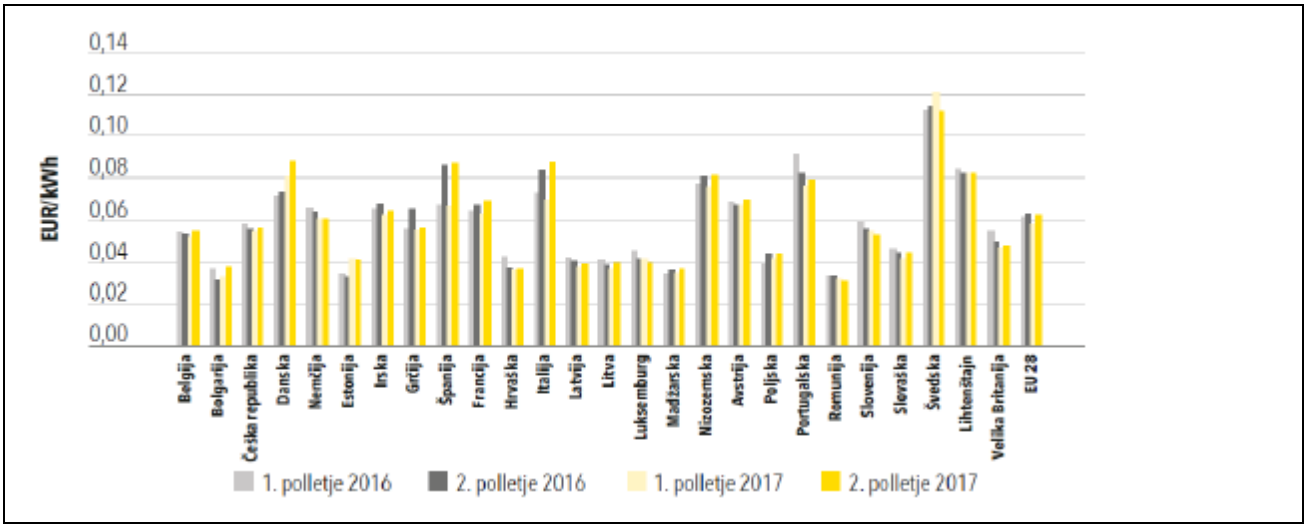
The final price of electricity decreased in 2017 compared to 2016 due to the decrease in the price of electricity in the structure of the final price. In the last three years, the fluctuation of this price has not exceeded the two percent increase relative to the lowest value reached in the first half of 2015 (Report on the Energy Sector in Slovenia in 2017, p. 87).

The average final price of electricity supplied for business consumption, excluding value-added tax in the second half of 2017 amounted to EUR 80.7/MWh and decreased by 5.1% compared to the same period of 2016. The decrease in the retail price, however, does not reflect prices on the wholesale markets, as they increased sharply there. Supplier pricing models are tailored to customers and are directly or indirectly linked to wholesale prices. Suppliers may be assumed to have purchased most of the energy for the portfolio they supply in the futures markets when the price of energy was significantly lower (at the end of 2016) (Energy Situation Report for Slovenia in 2017, p. 88).

### Natural gas price structure

The figure below shows the final natural gas prices for typical D2 household gas customers with annual consumption of 5 556 to 55 556 kWh in Slovenia and EU countries. In most countries, natural gas prices have decreased compared to 2016, which is also reflected in the average price at EU-28 level, which has decreased. Estonia had the largest increase in natural gas prices, and the UK had the largest decrease. The price of natural gas in Slovenia remained below the EU-28 average in 2017 (Report on the Energy Sector in Slovenia in 2017, p. 146).

***Figure 75: Final natural gas prices for a typical D2 household customer with all taxes and levies for Slovenia and individual EU countries in 2016 and 2017***




Source: Report on the Energy Sector in Slovenia in 2017, p. 146.

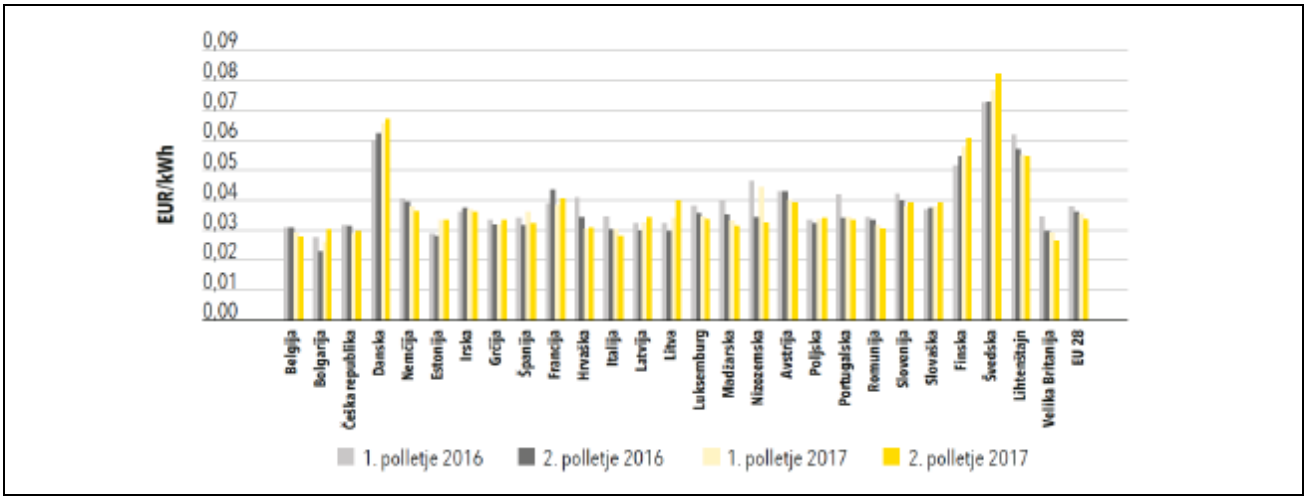
Key to Figure 75:

Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Latvia, Lithuania, Luxembourg, Hungary, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Sweden, Liechtenstein , United Kingdom;

1st semester 2016, 2nd semester 2016, 1st semester 2017, 2nd semester 2017

The figure below shows the half-yearly trend in natural gas prices with all taxes and levies in 2016 and 2017 in Slovenia and EU countries for large industrial gas consumers I3 with annual consumption from 2 777.800 to 27 778.000 kWh. In more than half of the EU Member States, prices in this consumer group fell compared to 2016, as did the average price for the EU-28. The largest increase in natural gas prices was recorded in Lithuania and the largest decrease in Croatia. The price of natural gas in Slovenia remained above the EU-28 average in 2017 (Report on the Energy Sector in Slovenia in 2017, p. 147).

***Figure 76: Final price of natural gas with all taxes and levies for typical band I3 industrial customer for Slovenia and individual EU countries in 2016 and 2017***



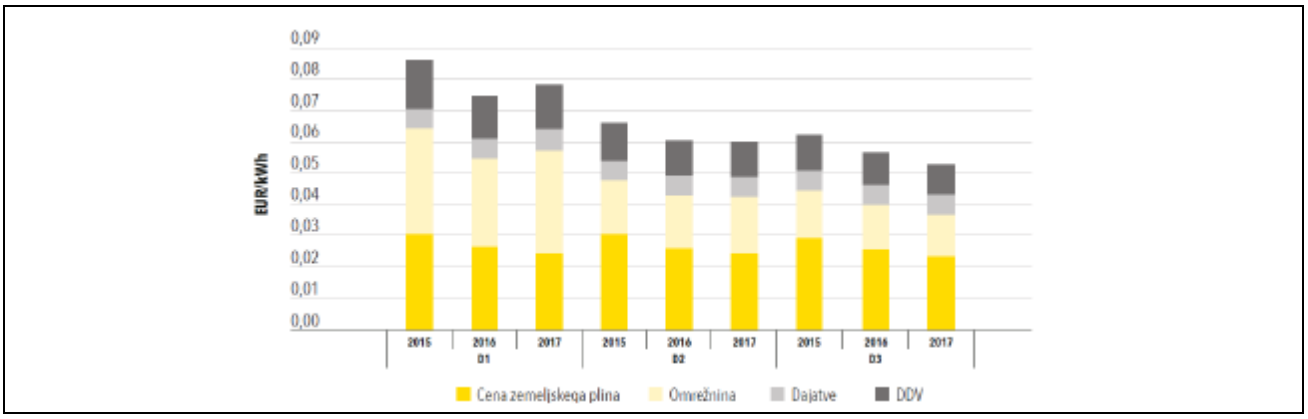

Source: Report on the Energy Sector in Slovenia in 2017, p. 147.

Key to Figure 76:

| |
|---|
| Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Latvia, Lithuania, Luxembourg, Hungary, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Sweden, Liechtenstein , United Kingdom;<br>1st semester 2016, 2nd semester 2016, 1st semester 2017, 2nd semester 2017 |

The figures below show the structure of the final price for typical household and business customers connected to distribution systems in 2015-2017.

### *Figure 77: The structure of the final price of natural gas for household customers in 2015-2017*

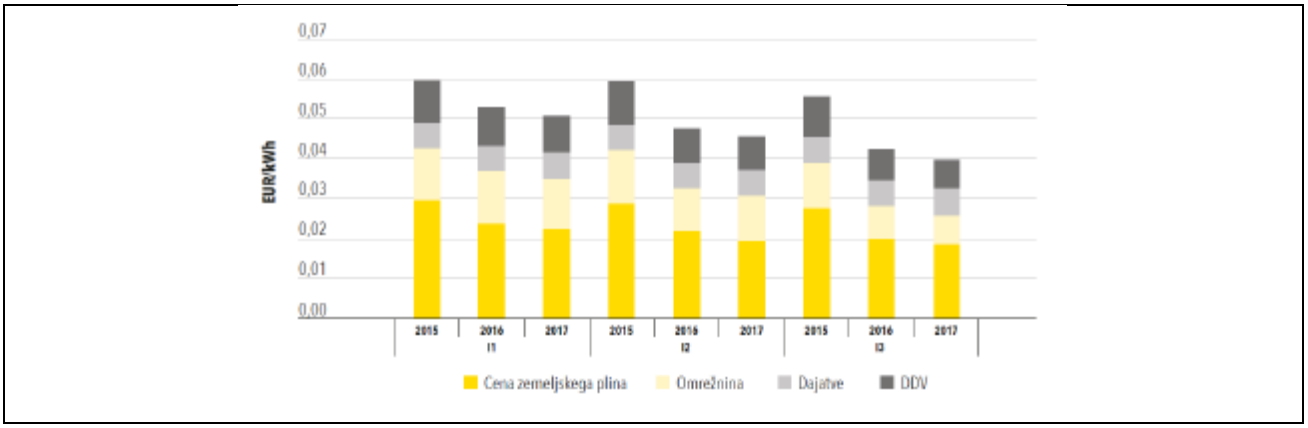



Source: Report on the Energy Sector in Slovenia in 2017, p. 148.

Key to Figure 77:

| | | | |
|---|---|---|---|
| ▪ Natural gas price | ▪ Network charge | ▪ Duties | ▪ VAT |

### *Figure 78: The structure of the final price of natural gas for business customers in 2015-2017*




Source: Report on the Energy Sector in Slovenia in 2017, p. 148.

Key to Figure 78:

| | | | |
|---|---|---|---|
| ▪ Natural gas price | ▪ Network charge | ▪ Duties | ▪ VAT |

## iv. Description of energy subsidies, including for fossil fuels

### Subsidies in energy

Subsidies in the energy sector in 2017 amounted to EUR 163 million (current prices). They relate solely to support for the production of electricity from RES and CHP. The table below gives an overview of the structure of subsidies awarded per year in the period 2010 to 2017.

***Table 64: Subsidies awarded in the energy sector in the period 2010-2017***

| *EUR million at current prices* | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| **RES and EEU** | 61 | 92 | 143 | 200 | 205 | 178 | 140 | 163 |

Source: PES Analysis - CEU, Borzen-CP Database, FURS, MZI, Eco fund, 2019

### Incentives counter to the objective of reducing GHG emissions

Incentives counter to the objective of reducing greenhouse gas emissions have been increasing over the years as consumption of energy products increases. The excise duty on commercial diesel (freight and passenger vehicles) is the highest in terms of share. Their amount also varies according to the number of excise duties on individual energy products, and in the event of tax reduction, the incentive amount also falls. In 2017, such oil and gas incentives amounted to EUR 95 million (at current prices).

# 5. IMPACT ASSESSMENT OF PLANNED POLICIES AND MEASURES

**By implementing the planned measures and policies of the ambitious NEPN scenario, compared to 2017 Slovenia will achieve a 6% reduction in final energy use by 2030 and a reduction of more than 20% by 2040, while by 2030 it will increase the use of renewables and waste by more than 35 % compared with 2017. The estimated volume of investment for implementation of the NEPN scenario in the period 2021-2030 is over EUR 28 billion, which requires almost EUR 5 billion more investment than in the existing measures scenario; and between EUR 200 million and EUR 250 million annually for the necessary incentives for implementation. The impact and investment assessment is based on the assumptions of the model used and the indicative resource plan presented in the section below.**

## 5.1 Impacts of planned policies and measures on energy systems and emissions

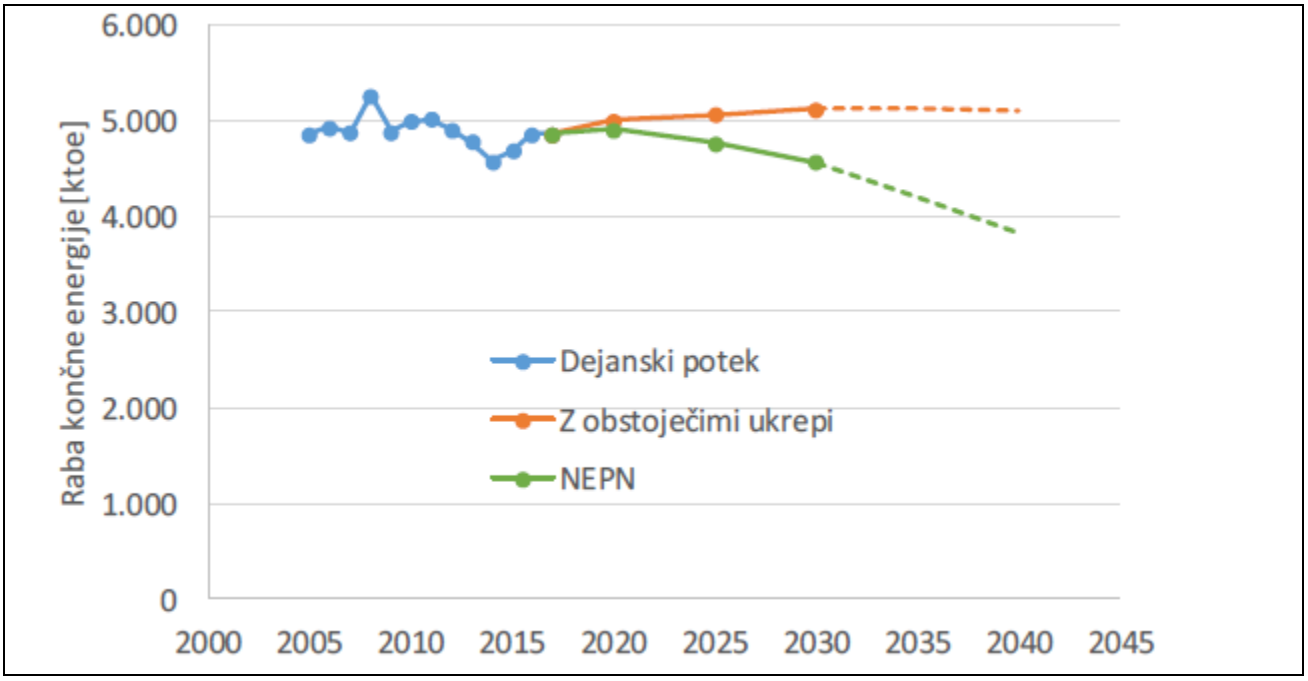
The effects of the implementation of the planned additional policies and measures of the NEPN (ambitious scenario with additional measures) scenario, which, in comparison with the existing measures (EM) scenario, achieve the set targets and have significant positive environmental and social impacts, are shown below.

### 5.1.1 Energy system development projections up to 2040

Implementation of NEPN scenario policies and measures would achieve a gradual reduction of end-use of energy by about 53 TWh or 6% from 2017 by 2030, and by 2040 a reduction of more than 20% (to 45 TWh), as shown in Figure 79. Thus, with the implementation of the additional NEPN measures in transformations up to 2030, primary energy consumption is also significantly reduced: by 2030 to some 71 TWh or by almost 10% compared to 2017 (Figure 80).

The indicative area of primary energy consumption in the period 2030-2040 is limited by the curves of two possible directions of development in electricity production, i.e. construction of a new nuclear power plant and the use of synthetic gas. In the first option, primary energy consumption increases to just under 80 TWh by 2040, and in the second option, primary energy consumption is reduced to some 65 TWh by 2040.

### *Figure 79: Final energy projection for the NEPN scenario and the existing measures scenario*

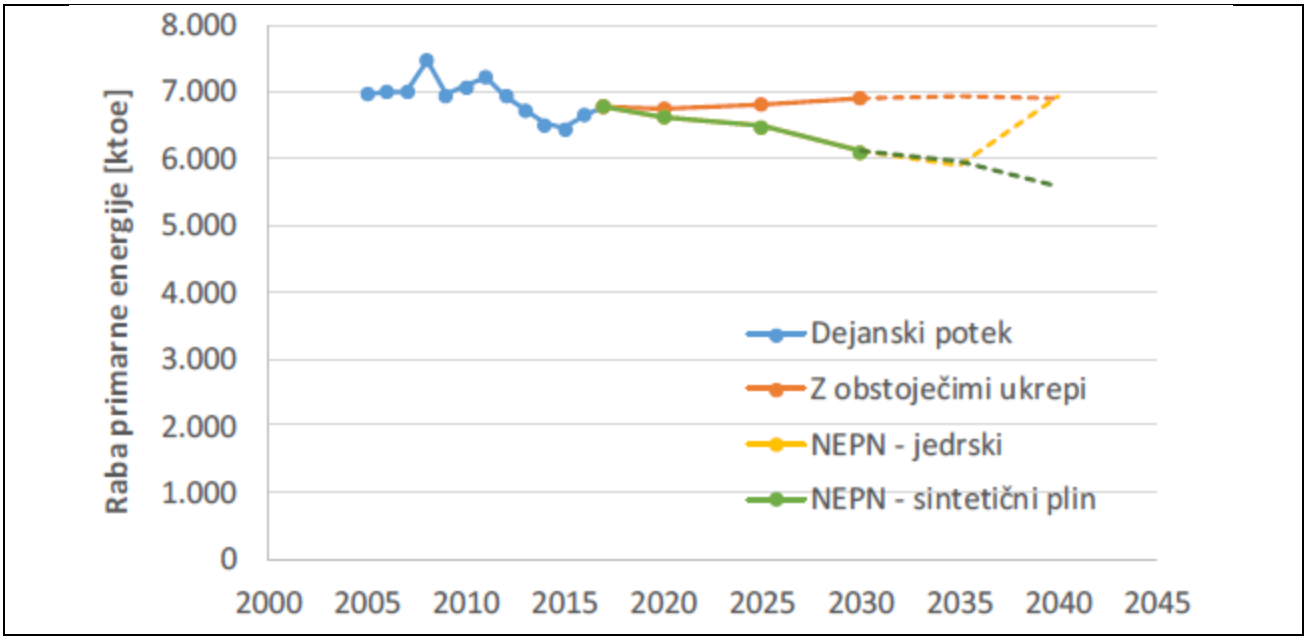



*Source: IJS-CEU*

Key to Figure 79:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Final energy consumption [ktoe] | ▪ | Actual development | ▪ | With existing measures | ▪ | NEPN |

### *Figure 80: Primary energy projection for the NEPN scenario and the existing measures scenario*




*Source: IJS-CEU*

Key to Figure 80:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Primary energy consumption [ktoe] | ▪ | Actual development | ▪ | With existing measures | ▪ | NEPN - nuclear | ▪ | NEPN - synthetic gas |

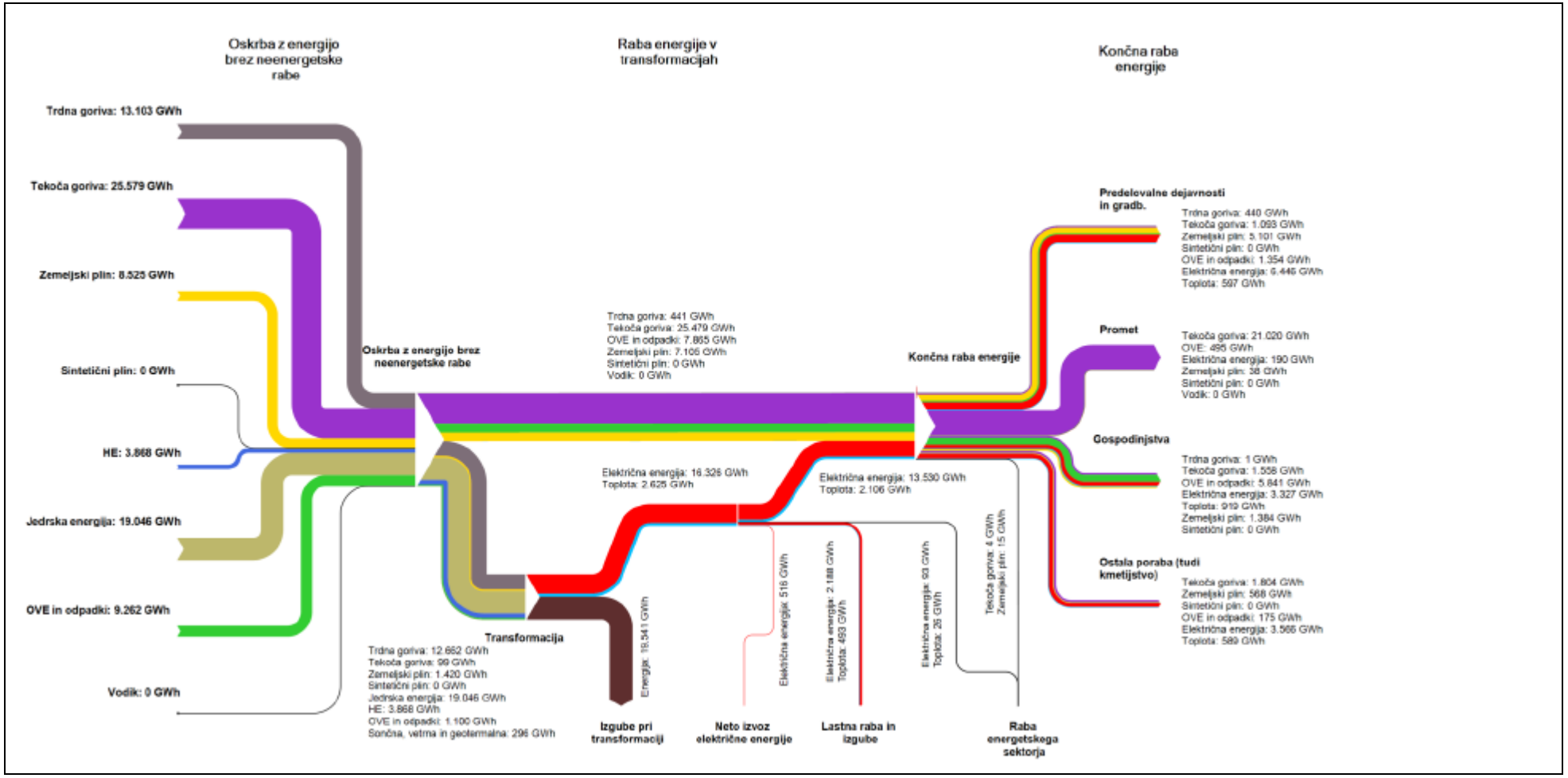
The detailed comprehensive energy balance of the NEPN scenario is shown in the Sankey diagram, as illustrated in the figures below for the year 2017 and for the year 2030 following the NEPN; the following trends in primary energy consumption should be noted:

- halving of consumption of solid fuels (coal) - consumption reduced by 6 TWh,
- reduction of consumption of liquid fuels by 18% or 5 TWh,
- increase in use of RES and waste by 25% and 3.3 TWh compared to 2017,
- increase of consumption of natural gas by more than 10% (0.9 TWh) and additional consumption of 1 TWh of synthetic gas,
- in transformations, electricity production increased by 8% (by 1.2 TWh), district heat production reduced by 11% and the total transformation losses reduced by 21% (4.2 TWh).

Figure 83 shows the balance of electricity production by energy product for both the EM and the NEPN scenarios with both development options up to 2040. Up to 2030, renewable electricity production (solar and hydro) contributes to an increase in production, while the decline in coal-fired electricity production is replaced by wood biomass and natural gas (the share of synthetic gas gradually increasing). Similar trends continue until 2040 when production increases significantly with the option of the construction of a new nuclear power plant or more moderately if the synthetic gas development option is adopted.

## *Figure 81: Sankey diagram - 2017*

BALANCE - 2017



Key to Figures 81 and 82:

| | |
|---|---|
| **Oskrba z energijo brez nenergetske rabe** | **Energy supply without non-energy use** |
| **Raba energije v transformacijah** | **Energy use in transformations** |
| **Končna raba energije** | **Final energy use** |
| | |
| Trdna goriva | Solid fuels |
| Tekoča goriva | Liquid fuels |
| Zemeljski plin | Natural gas |
| Sintetični plin | Synthetic gas |
| HE | Hydro energy |
| Jedrska energija | Nuclear energy |
| OVE in odpadki | RES and waste |
| Vodik | Hydrogen |
| | |
| **Oskrba z energijo brez nenergetske rabe** | **Energy supply without non-energy use** |
| | |
| **Transformacija** | **Transformation** |
| | |
| Sončnavetrna i geotermalna | Solar, wind and geothermal |
| | |
| Električna energija | Electricity |
| Toplota | Heat |
| | |
| Energija | Energy |
| | |
| **Izgube pri transformaciji** | **Transformation losses** |
| **Neto izvoz elektrine energije** | **Net electricity exports** |
| **Lastna raba in izgube** | **Own use and losses** |
| **Raba energetskega sektorja** | **Energy sector use** |
| | |
| **Končna raba energije** | **Final energy use** |
| | |
| **Predelovalne dejavnosti in gradbeništvo** | **Manufacturing and Construction** |
| | |
| **Promet** | **Transport** |
| | |
| **Gospodinjstva** | **Households** |
| | |
| **Ostala poraba (tudi kmetijstvo)** | **Other consumption (including agriculture)** |

## *Figure 82: Sankey diagram - NEPN scenario for 2030*

BALANCE - NEPN

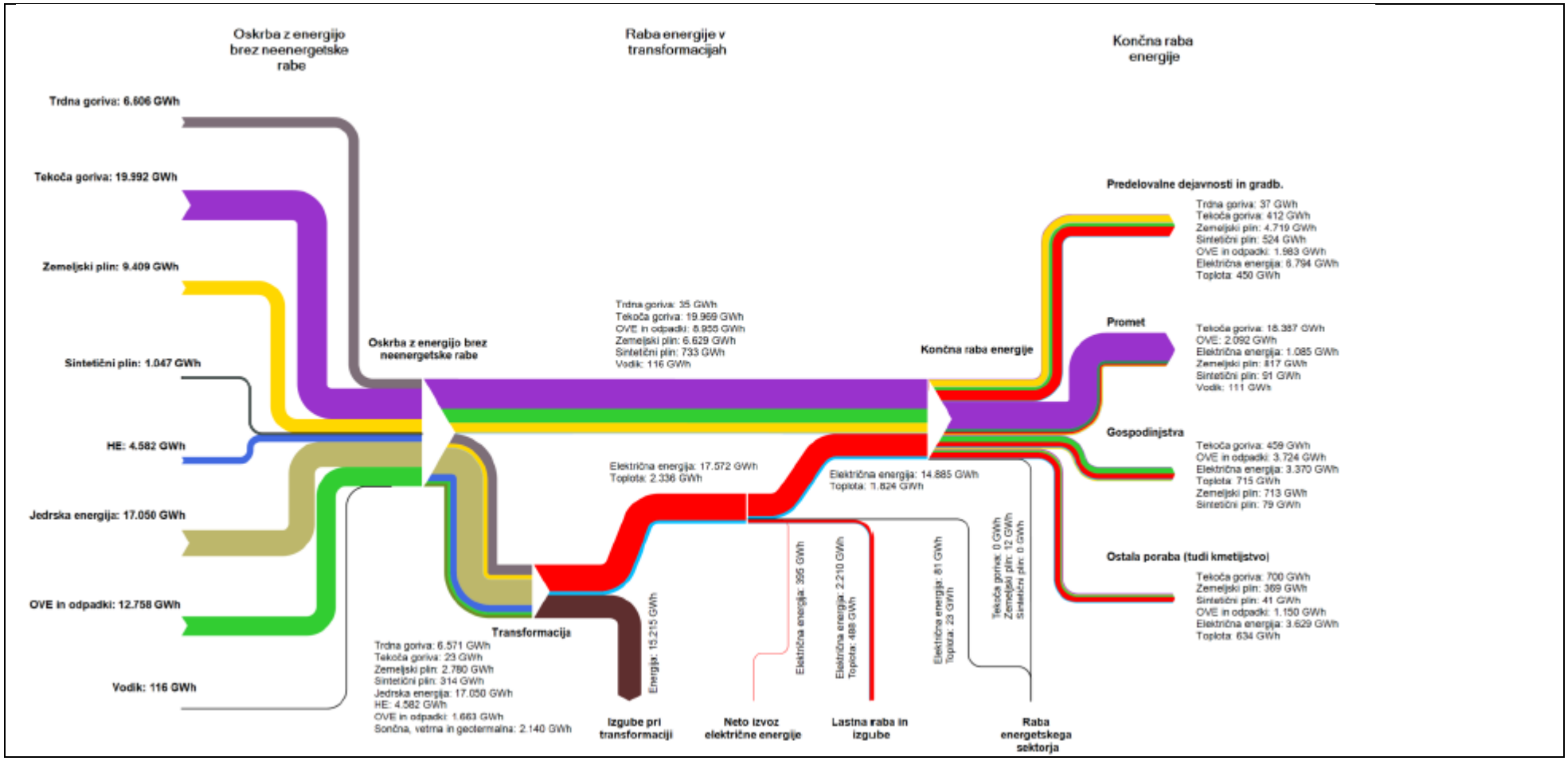
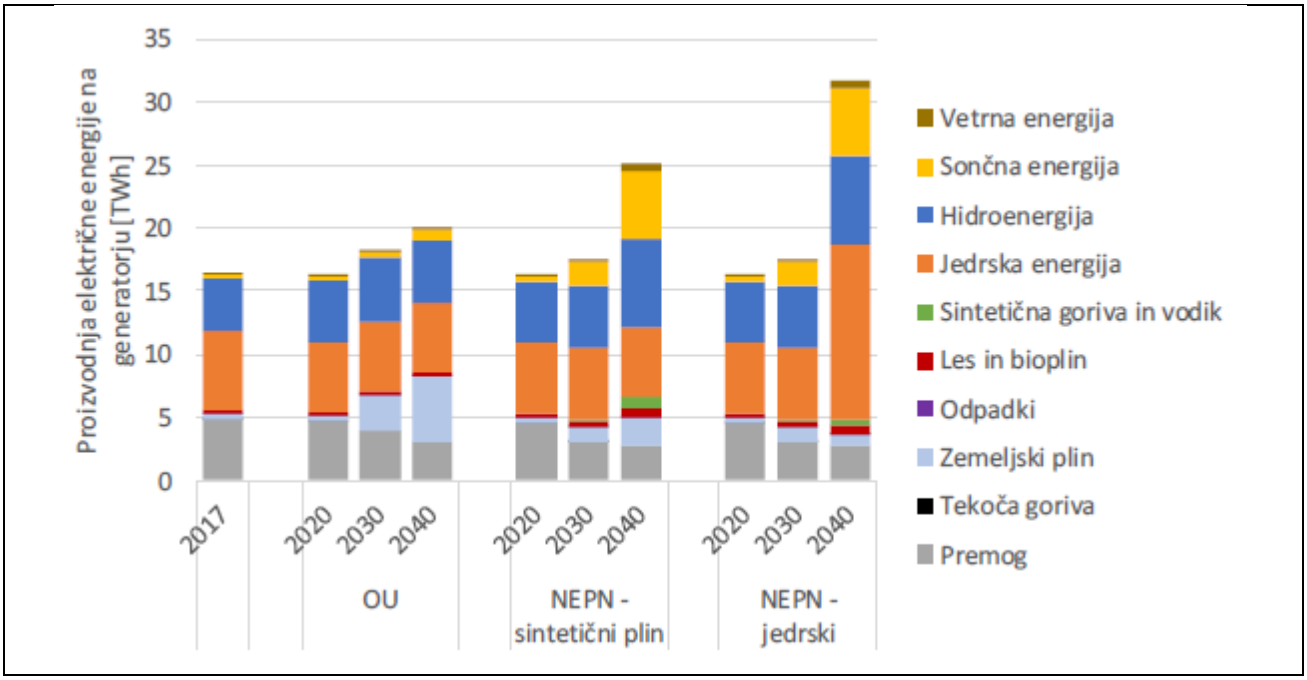


***Figure 83: Production of electricity by energy sources in 2017 and according to the EM and NEPN scenarios (taking into account the total electricity production from the Krško Nuclear Power Plant)***




Source: SORS and IJS-CEU

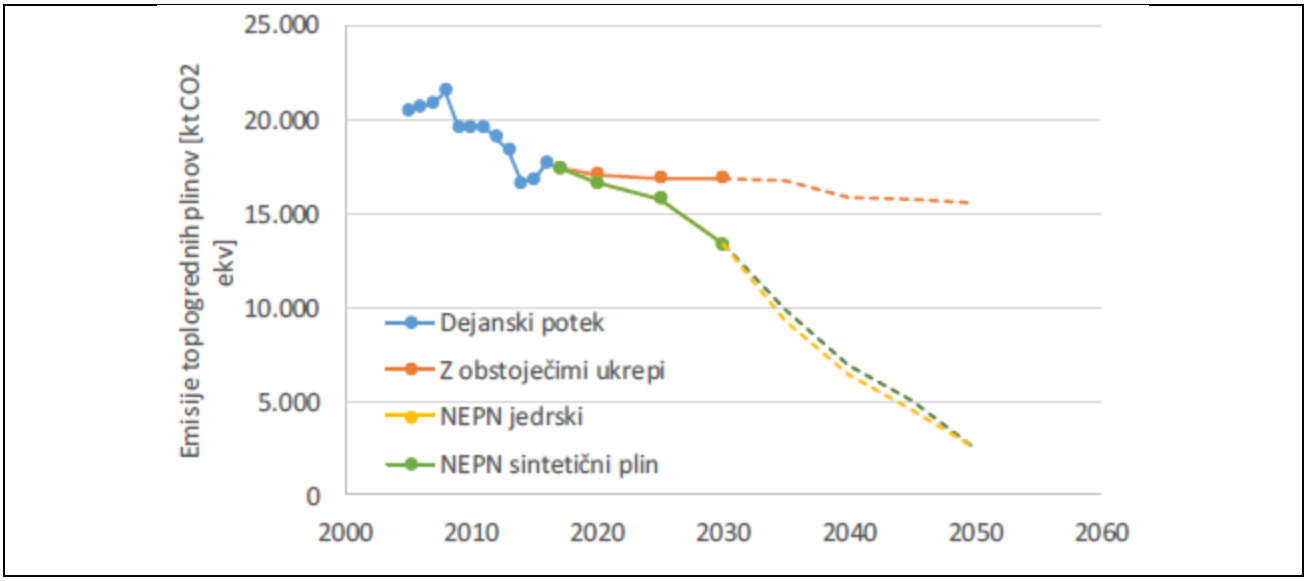
Key to Figure 83

| | | |
|---|---|---|
| Electricity production on generator [TWh] | ▪ Wind energy<br>▪ Solar energy | ▪ Wood and biogas<br>▪ Waste |
| Existing measures / | ▪ Hydro energy | ▪ Natural gas |
| NEPN synthetic gas / | ▪ Nuclear energy | ▪ Liquid fuels |
| NEPN nuclear | ▪ Synthetic fuels and hydrogen | ▪ Coal |

## 5.1.2 Projections for the development of greenhouse gas emissions and removals by 2050

Reducing the use of energy and fossil energy sources and increasing the use of renewable and low carbon sources through the implementation of NEPN measures is reflected in a large reduction in GHG emissions, which in the NEPN scenario is reduced to some 13 million tCO2e by 2030, or 25% compared to 2017, and by 36% in relation to 2005 (Figure 84). The indicative total greenhouse gas emissions in 2040 are 8.6 million tCO2eq in the event of the nuclear development scenario and 9 million tCO2eq in the event of the synthetic gas development scenario, representing a decrease of 56 to 58% in relation to 2005 (Table 65).

***Figure 84: Projection of total GHG emissions for the NEPN scenario and the existing measures scenario***




Key to Figure 84:

| | | |
|---|---|---|
| Greenhouse gas emissions [kt $CO_2$ eq] | ▪ Actual development<br>▪ With existing measures | ▪ NEPN nuclear<br>▪ NEPN synthetic gas |

***Table 65: Projection of total GHG emissions for the NEPN scenario and the existing measures scenario***

| [kt $CO_2$ eq] | 2005 | 2017 | 2020 | 2030 | 2040 | |
|---|---|---|---|---|---|---|
| NEPN | 20 519 | 1 453 | 16 660 | 13 089 | 6 398 | (nuclear) |
| | | | | | 6 876 | (synthetic gas) |

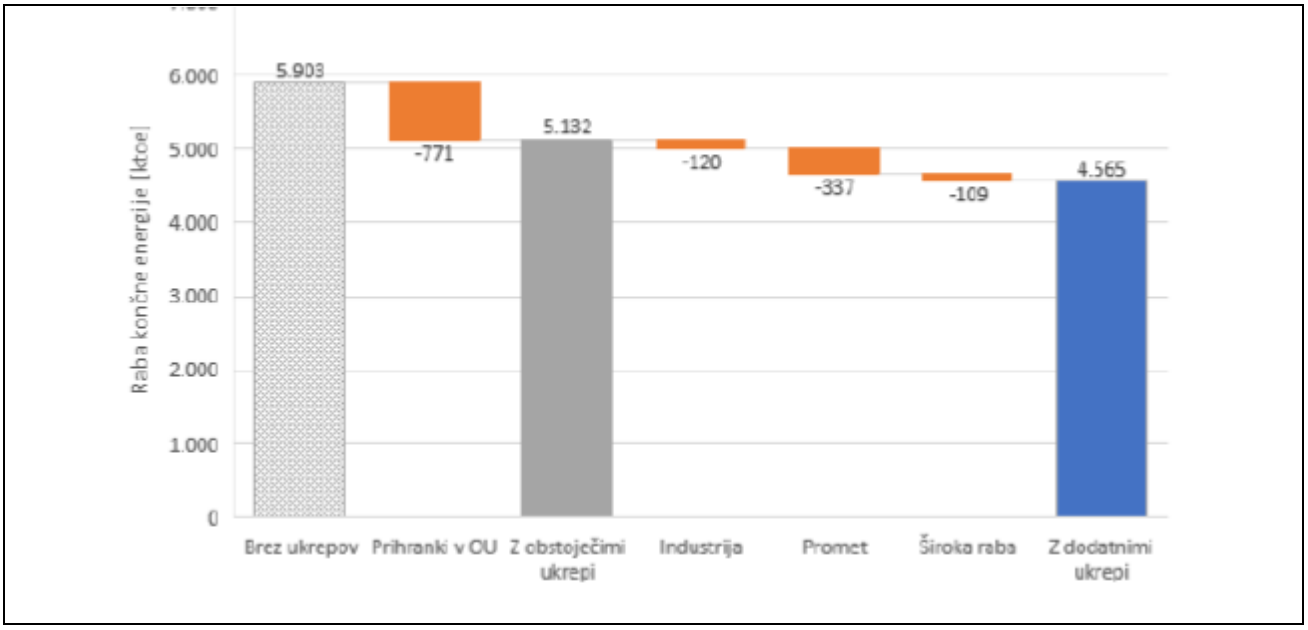
NEPN measures will contribute to the improvement of air quality in Slovenia. More detailed analysis and additional measures relating to air pollutant emissions under Directive (EU) 2016/2284 will be included in the programme of air pollution control measures (OP NEC) currently in preparation.

### 5.1.3 Energy savings

Slovenia is already implementing a wide range of measures to achieve 9.0 TWh of final energy savings in the existing measures scenario up to 2030. By implementing the ambitious additional measures of the NEPN scenario, the amount of final energy savings will be increased by almost 7 TWh by 2030, with savings in transport (3.9 TWh), industry (1.4 TWh), and general consumption (1.3 TWh), as shown in Figure 85.

In addition to the final energy savings, through the measures of the NEPN scenario in transformations we can achieve energy savings of 2.7 TWh, bringing total primary energy savings of 9.3 TWh by 2030, or reducing primary energy by more than 19% in relation to the projection of the scenario without measures and some 12% compared to the existing measures scenario (Figure 86).

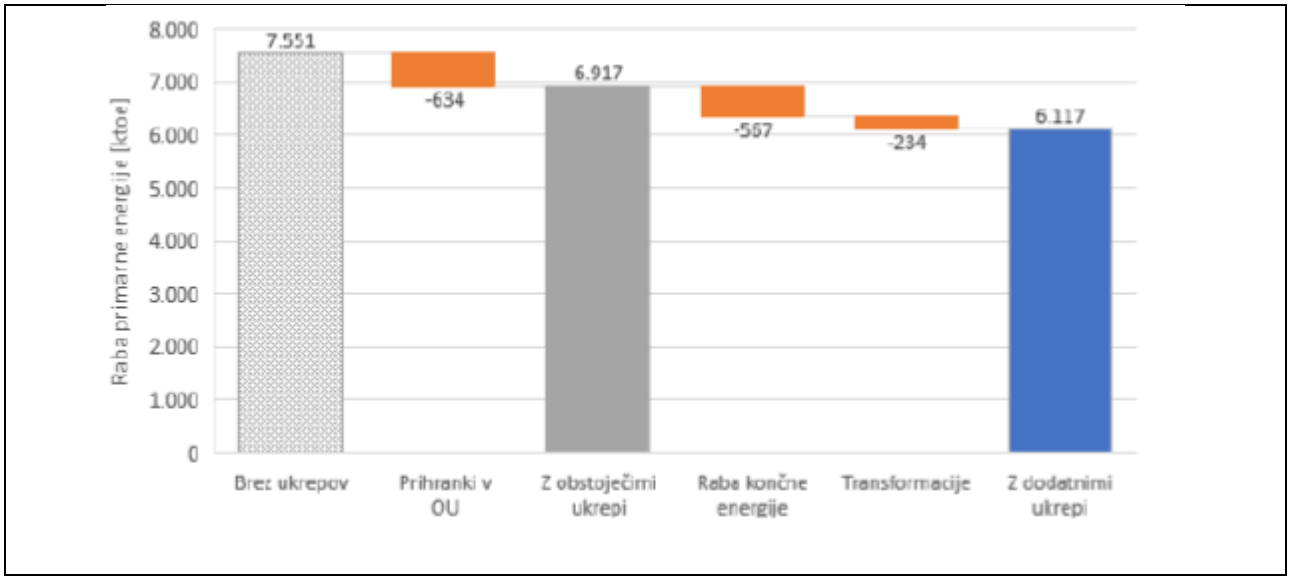
***Figure 85: Final energy savings in the scenario with existing and additional NEPN measures up to 2030***




Key to Figure 85:

| | | | |
|---|---|---|---|
| Primary energy use | Without measures<br>Savings in EM<br>With existing measures | Industry<br>Transport<br>General consumption | With additional measures |

***Figure 86: Primary energy savings in the scenario with existing and additional NEPN measures up to 2030***



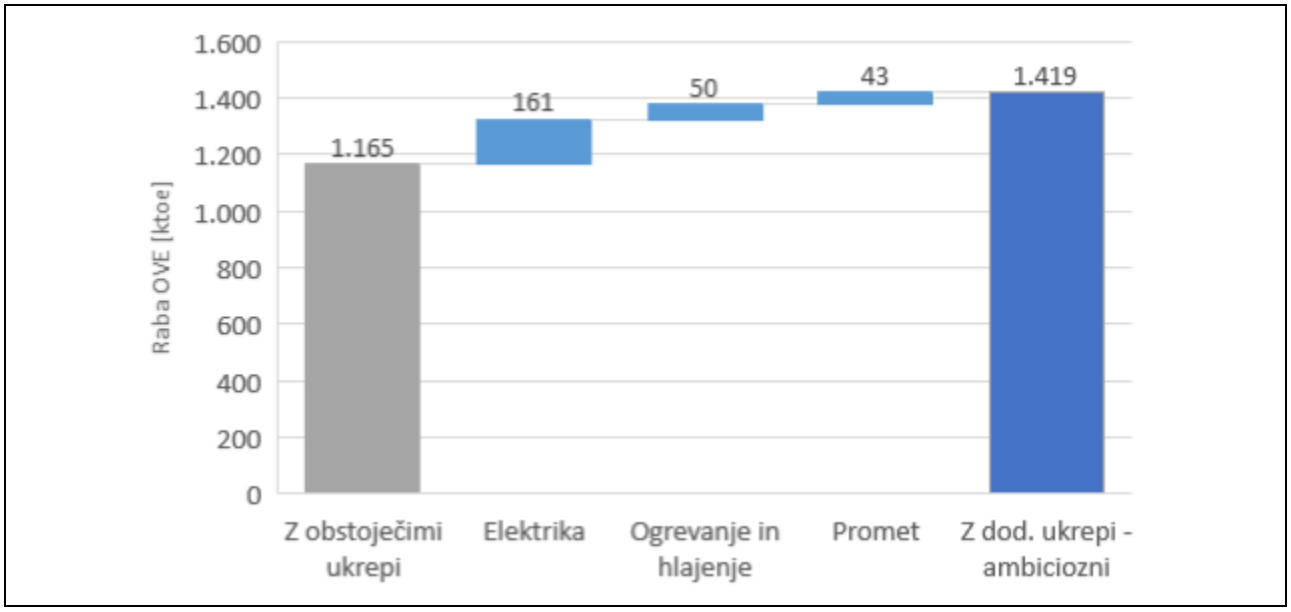

Key to Figure 86:

| | | |
|---|---|---|
| Primary energy use | Without measures<br>Savings in EM<br>With existing measures | Final energy consumption<br>Transformation<br>With additional measures |

### 5.1.4 Renewable energy

Total use of RES[99] with the additional NEPN measures increases to 16.5 TWh by 2030, which is 3 TWh more than in the existing measures scenario (Figure 87). The largest increase is in electricity production (1.9 TWh) and heating and cooling (0.6 TWh), while in transport, RES usage is increased by 0.5 TWh.

***Figure 87: Increase in RES usage in the NEPN scenario in 2030 by sector compared to the EM scenario***



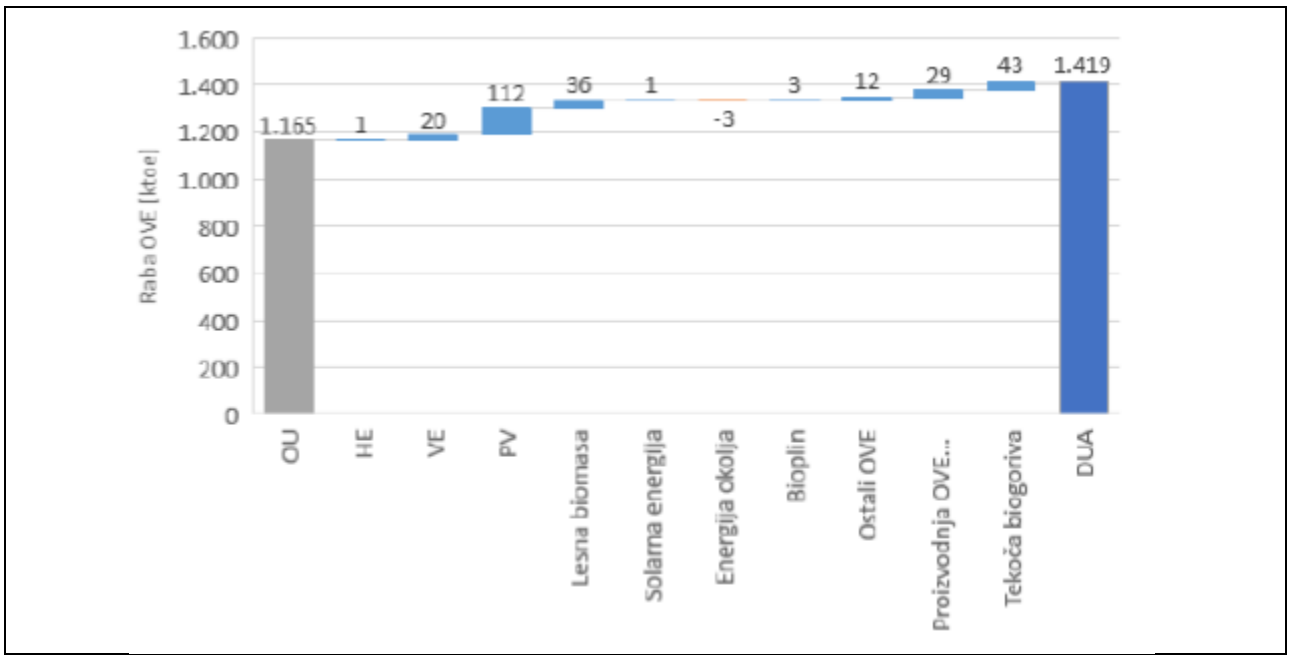

Key to Figure 87:

| | | |
|---|---|---|
| Use of RES | With existing measures<br>Electricity<br>Heating and cooling | Transport<br>With additional measures – ambitious |

Solar power plants (1.3 TWh) and wood biomass and RES (0.4 and 0.3 TWh) contribute the most to the increase, as shown in the figure below.

[99] At the primary energy level, synthetic gas is not included.

***Figure 88: Increase in RES use in the NEPN scenario by source in 2030 in relation to the EM scenario***




Key to Figure 88:

Use of RES

- Existing measures [OU]
- Hydro-electric [HE]
- Wind [VE]
- PV
- Wood biomass
- Solar energy
- Environmental energy
- Biogas
- Other RES
- RES production
- Liquid biofuels
- Ambitious additional measures [DUA]

## 5.2 Macro-economic and other effects of the NEPN

The requirements in the area of reducing greenhouse emissions, use of renewables and increasing energy efficiency included in the NEPN also call for an assessment of the impact of various energy and climate scenarios on macro-economic and sectoral aggregates.[100]

When assessing macro-economic impacts, the results of simulation of the NEPN scenario are compared with the existing measures (EM) scenario. The EM scenario proposes the consistent general evolution of economic activity subject to given exogenous assumptions[101] of the main drivers and represents a benchmark against which the effects of the planned additional actions of the NEPN scenario in the 2020-2030 period can be compared.

### 5.2.1 Macro-economic effects of energy and climate scenarios

Although the period covered by NEPN is shorter, it is nevertheless necessary to proceed from a broader framework covering the period up to 2050. Based on the targets and taking into account the EU's climate change neutrality target of 2050, endorsed by the European Council of 12 December 2019[102], the NEPN scenario envisages for Slovenia a reduction in $CO_2$ emissions of between 90% and 95%, which together with the emission sinks, creates the scenario to achieve net-zero greenhouse gas emissions in Slovenia by 2050.

The following section describes the macro-economic results of the NEPN scenario. Here we are interested in what changes are brought about by the additional planned energy and climate measures compared to the basic existing measures scenario (EM scenario). It should be noted that the estimates made are not forecasts of the movements of individual macro-economic aggregates in the period under consideration but rather that they assess the changes due to the planned measures if all other conditions remain unchanged and while considering all the complex connections taken into account by the existing version of the energy-environmental dynamic model of the general equilibrium of the Slovenian economy.

Additional energy investments increase energy efficiency and thus reduce energy consumption[103] per unit of production in each industrial sector or energy in the final consumption of households. Lower energy product costs have a positive effect on increasing demand for labour and reducing unemployment and increasing production. The final effect on relative consumer prices is positive, as they are expected to decline slightly relative to the baseline scenario (by – 0.3% by 2030).

---

100 For this purpose, a dynamic, multi-sector computable Generalised Equilibrium Model (CGE) for Slovenia - GreenMod Slovenia, specifically designed to analyse energy and environmental issues, was established and used, taking into account the quantitative results of a reference energy-ecological model called REES-SLO2. The core of the CGE model database is the Social Accounting Matrix (SAM), which is the most important input system for calculating the CGE model-based solution. With the available data for 2015, it was possible to produce the 2015 SAM matrix based on the supply and consumption table. A particular challenge is the desired level of division of products and activities in the SAM matrix and, of course, its balancing. The complexity of preparing the SAM matrix was greatly increased following the decision to break households down by quintile classes and related data. However, this step makes sense because of the social challenges facing Slovenia at the time of creating a post-industrial and climate-neutral society.

101 Exogenous assumptions in the existing measures scenario are technical progress, projections for domestic production growth, global price growth and projected investments in energy and energy efficiency. However, population growth forecasts are based on Eurostat. Endogenous variables of the model include supply - production and export, demand - intermediate, private, public, investment and export (quantities, sectoral), resources and consumption of material, energy, labour and capital. The model also calculates for each sector the prices of domestic production, exports, imports and changes in primary factor incomes.

102 European Council Conclusions, 12 December 2019. Available at: https://www.consilium.europa.eu/media/41768/12-euco-final-conclusions-en.pdf.

103 The energy products in the general equilibrium model are the following products: wood, coal, natural gas, petroleum products, coke, electricity and heat, which are consumed in the production of a particular activity or final consumption of households and the State.

Increased household disposable income is reflected in higher final private consumption (1% in 2020 and 2.2% in 2030) compared to final private consumption in the EM scenario.

The positive effects of the additional measures are also reflected in increased savings for both businesses and households while simultaneously reducing the country's current budget deficit, which increases its income due to increased economic activity. Increased total savings are reflected in higher total gross investment, which may be 3.1% higher in 2020 and 3.8% higher in 2030 than in the EM scenario. Increased economic activity also creates jobs in the Slovenian economy, so that employment in 2021 is 0.7% higher than in the EM scenario and by 2030 1.4% higher. The changed structure of investments also influences change in the structure of production in the Slovenian economy, which will be more important after 2030. Demographic change or population ageing is integrated into the model indirectly through modelling of the labour supply.

Increased energy efficiency and therefore lower energy consumption have the effect of increasing the international competitiveness of domestic production and increasing exports (by 0.8% in 2021 in relation to the EM scenario and by 1.2% in 2030) compared to imports (which after 2020 increases by 0.5% over the EM scenario each year up to 2030). The positive effects of the planned additional measures in the NEPN scenario are reflected, lastly, in GDP, which is expected to be 1.8% higher in 2021 compared to the GDP in the EM scenario, and 2.1% by 2030.

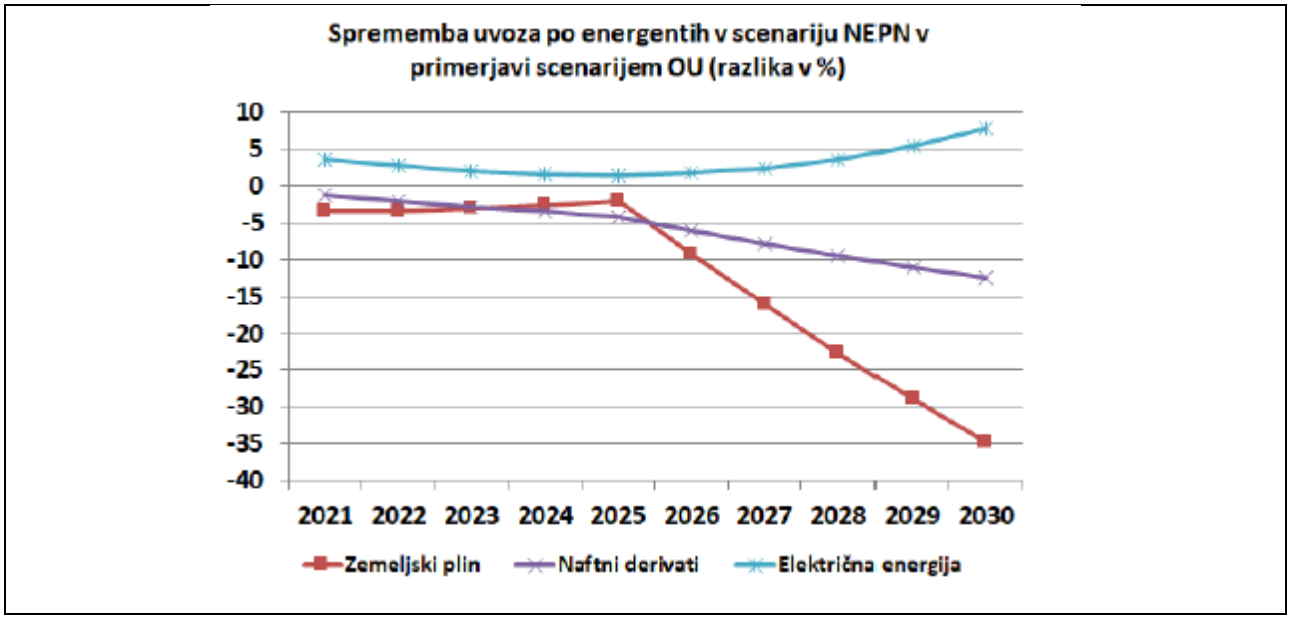
### *Table 66: Changes in macro-economic indicators under the NEPN scenario relative to the EM scenario*

| **% difference in the existing measures scenario (EM)** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Macro-economic aggregates** | **2021** | **2022** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** |
| GDP | 1.81 | 1.96 | 2.08 | 2.18 | 2.25 | 2.00 | 2.05 | 2.09 | 2.12 | 2.12 |
| Employment | 0.72 | 0.76 | 0.80 | 0.84 | 0.88 | 0.89 | 1.00 | 1.12 | 1.25 | 1.39 |
| Private consumption | 0.88 | 0.94 | 1.00 | 1.06 | 1.12 | 1.23 | 1.45 | 1.69 | 1.94 | 2.21 |
| State consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| GFCF | 4.47 | 4.59 | 4.64 | 4.61 | 4.48 | 3.93 | 4.02 | 4.06 | 4.05 | 3.97 |
| Disposable household income | 0.92 | 0.99 | 1.05 | 1.11 | 1.18 | 1.28 | 1.50 | 1.73 | 1.99 | 2.26 |
| Export | 0.86 | 0.93 | 0.99 | 1.06 | 1.12 | 1.00 | 1.04 | 1.09 | 1.15 | 1.23 |
| Import | 0.43 | 0.46 | 0.49 | 0.52 | 0.55 | 0.46 | 0.46 | 0.46 | 0.47 | 0.48 |
| Real labour cost | 0.51 | 0.54 | 0.57 | 0.59 | 0.62 | 0.63 | 0.71 | 0.79 | 0.88 | 0.98 |
| Relative consumer prices | -0.3 | -0.3 | -0.2 | -0.1 | 0.0 | -0.2 | -0.2 | -0.2 | -0.3 | -0.3 |

Source: IER calculations.

Taking into account the planned additional measures in the NEPN scenario, the consumption of energy inputs should be further reduced compared to the EM scenario and thus also energy import dependency. Accordingly, natural gas imports are expected to decline rapidly, especially after 2025, and by 2030 to achieve a reduction of 35% relative to natural gas imports in the EM scenario, in which on account of increased electricity consumption by 2030 it is necessary to build an additional gas-steam power plant. With production estimated as lower than electricity consumption, the NEPN scenario indicates the need for a slight increase in electricity imports after 2025 compared to the EM scenario, and this is reflected in a 7.8% increase in imports in 2030. Imports of petroleum products are projected to decline by over 12% by 2030, as Figure 89 shows.

***Figure 89: Energy imports in the NEPN scenario compared to the EM scenario***




Source: IER calculations.

Key to Figure 89:

Change in imports by energy product in the NEPN scenario compared to the EM scenario (difference in%)

- Natural gas
- Petroleum products
- Electricity

## 5.2.2 Environmental and social effects of energy and climate scenarios

### Effects on environmental well-being

The largest share of GHG emissions is attributed to $CO_2$ emissions. By 2030, investments in increasing energy efficiency will be key to reducing emissions. However, major changes in the structure of resource use cannot be expected during this period, as some resources are not yet commercially competitive (e.g. synthetic gas) or the changes require major political decisions that have not yet been taken.

The fact is that the damage caused by GHG emissions is already reflected in terrestrial ecosystems and extreme weather conditions (droughts, high winds, storms, heavy rainfall, prolonged intense rainfall, floods, melting of both Slovenian glaciers, etc.) and changes in the precipitation regime. Our aim in reducing GHG emissions is to halt these trends.

### Effects on consumer well-being

What will happen to consumer well-being is not entirely dependent on GDP growth. Consumer benefits depend on the use of goods, leisure and, last but not least, environmental benefits. It is determined mainly by the consumption of goods, which in 2021 will be increased by 0.9% in the NEPN scenario and by 2.2% in 2030 in relation to the existing measures scenario. It should be emphasised that if a decision were taken to raise the environmental tax in order to reduce emissions, it would be reasonable to combine this financial instrument with the use of tax revenue to implement energy poverty mitigation measures. This could correct the estimated adverse impact of planned additional measures on household disposable income, especially in the lowest quintile.

The real disposable income of households in the 1st quintile class is, in the NEPN scenario, 0.15% higher in 2021 compared to the EM scenario, and lower (- 0.59%) in 2030. In the 2nd quintile, in both observed years, the real disposable income of households, in the NEPN scenario, increases by 0.69% and 0.03% more in comparison to the EM scenario. In the other three quintile classes, real disposable household income in the NEPN scenario is higher than in the EM scenario. From the

perspective of the fairness of the transition to a climate-neutral society, after 2022 the NEPN scenario is unfavourable for the 20% of households in the lowest-income bracket, and appropriate mitigation measures will need to be taken.

This is the households income bracket where energy poverty is already experienced today, especially on account of the difficulty of paying energy bills and living in apartments where the roof is leaking, there are damp walls, foundations or floors, loose window frames or floors. Often the poorest households also lack access to bank credit because they do not have enough regular income and at the same time lack the social knowledge and skills to access support at all.

***Table 67: Change in real disposable income by income quintile in the NEPN scenario relative to real disposable income in the EM scenario (%)***

| Quintile | January | February | March | 4 | 5 |
|---|---|---|---|---|---|
| 2021 | 0.15 | 0.69 | 1.05 | 1.19 | 1.38 |
| 2022 | 0.06 | 0.64 | 1.03 | 1.18 | 1.39 |
| 2023 | -0.06 | 0.56 | 0.98 | 1.15 | 1.37 |
| 2024 | -0.20 | 0.46 | 0.90 | 1.07 | 1.31 |
| 2025 | -0.36 | 0.31 | 0.77 | 0.96 | 1.20 |
| 2026 | -0.37 | 0.22 | 0.62 | 0.78 | 1.00 |
| 2027 | -0.40 | 0.21 | 0.62 | 0.77 | 0.99 |
| 2028 | -0.44 | 0.18 | 0.58 | 0.73 | 0.95 |
| 2029 | -0.50 | 0.12 | 0.52 | 0.66 | 0.88 |
| 2030 | -0.59 | 0.03 | 0.42 | 0.55 | 0.77 |

Source: IER calculations.

***Table 68: Change in real household consumption by income quintile in the NEPN scenario relative to real household consumption by EM scenario (%)***

| Quintile | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 2021 | 0.37 | 0.69 | 0.89 | 1.00 | 1.06 |
| 2022 | 0.39 | 0.74 | 0.95 | 1.06 | 1.13 |
| 2023 | 0.40 | 0.79 | 1.01 | 1.13 | 1.20 |
| 2024 | 0.42 | 0.84 | 1.07 | 1.19 | 1.28 |
| 2025 | 0.43 | 0.88 | 1.13 | 1.26 | 1.35 |
| 2026 | 0.61 | 1.04 | 1.26 | 1.36 | 1.43 |
| 2027 | 0.80 | 1.25 | 1.49 | 1.58 | 1.66 |
| 2028 | 1.00 | 1.48 | 1.73 | 1.81 | 1.90 |
| 2029 | 1.21 | 1.73 | 1.99 | 2.07 | 2.16 |
| 2030 | 1.43 | 1.99 | 2.27 | 2.34 | 2.45 |

Source: IER calculations.

From the point of view of household consumption, the NEPN scenario is more favourable than the EM scenario, since, in all income quintile classes, real household consumption is higher throughout the whole period than consumption in the EM scenario. However, the increase is greater in the higher quintile classes.

### Effects on employment

The planned additional measures in the NEPN scenario are expected to be reflected in an estimated increase in employment and decrease in unemployed numbers in relation to the employment/unemployment numbers in the basic existing measures scenario. Thus, in the NEPN scenario, in 2021 employment is expected to be 0.7% higher than in the EM scenario, increasing to 1.4% by 2030. Increased economic activity has the effect of increasing demand for labour and reducing unemployment. We estimate that in each year up to 2030 in the NEPN scenario demand for labour will be higher, compared to the EM scenario, in all economic activities, except for the coal, coke production and refined petroleum, transport, and metal and paper industries.

***Table 69: Comparison of change in the unemployment rate in the NEPN scenario compared with the EM scenario***

| Year | Change in the unemployment rate (%) |
|---|---|
| 2021 | -10.0 |
| 2022 | -10.4 |
| 2023 | -10.5 |
| 2024 | -10.4 |
| 2025 | -10.1 |
| 2026 | -8.7 |
| 2027 | -8.6 |
| 2028 | -8.4 |
| 2029 | -8.0 |
| 2030 | -7.3 |

*Source: IER calculations.*

### Effects on health

The assessment of the impact on health is summarised in the draft environmental report (2019)[104]. Environmental interventions that are foreseen as a result of NEPN implementation and that may have an effect on increasing environmental noise pollution are related to the implementation of construction interventions as part of major projects and to road and rail noise and the noise of newly installed facilities that generate noise. As a general rule, of all facilities using renewable energy sources, special attention in terms of the health impact of noise emissions is needed in the case of wind turbines. Noise is also caused by high-voltage power lines (400 kV) and distribution power stations. Noise reduction, especially in urban areas, is achieved by promoting an increase in the number of electric vehicles.

In the context of promoting sustainable mobility, cycling and walking have an associated impact, both reducing ambient air pollution and also having a good effect on health through movement, enhancing endurance and the respiratory and cardiovascular systems. In addition, they contribute to reducing passenger kilometres and carbon footprint.

The NEPN envisages measures that will jointly contribute to the reduction of emissions of substances into the air (mainly CO2 and also other pollutants such as SO2, NOX, PE2.5, NH3 and NMVOC). Negative impacts on the air are possible due to the increase in diffuse dust emissions during the construction of infrastructure and energy facilities. The NEPN envisages measures that will, on the other hand, have a positive effect on air quality. These are, in particular, measures related to the

[104] Parts based on the draft environmental report, will be revised or updated accordingly, in line with changes to the environmental report, which will be approved by the Ministry of Environment and Spatial Planning as appropriate.

phasing-out of coal-fired electricity production and, in particular, to changes in the types of energy product used in vehicles and households. Some measures are also envisaged that make for new sources of atmospheric emissions, such as a new gas-steam power plant operating on natural gas or synthetic gas and biomass-fired thermal power plant using modern technology, both of which are more acceptable in terms of air emissions than coal-fired power plants. Important sources for which additional emission reduction measures will need to be implemented are, in particular, combustion of wood in small burners and road transport. An additional reduction in energy consumption is envisaged, which is positively reflected in the reduction of emissions of all pollutants.

The NEPN provides for supplementing and upgrading the transmission and distribution electricity grid and speeding up the expansion of dispersed renewable facilities, and this will increase electromagnetic radiation emissions. The expected impact is generated during the operation of high-voltage 110, 220 and 400 kV interconnectors and HV transformer stations and 110, 1-35 kV IC and associated transformer stations. Only direct impacts are generated due to the operation of the infrastructure.

Implementation of the NEPN is expected to generate large amounts of construction waste in the construction of transport and energy infrastructure and energy facilities. By shutting down the operation of individual coal units, the amount of ash, slag and gypsum produced during coal burning is reduced. Further generation of waste from existing power plants is expected, including radioactive waste from the Krško NPP. In the long term, it is expected that larger quantities of used batteries will be generated due to the increase in electrification of transport and the generation of waste photovoltaic panels after their useful lifetime. The generation of waste from hydro-electric facilities, especially large quantities of sludge, and digestate from biogas plants can be expected.

The implementation of the interventions foreseen in the NEPN may affect the quality of drinking water if wind power plants, hydro-electric power plants, gas-steam power plants or other interventions are sited in water protection areas and near water sources intended for own drinking water supply. Effects on drinking water sources can also be caused by changes in the amount and chemical status of groundwater due to interventions foreseen in the NEPN.

Implementation of the NEPN measures will have a significant positive impact on improving the quality of living and working in buildings and other positive impacts due to climate change mitigation.

### Effects on education

The NEPN scenario envisages several instruments in the area of training, education, information and energy and climate literacy, to a total value of approximately EUR 17 million per year. This will improve overall energy and climate literacy while the activity of households in terms of improving energy efficiency will be boosted by measures in the area of EEU and RES subsidies. Encouraging around 25% of passive households towards energy efficiency and the introduction of RES will also require additional action on energy poverty since, in addition to knowledge and awareness, the activity or passivity of households is also affected by their wealth situation.

Climate content is already actively integrated into education and this will need to be continued and intensified. Measures are envisaged to raise public awareness and literacy regarding the expected impacts of climate change and reduce exposure to climate change impacts, Slovenia’s sensitivity and vulnerability, adaptation to climate change and increasing resilience. Also, in order to reduce the impact on air quality on account of promoting the energy use of biomass, awareness and education of users will be designed and carried out on the proper use of biomass installations, creation of appropriate conditions for the professional performance of chimney sweeping services and a workshop on sustainable forest management for forest owners.

## 5.3 Overview of investment needs

For the implementation of NEPN measures, the estimated total investments for the period 2021 - 2030 are almost EUR 22 billion, which is 22% or almost EUR 4 billion more than in the existing measures scenario. Together with investments in transport infrastructure and sustainable mobility, the total estimated investment volume is over EUR 28 billion.

This is only a limited amount of targeted investment, and in order to **successfully achieve the energy and climate policy goals, good targeting of all investments in the period up to 2030 will be crucial,** with an important limiting factor also on the financial resources side, which will presumably require the selection of investment priorities based on analyses of their effects.

### 5.3.1 Existing investment flows and future investment assumptions, taking into account planned policies and measures

The detailed table of investments for the NEPN is shown in the table below, which shows the estimated required investments for the following main sectors:

- households and services,[105]
- industry,[106]
- electricity transmission,
- distribution of electricity,[107]
- central supply,[108]
- local supply.[109]

Estimated investments in buildings (households and services) are shown in full (including new buildings) and separately only the energy part of investments for energy renovation.

***Table 70: Estimated total investments in the period 2021-2030 according to the NEPN scenario***

| Sector [EUR million] | Total investment | Energy part of investment |
|---|---|---|
| Households | 9,539 | 4 043 |
| Services (public and private sector) | 4 632 | 948 |
| Industry | 1 148 | 1 148 |
| Electricity transmission | 407 | 407 |
| Electricity distribution | 4 203 | 4 203 |
| Central supply | 559 | 559 |
| Local supply | 1 275 | 1 275 |
| TOTAL | 21 829 | 12 649 |

105 Household and services investments include all investments in new construction and refurbishment of buildings and the replacement of energy installations throughout the period (the energy part of the investments is estimated at EUR 4 billion).

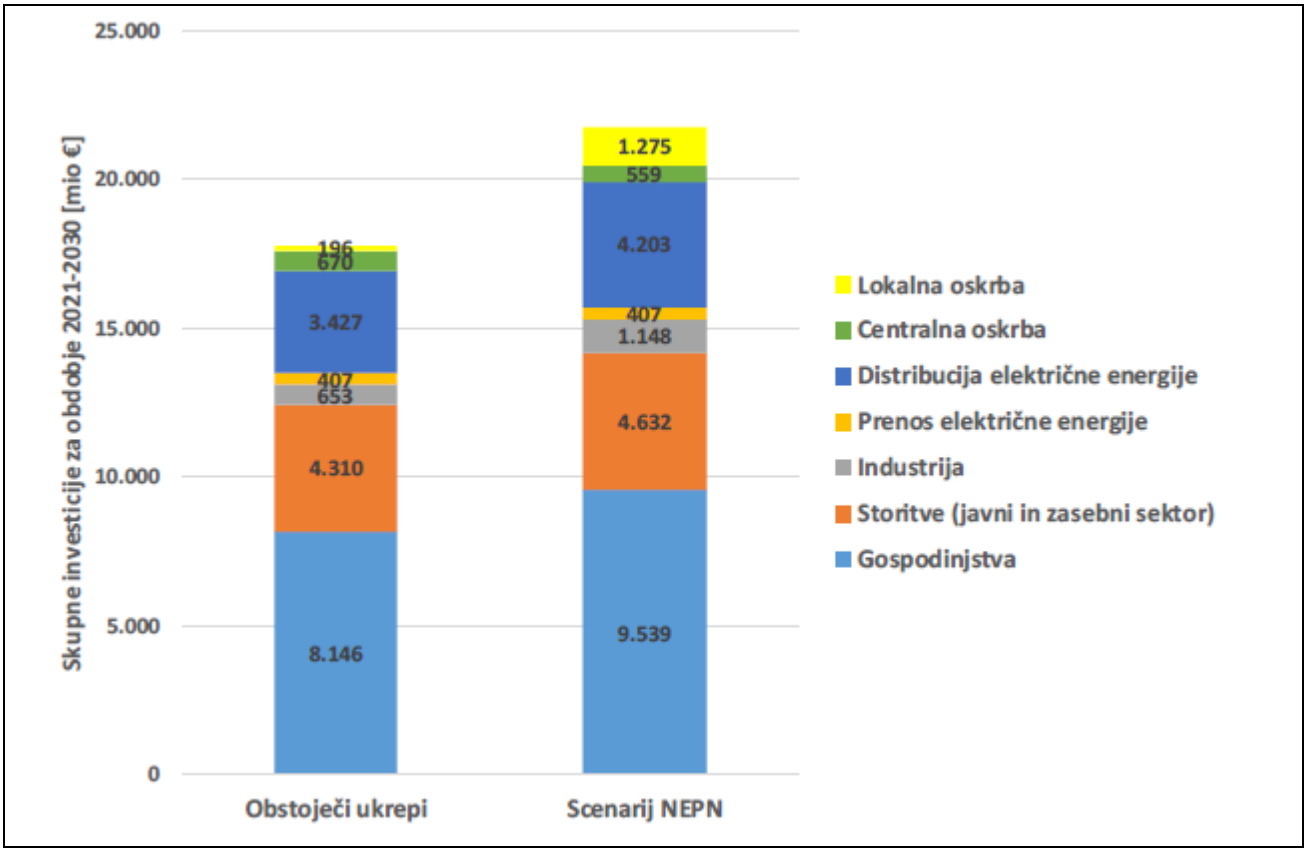
106 Investments in the industry sector include estimated funding earmarked for new technologies, new forms of processes to mitigate environmental impact during and at the end of manufacturing processes, and the transition to a climate-neutral and circular economy.

107 The value of investments was estimated on the basis of current technology prices and the planned scope of NEPN measures. Given the high cost, implementation to this extent is difficult to realise, and it is realistic to expect cost reductions in the coming years as a result of new technological solutions.

108 Investments in the central supply sector are intended for the construction of new production facilities on the transmission network.

109 Investments in new facilities for dispersed electricity generation (solar, wind power, etc.) and district heating systems.

***Figure 90: Comparison of total investments (excluding transport) according to the EM and NEPN scenarios for the period 2021-2030.***




Key to Figure 90:

Total investments for the period 2021-2030 [million €]

Existing measures
NEPN scenario

- Local supply
- Central supply
- Electricity distribution
- Electricity transmission
- Industry
- Services (public and private sector)
- Households

The estimates above do not include investments in the transport sector, which are detailed in the table below. The necessary investments in railway infrastructure are crucial, and almost 60% of investments are earmarked for these, which, in accordance with strategic documents already adopted, are already included in the existing measures scenario. The total estimated volume of investment in the transport sector in the period 2020-2030 under the NEPN scenario is EUR 6.6 billion, which is EUR 0.8 billion more than in the existing measures scenario, mainly due to additional investments in sustainable mobility and railways.

***Table 71: Estimated total investments in transport by sector in the period 2020-2030 for the existing measures scenario and NEPN measures***

| 2020-2030 [EUR million] | Existing measures | NEPN measures |
|---|---|---|
| **Sustainable mobility** | 977 | 1 632 |
| **Railway transport** | 3 724 | 3 884 |
| **Road transport** | 1 021 | 1 041 |
| **TOTAL** | **5 722** | **6 558** |

A more detailed sectoral overview of NEPN investments is shown in the table below.

***Table 72: Sectoral presentation of the required investments for NEPN measures in the period 2021-2030***

| Sector | EUR million |
|---|---|
| **Households - buildings** | 9 539 (4 043) * |
| **Public sector - buildings** | 1 612 (243) * |
| **Private sector - buildings** | 3 020 (705) * |
| **Industry** | 1 148 |
| **Sustainable mobility** | 1 632 |
| **Railway transport** | 3 884 |
| **Road transport** | 1 041 |
| **Solar power plants** | 1 208 |
| **Wind power plants** | 142 |
| **Other RES-E production** | 13 |
| **District heating** | 80 |
| **Electricity distribution** | 4 203 |
| **Electricity transmission** | 407 |
| **Central supply (large HPPs and TPPs)** | 358 |
| **Pilot projects (synthetic fuels, geochemistry, etc.)** | 100 |
| **TOTAL NEPN investments** | **28 386 (23 394) *** |

** The figures in brackets show the value of the energy part of the investment (in the renovation of buildings).*

### 5.3.2 Sectoral or market risk factors or obstacles in the national or regional context

In addition to the necessary extensive financial resources and associated risks for the implementation of planned investments in all sectors, it is primarily **human resources** that represent the **greatest obstacle and risk** preventing the **successful implementation of planned additional NEPN policies and measures.** The staffing shortage and the additional skills needed to introduce and manage low-carbon technologies are a challenge at all levels of implementation - from ministries, energy companies to end-users of energy. The additional risk also entails the necessary development of new technologies and approaches associated with accelerated investment in research and innovation. The spatial siting of projects and establishment of the necessary legislative framework for the simple and fast transfer of new technologies and market access also represent a great challenge and risk.

### 5.3.3 Analysis of additional financial support or funding to close the gap

The maximum possible amount of private funding will be required to carry out the planned NEPN investments, and **gaps in financing will be filled by prioritising the use of available EU funds and financing through EU and national financial instruments.**

The planned financing model for realising NEPN investments is based on the coordinated use of grants and repayable public funds as well as sources of financing provided by financial institutions and funds. The starting points of the financing model are:

- **non-refundable and refundable funds:** cohesion funds, climate fund funding, Eco fund funding, earmarked contribution funds (the renewable electricity generation scheme, the EEU contribution, road tolls, user charges, etc.);
- **design and creation of financial instruments** (repayable funds, guarantees, equity contributions) from cohesion funds and the use of EU budgets (InvestEU Guarantee, European Green Investment Plan (EGDIP), Just Transition Fund (JTF)) or the use of EIB instruments with the necessary participation and the contribution of the State budget to the implementation of financial engineering.

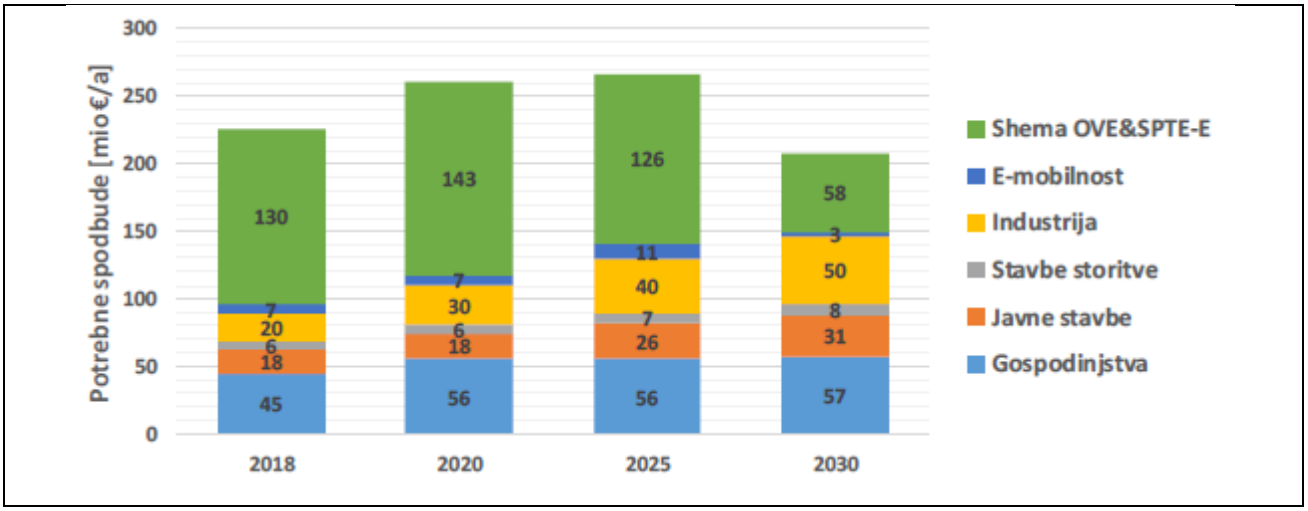
The design of the financing model will be coordinated between all stakeholders to create an effective supportive financial environment that will enable quality preparation (including by combining a large number of diffused projects), project management and a high level of combination of different sources of funding.

The financial resources necessary to implement the policies and measures of the ambitious NEPN scenario with additional measures are one of the key conditions for successful implementation of the NEPN. **The total amount of incentives needed to achieve the RES and EEU targets** (excluding transport, additional R&D funding and the distribution network) **is almost EUR 2.5 billion for the period 2021-2030, or between EUR 200 and 250 million annually:**

- in the area of **renovation of buildings** (households, public and private buildings) just over EUR 0.9 billion,
- around EUR 0.4 billion **in industry,**
- in the area of **sustainable e-mobility**, around EUR 74 million will be needed to replace vehicles (hybrid and electric vehicles and other alternative fuel vehicles),
- **support for the generation of electricity from RES and CHP** around EUR 1.1 billion (of which EUR 0.4 billion for new generating installations).

The necessary incentives at the annual level are shown in Figure 91, where there is a noticeable increase in incentives in all sectors and incentives for the RES and CHP support scheme are significantly reduced after 2025 due to the exclusion of old installations from the scheme. Figure 92 shows a summary of the necessary incentives by period.

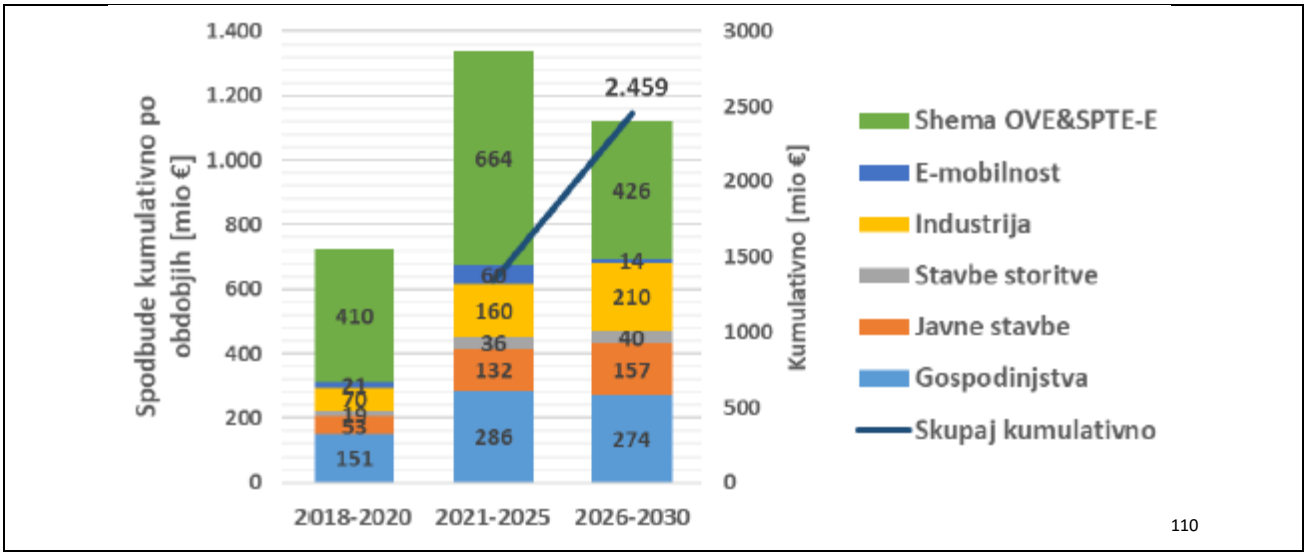
***Figure 91: Required annual incentives by sector under the NEPN scenario***




Key to Figure 91:

| | | |
|---|---|---|
| Necessary incentives [EUR million/a] | ▪ ES & CHP-E Scheme<br>▪ E-Mobility<br>▪ Industry | ▪ Building services<br>▪ Public buildings<br>▪ Households |

***Figure 92: Joint NEPN incentives required - joint display by sector and period***




Key to Figure 92:

| | | |
|---|---|---|
| Incentives, cumulative by period<br>Cumulative | ▪ RES & CHP-E scheme<br>▪ E-mobility<br>▪ Industry<br>▪ Building services | ▪ Public buildings<br>▪ Households<br>▪ Total cumulative |

Dedicated contributions (RES and CHP contributions, EEU contribution) and the Climate Fund are the main sources of funding from NEPN incentives in the period 2021-2030. The available resources from these sources range between EUR 300 million and EUR 350 million annually (Figure 93)[111] and represent a total of up to EUR 3.1 billion in the period 2021-2030, which is the main financial source for implementing the planned amount of incentives needed.

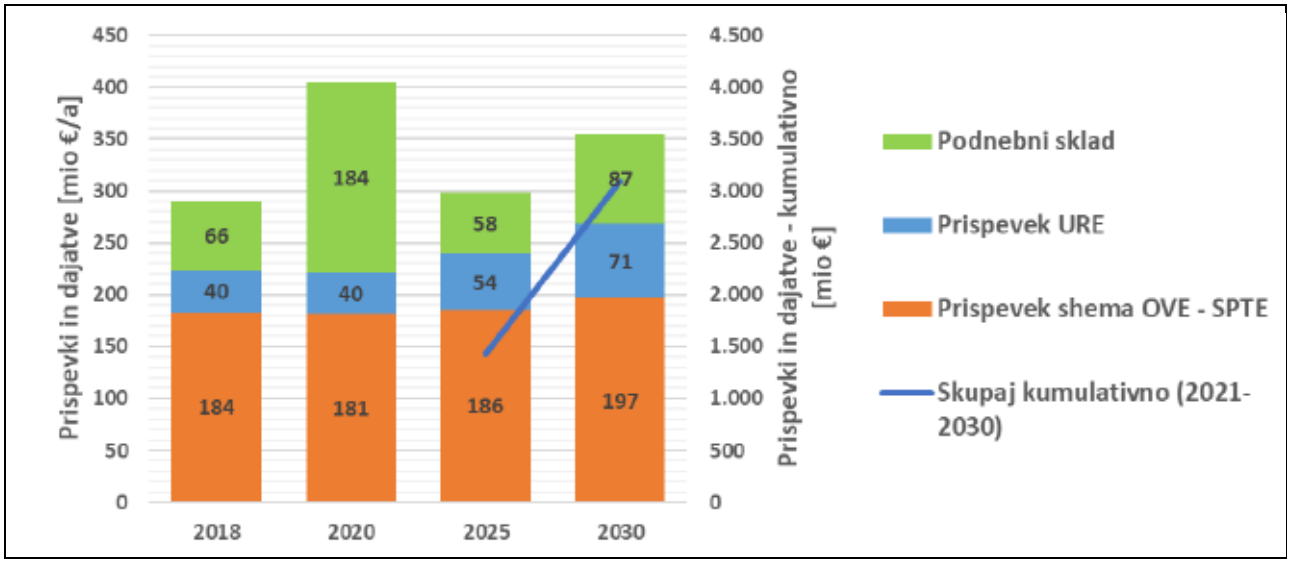
In addition, the greatest possible amount of cohesion funding will need to be integrated and carefully planned for the next financial period, in particular for the requirements of the sustainable renovation of public buildings, industry incentives, sustainable mobility measures and the mitigation of energy poverty.

However, other public funding resources will need to be provided for investment in rail infrastructure and increased funding for research and innovation.

110 The volume of funding is increased as a result of the increase in the EuP contribution and the increased inflow into the climate fund due to higher emission allowance prices, and the contribution to the RES & SPTE-E support scheme will not need to be increased.

111 Increase in the climate fund in 2020 due to the unspent funds from previous years.

***Figure 93: Funding sources from assigned contributions for the period 2018-2030***

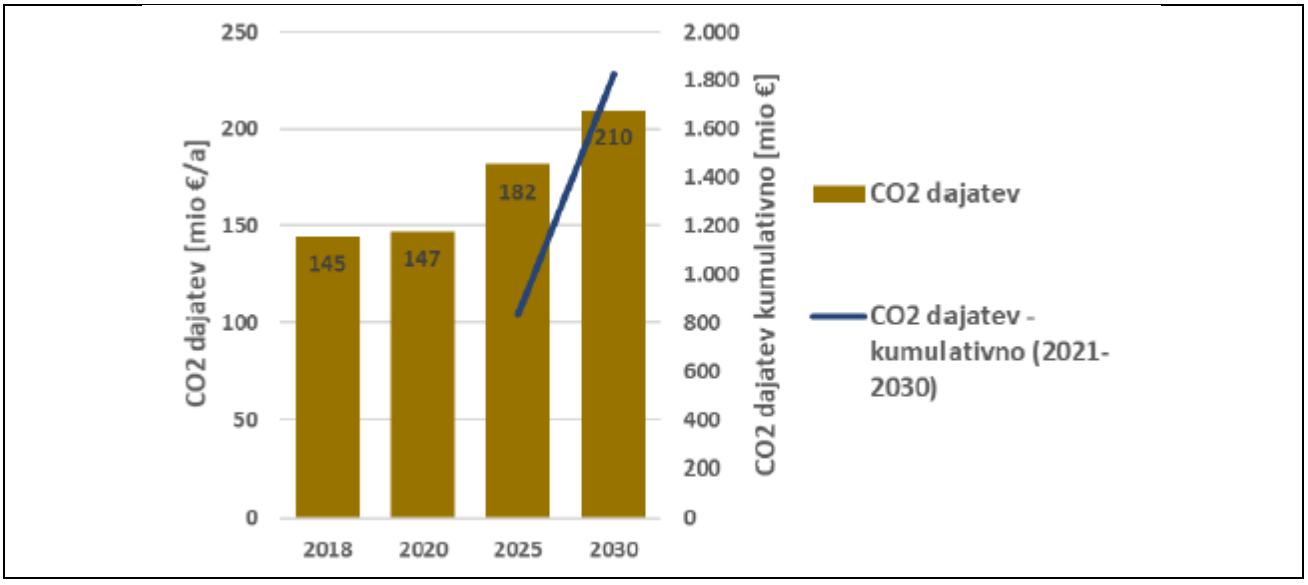



Key to Figure 93:

| | |
|---|---|
| Contributions and benefits<br>Contributions and benefits - cumulative | ▪ Climate Fund<br>▪ EEU contribution<br>▪ RES - CHP contribution<br>▪ Total cumulative |

In addition to the sources already mentioned, the $CO_2$ tax, which is part of budget resources , plays an important role. The planned volume of fund raising increases gradually after 2020 as the level of the charges approaches the price of ETS coupons and amounts to EUR 1.8 billion in the period 2018-2030, which is an additional potential source of financing for measures, while also offsetting reduced inflows from the budget due to lower energy consumption. In future, the amount of funds raised under ETS coupons will also depend on changes in EU-wide regulation.

***Figure 94: Budget appropriations from the $CO_2$ charges for the period 2018-2030***




Key to Figure 94:

| | |
|---|---|
| $CO_2$ charge [million EUR/a]<br>$CO_2$ charge cumulative [million EUR] | • $CO_2$ charge<br>• $CO_2$ charge cumulative |

## 5.4 Impacts of planned policies and measures on other Member States and regional cooperation up to 2030

Implementation of the planned NEPN policies and measures will have a number of positive effects on neighbouring Member States and the entire area of the EU by virtue of the increased scale of investment and energy services and reduced importation of primary energy products to the region.

### 5.4.1 Impacts on the energy system in neighbouring and other Member States in the region to the extent possible

The estimated impacts on the functioning of energy systems are positive, taking into account the implementation of all necessary measures for the reliable and safe operation of the electricity system in particular. The ongoing co-operation in this area, which will be further reinforced through the implementation of the NEPN, is expected to further boost these positive effects.

Establishing new energy interconnections with neighbouring countries will allow for greater and more dynamic energy exchanges in the region which will be particularly important for ensuring the stable operation of energy systems with a significantly higher share of unpredictable renewable electricity generation. Joint cooperation in the provision of system services, energy storage and investment in research and innovation will contribute to lower energy system operation costs.

### 5.4.2 Impacts on energy prices, utilities and energy market integration

The implementation of the planned NEPN policies and measures – thanks, in particular, to the necessary additional investment in networks and low carbon technologies and the increasing of some levies, alongside the expected increase in energy prices on the regional market – will contribute to a gradual increase in energy prices for end customers (no significant price increases are expected by 2030 according to current forecasts[121]) while at the same time reducing the necessary volume of energy consumption, which will substantially mitigate the increase in final energy costs. By consistently enforcing the 'polluter pays' principle and gradually reducing and eliminating environmentally harmful incentives, energy and resource costs will gradually increase over the period, while other business costs will be reduced thanks to alternative more environmentally friendly incentives and measures. The measures implemented will thus increase competitiveness and reduce the vulnerability of businesses to price risks on unpredictable energy markets.

The increased volume of renewable electricity production will have a significant impact on the functioning and interconnection of energy markets, where, due to increased fluctuations in unpredictable production, it will be necessary to provide efficient market-based instruments to establish flexibility and necessary new energy services. By converting and storing surplus electricity into gas fuels and heat, we will link the gas, heat and electricity sectors to achieve combined effects and hence lower energy prices. The planned reform of the energy taxation system at European Union level in 2021 will also have a major impact on energy pricing.

### 5.4.3 Impacts on regional cooperation

The implementation of the NEPN policies and measures, as described, offers many opportunities, in particular with regard to reinforcing regional economic cooperation. The successful interlinking and operation of energy markets and the provision of system services can be broadened in particular in the area of the advanced development and integration of networks to manage the increased volume of renewable electricity production and in all other fields of research and innovation. There are great possibilities in terms of the transfer of knowledge and cooperation and interconnection in the area of new energy infrastructure (alternative fuels, energy storage, etc.).

Establishing regional co-operation could enable transport infrastructure to be used better and transport flows in the region to be managed significantly better. Freight transport management is particularly relevant here, in particular where steered towards more sustainable modes of transport (rail) in the region and the interlinking of sustainable passenger transport solutions.

# List of abbreviations

| | |
|---|---|
| AE | Energy Agency [Agencija za energijo] |
| AKIS | Agricultural Knowledge and Innovation Systems |
| AN | Action Plan [Akcijski načrt] |
| AN OVE | Renewable Energy Action Plan [Akcijski načrt za obnovljive vire energije] |
| AN URE | Energy Efficiency Action Plan [Akcijski načrt za učinkovito rabo energije] |
| AP AGvP | Action programme for alternative fuels in transport [Akcijski program za alternativna goriva v prometu] |
| aFRR | automatic Frequency Restoration Reserve [avtomatska rezerva za povrnitev frekvence (aRPF)] |
| ARRS | Public Research Agency of the Republic of Slovenia [Javna agencija za raziskovalno dejavnost Republike Slovenije] |
| BAT | best available technology |
| GDP | gross domestic product |
| BiH | Bosnia and Herzegovina |
| B2B | business to business - sale of goods and services between companies |
| B2C | business to consumer – sale of goods and services directly to the buyer |
| CCS | carbon capture and storage |
| CNG | compressed natural gas |
| CEIA | comprehensive environmental impact assessment |
| TRP | targeted research project |
| pHPP | pumped hydro-electric power plant [črpalna hidro-elektrarna (ČHE)] |
| VAT | value-added tax |
| PDS | power distribution system [distribucijski elektro energetski system (DEES)] |
| DH | district heating [daljinsko ogrevanje (DO)] |
| DHC | district heating and cooling [daljinsko ogrevanje in hlajenje (DOH)] |
| DSEPS | Long-term strategy to encourage investment in the energy renovation of buildings [Dolgoročna strategija za spodbujanje naložb v energetsko prenovo stavb] |
| DU | scenario with additional measures (AM) [scenarij z dodatnimi ukrepi] |
| DUA | scenario with additional measures - ambitious (AMA) [scenarij z dodatnimi ukrepi – ambiciozni] |
| IC | interconnector |
| NA | National Assembly of the Republic of Slovenia |
| EDC | electric distribution company [električno distribucijsko podjetje (EDP)] |
| EE | electricity |
| EES | electricity System of Slovenia [elektroenergetski sistem Slovenije] |
| EFTI | Electronic Freight Transport Information |
| EGDIP | European Green Deal Investment Plan |
| EIMV | Electrical Institute Milan Vidmar [Elektroinštitut Milan Vidmar] |
| EIO | Eco Innovation Observatory |
| EIP | European Innovation Partnership |
| EC | European Commission |
| ECS | Energy concept of Slovenia [Energetski koncept Slovenije (EKS)] |
| ELENA | European Local Energy Assistance |

| | |
|---|---|
| ELES | [name of the] Slovenian transmission system operator |
| ENTSO-E | European Network of Transmission System Operators for Electricity |
| FTE | Full-Time Equivalent |
| EPO | energy contracting [energetsko pogodbeništvo] |
| EPOS | reporting system for e-reporting of data from energy operators |
| ESD | Emission scenario documents – greenhouse gas emissions not included in the EU ETS |
| ERDF | European Regional Development Fund |
| ETS | EU Emission Trading Scheme |
| EU | European Union |
| EUCO | European Commission core policy scenarios using the PRIMES Model |
| EV | electric vehicle |
| EZ | Energy Act [Energetski zakon] |
| FBC | fluidised bed combustion |
| GE | geothermal energy |
| FMA | Forest Management Area [gozdnogospodarska območja (GGO)] |
| CPS | commercial public service [gospodarska javna služba (GJS)] |
| HPP | hydro-electric power plant [hidro-elektrarna (HE)] |
| HHI | Herfindahl-Hirschman Index |
| IARC | International Agency for Research on Cancer |
| IEA | International Energy Agency |
| IPPT | integrated public passenger transport |
| ILUC | Indirect Land Use Change |
| IPCC | Intergovernmental Panel on Climate Change |
| PPT | Public Passenger Transport [javni potniški promet (JPP)] |
| JTF | Just Transition Fund |
| KGZS | Chamber of Agriculture and Forestry of Slovenia [Kmetijsko gozdarska zbornica Slovenije] |
| LEA | Local Energy Agencies |
| LIFE | L'Instrument Financier pour l'Environnement |
| LNG | liquefied natural gas [UZP] |
| LULUCF | Land Use Land Use Change and Forestry |
| M2M | Machine to Machine |
| MF | Ministry of Finance of the Republic of Slovenia [Ministrstvo za finance] |
| MGRT | Ministry of Economic Development and Technology of the Republic of Slovenia [Ministrstvo za gospodarski razvoj in tehnologijo] |
| sHPP | small hydro-electric power plant [mala hidro-elektrarna (mHE)] |
| MIZŠ | Ministry of Education, Science and Sport of the Republic of Slovenia [Ministrstvo za izobraževanje, znanost, in šport] |
| MJU | Ministry of Public Administration of the Republic of Slovenia [Ministrstvo za javno upravo] |
| MKGP | Ministry of Agriculture, Forestry and Food of the Republic of Slovenia [Ministrstvo za kmetijstvo, gozdarstvo in prehrano ] |
| MOP | Ministry of the Environment and Spatial Planning of the Republic of Slovenia [Ministrstva za okolje in prostor] |
| MPZ | inter-district transmission capacity [medobmočna prenosna zmogljivost] |

| | |
|---|---|
| MRC | Multi-Regional Coupling |
| SME | small and medium-sized enterprises |
| MzI | Ministry of Infrastructure of the Republic of Slovenia [Ministrstvo za Infrastrukturo] |
| NEK | Krško Nuclear Power Plant |
| NIJZ | National Institute of Public Health [Nacionalni inštitut za javno zdravje] |
| LV | low voltage |
| NTC | net transfer capacity |
| OECD | Organisation for Economic Cooperation and Development |
| HaC | Heating and cooling [ogrevanje in hlajenje (OiH)] |
| OP | Operational Programme |
| OP EKP | Operational Programme for the implementation of the European Cohesion Policy 2014-2020 [Operativni program za izvajanje evropske kohezijske politike v obdobju 2014–2020] |
| OP NGP | Operational Programme for the implementation of the National Forest Programme [Operativni program za izvajanje Nacionalnega gozdnega programa] |
| OP TGP | Operational Programme for measures to reduce greenhouse gas emissions by 2020 [Operativni program ukrepov za zmanjševanje emisij toplogrednih plinov do leta 2020] |
| TSO | transmission system operator (gas) |
| MM | mitigation measure [omilitveni ukrep (OU)] |
| EM | existing measures scenario [scenarij z obstoječimi ukrepi (OU)] |
| P+R | Park & Ride |
| pAN OVE | update of the Renewable Energy Action Plan 2010-2020 - draft |
| PCR | Price Coupling of Regions |
| REC | European Commission recommendations [priporočila Evropske komisije (PEK)] |
| PE | particulate emissions |
| PPO | Waste prevention programme [Program preprečevanja odpadkov] |
| PRIMES | Price-Induced Market Equilibrium System |
| PRP | Rural Development Programme [Program razvoja podeželja] |
| PRzO | Waste management programme [Program ravnanja z odpadki] |
| PURES | Rules on efficient use of energy in buildings [Pravilnik o učinkoviti rabi energije v stavbah] |
| EIA | Environmental Impact Assessment |
| QA/QC | quality assurance/quality control |
| REES-SLO | Slovenia's Reference Energy and Environmental System model |
| REMIT | Regulation (EU) No 1227/2011 on wholesale energy market integrity and transparency |
| ReNPRP30 | Resolution on the National Program for the Development of Transport in the Republic of Slovenia until 2030 [Resolucija o nacionalnem programu razvoja prometa v RS za obdobje do leta 2030] |
| R&D | research and development activity [raziskovalno-razvojna dejavnost (RRD)] |
| DTS | distribution transformer station [razdelilna transformatorska postaja (RTP)] |
| FCR | Frequency Containment Reserve [Rezerva za vzdrževanje frekvence (RVF)] |

| | |
|---|---|
| S AGvP | Market development strategy for the establishment of an appropriate infrastructure for alternative fuels in the transport sector in the Republic of Slovenia [Strategija na področju razvoja trga za vzpostavitev ustrezne infrastrukture v zvezi z alternativnimi gorivi v prometnem sektorju v Republiki Sloveniji] |
| S4 | Slovenian Smart Specialisation Strategy |
| SCENIHR | Scientific Committee on Emerging and Newly Identified Health Risks |
| SPP | solar power plant [sončna elektrarna (SE)] |
| SPE | solar photovoltaic energy [sončna fotovoltaična energija (SFE)] |
| SINCRO.GRID | investment project for smart grids of European importance in Slovenia and Croatia |
| CAP | common agricultural policy |
| MV | medium voltage |
| SNG | synthetic natural gas |
| EDSO | electricity Distribution System Operator |
| SOPPS | Strategic framework for adapting to climate change [Strateški okvir prilagajanja podnebnim spremembam] |
| SPR | Spatial development strategy [Strategija prostorskega razvoja] |
| SPRS | Spatial development strategy of Slovenia [Strategija prostorskega razvoja Slovenije] |
| CHP | cogeneration of heat and power [soproizvodnja toplote in električne energije (SPTE)] |
| SRS | Slovenia's Development Strategy [Strategija razvoja Slovenije] |
| SSE | solar collectors, collectors [sprejemniki sončne energije, kolektorji (SSE)] |
| SORS | Statistical Office of the Republic of Slovenia [Statistični urad Republike Slovenije (SURS)] |
| SVRK | Government Office for Development and European Cohesion Policy [Služba vlade za razvoj in evropsko kohezijsko politico] |
| HP | heat pump [toplotna črpalka (TČ)] |
| TEB | Brestanica thermal power plant |
| TEN-T | Trans-European Transport Network |
| TEŠ | Šoštanj thermal power plant |
| GHG | greenhouse gases [toplogredni plini (TGP)] |
| TS | transformer station [transformatorska postaja (TP)] |
| URE | energy efficiency [učinkovita raba energije] |
| LNG | liquefied natural gas |
| WPP | wind power plant [vetrna elektrarna (VE)] |
| HV | high voltage |
| WEO | World Energy Outlook |
| WHO | World Health Organisation |
| ZERO | Reducing the energy poverty of citizens [Zmanjšanje energetske revščine občanov] |
| ZGS | Slovenian Forest Service [Zavod za gozdove Slovenije] |
| ZV | Water Act [Zakon o vodah] |
| ŽOLP | the area of Ljubljana railway stations |

# Annex: Additional environmental mitigation measures and policies[112]

## A. General mitigation measures

**Spatial siting of facilities and infrastructure - preparation of professional bases, consideration of additional spatial-planning restrictions**

The following mitigation measures shall be respected:

- For larger projects such as wind (VE), hydro-electric (HE), gas-steam (PPE), solar (SE) (excluding solar power elements on structures), and geothermal (GE) power projects, alternative locations for siting spatially and on the energy network should be sought at national or regional level.
- In the siting, construction and operation of facilities, the potential impact of the facilities on drinking water pumping stations that have been granted water permits which are not protected through safeguard zones must be checked and all necessary measures to protect those water sources must be ensured.
- The execution of projects in the proximity of water resources and the planning of appropriate measures for the protection of these water sources should be checked in the context of the issuing project conditions and building permits.
- If subsequent planning stages show that implementation of the NEPN will result in projects that may have a significant impact on the quality of drinking water in areas where drinking water monitoring is not established, monitoring should be established in those areas.
- When installing new SEVESO plants, adequate buffer margins should be identified and they must be located at appropriate distances away from areas where large numbers of people are gathered and from infrastructure. When siting other projects within the impact zones of existing SEVESO facilities, safety criteria must be observed.
- The environmental impact assessment process, for the assessment of wind turbine noise in the case of buildings with protected areas, should include: modelling of sound propagation (in infrasound and audible sound ranges, including low frequencies) in the environment with reference to the local terrain and specific weather factors (wind characteristics at different altitudes – wind strength, direction, changes over time), performance of initial assessment and operational monitoring of noise in the population (which must be coordinated with all sectors); in this process, until new legal provisions are adopted, the National Institute of Public Health [NIJZ] position [Impact of wind power plant noise on human health, NIJZ position, issued on 24 April 2016 on behalf of the Ministry of Health], must be taken into account for wind farms up to 3 MW and, for wind power plants above 3 MW, the investor must prove that there will not be significant effects on human health and well-being.

112 The mitigation measures are based on an environmental report: Technical Support for Comprehensive Environmental Impact Assessment for the Integrated National Energy and Climate Plan of the Republic of Slovenia, Call SRSS/ C2019/048, Study: 219240-2-3-S, Milan Vidmar Electrical Institute, ZaVita d.o.o., STRITIH d.o.o., 2020. Part of the mitigation measures was included in the NEPN, and the part of the mitigation measures that should also be taken into account when implementing the NEPN is presented in the Annex. Other mitigation measures proposed in the environmental report and not included in the NEPN were discussed and rejected in part or in full, justifications being provided, pursuant to Article 20(2) of the Decree on the content of the Environmental Report and on the detailed procedure for the comprehensive assessment of the impact of the implementation of plans on the environment (UL RS No 73/05).

- Noise pollution (infrasound and audible sound, including low frequencies) generated by wind farms (or other installations) needs to be regulated at national level by legislating - with the involvement of an interdisciplinary group – on limit values, distances to the nearest buildings with protected areas and appropriate monitoring (which must be coordinated with all sectors) and, after the new legal provisions have been adopted, it must be ensured that the living environment with protected areas is not exposed to an excessive burden due to sound emissions.

## B. Mitigation measures to complement policies/instruments

**In the area of LULUCF**

The following mitigation measures shall be respected:

- By the end of 2020, the National Action Plan for Adaptation should be established and adopted.
- In addition to the requirement that guidelines for the preparation of Forest Management Area (FMA) Forest Management Plans (2021-2030) should include appropriate targets for timber stock, felling and accumulation, they should also include the adaptation of forests to expected climate change in order to ensure timber stocks, growth and carbon sinks.

**In the area of waste**

The following mitigation measures shall be respected:

- Creation of the expert basis for recording potential types and quantities of waste suitable for energy use, for the spatial siting of facilities and for ensuring the environmental acceptability of a selected solution.
- Assessment of the energy potential and promotion of the use for energy purposes of biodegradable waste with a view to producing biogas and advanced biofuels.
- Increasing the use of energy from waste that cannot be re-used or recycled and is suitable for energy use.
- In drawing up the expert basis and deciding on the energy use of waste, it is also necessary to comply with the Commission's instructions with regard to banning the placing of packaging materials that are not technically or economically suitable for material recovery on the market after 2030.
- Checking capacity for the treatment or disposal of sludge from reservoirs and, if necessary, creating such capacity.

**In the area of the economy**

The following mitigation measure shall be respected:

- Identifying instruments and policies to promote self-sufficiency in RES as a condition for obtaining financial incentives (e.g. full exploitation of the potential of solar power elements on facilities as a condition for - or increasing potential for - obtaining national incentives).

**In the area of the promotion of renewable electricity generation**

The following mitigation measures shall be respected:

- When planning the construction of small and large hydro-electric plants, their spatial siting should take the expected impacts of climate change on their productivity and flood safety into consideration.
- If a planned hydro-electric plant gives rise to an exception with regard to the achievement of good water status, procedures in accordance with Slovenian law and with the Water Framework Directive shall be followed. The expert bases drawn up in justification of

exceptions also envisage feasible and economically justified measures to mitigate adverse effects on water status and reduce the impact on biodiversity.

- For the long-term renewability of deep thermal regional aquifers, it is imperative to ensure that all thermal water consumers optimise and minimise the amount abstracted, ensuring maximum thermal utilisation of the water and at the same time, where and whenever possible, returning spent thermal water to the aquifer (reinjection). The introduction of the most advanced technologies for the construction of wells and systems for the exploitation of thermal water should be encouraged. A national observation system for selected inactive wells and monitoring of the status of deep geothermal aquifers should be established. Thermal water abstraction and the status of deep aquifers should be monitored, and their management should be coordinated with neighbouring countries (Austria, Hungary, Croatia). Reinforced inspection of geothermal water consumers should be pursued. A pilot project for the use of geothermal energy for electricity generation should be carried out.
- In order to eliminate obstacles and ensure that intensive heat pump installations are environmentally acceptable, it must be ensured that:
  - In 2018, guidelines on shallow geothermal drilling have been developed to be used for determining the general and specific conditions for the installation of geothermal heat pumps.
  - Establishing records of geothermal heat pumps is essential. All underground installations that, for the purpose of generating geothermal energy, impact on soils by means of the construction of heat exchangers must be recorded. The records should be established on the basis of permits issued for the construction of geothermal heat pumps.
  - When designing and operating water-to-water type geothermal heat pumps, there is a mandatory obligation to return groundwater to aquifers once it has been used for energy purposes. The holder of the water right is responsible for this action.
- Noise pollution (infrasound and audible sound, including low frequencies) generated by wind farms (or other installations) needs to be regulated at national level by legislating - with the involvement of an interdisciplinary group – on limit values, distances to the nearest buildings with protected areas and appropriate monitoring (which must be coordinated with all sectors) and, after the new legal provisions have been adopted, it must be ensured that the living environment with protected areas is not exposed to an excessive burden due to sound emissions.
- The installation of solar power plants on roofs of buildings and in degraded and industrial areas (if the construction of buildings is not rational or feasible) should be considered among the conditions and criteria for the award of investment incentives.

**Energy efficiency In the area of industry**

The following mitigation measures shall be respected:

- The energy efficiency of the industrial sector must comply with the requirements of the BAT findings, which, in addition to emission limits, determine energy and material efficiency.
- Adoption of a new Slovenian industrial policy/strategy to anticipate the decarbonisation of (especially) energy-intensive industry with measures to promote energy efficiency and energy change, increase material efficiency and promote the introduction of circular solutions in the basic materials industry (use of secondary raw materials, substitution of carbon-/energy-intensive raw materials with low-footprint materials). The drafting of the new strategy should also take into account the orientations of the new EU industrial strategy, expected to be adopted in March 2020.

- Establishment of indicators to better monitor progress in deployment of the circular economy.

**The energy efficiency of buildings and the use of renewables in buildings**

The following mitigation measures shall be respected:

- The design and implementation of measures on the energy efficiency of buildings and the use of RES in buildings should take into account the expected impacts of climate change, especially in view of reducing the need for heating and increasing the need for cooling.
- Priority should be given to the implementation of measures in buildings accommodating persons who are vulnerable in the event of heat waves, i.e. hospitals, nursing homes, kindergartens and schools.
- In addition to energy efficiency, the design, construction and renovation of facilities should take material efficiency into consideration:
  - the design of the facilities should include evaluation of the consumption of materials according to the needs and functionality of the facilities, taking into account scenarios for the final decommissioning of facilities,
  - the use of recycled materials and the re-use of materials and products is encouraged; priority should be given to using local materials with appropriate technical properties that are not harmful to the environment and human health,
  - materials with low life-cycle emissions (e.g. wood) should be appropriately integrated into the system and sustainable construction indicators,
  - the use of such materials should be encouraged as much as possible in the energy renovation of buildings (e.g. for joinery work),
  - energy renovation of buildings should take into account that energy renovation can increase the load on the premises in a building with radon, so the renovation must be carried out so that this does not happen, especially in high-risk areas and areas where concentrations higher than reference values,
  - in the energy renovation of buildings account should be taken of the fact that energy renovation can increase the air load in rooms with many pollutants that are harmful to health generated on the premises and that renovation must be carried out in such a way as to allow effective ventilation of the premises.
- The Ministry of Culture is also involved in the preparation of criteria for determining eligible costs and tenders and in upgrading the instrument for the renovation of both private and publicly owned cultural heritage buildings.
- Improving conditions for the professional provision of chimney sweeping services, introduction of professional supervision of chimney sweeps, preparation of additional training for chimney sweeps.
- For the renovation of cultural heritage buildings and other specific groups of buildings, the full implementation of the measure indicated in the amended DSEPS should be ensured at the earliest possible opportunity, and criteria for determining eligible costs for energy or sustainable renovation of those groups of buildings should be drawn up. Energy renovation of cultural heritage buildings shall take due account of the energy-efficiency improvement measures indicated in the Guidelines on the energy renovation of cultural heritage buildings.

**In the area of multi-sectoral measures**

The following mitigation measure shall be respected:

- Developing expert bases (vulnerability studies by sector and municipality) for the drafting of the Action Plan on Adapting to Climate Change.

**Internal Energy Market Dimension**

The following mitigation measure shall be respected:

- Flexibility to generate electricity from RES should be encouraged in the event of transmission or distribution network failures.

**In the area of training, education, information and promotion**

The following mitigation measures shall be respected:

- Raising public awareness of the expected impacts of climate change and reducing exposure to the effects of climate change, the sensitivity and vulnerability of Slovenia, and increasing the resilience and adaptive capacity of society.
- Provision should be made for measures to train civil service staff and build capacity on climate, environmental, nature protection and energy issues as well as their capacity to ensure the successful execution of NEPN measures, focusing on energy poverty and the just transition to a low-carbon society, and the provision of publicly accessible data in these areas.
- Raising public awareness of the impact of lifestyle and consumer habits on climate change mitigation, especially travel and eating habits and product choices.

**In the area of research, innovation and competitiveness**

The following mitigation measure shall be respected:

- Incentives for installing particulate filters on small combustion plants.

**In the area of cross-sectoral measures**

The following mitigation measures shall be respected:

- Updating the Decree on the limit values for environmental light pollution by 2020. Low-energy lighting to reduce light pollution, limiting uneconomical excessive public lighting, especially outside settlements, identifying environmentally friendly streetlamps that do not emit a high proportion of blue and ultraviolet spectrum light. Also, guidelines should be laid down for the permissible illumination of private land and the limitation of illumination by light fixtures.

**In the area of agriculture**

The following mitigation measure shall be respected:

- Modernisation of the Slovenian agricultural policy/strategy, envisaging reduction of the volume of (especially) intensive livestock production and related intensive agriculture in coordination with measures to promote pasture, replacement of crop species for use in human food rather than animal fodder, and promoting the use of seasonal and locally produced products. Adaptation to expected climate change conditions should also be taken into account when drawing up the new strategy.

### C. Mitigation measures to supplement measures

The following mitigation measures to supplement measures shall be respected:

- Restricting the spread of public lighting outside agglomerations, limiting the number of lamps, smart management of public lighting (especially in smaller settlements), lamps emitting lower levels of blue and ultraviolet light.

- In order to achieve economic land use, the construction of buildings should be prioritised in degraded areas and industrial sites, with the requirement that solar power units be installed on roofs where technically feasible. Free-standing solar power plants should only be installed in degraded areas and industrial sites if the construction of buildings and renaturalisation is not rational or feasible. Moreover, solar power plants should be located adjacent to transport infrastructure (motorways and expressways) in an area with a defined PNRP [land use designation] for transport infrastructure (P), where it is acceptable in environmental and energy terms.
- More intensive, high-subsidy incentives for the replacement of old wood biomass-fired plants with modern wood biomass plants (eco-labelled installations) or heat pumps - local/ national plan for replacing old wood biomass boilers. There are, however, limitations on the co-financing of the measure for biomass utilisation in individual combustion plants located in areas where ordinances are adopted due to excessive air pollution by PE10 particles.
- Co-financing the utilisation of wood biomass for energy purposes in industry, DH systems and services is only permissible if, after a preliminary examination of the effects on ambient air pollution, the limit values and targets laid down in the Regulation on ambient air quality are not exceeded.
- High subsidies encourage connection to district heating systems and also the construction of smaller systems (including wood biomass). In areas where wood biomass is locally available, it is rational to promote its use in larger units, in which it is easier to ensure optimal combustion conditions and thus lower emissions.
- Installation of new facilities to be performed by qualified contractors, with a mandatory requirement for the installation installers to demonstrate the proper use of the newly purchased equipment, ensuring that users are protected against purchasing and installing unsuitable equipment.
- Incentives for installing particulate filters on small combustion plants.
- Raising awareness and educating users of wood biomass appliances about the correct fuel and the correct burning method, raising awareness of the consequences of incorrect burning, use of different channels - chimneys, fire-fighters, media, professional conferences, trade fairs (e.g. the 'Dom' (home) trade fair).
- Establishing appropriate conditions for the professional operation of chimney sweeps, introduce professional supervision of the work of chimney sweeps, prepare additional training for chimney sweeps.
- Intensification of the transport policy measure to further reduce the increase in personal traffic, e.g. by:
    - promoting co-travel,
    - further promoting the development of local entrepreneurship and craft sectors to reduce long-distance commuting,
    - intensification of the Park & Ride (P&R) concept,
    - establishment of the P&R concept at motorway junctions and link with high-speed bus routes,
    - increasing the capacity of bus transport linked with rail transport,
    - improving spatial planning,
    - raising public awareness of sustainable forms of transport,

  - intensifying the promotion of walking and cycling and creating better safety conditions for these forms of transport,
  - reform of transport allowances, introduction of tax incentives for users of public transport and non-motorised modes of transport.
- Reduced increase in road freight transport:
  - Intensifying the promotion and facilitation of the circular economy, digitisation and improvement of logistics.
  - Faster siting and improvement of the railway network, enabling even greater transfer of freight transport from road to rail (we would point out that a key project in this respect is the Ljubljana railway hub, which, in order to overcome the next bottleneck affecting the flow of rail traffic following the construction of track II), needs to be deployed as quickly as possible).
  - Promoting the transition of freight transport to rail (Italy-Hungary rail freight transit).
  - Restricting the expansion of existing motorways.
  - Reform of tax policy on the refund of excise duties on fuel.
- Monitoring of potentially affected bird, bat and large carnivore populations should be undertaken for at least one year before the preparation of an EIA for a wind power plant.
- Selecting technology and operating systems that are less hazardous to bird and bat collisions. In the event of collisions, wind power equipment operation should be adjusted to reduce the risk of collisions.