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National Development Plan of the Energy Sector until 2030

Tallinn 2017

DEFINITIONS

The definitions of the terms of this Development Plan are available on the website of the Development Plan:

http://www.energiatalgud.ee/index.php?title=Kategooria:M%C3%B5isted

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Introduction

The preparation of the National Development Plan of the Energy Sector until 2030 was launched with the Government of the Republic decision of 8 August 2013. *The National Development Plan of the Energy Sector until 2030* (NDPES 2030) is a sectoral development plan for the purposes of the State Budget Act.

In accordance with the proposal for preparing the development plan as approved by the Government of the Republic, **the Estonian National Development plan of the Energy Sector until 2030 presents a pooled inventory of future actions in the electricity, heating and fuel sectors, as well as actions related to energy use in the transport and housing sectors**. The NDPES 2030 replaces the following current or recently expired development plans: *the National Development Plan of the Energy Sector until 2020*, *the Estonian Energy Sector Development Plan until 2018*, *the Estonian Energy Technology Programme* and partially *the Estonian Housing Sector Development Plan 2008-2013*. In addition, the NDPES 2030 establishes the foundations of the following development plans, which have to be submitted to the European Commission pursuant to the EU law: *a national renewable energy action plan under Directive 2009/28/EC*; *a national energy efficiency action plan under the Energy Efficiency Directive (2012/27/EU)* and *a strategy for renovation of buildings under the Energy Efficiency Directive (2012/27/EU)*. The plans, which are to be submitted to the European Commission, are subject to special formal and methodological requirements specified in the respective Directives.

A pooled inventory of multiple sectors is prepared to reduce the number of different development documents, which regulate the energy sector, and to ensure that comprehensive planning of the energy sector is governed by a single development plan. This will improve cohesion between the sectors of the energy industry and reduce administrative burden in updating different development documents. The studies conducted in the course of preparation of the development plan and the source data used in the NDPES 2030 are available on-line at www.energiatalgud.ee.

1. Conclusion

The NDPES 2030 describes the objectives of Estonia's energy policy until 2030, the vision for the energy sector until 2050, as well as the overall and specific targets and actions to meet them. A strategic environmental assessment report (SEAR NDPES) was prepared in accordance with the Environmental Impact Assessment and Environmental Management System Act, providing an overview of alternative options for developing the energy sector and the potential environmental impact of those options. The potential development paths of the fields governed by the development plan were grouped in the SEAR NDPES process depending on the degree of public sector intervention, from a market-driven liberal scenario with minimum involvement of the government to a scenario of knowledge-based interventions. The process resulted in the identification of 135 alternative development paths, with 15 of them meeting the most restrictive criterion – the target level of final energy consumption by 2020[1]. Based on the objectives of the development plan, **the best scenarios in almost all examined fields were those that involved knowledge-based interventions of the government**. **An exception was electricity generation where the best option in terms of economic competitiveness and energy security was a market-driven scenario with limited intervention of the government**, projecting development of new generation capacity under free market conditions. All 15 alternative development paths conform to the currently known environmental restrictions, including the EU 2030 Framework for Climate and Energy that was approved by the European Council at the end of October 2014[2].

The role of the energy sector, as a sector servicing the other sectors and Estonian residents, is to ensure availability of fuels and energy to consumers for a reasonable price and in compliance with environmental requirements.

The overview of the current situation, presented in the development plan, reviews the performance of the government in implementing the *National Development Plan for the Energy Sector until 2020*. The opening of the electricity market in Estonia can be considered a success. The power system includes sufficient generation capacity and new external connections have been put in service; the country is ahead of schedule to meet the overall renewable energy target for 2020. Public support measures for using renewable fuels in the heating sector and for launching renovation of buildings bring benefits for many home-owners and other energy consumers. State price regulation in gas networks, power supply networks and the district heating market appears to function well. New technological solutions implemented in the oil shale power industry point to the possibility of continued mining and use of oil shale, even under significantly stricter environmental restrictions.

The desired changes in the energy sector and the associated fields have to be brought about primarily by the economic environment and market regulation, with interventions involving public funds used only as an exception. The analyses performed for the NDPES 2030

[1] NDPES 2030 SEAR report, Chapter 5, 8.3 and Annex 4 NDPES 2030 Roadmap Model. http://www.energiatalgud.ee/index.php?title=ENMAK:Dokumentatsioon

[2] http://data.consilium.europa.eu/doc/document/ST-169-2014-INIT/et/pdf (10.07.2017)

indicate that implementation of the actions envisaged in the development plan would have a positive impact on Estonia's economic growth and competitiveness. The findings of SEAR NDPES 2030 suggest that implementation of the actions of the NDPES 2030 are important for improving the environmental situation in Estonia.

Meeting of the 2030 targets for Estonia's energy sector can be described in terms of the following outcomes:

- Fuel and electricity markets operate in a free, unsubsidised and open manner;
- Electricity generation capacity in Estonia is sufficient when the N-1-1 criterion is satisfied (for generation equipment);
- Estonia's electricity system is synchronised with the synchronous grid coordinated in EU;
- Electricity generated from renewable sources accounts for 50% of domestic final electricity consumption and new generation equipment for renewable electricity is built under the conditions of an open electricity market without additional domestic subsidies;
- The share of the largest supply source in Estonia's gas market does not exceed 70%;
- The share of the largest gas seller in Estonia's gas market does not exceed 32%;
- Market concentration in the gas market has decreased significantly and the level of gas market concentration according to HHI[3] is lower than 2,000 points[4];
- District heating systems have been preserved in areas where they are sustainable and capable of providing consumers with reasonably priced energy solutions in line with environmental requirements;
- 80% of heat generated in Estonia is generated from renewable sources; the importance of local energy sources for heat generation is increased through the use of peat. The target will be met mainly through market mechanisms;
- The System Average Interruption Duration Index (SAIDI) in the distribution grid does not exceed 90 minutes per consumption point and this level is achieved without additional burden on consumer tariffs;
- Renovation efforts have improved the energy efficiency of buildings (40% of small residential buildings have energy efficiency class C or D, 50% of apartment buildings have class C, 20% of non-residential buildings have class C);
- New buildings have an energy performance indicator, which conforms to the requirement for nearly zero-energy buildings;
- 37% of the total net area of the buildings used by the central government is located in buildings that satisfy at least the minimum energy efficiency requirements enforced in 2013;
- Fuel consumption of vehicles in 2030 does not exceed the level of year 2012 (8.3 TWh).

[3] HHI – Herfindahl-Hirschman Index, which ranges from 0 to 10,000 points and is calculated by summing the squared market shares of all individual gas suppliers [$\sum(x_i)^2$]. A high value indicates a strong dependence of the gas market on one gas provider.

[4] HHI < 2,000 would mean that there are 7 gas providers in Estonia, with the largest of them having a market share of less than 32%.

The NDPES 2030 describes actions for implementation of the development plan. **The states's principal functions in providing energy security infrastructure** now and in the future include securing cross-border electricity and gas connections, ensuring the availability of required levels of liquid fuel and gas reserves in Estonia, ensuring sufficient heat generation capacity to cover base and peak loads, and proposing legislation to promote distributed generation and micro generation. The supply of energy for vital services must be ensured.

Energy savings and energy efficiency are achieved through grants in the housing and heating sectors (by supporting renovation of the existing housing stock and construction of nearly zero-energy buildings) and through tax system changes in the transport sector. The final energy consumption stabilises at the level of 32 TWh by 2030, **with renewable energy accounting for 50% of the final energy consumption** and significant improvement of efficiency in primary energy consumption.

Sustainability of the housing stock is ensured by approaching renovation and new construction in a comprehensive manner to provide Estonian residents with **high-quality housing**. The current rate of new construction is slower than the actual need, considering the ageing of the housing stock**.**

The quality of the **housing environment** can be increased by **combining the technical, social, environmental and economic aspects of urban planning with assessment of energy use** to ensure energy efficiency of the planned housing environment. An assessment of energy use of an area in terms of energy consumed in the buildings, as well as fuel and time resources associated with daily mobility needs (workplace-home-kindergarten-school), is envisaged as an integral part of the impact assessment process in urban planning.

Electricity generation takes place under the conditions of an open electricity market. **New electricity generation capacities are developed in line with the conditions of the electricity market, where the government intervenes only to ensure fulfilment of the generation capacity criterion or to help innovative new technologies enter the market.** Modifications of the tax system, the system of environmental charges and legislation are required as preconditions for the creation of new electricity generation capacities in Estonia. Increased reliability of power networks is ensured by increasing the minimum transmission tariffs. With regard to co-generation, the cost-effective co-generation potential in district heating areas is realised by 2030.

Greenhouse gas emissions in the energy sector are reduced by at least 70% by 2030 (compared to the 1990 level) and a reduction of emissions by more than 80% could be realistically achieved by 2050.

The use of oil shale is based on the mineral resources strategy currently under preparation, on the National Development Plan for Oil Shale Use 2016-2030 and on action plans of economic operators. Generation of electricity from oil shale is reduced while **the production of shale oil increases and, according to the development plan, this can be achieved by**

developing a tax environment, which facilitates investment. The by-products of shale oil production (retort gas, semi-coke) are used for electricity generation. If implementation of the action plans of the oil shale industry does not reach the expected levels, resulting in a shortage of resources for electricity generation capacity, the system operator will take measures to ensure sufficient generation capacity in accordance with the electricity market regulation.

The long-term perspective on the use of biofuels until 2050 envisages generation of electricity and heat in line with forest growth. The use of biomethane and other alternative motor fuels increases. The potential of using biological resources for production of motor fuels is investigated.

Fuel-free energy sources account for at least 10% of the final consumption by 2030. The potential of hydro power is already being harnessed; the use of solar energy in small applications is expected to increase 100 MW by 2050, covering about 1% of the country's power demand. Wind energy can cover up to a third of the country's power demand in 2050.

The development of the energy sector and the associated sectors or fields is financed from a variety of sources. Most of the financing is provided by the private sector, which is why the primary task of the government in implementing the development plan is to create an attractive investment environment through legislation and taxation policy. The envisaged financing of the development plan from the state budget constitutes, on average, only 3% of the total expenditure in the energy sector and the sectors directly affecting it.

State budget financing for the actions of the development plan is planned only for situations where achievement of the objectives of the development plan is prevented by market failures or where financing is necessary for performing the functions of the state.

The estimated total cost of actions to be implemented on the basis of the state budget strategy from 2018 to 2021 is 380 million euros, with the largest portions of public funds set aside for the energy conservation measures in the industrial sector and street lighting (101.2m euros), for measures of energy efficient renovation of residential buildings (80.9m euros), for modernisation of the heating sector (60.9m euros), for supporting the development of energy efficient municipal residential building stock for (60m euros), renovation of public sector buildings (47.3m euros) and for the use of alternative energy sources in the transport sector (25.9m euros).

The main sources of funding for the actions from 2018 to 2021 include the EU cohesion policy funds (240m euros) and revenues from the EU emissions trading scheme (71m euros).

In the course of implementing the development plan, opportunities have to be identified for taking additional actions, which are needed to achieve the expected outcomes of the NDPES 2030. When it comes to some of these additional actions, funding cannot be seen only as expenditure for the state budget. For instance, the studies of the NDPES 2030 indicate that residential reconstruction grants or loans have a stimulating effect on the economy, which will also lead to higher tax revenue from the increased volume of construction. Assuming that more than 2/3 of the cost of necessary investments can be provided by sources outside the state budget, the extra tax revenue would be comparable to the potential expenditure from the state budget; however, these support measures play a very important role for the achievement of the objectives of the development plan.

The development plan also foresees investments by energy companies, which could affect the prices of energy. Consumers are mainly affected by investments in increasing the reliability of power distribution grids and in diversification of supply sources in gas networks. This is not reflected in the information on the cost of implementation of the development plan.

Implementation of the actions described in the development plan could lead to the following outcomes for Estonia’s energy sector and economy in general:

Main outcomes of NDPES 2030	▪ State budget revenue increase by **2%/year** compared to the base scenario[5]
	▪ Energy intensity of the economy decreases to **66%** by 2030 compared to 2012[6]
	▪ The share of imported fuels constitutes **<25%** of domestic primary energy consumption in 2030
	▪ Meeting of the long-term energy and climate policy targets of the EU is ensured

The following table presents a comparison of the EU climate and energy targets for 2020 and 2030 and the expected outcomes of the NDPES.

Table 1.1. The EU 2030 Framework for Climate and Energy and the expected outcomes of the NDPES 2030

Field	EU Framework for Estonia 2020	NDPES 2030 outcomes by 2020	Overall EU targets for 2030	NDPES 2030 outcomes by 2030
Renewable energy	▪ **25%** of final energy consumption ▪ **10%** of final consumption of transport fuels	▪ **11%** of final consumption of transport fuels	▪ **27%** of final energy consumption	▪ **50%** of final energy consumption[7]
Final energy consumption	▪ Final energy consumption **32.8 TWh**	▪ Final energy consumption **32.4 TWh**	-	▪ Final energy consumption **31.6 TWh**

[5] Full implementation of the actions planned in the NDPES 2030 would increase the state budget revenue by an estimated 144 M€/y over the period 2015…2030 compared to the base scenario (minimum regulation and support by the government) (Table 7.1); it is equivalent to ~2% of the state budget revenue in 2014.
[6] Energy intensity of Estonian economy: projection until 2030. Energy intensity in 2012 was 5.6 MWh/1,000 $€_{GDP}$; the projection for 2030 is 2 MWh/1,000 $€_{GDP}$
[7] The estimate only reflects the ratio between renewable energy generation and energy consumption, but does not include potential statistical trading in renewable energy.

Field	EU Framework for Estonia 2020	NDPES 2030 outcomes by 2020	Overall EU targets for 2030	NDPES 2030 outcomes by 2030
Gross inland primary energy consumption	-	-	▪ Primary energy consumption ↓**27%** (vs. projection for 2030 in the PRIMES 2013 model)	▪ Primary energy supply **57.7 TWh**
Greenhouse gas (GHG) emissions[8]	▪ GHG emissions ↓**20%** vs. 1990 (40.6 Mt CO_2-eq /y) ▪ CO_2 non-ETS ↑**11%** vs. 2005 (5.67 Mt CO_2-eq /y)	▪ GHG emissions from energy sector ↓**54%** (16.6 Mt CO_2-eq /y) ▪ GHG emissions from energy sector in the trading system (ETS) 13.5 Mt CO_2-eq /y) ▪ GHG emissions from outside the trading system (non-ETS, i.e., transport, energy generation) **2.7…2.9** Mt CO_2-eq /y)	▪ GHG emissions ↓**40%** (vs. 1990) ▪ CO_2-eq emissions from ETS sectors ↓**43%** vs. 2005 (12.6 Mt CO_2-eq /y) ▪ CO_2-eq emissions from non-ETS ↓**30%** vs. 2005 (5.67 Mt CO_2-eq /y)	▪ GHG emissions from energy sector ↓**70%** (10.5 Mt CO_2-eq /y) ▪ GHG emissions from ETS energy sector ↓**45%** (8.2 Mt CO_2-eq /y) ▪ CO_2-eq emissions from non-ETS (transport, energy generation) **1…1.6** Mt CO_2-eq /y

The following tables present some figures to describe Estonia's energy sector in 2030. These figures primarily reflect the results of the analyses performed during the preparation of the NDPES 2030, forecasting the outcomes of the actions specified in this development plan. Even though some of these figures are specified in the NDPES 2030 as targets of individual actions, they should not be regarded as the targets of the NDPES 2030 but as the expected outcomes of the NDPES 2030.

Table 1.2. Contribution of the NDPES 2030 actions to meeting the targets of the EU Framework for Climate and Energy

EU 2030 Framework for Climate and Energy	▪ Final energy consumption in **2020** and **2030** is at the same level as in 2010 (**~32 TWh**)
	▪ In 2030, renewable energy accounts for at least **50%** of final energy consumption
	▪ In 2030, renewable energy accounts for at least **28%** of domestic primary energy consumption

Table 1.3. Energy efficiency outcomes of the NDPES 2030 actions in 2030

Energy efficiency	▪ In 2030, domestic primary energy consumption is **10%** lower than in 2012
	▪ Energy intensity of Estonian economy decreases from current 5.6 MWh/1,000 $€_{GDP\ 2012}$ to **2 MWh/1,000 $€_{GDP2012}$**

Table 1.4. Energy security outcomes of the NDPES 2030 actions in 2030

Energy security	▪ Estonia achieves **energy independence** by 2030 (vs. the dependence rate of 13.6% in 2013)

[8] The absolute values in time series of Estonian greenhouse gas emissions could be changed due to the adoption of new calculation rules for Estonia's national greenhouse gas inventory in 2015.

	▪ In 2030, the **share of imported electricity is 0%** (vs. 0% in 2012)

Table 1.5. Economic impact of the NDPES 2030 actions in 2030

Economic impact[9]	▪ As a result of the NDPES 2030 actions, GDP **increases 16bn €** from 2015 to 2030[9]
	▪ State budget revenue increase by **2%/year** compared to the base scenario[9]
	▪ **Total value of public investments (incl. grants)** in the sectors covered by the development plan from 2015 to 2030 is **2.9bn €**[9]
	▪ **Government revenue** increases **5.2bn €** due to the impact of the sectors covered by the development plan from 2015 to 2030[9]

Table 1.6. Health and environmental impact of the NDPES 2030 actions in 2030

Health and environmental impact	▪ The **number of early deaths** caused by the environmental impact of the energy sector **decreases ~50%** compared to 2012
	▪ **Disease burden (disability-adjusted life years)**[10] caused by the environmental impact of the energy sector **decreases to 40%** compared to 2012
	▪ The **negative impact of the energy sector on biodiversity is alleviated** through the actions specified in Chapter 9 of the SEAR report

[9] The calculation results are presented in 2011 prices and compared to the non-intervention (BASE) scenario. Detailed calculation results can be seen in the model of economic impact of the NDPES 2030 and the NDPES 2030 Roadmap model.
[10] Disease burden, or disability-adjusted life years, is an indicator of public health loss, expressed as the total number of life years lost due to death and healthy life years lost due to disease and external causes. NDPES 2030 SEAR report, Annex 9, http://www.energiatalgud.ee/img_auth.php/1/16/ENMAK_2030._Valdkondade_stsenaariumitega_kaasneva_keskkonnam%C3%B5ju_modelleerimine.pdf

2. ESTONIA'S ENERGY POLICY TARGETS

NDPES 2030 describes the vision for the development of Estonia's energy sector and selects the optimal solution paths for individual sectors, based on the overall objective of **ensuring energy supply with market-driven prices and availability for consumers in line with the long-term energy and climate targets of the European Union, while contributing to the improvement of Estonia's economic climate and environmental status and increased long-term competitiveness.**

Meeting of the overall objective of the Estonian development plan of the energy sector by 2030 can be described in terms of the following outcomes:

- Fuel and electricity markets operate in a free, unsubsidised and open manner;
- Electricity generation capacity in Estonia is sufficient when the N-1-1 criterion is satisfied (for generation equipment);
- Estonia's electricity system is synchronised with the synchronous grid coordinated in EU;
- Electricity generated from renewable sources accounts for 50% of domestic final electricity consumption and new generation equipment for renewable electricity is built under the conditions of an open electricity market without additional domestic subsidies;
- The share of the largest supply source in Estonia's gas market does not exceed 70%;
- The share of the largest gas seller in Estonia's gas market does not exceed 32%;
- Market concentration in the gas market has decreased significantly and the level of gas market concentration according to HHI3 is lower than 2,000 points;
- District heating systems have been preserved in areas where they are sustainable and capable of providing consumers with reasonably priced energy solutions in line with environmental requirements;
- 80% of heat generated in Estonia is generated from renewable sources; the importance of local energy sources for heat generation is increased through the use of peat. The target will be met mainly through market mechanisms;
- The System Average Interruption Duration Index (SAIDI) in the distribution grid does not exceed 90 minutes per consumption point and this level is achieved without additional burden on consumer tariffs;
- Renovation efforts have improved the energy efficiency of buildings (40% of small residential buildings have energy efficiency class C or D, 50% of apartment buildings have class C, 20% of non-residential buildings have class C);
- New buildings have an energy performance indicator, which conforms to the requirement for nearly zero-energy buildings;
- 37% of the total net area of the buildings used by the central government is located in buildings that satisfy at least the minimum energy efficiency requirements enforced in 2013;
- Fuel consumption of vehicles in 2030 does not exceed the level of 2012 (8.3 TWh).

The development targets for the Estonian energy sector will be met primarily through this Development Plan, but important contributions are also possible from potential agreements in the European Union (incl. Directives, Regulations, etc.) or with other countries.

2.1. International and EU frameworks that affect the choices made in the Development Plan

2.1.1. EU 2020 Climate and Energy Package

Selecting the best scenario for the energy sector in Estonia is framed by the **commitments and targets established by the political agreements of the European Union** in the energy field or fields closely related to the development of the energy sector. The meeting of these commitments is described through the following indicators and target levels:

RENEWABLE ENERGY 2020	The share of **renewable energy** shall constitute **25% of final energy consumption** by 2020 (mandatory target based on the Renewable Energy Directive 2009/28/EC).
	The share of **renewable energy** shall constitute **10% of final consumption in the transport sector** by 2020 (mandatory target based on the Renewable Energy Directive 2009/28/EC).

FINAL ENERGY CONSUMP-TION	**Final energy consumption** in 2020 shall not exceed the 2010 level of final energy consumption, i.e., 2818 ktoe (=118 PJ/a =**32.8 TWh/a**) (indicative target based on the Energy Efficiency Directive 2012/27/EU and the "Estonia 2020" competitiveness strategy).

GHG EMISSIONS 2020	Total greenhouse gas emissions into the atmosphere from sectors **outside the EU Emissions Trading System** may increase up to **11% (6.27 Mt CO_2-eq.)** by 2020 compared to the 2005 level (5.65 Mt CO_2-eq.) (mandatory target based on Decision No 406/2009/EÜ of the European Parliament and of the Council and the "Estonia 2020" competitiveness strategy)[11].

[11] The absolute values in time series of Estonian greenhouse gas emissions will be somewhat modified due to the adoption of new calculation rules for Estonia's national greenhouse gas inventory in 2015. Consequently, the absolute values of the annual greenhouse gas limits for sectors outside the EU Emissions Trading System will be changed in Estonia from 2015. It means that the increase in greenhouse gas emissions in Estonia by 2020 can be up to 11%, which would amount to 6.47 Mt CO_2-eq. in accordance with Annex II of Commission Decision of 26 March 2013. http://eur-lex.europa.eu/legal-content/ET/TXT/?uri=CELEX:32013D0162.

2.1.2. EU 2030 Climate and Energy Package

The EU 2030 Climate and Energy Framework, approved by the European Council at the end of October 2014, is a continuation of the current 2020 framework and an intermediary stage in the movement towards low-carbon economy by 2050.

The 2030 Climate and Energy Framework includes agreements on the following key targets:

RENEWABLE ENERGY 2030	**EU-wide** target to increase **the share of renewable energy** to **27%** of final energy consumption by 2030. The EU-wide target is not automatically transformed into binding national targets, as was done in the current climate and energy package.
FINAL ENERGY CONSUMPTION	The non-binding target for energy efficiency in the EU is to increase energy savings by **27%** (compared to the **primary energy consumption forecasts** for 2030 made in 2007 using the **PRIMES** model).
GHG EMISSIONS 2030	The EU-wide target is to **cut greenhouse gas emissions by 40%** by 2030 compared to **1990** levels, divided into the following sub-targets: 1. **sectors included in the EU emissions trading system** (ETS) have to deliver a **reduction of 43%** in emissions **compared to 2005;** 2. **sectors outside the EU emissions trading system** (non-ETS) have to reduce emissions by **30%**[12].

A detailed specification of the indicators and target levels for describing progress in meeting these targets will be developed over the coming years.

2.1.3. EU Energy Roadmap 2050

The *Energy Roadmap 2050*[13] establishes policies for transforming the energy sector in the EU by 2050 for moving to a low-carbon economy. EU's long-term goal for 2050 is to cut emissions by 80-95% compared to 1990 levels.

2.1.3.1. <u>BEMIP (Baltic Energy Market Interconnection Plan)</u>

On 17 June 2009, eight Baltic countries (Finland, Sweden, Estonia, Latvia, Lithuania, Poland, Germany, Denmark)[14] and European Commission signed a Memorandum of

[12] Assuming continued application of the current calculation principles (based on national GDP per capita), the Estonia's national emission reduction target is likely to be -11% compared to 2005 levels.
[13] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0885:FIN:EN:PDF (10.07.2017)
[14] http://ec.europa.eu/energy/infrastructure/bemip_en.htm

Understanding on BEMIP, including an action plan on improving cross-border interconnections and functioning of the market.

The BEMIP cooperation framework targets development of a functional and integrated internal energy market and elimination of 'energy islands', combined with development of necessary electricity and gas infrastructure and interconnections in the Baltic Sea region. The BEMIP cooperation framework is a positive example of regional cooperation that has helped to move towards meeting these targets.

In the first phase of BEMIP actions, the focus was on developing a single harmonised electricity market in the Baltic Sea region by establishing interconnections between Baltic and Nordic countries at first and then connections to the Central European electricity market. Development of a regional gas market has become increasingly important in the BEMIP framework, with an agreement reached in 2013 on an action plan for developing gas infrastructure and diversification of gas supply in the Eastern Baltic region.

A high-level working group has regularly steered the implementation of the BEMIP Action Plan and monitored the need for updates. A discussion on updating BEMIP was initiated in the autumn of 2014 and it is likely that issues of energy security will come into a sharper focus in connection with ensuring security of gas supply and developing the regional gas market. In a longer-term perspective, energy security in the electricity sector can be increased by connecting Baltic countries to the the synchronous grid coordinated in EU .

2.1.3.2. Ranking of Estonia's energy policy in the Energy Trilemma Index of the World Energy Council

In 2016, Estonia was ranked 40th among the 125 countries in the annual Energy Trilemma Index[15] of the World Energy Council. In terms of sub-categories, Estonia was ranked 22nd in energy security, 50th in energy equity and 111th in environmental sustainability.

It means that, compared to other countries, Estonia achieves average results in terms of sufficiency and affordability of energy supply and the strength of the economic and political framework in supporting the energy policy. The low ranking in environmental sustainability is largely caused by the environmental impact of using oil shale and the export of energy products.

However, it is likely that implemented changes in the energy sector will enable Estonia to achieve a higher ranking in the coming years. Increased share of renewable energy will reduce environmental impact, increasing income levels will make energy more affordable, and the expansion of the electricity market through interconnections is likely to reduce energy prices.

[15] https://trilemma.worldenergy.org (7.04.2017)

2.1.4. A Clean Air Programme for Europe

According to the Clean Air Programme for Europe, implementation of current legislation is expected to reduce health impacts (premature mortality due to particulate matter and ozone) by 40% and ecosystem areas exceeding eutrophication limits by 22% relative to 2005 by 2030. Based on the new air policy objectives, the respective reductions are 52% and 35%. The envisaged reduction of air pollutants in energy generation should be achieved through the following legal acts or initiatives:

- Directive (EU) 2016/2284 of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC [COM/2013/0920 final - 2013/0443 (COD)];
- Directive (EU) 2015/2193 of the European Parliament and of the Council on the limitation of emissions of certain pollutants into the air from medium combustion plants. The directive establishes environmental requirements for the combustion of different fuels establishes environmental requirements for fuel combustion in plants in the capacity range of 1-50 MW;
- Proposal for a Council Decision on the acceptance of the Amendment to the 1999 Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-level Ozone [COM/2013/0917 final - 2013/0448 (NLE)].

The emission of air pollutants and their impact on air quality, associated with the energy supply scenarios developed for NDPES 2030, is discussed in Section 8.3.1 of the NDPES 2030 SEAR report. The targets for reducing air pollutants by 2030 will be agreed in negotiations with the European Commission and EU Member States. The projections prepared by the Estonian Environmental Research Centre for NDPES 2030 (Annex 6 to the NDPES 2030 SEAR report) indicate that Estonia would be able to meet the target levels for NO_x, SO_2 and PM2.5 by 2020. The national measurement and calculation methodology for PAH and HCB is in the process of being updated.

2.2. Vision for the Estonian energy sector in 2050

In 2050, Estonia will mainly use domestic resources to meet its energy needs; this includes heat generation and transport sector in addition to electricity production. The investments in the energy sector will result in redoubling the efficiency of using local primary fossil fuels compared to the current level. In accordance with the targets of the *EU energy roadmap 2050*, the level of CO_2 emissions in the energy sector will be reduced by over 80% (compared to 1990 level). Locally produced Estonian gas products will be more competitive in the developed regional gas market and the production levels will be sufficient to cover up to one third of Estonia's gas consumption needs.

Using modern and green technologies, Estonia will become an energy exporter in the established Northern-Baltic energy market. Estonia's energy independence and

securing it in the long term will become the main foundation of economic welfare of the country's residents, competitiveness of local businesses and Estonia's energy security.

The government will have developed a solid policy on resource ownership with a long-term vision to support the development of Estonia's industrial sector. The public revenue from the use of energy resources will be invested mainly in programmes of promoting sustainable energy supply, which will ensure continued energy independence of the country after exhaustion of fossil fuels.

The state budget resources allocated to energy efficiency, development of domestic fuel production and knowledge-based economy will serve as drivers of economic growth and long-term competitiveness of the country through tax revenue, increased employment rate and improved foreign trade balance.

2.3. Overview of meeting the development targets of the previous period

Table 2.1. Measures described in NDPES 2020 and their implementation

Target	Measures	Indicators
Continuous energy supply is ensured for the Estonian population	In addition to Estlink 1 that became operational in 2007, Estlink 2 was completed in 2014, increasing the transmission capacity between Estonia and Finland to 1,000 MW. The share of renewable energy in final energy consumption increases. The use of renewable energy should further increase in transport where Estonia has committed to the target of 10% of renewable energy in the final consumption of transport fuels. Liquid fuel stocks are secured, in accordance with requirements, for at least 90 days. Implementation of trans-boundary energy projects continues in the context of BEMIP for the development of a single regional electricity and natural gas market. Joining the International Energy Agency (IEA) in 2014 has improved access to international information on energy security.	The Estlink 2 direct current connection (650 MW) between Finland and Estonia was completed in 2014. The share of renewable energy in final consumption is 28.6% (2015), incl. 0.39% of transport fuels (2015). The share of oil shale in energy balance has fallen to 25% (2015). Liquid fuel stocks for domestic consumption are ensured for 90 days. Estonia joined IEA in the spring of 2014. The Natural Gas Act was supplemented with provisions separating ownership of gas transmission networks from ownership of gas distribution and sale businesses from 1 January 2015.
Estonia's energy supply and consumption is more sustainable.	Network losses in the transmission network and distribution grid are stabilised below the target level. The use of renewable energy (mainly biomass) and the share of co-generation	Transmission network losses are at 2.9% (2016); losses in the distribution grid of AS Elektrilevi are at 4.8% (2015). The distribution grid has

Target	Measures	Indicators
	plants have increased in district heating networks and investments have been made through various support schemes to reduce heat losses from pipes and boilers. KredEx has provided strong support for energy efficiency renovation of buildings.	achieved the technical minimum level of network losses. The share of electricity produced in co-generation plants is 11.4% (2015). Primary energy consumption is at 62,8 TWh (2015). Pursuant to the Electricity Market Act, all consumers will be provided with hourly remote metering devices by the beginning of 2017.
Energy supply at a justified price has been ensured for consumers.	The Estonian electricity market was opened for all consumers in the beginning of 2013, which means that the price of electricity is subject to competition, based on demand and supply in the electricity market, which depends on multiple factors, incl. weather, technical capacity limitations, etc. Developers are supported in their attempts to build a regional LNG terminal in Estonia. The BalticConnector gas pipeline project for connecting Estonian and Finnish gas transmission systems has been prepared in cooperation with Finland. Development of gas market regulations is based on the objective of launching a competitive gas market in the region. The district heating sector transitions from more expensive fossil fuels (gas, shale oil) to cheaper domestic fuels (wood chips, pellets, peat), which results in a better price for consumers and improved prospects for the sustainability of district heating.	As of April 2014, 581,500 electricity supply contracts had been concluded, covering more than 80% of all consumption points. The universal service is used by 138,900 consumers. The average NPS price of electricity in 2016 for the Estonian price region was 33.06 €/MWh. The average price of natural gas traded in GET Baltic Gas Exchange, Lithuania, was 17.30 €/MWh in 2016. The weighted average price of district heating in April 2017 was 60.7 €/MWh (incl. VAT).

Table 2.2. Measures and their implementation *under* the Estonian National Development Plan for Electricity Sector until 2018

Target	Measures	Indicators
Continuous energy supply is ensured for consumers located in Estonia.	The installed generation capacities in Estonia exceed the peak load of the system and this trend will continue at least until 2020. In addition to generation capacities, security of supply in Estonia is reinforced through extensive investment in the power transmission network and interconnections with the power systems of the neighbouring countries, in particular, the emergency reserve power plant in Kiisa and the new direct current interconnection with Finland, opened in the beginning of 2014. According to the 2017 report[16] on the security of supply in the Estonian power system, prepared by Elering AS, the generation capacities and interconnections with neighbouring countries will be sufficient for the next ten years to ensure that consumers can be supplied during peak periods and in case of extreme weather conditions.	Estonian electricity production rose to 10.4 TWh, which is a 32% increase from 2009. The Estlink 2 direct current connection (650 MW) between Finland and Estonia was completed in 2014. The first emergency power plant (110 MW) in Kiisa was completed at the end of 2013 and the second (140 MW) was completed in the middle of 2014.
Additional savings have been achieved in the supply and consumption of electricity for consumers in Estonia.	Pursuant to the Electricity Market Act, network operators have to install hourly remote meters for all consumers by 2017, which will improve consumers' ability to control their consumption depending on hourly prices in the electricity market.	Total consumption of electricity incl. losses increased in 2016 by 5.2% compared to year 2009, corresponding to 8.4 TWh. The share of electricity from co-generation processes was 11.4% in 2015. In 2015, network losses amounted to 2.9% in the

[16] https://www.elering.ee/sites/default/files/public/Elering_VKA_2017.pdf (10.07.2017)

Target	Measures	Indicators
		transmission network and 4.8% in the distribution grid of Elektrilevi OÜ. Energy intensity of GDP in 2015 was 12,951 GJ per one million euros GDP. The share of electricity from renewable sources was 15.1% in 2015.
Energy supply at a justified price is ensured for consumers located in Estonia.	In addition to Estlink 1 that became operational in 2007, Estlink 2 was completed in 2014, increasing the transmission capacity between Estonia and Finland to 1,000 MW. The Estonian electricity market was opened for all consumers in the beginning of 2013, which means that the price of electricity is subject to the ratio of demand and supply and many other factors (weather, technical capacity limitations).	The electricity market is open since the beginning of 2013. A total of 581,500 electricity supply contracts had been concluded by April 2017, covering more than 80% of all consumption points. The universal service is used by 138,900 consumers. The average NPS price of electricity in 2016 for the Estonian price region was 33.06 €/MWh.

Table 2.3. Measures and their implementation relevant for the energy sector in the Estonian National Development Plan for Housing Sector 2008-2013

Target	Measures	Achievements
Make the option of having a dwelling available to all residents of Estonia.	The largest investments under this target were connected to the housing support for large families and the right to deduct housing loan interests from taxable income.	The housing conditions of **1,818 large families** were supported. In 2015, housing loan interests were deducted from taxable income in case of **107,941 income tax returns**.

Target	Measures	Achievements
Improve the quality and sustainability of the housing stock.	The largest investment of the previous development plan across all measures was connected to energy efficient renovation of the housing stock. Both renovation support and renovation loans were issued through KredEx.	A total of **591** apartment buildings were renovated by utilising the loan or support facility. Furthermore, support was granted for renovation of **53** apartment buildings that were subject to restitution in the ownership reform. Support for expert assessments, energy audits or design projects of buildings was paid on **4,015** instances.

3. DEVELOPMENT OF FIELDS

3.1. Energy consumption and energy efficiency

Estonia's energy consumption reflects the structure of the country's economy and its geographic location. Compared to the other 29 members of the International Energy Agency (IEA), Estonia is notable for the largest share of households in total energy consumption[17]. Estonia is fifth the ranking of the same countries, characterising the relative importance of the industrial sector in final energy consumption starting from the country with the lowest share. In terms of energy consumption in the transport sector, Estonia is in the middle group of those countries. Estonia's ranking is also relatively high in terms of the share of the service sector in total energy consumption.

Total final energy consumption remained in the range of 32...36 TWh from 2004 to 2015. The breakdown of energy consumption between sectors is shown in figure 3.1. The household sector is the largest energy user (33%[18]) and it has lower annual fluctuations in consumption compared to the other sectors. The largest differences in annual consumption levels have occurred in the industrial sector, which accounts for 22% of total final energy consumption. Transport is the third-largest final consumption sector, with the average consumption being consistently around 27% of total final energy consumption in recent years. The average share of the business and public service sector amounted to 15% of final consumption, while the share of the remaining sectors has been around 4%.

[17] Energy Policies Beyond IEA Countries: Estonia, IEA 2013

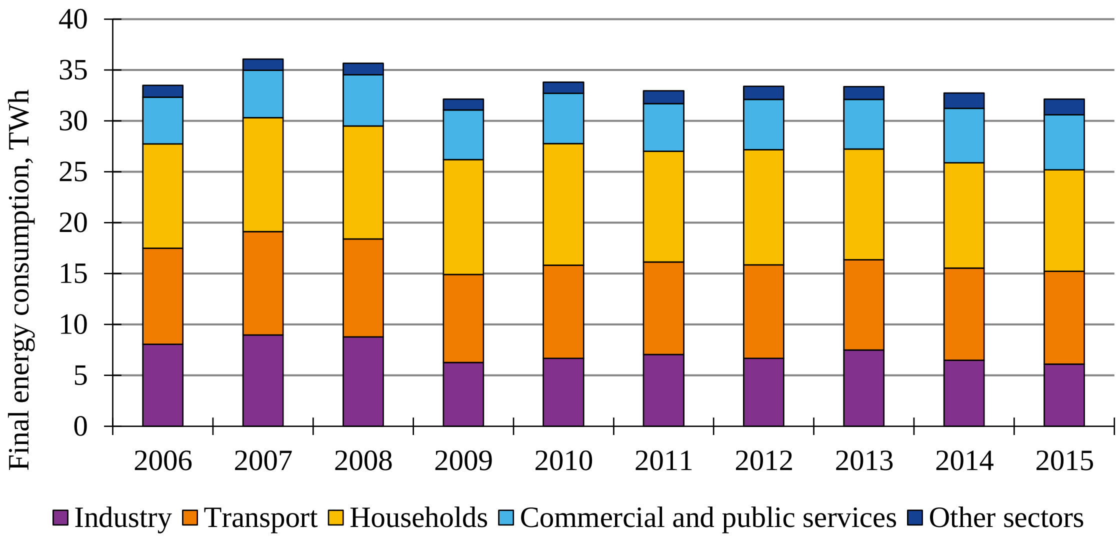

Figure 3.1. Final energy consumption in Estonia, 2006...2015[18]

The structure of final energy consumption indicates that liquid fuels are the most used type of fuel in Estonia, accounting for one third (33%) of final consumption. Solid fuels, electricity and heat have all relatively similar shares in final consumption, remaining slightly above or below the 20% level. Renewable sources constitute the largest group of solid fuels, with an average share of 17% of total final consumption over the past 10 years. The share of gas fuel has decreased in Estonia over the years. In 2012, it accounted for 9% of final energy consumption. Despite the fact that any changes in the structure of energy consumption take a long time, figure 3.2 reveals that the share of electricity in final energy consumption increases year on year while the share of heat tends to decrease.

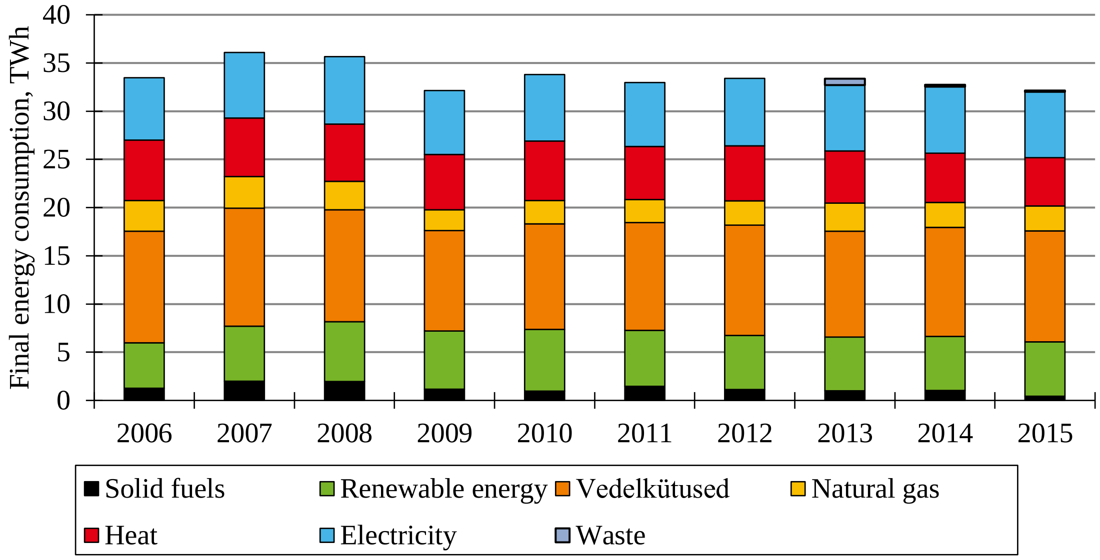

Figure 3.2. Structure of final energy consumption in Estonia by types of energy, 2006...2016[18]

[18] Eurostat, table nrg_100a (27.03.2017)

The changes in the types of energy used in final consumption are somewhat more visible when we observe the individual sectors of final consumption. According to statistics (see figure 3.3), the largest changes in absolute terms have occurred in the past 12 year in electricity consumption in the service sector (consumption increase ~900 GWh), in the use of renewable energy in households (consumption increase ~500 GWh[19]) and in the use of gas in the industrial sector (consumption decrease ~700 GWh). A clear increase in consumption is also noticeable in the use of liquid fuels in the transport sector - the average increase in volume is 500 GWh (corresponding to approximately 45,000 tonnes of motor fuels). Energy use has decreased about 800 GWh in the category of heat consumption by households, which is the sector where the public measures have probably had the strongest impact.

When we compare the level of energy consumption in different sectors now and ten years ago, it is notable that energy consumption in the industrial sector has decreased by nearly 1,400 GWh in total. Energy consumption has slightly decreased in households – approximately 200 GWh. The largest growth of final energy consumption has happened in services sector – approximately 900 GWh; the final consumption has also increased in the transport sector (~500 GWh).

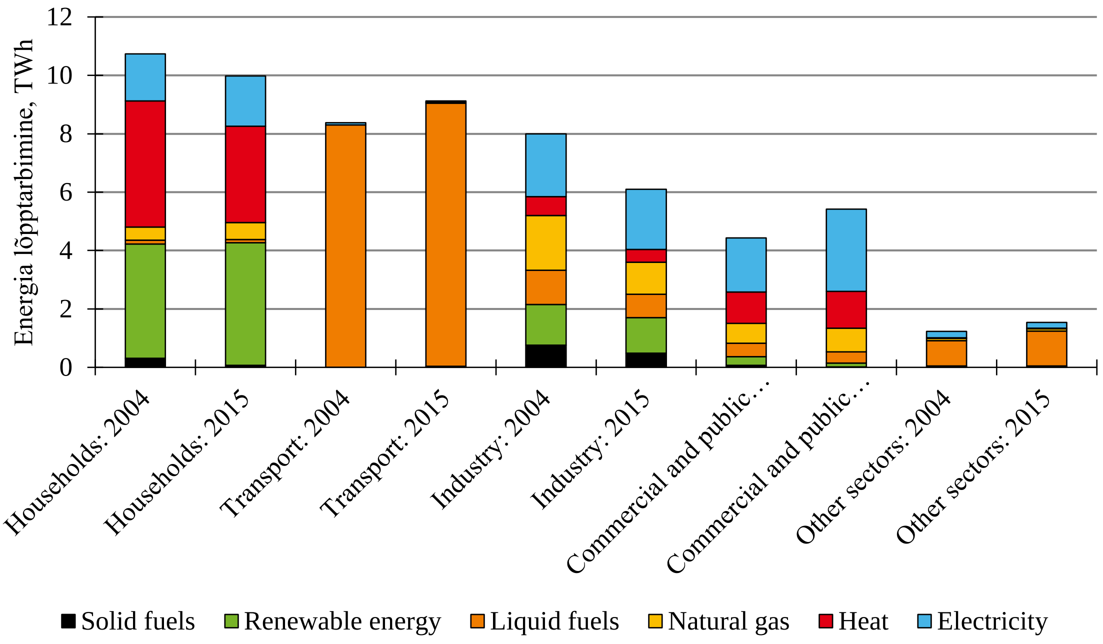

Figure 3.3. Structure of final energy consumption in Estonia by sectors of final consumption in 2004 and 2015[20]

[19] The numerical data in this paragraph were calculated on the basis of the data from Eurostat, table nrg_100a (03.04.2017), using the average ranges from 2003..2005 and 2013..2015.

[20] The term 'negajoule' is often used to describe energy savings and make comparisons with the contributions of different energy carriers to the energy balance; it characterises the notional contribution of energy efficiency measures to ensuring a country's supply of energy.

In addition to domestic energy saving measures, a significant part of such measures is based on the actions initiated by the European Union. The extent of EU interventions to ensure energy savings in the Member States has grown on an annual basis. The transposition of the EU Energy Efficiency Directive (2012/27/EU) is associated with the creation of several new opportunities in Estonia for ensuring energy efficiency in generation, transmission and use of energy. The Energy Efficiency Directive (2012/27/EU) was transposed with the Energy Sector Organisation Act. Based on the Directive, the Act establishes the foundations for the performance of energy audits, for the exemplary role of government agencies in energy efficiency, as well as providing additional options to ensure energy efficiency in generation, transmission, etc. The Directive also requires Estonia to prepare a national energy efficiency action plan every three years; the plan should be submitted to the European Commission while also providing annual implementation reports.

The highest level of public funding for energy efficiency measures was achieved during the period of realisation of the green investment schemes funded from the sale of CO_2 allowances. Such green investment schemes were used to finance energy efficient renovation of public buildings, renovation of apartment buildings and private houses, renovation of district heating systems, creation of co-generation plants, renovation of street lighting and development of public transport. The analysis of the relations between implemented support schemas and outcomes is still limited to the level of individual support schemas. Comprehensive overviews that would observe the links between the changes in final energy consumption and the results of support schemes and other public energy efficiency measures are rather rare. In completed analyses, the correlations between taxes, investments or increased awareness and energy savings are rarely based on Estonian data. It is not clear what is the contribution of Estonian energy efficiency measures to ensuring the supply of energy[21] or what extent of the reduced energy consumption can be attributed to the implemented energy efficiency measures.

The preparatory process for this Development Plan included extensive analyses of potential future energy consumption in two significant sectors of final consumption: buildings and transport. The future level of energy consumption in those sectors will depend on the level of intervention with energy efficiency measures (figure 3.4). **It is likely that the long-term energy efficiency targets, arising from the EU energy policy, can be best met through extensive public intervention; Estonia's final energy consumption will probably increase if only market-driven measures are utilised.**

Estonia's housing and energy sectors are very closely connected, as the energy demand of buildings constitutes a large share of Estonian energy balance. However, these sectors also have a high potential for energy savings - the energy consumption of buildings constitutes

[21] The term 'negajoule' is often used to describe energy savings and make comparisons with the contributions of different energy carriers to the energy balance; it characterises the notional contribution of energy efficiency measures to ensuring a country's supply of energy.

about 40% of total energy consumption in the EU. In Estonia, household consumption accounts for 40..45% of the total energy balance.

Renovation of the housing stock can reduce the heating demand of buildings by up to 50%, which would also reduce the volume of fossil fuel imports and the level of CO_2 emissions. At the same time, it is possible to improve the quality of the living environment and reduce the maintenance costs of the housing stock – this has a direct impact of people's welfare. Therefore, the housing sector has been addressed due to its close connections with the energy sector as well as in an attempt to integrate sectoral development plans to create synergy between sectors and to achieve a holistic approach.

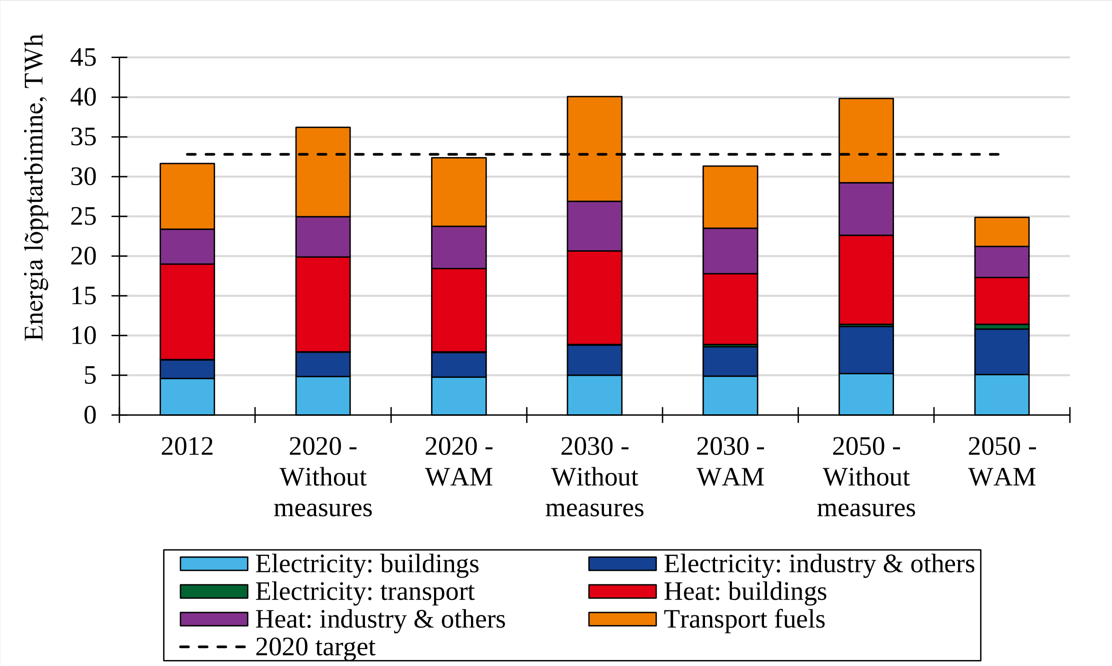

Figure 3.4. Structure of final energy consumption in Estonia by sectors – aggregate projection

Taking into account the above-described situation and potential future development of energy consumption, implementation of the national energy policy focuses on the organisation of energy efficiency actions in the following final consumption sectors:

- **buildings,** in public and private sectors, because they account for the largest part of final energy consumption and are likely to be the most cost-efficient in terms of realising the potential for energy savings;
- **transport,** because, without the implementation of measures, energy consumption would increase even further, leading to greater dependence on the import of liquid fuels;
- **industry,** because this is the third major final consumption sector where energy consumption and prices will have an increasing impact on competitiveness of the sector;
- **street lighting,** where local governments have limited opportunities for bringing the systems up to a new quality level in terms of compliance with lighting requirements, reliability and energy efficiency.

The following sectoral chapters of the Development Plan focus on the energy efficiency aspects in transport.

3.2. Electricity sector

3.2.1. Vision for the Estonian electricity sector in 2050

The electricity sector will contribute to competitiveness of Estonia's economy through the security of supply, market-driven electricity prices for final consumers and the use of environmental solutions. Electricity generation supports economic resource efficiency, incl.

- generation of electricity from production waste, which cannot be used efficiently, or at all, for other purposes in addition to a straightforward use of primary fuels;
- increasing the share of fuel-free and other renewable sources in electricity generation.

The new electricity generation portfolio must be competitive in the regional electricity market without any additional subsidies. Support will be granted for electricity generation only in exceptional cases and on a needs basis to ensure critical generation capacity or to support market entry of new generation technologies, which are considered to have good prospects from the perspective of research and development in Estonia. Market mechanisms (incl. flexible cooperation mechanisms in renewable energy, the European system for trading in greenhouse gas emissions) will serve as the main initiators of investment.

Estonia’s electricity transmission network will be synchronised with the the synchronous grid coordinated in EU. The development of electricity networks will not result in an excessive pressure on tariffs.

3.2.2. Electricity market

Estonian electricity market was fully opened to all consumers in the beginning of 2013. In 2009, Estonia's electricity market was opened to large consumers (approximately 35% of the total Estonian electricity market). The opening of the electricity market ended the electricity price regulation for small users and all consumers were given the opportunity to buy electricity from competing suppliers in the electricity market. The price of electricity is based on the balance of supply and demand on the single Nordic and Baltic electricity market.

In 2014, EstLink 1, the high-voltage direct current interconnection between Estonia and Finland, was supplemented by EstLink 2, which tripled the electricity transmission capacity between the Baltic and Nordic countries, effectively transforming Estonia and Finland into a single market region. According to NordPoolSpot, the Nordic power exchange, the day ahead price of electricity in Estonia and Finland was the same in 90.3% of the time in year 2016, indicating that there was no shortage of transmission capacity in those periods.

There were more than 10 suppliers in the Estonian electricity market in the autumn of 2014. The launch of the electricity market has proceeded as expected and Estonian consumers have adapted to the opportunities of the open market; this is evident in the fact that more than

80% of consumers had entered into a contract with an electricity supplier (i.e., 95% of total consumption) by August 2017[33].

3.2.3. Electricity consumption

The level of electricity consumption in Estonia in 2016 was 8.4 TWh, incl. losses. According to the 2016 security of supply report of Elering AS, Estonian system operator and transmission network operator, the increase in electricity consumption has decelerated in Estonia and is projected to be 1% per year in 2030. **The projected annual energy consumption in 2030 (including transmission and network losses) will be 10 TWh, assuming continuation of the current trends** (see **Figure 3.5**).

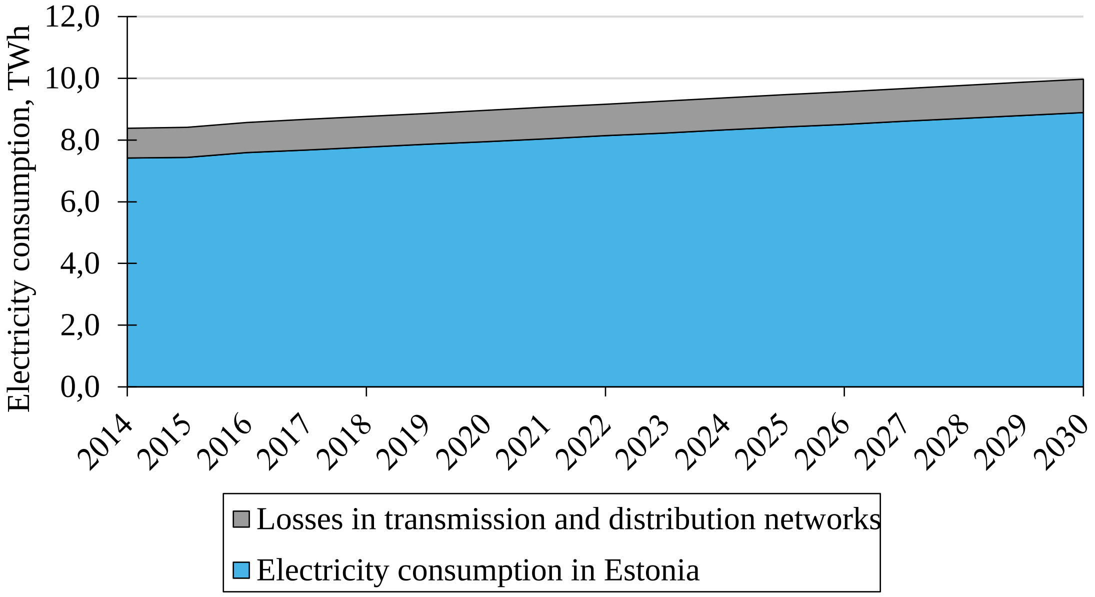

Figure 3.5. Projected electricity consumption in Estonia[22]

The projections prepared in connection with the Development Plan do not envisage connection of large consumers, because inclusion of large consumers in the Estonian electricity network is a case-by-case situation, which is difficult to predict. If a consumer that has a significant impact on electricity consumption levels should be connected to the Estonian electricity system, the projected generation capacity reserve and electricity consumption should be adjusted accordingly.

3.2.4. Development trends and principles in electricity generation

Several generation development scenarios were created in the course of the preparation of the Development Plan. They are used to model different developments of the generation portfolio, depending on materialisation of various conditions that guide or restrict

[22] Elering AS. ENMAK 2030. Eesti pikaajalised elektritootmisstsenaariumid [Long-term electricity generation scenarios for Estonia]. 2014. Available at: http://www.energiatalgud.ee/img_auth.php/6/6d/ENMAK_2030._Eesti_pikaajalised_elektritootmisstsenaariumid.pdf (09.10.2014).

development (e.g., permitting only renewable energy when new generation capacities are considered or establishing increased requirements for security of supply). Furthermore, development of generation capacity was modelled in a situation with a minimum level of government intervention. The developed scenarios were assessed in terms of economic impact, resource use, employment and environmental impact. The results favoured a market-driven scenario for development of generation capacity (labelled as PK&UG), which also takes into account the planned investments of the companies in the oil shale sector. This scenario results in the highest added economic value[93,94]and improved efficiency of resource utilisation and ensures security of supply through market-driven investments. Furthermore, Estonia would be able to meet its commitments at the international and EU level to reduce the environmental impact of electricity generation. **Creation of new generation capacity would be based on market demand instead of subsidies, which would reduce economic competitiveness.**

Any new generation capacities created in Estonia should be competitive in a long term in the single energy market of the EU. Furthermore, the planning of generation capacity should take into account restrictions arising from national defence considerations. In this context, it is important to maximise the potential of co-generation of electricity and heat based on local and renewable fuels, while ensuring resource efficiency in the use of local natural resources. Support schemes based on market prices can be used in exceptional cases where needed to meet the binding renewable energy commitments to the European Union, on the condition that they are compatible with the internal market and the EU state aid rules. Development of a market based energy supply system, based predominantly on local and renewable sources of the EU, is a key aspect of European energy policy.

Implementing the flexible cooperation mechanisms specified in the EU Renewable Energy Directive would be a realistic option for utilising the potential of renewable energy, located in Estonia and exceeding our national demand. The cooperation mechanisms enable countries to conclude bilateral agreements for selling the statistical surplus of generated renewable energy (exceeding the domestic renewable energy targets) to those countries that have not met their renewable energy commitments. In addition, the flexible cooperation mechanisms enable companies that develop renewable energy projects to participate in the renewable energy support schemes of other countries or to develop joint projects with companies from other countries. Considering the favourable wind conditions, availability of biomass and the scope of projects prepared in Estonia, the local renewable energy developers have excellent opportunities for developing renewable energy generation units by utilising the flexible cooperation mechanisms. The current development projects in Estonia include more than 1,000 MW worth of mainland and offshore wind farms and a pumped hydro accumulation power plant with a capacity of 500 MW, supplemented by a significant potential for generation of renewable energy from biomass. **Considering Estonia's preference for market-driven development of new generation capacities and for the utilisation of flexible cooperation mechanisms, as well as Estonia's intention to increase its energy security through the establishment of local generation capacity based on local primary energy resources or fuel-free generation capacity, support is granted for the implementation of projects that are in line with the above principles.** The Riigikogu has nearly finalised hearings of an amendment package for the Electricity Market Act[23], which will create the necessary platform for utilisation of flexible cooperation mechanisms and the resulting creation of renewable energy generation capacity in Estonia.

Development of generation capacity based on national subsidies should be replaced by an effective European system of emissions trading, offering a sufficient investment guarantee, and by open European support schemes for renewable energy. **From the perspective of energy security of the European Union, it is important to move from dependence on imported energy towards greater utilisation of primary energy sources found in the EU.**

According to projections, implementation of an efficient European emissions trading system that communicates the desired message and making the planned investments in the oil shale industry could reduce the average CO_2 intensity of the electricity generation portfolio to 400-450 g/kWh[24] (the corresponding indicator was 890 g/kWh, including total network losses, in 2012), which would be equivalent to about 4.5m tonnes of CO2 emissions to air per year (the corresponding indicator in 2012 was 12m tonnes), and result in the share of renewable electricity rising to 30% of final electricity consumption in Estonia by 2030. The share of electricity generated from renewable sources could be increased to 50% of final electricity consumption in Estonia, subject to successful implementation of the flexible cooperation mechanisms with other EU Member States. Most of the electricity generated from renewable sources is derived from biomass and wind energy.

In case of generating electricity from oil shale, the long-term climate and energy policy targets of the European Union necessitate a transition from the previously prevalent direct combustion technologies to combined shale oil and electricity generation solutions that increase the added value of oil shale, improve the efficiency of resource use (more than 75%) and reduce the environmental impact. **The analysis of the long-term scenarios of electricity generation, prepared as part of the research for the Development Plan, indicates a gradual decrease of competitiveness of oil shale electricity based on direct combustion.** This is primarily caused by rising CO_2 prices and increased utilisation of oil shale for the production of shale oil, which would create a competition for oil shale as an energy resource and result in an increased price of oil shale, assuming that the annual oil shale extraction limit of 20 million tonnes remains in force. Based on the investment plans of shale oil producers, the shale oil production capacity can be expected to reach the level where all annually extracted oil shale can be used for shale oil production somewhere between 2030 and 2035. The exact schedule of implementation of the investment plans of shale oil producers will depend on the dynamics of global oil prices and the stabilisation level but, from the perspective of efficient use of resources, combined production of oil and electricity is always more reasonable than generation of electricity alone.

[23] https://www.riigikogu.ee/tegevus/eelnoud/eelnou/5b8f3e3a-617c-424a-89a8-e10cc25f34d4/ (10.07.2017)
[24] Calculations of the Ministry of Economic Affairs and Communications and the Ministry of the Environment, 2014.

The by-products of producing oil from oil shale include high-temperature steam, semi-coke residue from the retorting process and retort gas, which has a higher calorific value than natural gas. In case of the solid heat carrier (SHC) process, which is predominantly used in Estonia for shale oil production, retort gas accounts for about a quarter of the energy contained in retorted oil shale. Due to the chemical properties of retort gas, it cannot be transported far away from the place of production (based on the current level of knowledge), which is why it has to be used locally. Retort gas is already successfully used for electricity and/or heat generation in the industrial oil shale complexes of Ida-Viru county. The projected increase in the volume of shale oil production means a corresponding increase in the generation of electricity from retort gas. In case of successful implementation of the plans of shale oil producers, **retort gas and oil shale semi-coke produced as by-products of oil production can be used to generate more than 5 TWh of electricity per year and the marginal cost of that electricity would be competitive in the regional electricity market of the EU.** An expanded and deeper study of the utilisation and transport options for retort gas is important, considering the potentially increasing volumes of retort gas from oil shale.

3.2.5. Electricity generation and generation capacity

In 2015, Estonia generated 9,1 TWh of electricity, which exceeded domestic consumption by more than 1 TWh (figure 3.6). In 2016, the electricity generation in Estonia was 10.4 TWh.

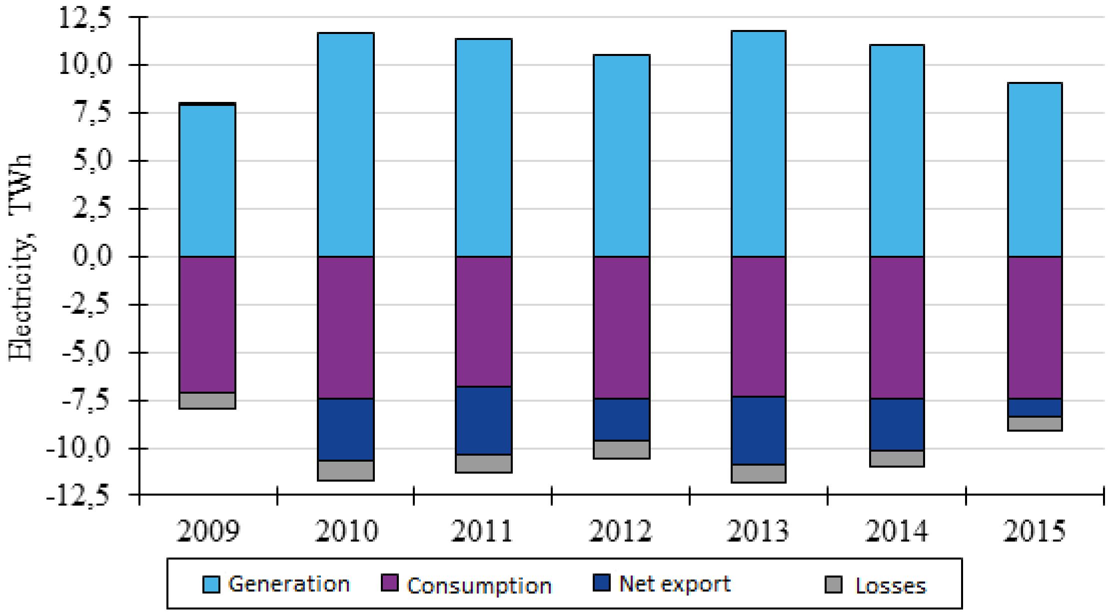

Figure 3.6. Estonia's electricity balance, 2009…2015[25]

According to Elering AS, Estonian system operator, the net installed generation capacity in the Estonian electricity system in September 2016 amounted to 2,677 MW. The instantaneously usable net generation capacity is lower, because some generation equipment

[25] Statistics Estonia. KE03 Elektrienergia bilanss, *03.04.2017*.

is undergoing repairs and, in case of some equipment, capacity depends on availability of wind and hydro power.

More than 3/4 of total electricity is generated in the thermal power plants that use oil shale as the main fuel. Oil shale is used in three Estonian power plants: Eesti Thermal Power Plant, Balti Thermal Power Plant and Sillamäe Thermal Power Plant. The 2016 report of the system operator on the generation adequacy indicates that Eesti Power Plant has an installed capacity of 1,355 MW, Balti Power Plant has an installed capacity of 322 MW and Sillamäe Power Plant has an installed capacity of 16 MW. In addition to the existing energy blocks that utilise oil shale, the completed Auvere Power Plant has a net capacity of 270 MW and can utilise oil shale and biomass (up to 50% of fuel volume). Due to stricter environmental requirements, particularly for air emissions from power plants (sulphur compounds, nitrogen compounds, fine particles, etc.), the older energy blocks that no longer conform to the environmental requirements will be gradually decommissioned from 2016 to 2023, reducing capacity by 501 MW. The remaining dust combustion blocks will be closed down by 2031, leaving two blocks based on the fluid bed technology and Auvere Power Plant, with the total capacity of 700 MW.

The reduction of capacity of the power plants using oil shale will be simultaneous with the development of shale oil production, where efficiency can only be maximised by utilising retort gas as one of the residues of shale oil production and this includes utilisation for electricity generation. The general projected trend in electricity generation is an increasing share of generation capacities based on renewable sources, such as wind and biomass, contingent on decreased cost of the technologies and increased price of CO_2 emission allocations.

Biomass and wind are the primary renewable sources of energy used in Estonia for electricity generation. In 2016, the total capacity of wind turbines connected to the network in Estonia was 375 MW and they generated more than 589 GWh of electricity per year. The total installed capacity of power plants using biomass, biogas and biodegradable municipal waste was 133 MW and they generated approximately 681 GWh of electricity. Taking into account co-firing of biomass in Narva power stations, electricity generated from biomass was 790 GWh in 2016. Estonia has limited potential for utilisation of hydro power due to geographic conditions and solar energy has been used for electricity generation mainly in small-scale solutions.

The potential for co-generation of electricity and heat has been realised in Estonia in the regions with high thermal intensity, but there is still sufficient co-generation potential for establishing co-generation plants based on peat or biomass in smaller settlements or cities. In addition, there is potential for co-generation of electricity and heat in industries with stable heat consumption, such as the cellulose and wood industries. In conclusion, the estimated potential for additional co-generation of electricity and heat is 150 MW, with possible generation of about 500 GWh of electricity. Economic cost-effectiveness is currently the main limiting factor that prevents utilisation of this potential, which is why it will depend on technological development and market conditions. The following table provides a list of existing electricity and heat co-generation plants.

Table 3.1. Heat and electricity co-generation plants in Estonian district heating networks in 2014[26]

Location	Fuel	District heating consumption, GWh	Name of plant	Thermal capacity, MW	Electric capacity, MW
Tallinn	wood chips, peat	1,785	Tallinn TPP	68	24
	natural gas		Iru TPP	190	380
	municipal waste		Iru TPP (waste energy block)	50	17
Tartu	wood chips, peat	456	Tartu TPP	60	25
Pärnu	wood chips, peat	174	Pärnu TPP	46	24
Narva	oil shale	436	Balti TPP, block 11	160	215
Kohtla-Järve; Jõhvi	oil shale, generator gas	294	VKG North TPP; VKG South TPP	70[27]	27[28]
Kiviõli	oil shale, generator gas	34	Kiviõli Keemiatööstuse TPP	20	10 (operational: 4 MW)
Sillamäe	oil shale, natural gas	182	Sillamäe TPP	94	18
Kuressaare	wood chips	66	Kuressaare TPP	9.6	2.4
Paide	wood chips	51	Pogi TPP	8	2
Põlva	natural gas	28	Põlva gas engine	1.25	0.9
Viljandi	natural gas	83	Viljandi gas engine	2	2
Võhma	wood gas	5	Võhma gas engine	0.46	0.2
Rakvere	wood chips	51	Rakvere TPP	4	1
Total		**3,645.52**		**783.31**	**742.5**

Largely due to Estonia's oil-shale-centric electricity generation portfolio (oil shale accounted for 76% of total electricity generated in power plants in 2015), further capacity development has to be carried out in line with the long-term climate and energy targets of the European Union, which require gradual decarbonisation of the energy sector without damaging the country's energy security, competitiveness in the global market or security of supply.

[26] Estonian Development Fund. Kaugkütte energiasääst [Energy efficiency of district heating], 2013. Available at: http://www.energiatalgud.ee/img_auth.php/4/46/Eesti_Arengufond._Kaugk%C3%BCtte_energias%C3%A4%C3%A4st.pdf *(09.10.2014).*

[27] According to VKG, the plants have an electric capacity of 71 MW_{el}. Additional electric capacity of 27 MW_{el} will be added in 2015.

[28] According to VKG, the plants have a thermal capacity of 71 MW_{el}. Additional thermal capacity of 27 MW_{el} will be added in 2015.

3.2.6. Security of electricity supply

Pursuant to the Electricity Market Act, system operator Elering AS is required to submit annual estimates on the total likely demand for usage capacity to the European Commission, the Competition Authority and the Ministry of Economic Affairs and Communications for the next 5 to 15 years. The estimate is based on the estimates of distribution grid operators on the total likely demand for usage capacity in their grids, the projected creation of new transmission capacities and planned or constructed generation capacities, as well as other relevant information.

The Competition Authority may impose an obligation on the system operator to invite tenders for the creation of new production capacities, energy storage devices or energy efficiency/demand-side management measures if, on the basis of the aforementioned report, the capacity reserve of generating installations of the system falls below the capacity reserve established in the grid code as required in order to satisfy the demand for consumption. The system operators finances these activities through the network tariff.

According to Elering's estimate, the total usage capacity of distribution grid operators will be between 1,500 and 1,603 MW in the period 2014-2020, or between 1,650 and 1,763 MW in case of particularly cold winters (see **Figure 3.7**).

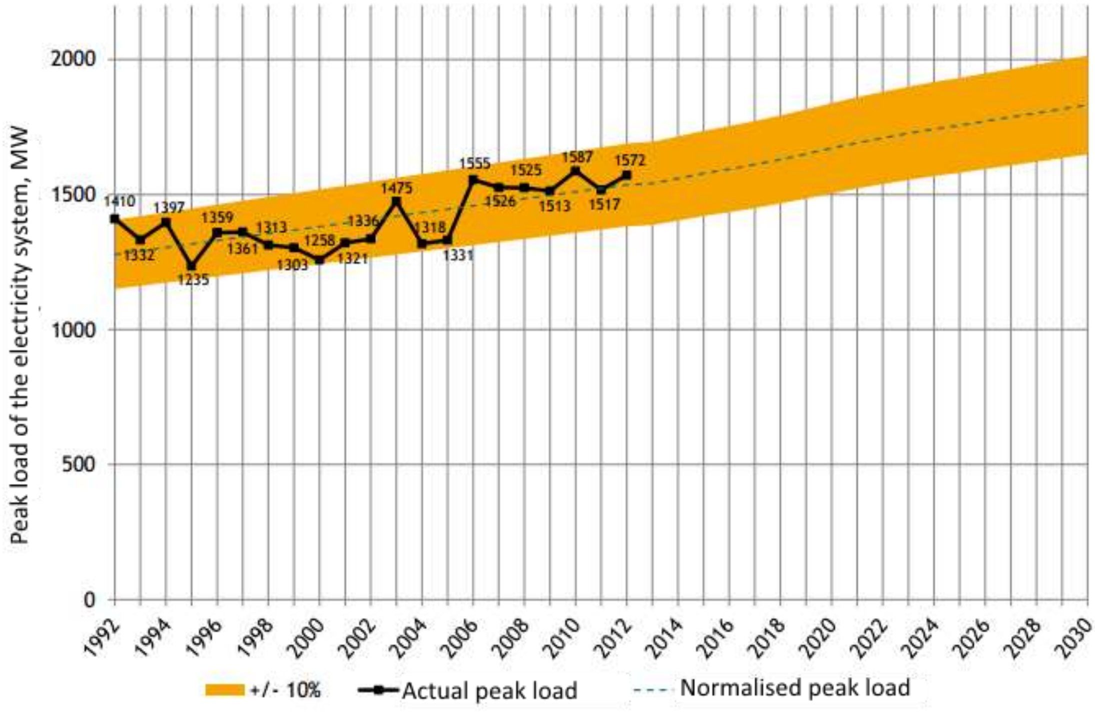

Figure 3.7. Statistics and projection of peak loads until 2030[29]

[29] Elering AS. (06.04.2017).

According to the current Grid Code[30] the system operator shall prepare the estimate of the production reserve, which is required to meet the usage demand, based on the requirement that the sufficiency reserve of the system may not be lower than the daily maximum usage in the system (consumption peak) plus a 10% reserve to ensure supply of electricity in case of unexpected load changes or unscheduled longer generation disruptions. According to the production sufficiency report of electricity transmission system operator Elering, the requirement of the Grid Code for production reserve is currently satisfied in Estonia and will remain so in the near future (at least until 2023). Availability of production capacities is illustrated in the following Figure 3.8.

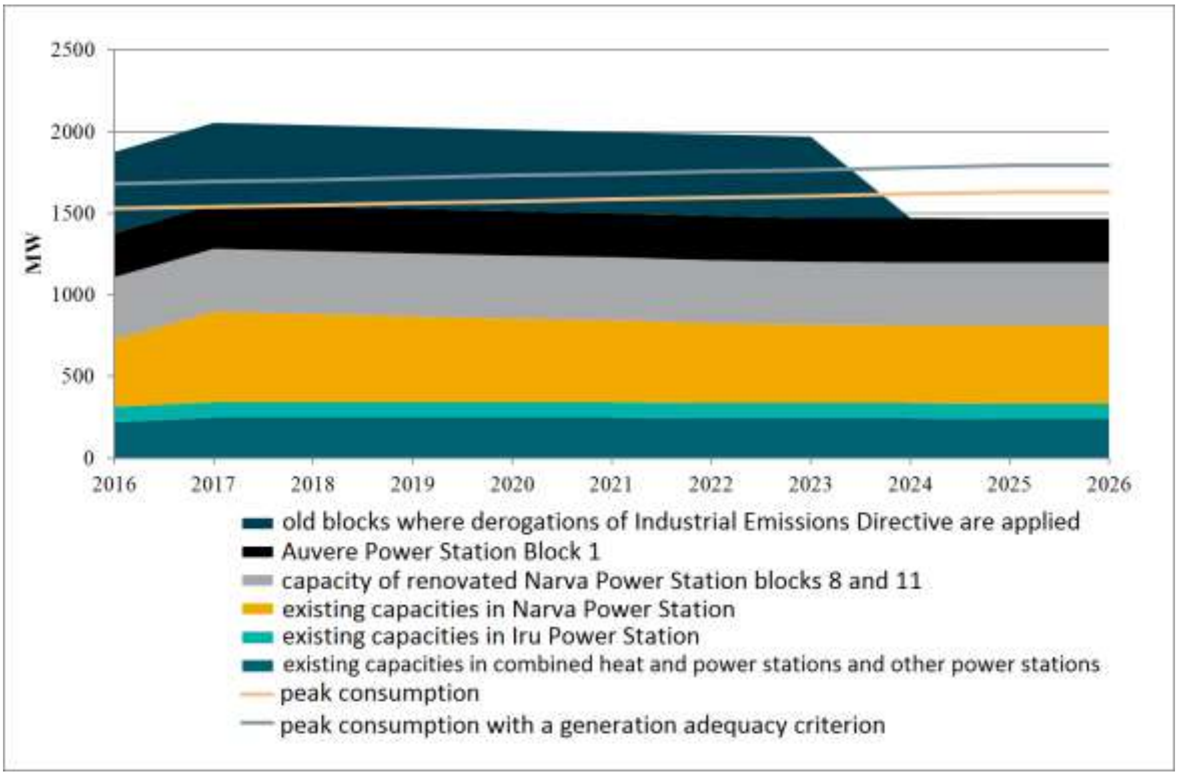

Figure 3.8. Availability of production capacities in Estonia until 2026[31]

However, it should be remembered that the current provision of the Grid Code only refers to domestic generation capacities when it comes to estimating security of supply, without taking into account the additional opportunities arising from the trans-boundary transmission capacities created in recent years.

Elering's security of supply report from 2014[32] also considers the sufficiency of production capacity in the Baltic and Baltic Sea region. The report indicates that the currently known production capacities and transmission lines will be sufficient for N-1-1 peak consumption

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30 Riigi Teataja. Võrgueeskiri [Grid Code]. Available at: https://www.riigiteataja.ee/akt/12831412 (09.10.2014).

31 Elering AS. Eesti elektrisüsteemi tarbimisnõudluse rahuldamiseks vajaliku tootmisvaru hinnang [Estimate of production reserve required for meeting the usage demand in the Estonian electricity system], 2013

32 Elering AS. Eesti elektrisüsteemi varustuskindluse aruanne [Report on security of supply in the Estonian electricity system], 2014.

situations in the Baltic countries at least until 2030. As a result of the import options, the required security of supply reserve will be available in 2030 as well.

The analysis of the electricity generation scenarios prepared for the Development Plan indicates that the current Grid Code requirement of maintaining a 110% production capacity reserve would result in an increased cost for Estonian electricity users after 2024, amounting to 0.6 cents per kWh of consumption. As the Estonian electricity system has been supplemented with trans-boundary transmission capacities through EstLink 1 with a capacity of 350 MW and EstLink 2 with a capacity of 650 MW, these transmission capacities can also be taken into account in security of supply estimates in order to maintain electricity prices at a competitive level. In the future, the security of electricity supply in Estonia must be ensured through a combination of domestic production capacities, which are competitive in the EU internal market, and strong interconnections with the power networks and markets of other EU Member States.

Consequently, it is rational to re-define the requirement for security of supply in a manner that would, in addition to domestic generation capacities, take into account transmission capacities with other EU Member States, assuming that the necessary production capacity exists in the region as a whole. The new definition of security of supply should also include the provision that operational continuity of services of vital importance must be ensured even when the transmission capacity between Member States is lost. Transmission capacities with any third countries will not be taken into account for the purposes of defining the minimum requirement for security of supply.

The power plants and traders located in Estonia must have equal conditions of competition compared to those producers and traders that are located outside of Estonia, including in any third countries.

3.2.7. Transmission of electricity

The primary function of the power network is to deliver electricity from generation sources to consumers. Modern power networks are extremely complex systems and there is strong integration between power networks of different countries. The Estonian power network is divided into the **transmission network** and **distribution grids**.

Estonia's entire transmission network is owned by AS Elering, a 100% government-controlled company. The interconnections with the neighbouring countries are jointly owned by Elering and the respective transmission network operator of the other country.

Estonia's electricity system has interconnections with Russia, Latvia and Finland. The current transmission capacity of Estonia's domestic power network of 110-330 kV is sufficient, guaranteeing required security of supply for consumers in Estonia. Estonia's electricity system operates synchronously with the integrated Russian energy system (IPS/UPS) and has interconnections with Russia and Latvia via 330 kW transmission lines.

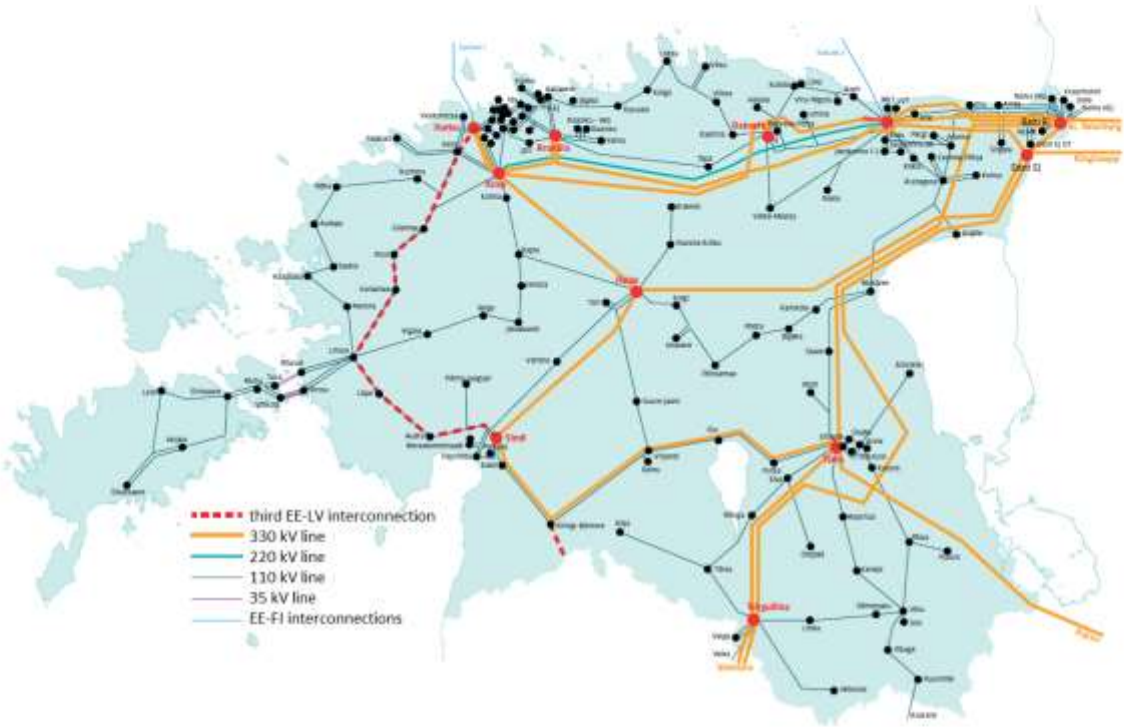

Figure 3.9. Estonian electricity system[33]

The main parts of Estonia's 110-330 kV power network were built from 1955 to 1985 as part of the integrated Russian energy system, designed to meet the demand for electricity in St. Petersburg and Riga by using electricity generated from oil shale in Narva. Subsequently, the cities of Tallinn, Tartu and Pärnu have become the main centres of consumption in Estonia, which has necessitated extension and strengthening of the transmission network in those areas.

The current domestic capacity flows mainly move in the directions of Narva-Tallinn and Narva-Tartu. The Narva-Tartu connection is mainly used for export and transit from Russia to Latvia, Lithuania and Kaliningrad, and currently the connection has sufficient transmission capacity. As Estonia's main load area in Tallinn and Harju county is fed via the Narva-Tallinn transmission network and the domestic load was supplemented with 350 MW load of EstLink 1 in 2007, the 330 kV Balti-Harku overhead transmission line was built in 2006 to ensure sufficient capacity. The 330 kV overhead transmission lines of Eesti AJ-Püssi and Balti AJ-Püssi were renovated in connection with the opening of the EstLink 2 direct current interconnection with Finland in December 2013 and the consequent increased capacity flows in the east-west direction. In order to ensure security of supply in the Tallinn and Harju region, where loads are expected to increase, Aruküla substation was renovated and converted from 220 kV to 330 kV in 2012. Tartu-Viljandi-Sindi 330 kV line is currently being built to increase security of supply to the load regions of Pärnu and Tartu and construction of a 330 kV Harku-Lihula-Sindi line will be completed in 2020. After completion of those lines, the entire mainland of Estonia will be covered with a strong 330

[33] Elering AS. 2014.

kW network and the Pärnu consumption region in particular will have a better connection to the electricity transmission system. Combined with the Kilingi-Nõmme-Riga line, the 330 kV overhead transmission line of Harku-Lihula-Sindi constitutes the third interconnection between Estonia and Latvia, and a decision has been made to allocate EU resources for constructing it by 2020.

Estonian system operator Elering AS also owns the emergency reserve power plant in Kiisa, commissioned in 2014, with a nominal capacity of 250 MW, which can be put into operation for a short term in case of failures in the transmission system to enable the system operator to meet its obligations.

The long-term goal of the Estonian system operator is to achieve greater independence from the Russian Integrated Energy System and to synchronise the electricity system in Estonia (and other Baltic countries) with the Nordic or Continental Europe synchronous grid.

During the period covered in this Development Plan, Estonia's electricity transmission system will be reoriented from the former east-west flows to north-south flows. This process will be supported by the planned new interconnections between the Baltic countries and Central and Eastern Europe and Nordic countries, improving Estonia's connections with Central Europe and the Nordic countries. From 2016, the transmission capacity between the Baltic countries and Central Europe is 500 MW (LitPolLink 1) and the capacity between the Baltic and Nordic countries should be 1,700 MW (in addition to Estlink 1 and 2, the 700 MW NordBalt interconnection between Lithuania and Sweden was completed at the end of 2015). The shortage of transmission capacity between Estonia and Latvia will be eliminated by 2019 after completion of the third trans-boundary transmission line. **Strong integration of the Baltic power networks will make it possible to disconnect the Baltic electricity system from the North-East Russia synchronous grid and synchronise it with the Continental Europe or Nordic synchronous grid over the period 2025-2030.** Investments in the development of the electricity transmission system in Estonia should support achievement of this goal.

In terms of domestic usage load, the Estonian 110 kV generally meets the needs of consumers, but continued efforts are required to renovate ageing lines and to optimise the positioning of substation and load centres. **Bringing the transmission network to all Estonian counties is important** for ensuring regional balance.

Greater coordination with country-wide plans and regional policy objectives should be achieved in the development of electricity transmission and distribution networks. Development and construction of power networks should contribute to Estonia's regional development and stimulation of entrepreneurship in rural areas by **improving availability of consumption capacities in the industrial regions specified in comprehensive plans and by making needs-based connection concessions to those consumers and producers of electricity that are important for Estonian economy**.

3.2.8. Electricity distribution grids

Estonia has a total of 65,700 km of low and medium voltage lines, which are owned by distribution grid operators. In 2015, the largest distribution grid operators in Estonia had the following market shares**:**

- Elektrilevi OÜ 87.2%;
- VKG Elektrivõrk OÜ 2.7%;
- Imatra Elekter AS 2.7%;
- TS Energia OÜ 1%.[34]

The combined market share of the listed four distribution grid operators is **93.6%.**

The main challenges associated with distribution grids include reducing the number of failures and weather-proofing the grids. In 2016, 35% of the faults in the grid of Elektrilevi OÜ were caused by weather conditions and 44% were caused by the age of the grid.

In 2016, weather-proof medium voltage grids constituted approximately 37% of all distribution grids. **By 2030, the optimum share of weather-proof grids would be approximately 75-80% of all distribution grids.** The emphasis on regional density of supply should be brought into a sharper focus in the context of developing the distribution grids, as it has the largest potential for damage in case of interruptions. **Considering the geographic placement and density of population in Estonia (densely populate and low-density areas, etc.) and the need to reduce the pressure to increase network charges, it is rational to differentiate the required target reliability values (SAIFI, SAIDI, CAIDI) of distribution grids depending on consumption density and potential interruption damage.**

For instance, in 2016, the grid of Elektrilevi included roughly 57,000 consumption points (i.e., 9% of all consumption points), where annual consumption was at a very low level (less than 50 kWh annualy) or there was no consumption at all. The current structure of network charges, which comprises mainly the variable component, does not motivate consumers to bring their contractual consumption conditions in line with their actual needs or to consider relinquishing the network connection if they do not use it. **For the purposes of better planning of networks, in line with the actual needs of consumers, it is rational to apply a fixed cost component, which would depend on the connection capacity of a consumption point or transmission capacity of a grid connection,** incl. apply a charge for using the grid connection to all persons who benefit from the network service.

An additional challenge for distribution grids is created by the increasing number of distributed and micro generations in distribution grids, which creates an increasing need to consider them in the planning and development of grids and to increase the number of smart grid solutions. In order to facilitate development of distributed and micro generation, distribution grids should be provided with technical solutions that enable generators to operate without being disconnected from the grid, particularly in regions where development of distribution grids is impractical due to low or seasonal consumption.

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[34] Competition Authority (04.04.2017).

3.3. Heating sector

3.3.1. Vision for the Estonian heating sector in 2050

The political choices and measures implemented in the heating sector should be based on the goal of long-term sustainability of the heating sector without the need of additional investment or activity support beyond regular economic activities. Heat will be produced mainly from local and renewable fuels and fuel-free energy sources. Due to the energy efficiency investments in buildings and higher efficiency of heat production, the use of fuels for heat production will decrease more than 40% by 2050 compared to 2012 level.

Considering the background of developing local heating solutions and construction standards, that foresee buildings able to generate energy for their own consumption in a certain period of the year, the district heating sector has to adapt to the changes and move closer to wider application of free-market principles in a long term. Monitoring should support the developments in the heating sector, taking into account the challenges facing the sector. District heating regulation should not prevent cost-effective solutions from competing with district heating. The increasing importance of local heat supply will lead to consumers' initiative to establish energy associations for production of heat and electricity to meet their needs. Regulation should establish the preconditions for efficient production of heat and electricity for self-consumption, while providing for an opportunity to sell any surplus or to cover any shortage from the public network.

The heat used by households in 2050 will be produced from local fuels, using the best possible technology. Estonia will be covered by a supply network for upgraded fuels (pellets, briquettes), combined with market-driven financial instruments for regular upgrading of local heating solutions.

The residual heat generated in the industrial sector, incl. the energy sector, data storage facilities, etc., will be utilised to reduce consumption of primary energy by implementing heat accumulation technologies, which enable the heat to be supplied to district heating networks and/or to local consumers.

3.3.2. Consumption of heat in Estonia

Heat is used primarily for regulating the interior temperature of buildings or as an input for running industrial technological processes. **According to data from 2012, the amount of thermal energy used in Estonia was 16 TWh, of which 45% was transmitted to users via district heating or local central heating, 40% was produced and used locally by users and 15% was used for heating buildings in the industrial sector.**

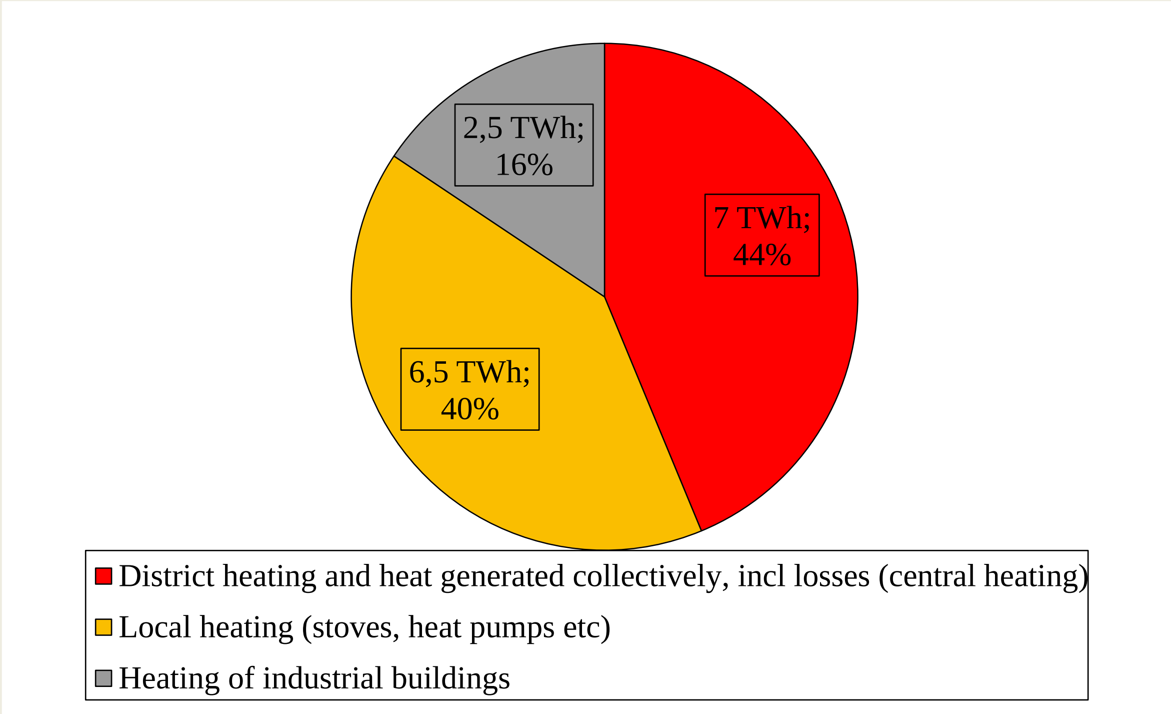

Figure 3.10. Consumption of heat by heating types in 2012[35]

A large part of heat production is based on natural gas and wood fuels, while heat produced from oil shale is important in some regions, particularly in Ida-Viru county where it is a by-product of the industrial oil shale complexes. The share of wood fuels has been on an upward curve in recent years. Wood fuels (firewood, pellets) are increasingly used for heat production by households, in addition to natural gas and, to a limited extent, liquid fuels (fuel oils), and this trend continues. Utilisation of wood biomass, which is suitable for use for the purposes of energy production, is not restricted by lack of available resources (according to the Forestry Development Plan until 2020, the annual prescribed cut volume is 12-15 million m^3 and 9 million m^3 of this can be used for energy production, which would correspond to about 18 TWh), but by the decreased energy consumption in the sectors where wood is the main source of energy, incl. the housing industry, as a result of implemented energy efficiency measures.

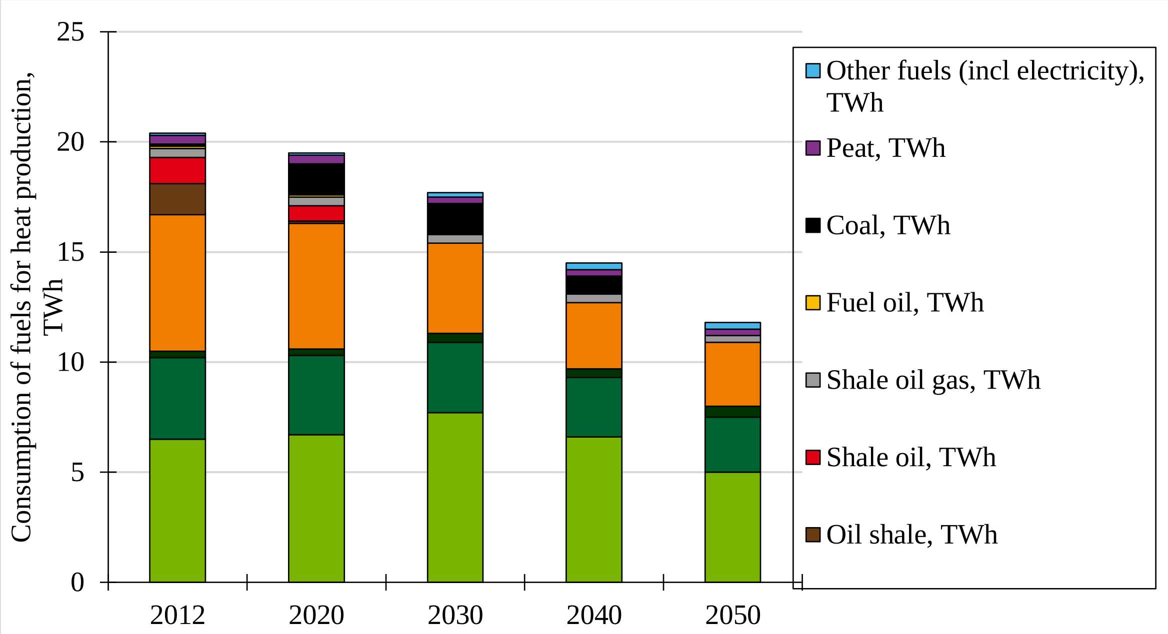

Figure 3.11. Use of fuels for heat production – aggregate projection[35]

3.3.3. District heating

The *National Development Plan of the Energy Sector until 2020* identified upgrades to existing production installations and reduced fragmentation in the district heating price monitoring as the key issues in the district heating sector. Wider utilisation of co-generation of electricity and heat and diversification of production portfolio were established as separate targets. The support measures adopted to achieve those targets have resulted in increased replacement of old boiler installations with new, more efficient systems. Boilers using shale oil are extensively replaced with equipment that uses more affordable biomass. Nevertheless, the number of heating plants that use shale oil for heat production remains relatively large.

Estonia had 215 municipalities in 2014 and district heating was used in 149 of them. There were 239 district heating network areas. As of the beginning year 2017, the Competition Authority had data on 145 district heating network areas, where the length district heat piping was 1455 km.

According to the analyses prepared by the Ministry of Economic Affairs and Communications and the Estonian Development Fund, the following factors inhibited or had a significant impact on the development of the district heating market:

1) Lack of motivation for identifying cost-effective district heating solutions and for internal efficiency increase. The price regulation applied to district heating does not motivate producers to look for solutions for lowering district heating prices. The investments that facilitate reduction of the price of heat for end users are not reflected

[35] Estonian Development Fund. 2014. Aruanne energiamajanduse arengukava soojusmajanduse tegevuskava koostamisest [Report on the preparation of the Heating Sector Action Plan of the Development Plan of the Energy Sector]. Available at: http://www.energiatalgud.ee/img_auth.php/a/ab/ENMAK_2030._Soojusmajanduse_stsenaariumite_aruanne.pdf (15.10.2014)

in improved financial results of the companies; the achieved effect is fully transferred to users.

2) Unstable regulatory environment does not promote long-term investment. The price regulation criteria, specified in the methodologies of the Competition Authority, are very strict and are subject to frequent amendment.
3) Business operators and the Competition Authority both have doubts about the sustainability of some district heating regions.
4) Addition of parallel production, or local production installations, reduces the long-term efficiency of the district heating network.

In order to reduce the listed weaknesses, the Government of the Republic proposed amendments to the District Heating Act[36], which were submitted to the Riigikogu on 13 June 2016.

The envisaged amendments in the District Heating Act would provide heat producers with regulatory guarantees and additional motivation, which is required for increasing the use of renewable sources and peat while reducing the use of more expensive fossil fuels (such as shale oil or natural gas).

In order to adapt to the changes in the housing sector (implementation of energy efficiency measures, adoption of new building standards), the government has to make steps towards liberalisation of the previously monopolistic district heating market. Consumers should be provided with efficient and cost-effective heating solutions, while motivating business operators to implement cost-effective solutions that would be competitive in the long term.

3.3.3.1. Price of district heating

Estonia's district heating market is regulated by the District Heating Act and the Competition Act; the maximum prices charged in network regions have to be approved by the Competition Authority. The average maximum prices in district heating regions, as approved by the Competition Authority, are shown in **Figure 11**. In April 2017, the **weighted average price** in district heating regions was **60.7 €/MWh**[37] (incl. VAT). In smaller network regions (with annual sales volume below 10 GWh), the average price of heat in 2017 was 72.3 €/MWh (incl. VAT)[38]. It can be assumed, based on the increasing prices of energy carriers and decreasing consumption levels, that the price of district heating will increase in the coming period. However, the increase can be mitigated by replacing boiler installations with others using a cheaper fuel and by implementing energy efficiency measures at end users. For instance, the price of heat in a network region with a boiler installation that uses shale oil would be 96 €/MWh (incl. VAT) if the oil shale price is at 60 €/MWh, but it would not

[36] SE 264, https://www.riigikogu.ee/tegevus/eelnoud/eelnou/f3be6f3f-1b97-44ff-8d8f-41d9a909b3a3

[37] Summary of the analysis by the Ministry of Economic Affairs and Communications, https://www.mkm.ee/sites/default/files/soojusmajanduse_analuus_mkm_2013.pdf

[38] Competition Authority (4.04.2017)

exceed 75 €/MWh[37] (incl. VAT) if the installation used solid biofuel or peat priced at 15.6-21.6 €/MWh.

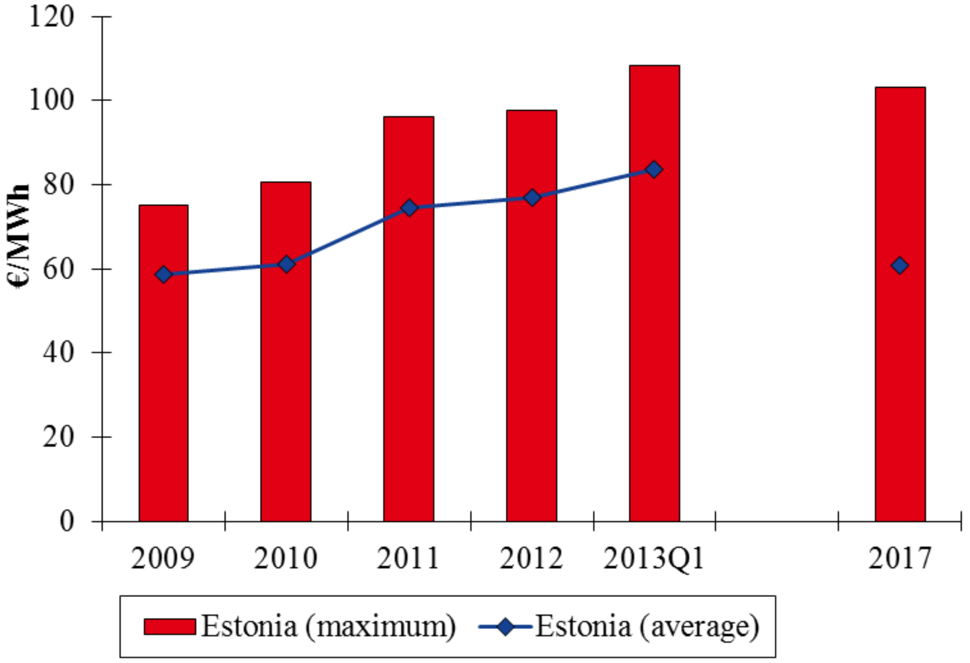

Figure 3.12. Average and highest maximum prices of thermal energy for end users as approved by the Competition Authority (incl. VAT)[39]

The increasing price of energy carriers increases the demand for more efficient production and distribution of district heat and for wider implementation of energy efficiency measures at the users' locations. Heating operators will need to continue working to maintain a competitive level of the district heating price in accordance with amended regulations.

3.3.3.2. Use and production of district heat

Estonia has a relatively large number of district heating regions, with most of them being small network regions (see **Figure 3.13**).

[39] Competition Authority (4.04.2017)

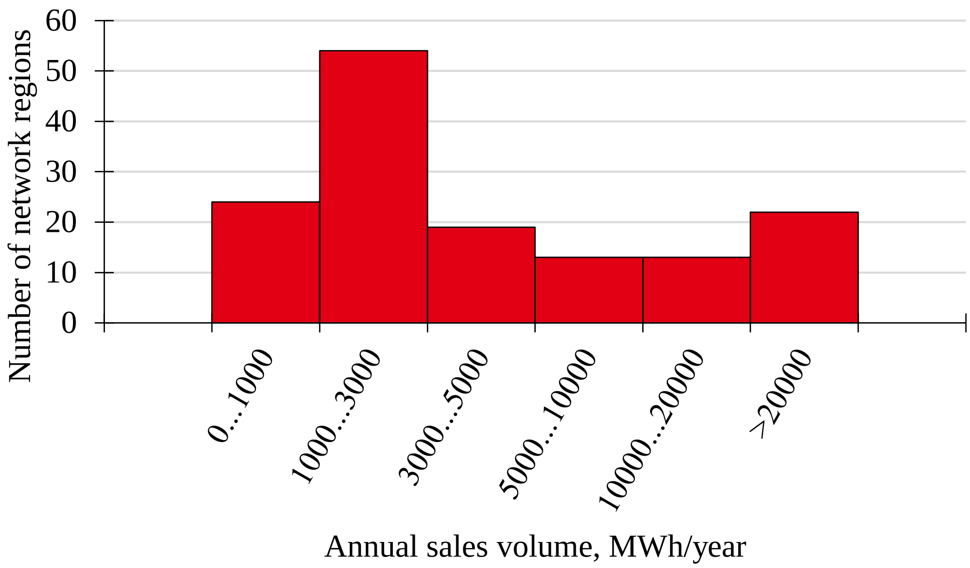

Figure 3.13. Breakdown of annual sales volumes between district heating network regions[40]

According to estimates, dwellings connected to a district heating network constitute 60% of the entire housing stock. District heating has certain advantages over local heating solutions, but district heating is not necessarily the best solution for small and low-density settlements. Consequently, low-density regions have to consider whether it would be reasonable to replace a part of district heating with local heating or even to stop using district heating.

The upgrading of the housing stock and increased efficiency of heat consumption can be expected to result in up to 30% reduction of the district heating sale volume by 2030, which means that district heat sales would decrease by 1.4 TWh by 2030 compared to 2010. In a longer term, the decrease in the use of district heat can be expected to be up to 62% in 2050 compared to 2010. This decrease in consumption requires a response by the district heating operators as well.

Local governments, having access the best knowledge about the future prospects of a region, have to be more involved through local heating sector audits or preparation of development plans in order to determine actual attainable energy savings and the associated investment levels, including investments in district heating systems. The goal should be adoption of financially justifiable solutions, taking into account the development prospects of the entire district heating network region. Greater utilisation of residual heat from the industrial sector and ground heat from the mines in district heating should be considered as an important aspect.

[40] Competition Authority (4.04.2017)

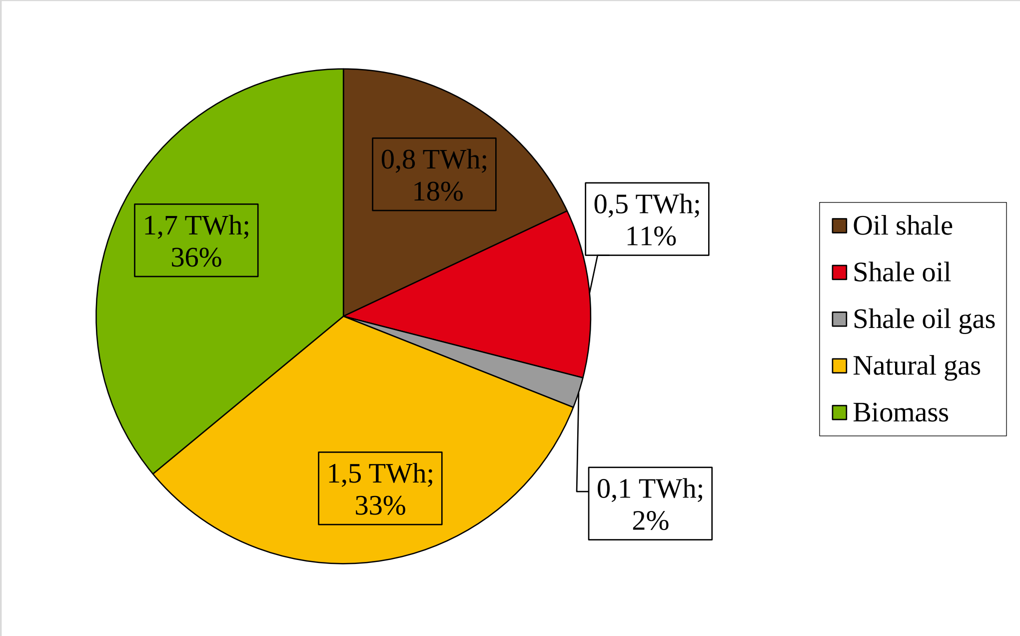

Figure 3.14. Consumption of district heat by fuel types in 2011[41]

Having been introduced in 2007, the support mechanism for generation of electricity in co-generation and from renewable sources has been used to build the Tallinn Power Plant (67 MW_{th}, 2009), Tartu Power Plant (65 MW_{th}, 2009), Pärnu Power Plant (50 MW_{th}, 2011), Kuressaare Power Plant (9.6 MW_{th}, 2013), Paide Power Plant (8.0 MW_{th}, 2014) and several smaller co-generation plants.

The near future of the district heating sector will be affected by dropping sales volumes due to increased energy efficiency awareness of consumers and greater competitiveness of local heating installations. The associated energy and financial savings considerations will lead to increased replacement of inefficient small boiler plants that use an expensive fuel by local heating equipment. The upgrading of production plants will also result in greater efficiency of production, or fuel use, which has been deteriorating in recent times due to over-dimensioned boiler plants and decreasing consumption volumes.

Heating operators have to make consistent efforts for efficient and cost-effective production of heat in order to provide users with a competitive final price. Construction of more affordable production solutions should also be supported by district heating regulation.

3.3.3.3. Distribution of district heat

Efficient distribution of the heat produced in district heating plants plays a key role when district heating is to retain its competitive advantage over local heating. Inefficient

[41] Ministry of Economic Affairs and Communications. Eesti soojusmajanduse analüüsi kokkuvõte [Summary of the analysis of Estonian heating sector], 2013. Available at: http://www.energiatalgud.ee/img_auth.php/9/91/MKM_Eesti_soojusmajanduse_anal%C3%BC%C3%BCsi_2013.pdf (5.04.2017).

distribution of heat increases the price of district heating for end users. Pipeline losses in the district heating network regions have decreased significantly; in 2013, the weighted average pipeline loss was 17.3%[42]. Smaller network regions (sales volume under 10 GWh) have higher relative pipeline losses due to low consumption density.

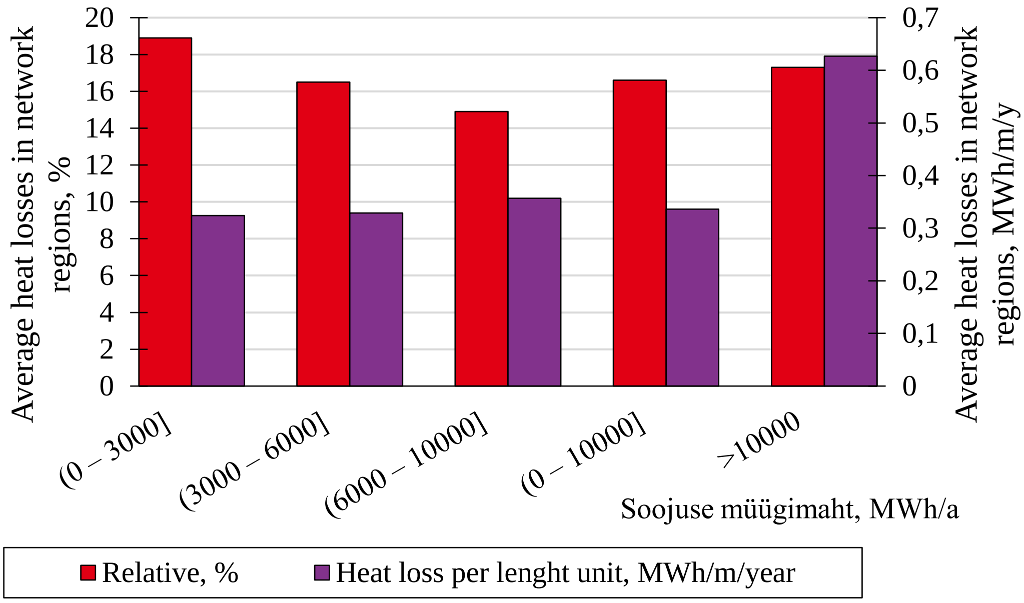

Figure 3.15. Weighted average heat losses from pipelines in 2013[42]

In order to preserve the competitive advantage of district heating over local heating, more investments are required in renovation of heating pipelines, particularly in small network regions (annual sales volume less than 10 GWh).

Increasing the efficiency of district heat distribution remains a priority for the government and heating operators. For this purpose, the government has allocated investment support from the cohesion policy funds for renovation of heating pipelines in the period 2014-2020.

3.3.4. Local heat supply

Local heat supply is the second popular option for production and consumption of heat (see Figure 3.8). Biofuels constitute the majority of fuel used in local heating, but the use of fossil fuels is common as well.

The prices of light fuel oil are bound to volatile global oil prices, which is why boiler installations based on fuel oil are increasingly replaced with plants that use local fuels with a more stable price level (firewood, pellets, peat briquettes).

[42] Competition Authority. Riikliku regulatsiooni otstarbekusest väikestes kaugkütte võrgupiirkondades [*On feasibility of public regulation in small district heating network regions*], 2013

Utilisation of various heat pumps and solar collectors has gradually increased over the years in parallel to district heating due to technological development and decreasing prices of equipment.

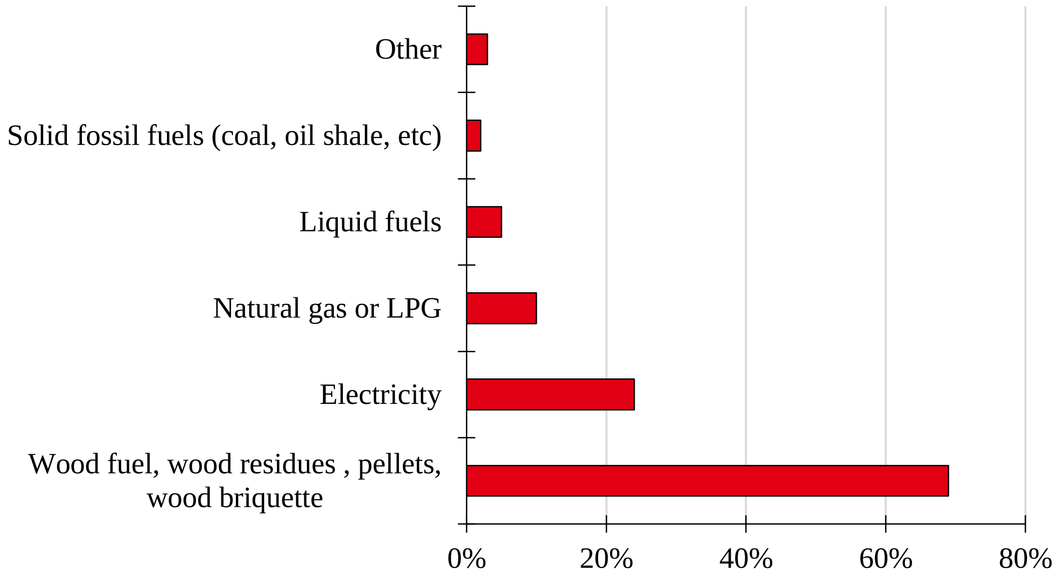

Figure 3.16. Fuels used in residential heat supply[43]

Simple calculations can often create the impression that local heating is significantly more affordable than district heating. Even though the use of local heating enables producers to forego some price components (wages, operating margin), the use of local heat supply systems is not automatically a more reasonable and financially more advantageous solution. Local heating used in urban regions creates air pollution, with fine particulate matter ($PM_{2.5}$, atmospheric particulate matter with diameter <2.5 μm) being particularly problematic. Fine particulate matter has a significant health impact and the energy sector, especially local heating is one of the major sources of fine particles (in addition to transport).

The role of local heating in final heat consumption will gradually increase in the future, forcing inefficient district heating regions to become more efficient.

Consumers are motivated to replace inefficient heating networks with energy communities to meet the heating and electricity needs of their members in an efficient manner. It would be reasonable for new energy communities to take advantage of existing infrastructure, which can be used to create local heating and electricity networks of energy communities. Regulations should be amended to create the necessary conditions for production, transmission and sale of heat and electricity generated by energy communities.

[43] Statistics Estonia. 2013. Leibkondade energiatarbimise uuring [Household energy consumption survey]. Available at: http://www.energiatalgud.ee/img_auth.php/9/93/Leibkondade_energiatarbimine_2012.pdf (15.10.2014)

3.4. Housing sector

Estonia's housing and energy sectors are very closely connected, as the energy demand of buildings constitutes a large share of Estonian energy balance. Household consumption constitutes over 40% of final energy consumption in Estonia, with the largest share consumed by buildings. Buildings, especially residential buildings, have a significant potential for energy savings. The high consumption level in buildings increases housing expenses and affects the economic situation of households.

The government needs to adopt a holistic approach to developing the housing sector. Based on the actions specified in the *Development Plan of the Energy Sector until 2030* and mapped in the underlying study,[44] the energy consumption in the housing sector is only one of the issues to be addressed and further measures are required to promote the development of the sector. In order to meet the established targets, it is essential to facilitate cooperation between the central government, municipalities, businesses and individuals. The Ministry of Economic Affairs and Communications implements the long-term strategy for the construction and housing sector by focusing on the knowledge-based approach highlighted in the housing stock development scenarios[45].

3.4.1. Vision for the development of the housing sector from the energy perspective until 2050

By year 2050, one third of Estonia's housing stock will conform to the energy efficiency rating for nearly zero-energy buildings and to the applicable standards for the indoor climate of buildings. An enjoyable, high-quality, energy efficient and integrated living environment will be ensured.

3.4.2. Main development needs and targets in the housing sector

Estonia is currently facing, or will face in the coming years, a number of challenges in the housing sector, which should be resolved with the help of this development plan.

The existing housing stock is characterised by high energy intensity and the indoor climate is often not up to standard. Renovation of the housing stock can reduce the heating demand of buildings by up to 50%, which would also reduce the volume of fossil fuel imports and the level of CO_2 emissions; it would improve the quality of the living environment and reduce the maintenance costs of the housing stock. It is important to modernise heating and ventilation systems and to ensure that healthy and environmentally sound construction and finishing materials are used to make sure that energy savings are not achieved at the expense of the indoor climate. The energy efficiency target for buildings can only be met by raising

[44] Arjakas P., Kurnitski J., 2014 Hoonestuse (elamumajanduse) valdkonna arengukava 2030+ lähteolukorra analüüs [Analysis of the baseline situation in the building (housing) development plan 2030+].
[45] http://www.energiatalgud.ee/index.php?title=ENMAK_2030._Hoonefondi_stsenaariumid [Scenarios for the housing stock]

the professional qualifications of the experts in the field, updating the training curricula in construction, and increasing the number of people receiving training.

Labour mobility needs to be facilitated to support the development of different regions in Estonia. Availability of energy efficient housing can be one measure that supports labour mobility in Estonia. In many cases, buying an energy efficient private residence is not reasonable, or it can simply be too expensive for many people. Housing availability has been a crucial issue throughout history. It mainly affects young people who have recently entered both labour and housing markets, while often earning only low income. Shortage and relative expensiveness of high-quality housing inhibits labour mobility. The common, and more dynamic, alternative is renting a dwelling instead of becoming an owner, which would restrict a person's freedom of movement and impose long-term obligations.

Currently, Estonia does not have a single and established policy on integrating technical, social, environmental and economic aspects in the development of residential areas and urban spaces to improve the quality of the housing environment, which is why the developments in the sector have been chaotic and have facilitated increased energy consumption. Energy consumption and impact can only be estimated after development of a respective methodology, which should be easily accessible, simple to understand and use. Energy consumption can also be guided and influenced through methodical assistance.

3.4.2.1. Reducing energy intensity of the housing stock (both existing and new buildings)

Improvement of energy efficiency of apartment buildings through integrated renovation is one of the most urgent investment needs in the housing sector. The 2010 energy consumption in buildings with controlled indoor climate amounted to 16.6 TWh, incl. 4.6 TWh of electricity and 12 TWh of heat. The largest share of this energy is consumed by households – a total of 11.8 TWh in 2010. As shown in Figure 3.17, the average residential energy consumption per square meter is higher in Estonia than in the European Union. The respective Estonian indicator is approximately 180 kWh/m^2 per year, while the EU average is 130 kWh/m^2 per year.

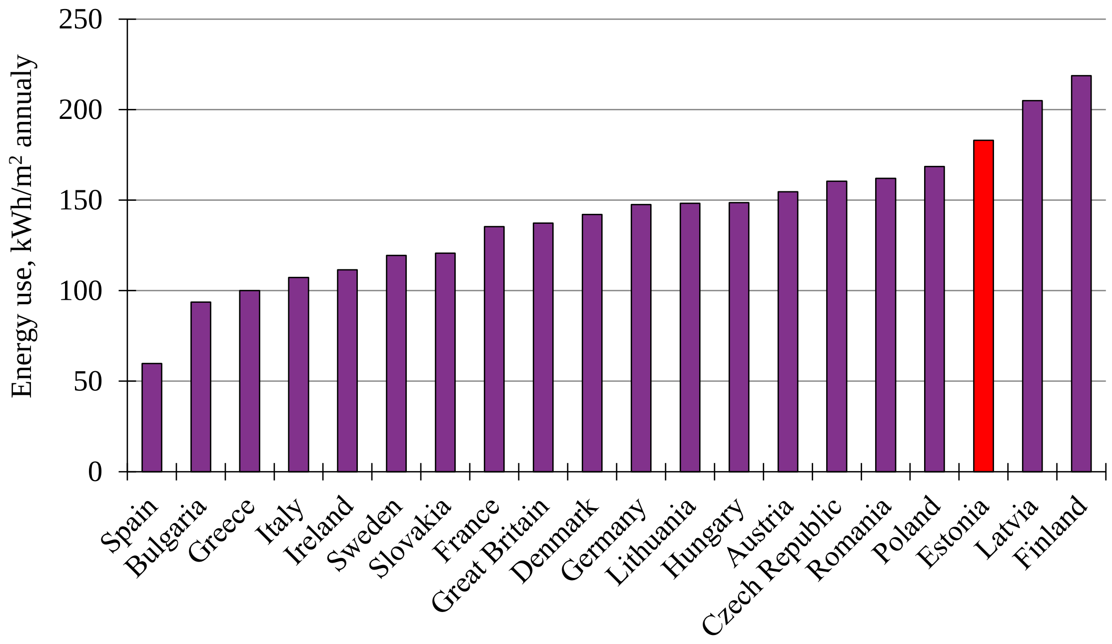

Figure 3.17. Average household energy consumption in selected EU Member States in 2010 (kWh/m^2 per year)[46]

However, this does not necessarily mean that residential energy consumption is unreasonably high in Estonia. If we adjust the EU average to take into account different climate conditions and compare such normalised average household consumptions, we can see that residential buildings have better energy efficiency than in Estonia only in seven EU Member States.

Renovation of the housing stock can reduce the heating demand of buildings by up to 50%, which would reduce the volume of fossil fuel imports and the level of CO_2 emissions. At the same time, it is possible to improve the quality of the living environment and reduce the maintenance costs of the housing stock.

Consequently, improvement of energy efficiency through integrated renovation continues to be one of the most urgent investment needs in the housing sector. In the period 2010-2014, SA KredEx provided renovation grants to help renovate 1.9m m² of residential area[47], but this only constituted about 10% of the potential target market of renovation. However, the annual renovation volume that would be required to meet the European 20-20-20 targets (specifically the target of Directive 2012/27/EU) would be between 700,000 and 1,000,000 m². This level can only be achieved by continuing the public grant scheme and allocating additional resources to this effort on top of the EU Structural Funds.

[46] http://www.indicators.odyssee-mure.eu/energy-indicators/household-heating-consumption.html (22.10.2014)
[47] http://www.kredex.ee/kredexist/uudised/rekonstrueerimistoetuse-abil-saavutasid-majad-aastas-45-mln-eurose-kokkuhoiu/ (10.07.2017)

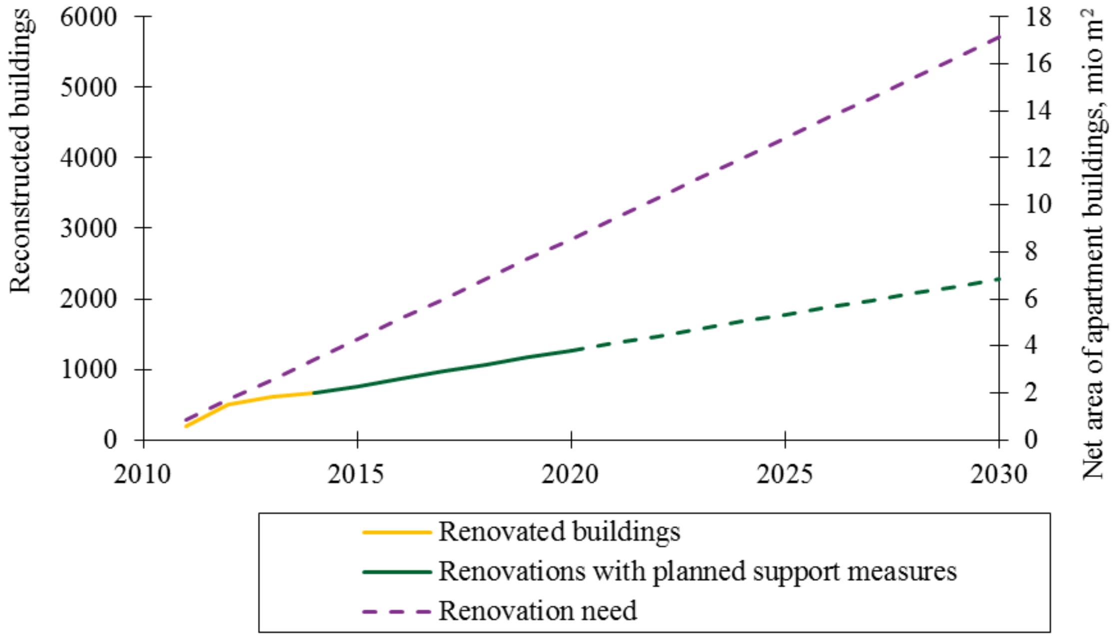

Figure 3.18. Scope of renovation of apartment buildings[48, 49]

The analyses performed during the preparation of the NDPES 2030 indicated that, in a comparison of three scenarios for the housing stock, taking also into account potential energy savings and direct tax revenue from the construction procurements for renovation, the most profitable scenario in terms of total cost would be the so-called 'knowledge-based risk scenario'. To reach the annual renovation levels required for meeting the 20-20-20 targets (Figure 3.18), some 330m € from building owners or other sources of financing should be invested in the housing stock in each year. Calculations indicate that 32% of the total investment in the renovation of the housing stock would be paid to the state in taxes within the same financial year. If the total value of annual construction procurements for renovation would be 330m € and the state grants or equivalent measures would cover 30% of this amount – assuming that owners themselves invest the remaining 70% (i.e., 230m €/y) – the state's tax revenue would be comparable to the amount of grant allocations. In addition, total investments of this magnitude would result in the creation of an estimated 5,600 new jobs. Consequently, the knowledge-based risk scenario would boost economic growth, while improving the indoor climate of buildings and reducing household energy expenses.

A special approach should be adopted in case of monuments, residential buildings located in heritage conservation areas or areas of cultural and environmental value, because cultural heritage or milieu requirements prevent, for instance, installation of additional insulation on

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[48] SA Kredex. 2014. Korterelamute renoveerimisturu ülevaade ja perioodi 2010-2014 korterelamute rekonstrueerimistoetuse mõju analüüs [Overview of the apartment building renovation market and impact analysis of the apartment building renovation grants 2010 to 2014]. http://www.energiatalgud.ee/img_auth.php/2/21/Kredex._Korterelamute_anal%C3%BC%C3%BCs_2010-2014.pdf (20.10.2014)
[49] Kurnitski, J. 2014. ENMAK 2030 elamumajanduse valdkonna stsenaariumite aruanne [Report on the scenarios for the housing sector in NDPES 2030]. Available at: http://www.energiatalgud.ee/img_auth.php/8/8b/ENMAK_2030._Elamumajanduse_valdkonna_stsenaariumite_aruanne.pdf (20.10.2014).

exterior walls of such buildings. The energy efficiency of these buildings should be improved while preserving their cultural value. This can be achieved by developing guidelines on increasing energy efficiency of buildings of cultural value.

3.4.2.2. *Improving the indoor climate of buildings*

As people spend almost 80% of their time indoors, it is very important to modernise heating and ventilation systems and to ensure that healthy and environmentally sound construction and finishing materials are used to make sure that energy savings are not achieved at the expense of the indoor climate. The indoor climate consists of physical (temperature, humidity, speed of movement, purity), chemical and biological air characteristics, which must be at appropriate healthiness levels for long-term occupancy of rooms and meet the criteria specified in EVS-EN 15251. Unfortunately, unauthorised or incorrect renovation techniques have impaired the designed ventilation systems in many buildings. Insufficient ventilation leads to unhealthy indoor climate in many rooms, causing a decrease in public health levels and in the number of healthy life years.

The energy efficiency and interior climate targets for buildings can only be met by **raising the professional qualifications of the experts** in the field, **updating the training curricula** in construction, and **increasing the number of people receiving training**. Currently, neither customers nor providers have the required knowledge and qualifications (in terms of professional activities) and, as a result, they make incorrect decisions from the perspective of sustainability of residential buildings and often use materials of low quality or hire workers with inadequate qualifications. In order to solve the aforementioned problems, the implementation measures of the NDPES 2030 also include relevant training activities.

3.4.2.3. *Promoting construction of high-quality and energy efficient new buildings*

The volume of residential construction in the past couple of decades has been significantly below the average level of the preceding period, 1950-1990 (Figure 3.19), whereas the buildings that were built nearly 50 years ago are approaching the end of their original design life. Consequently, we need to create preconditions for integrated and economically efficient modernisation of the buildings that are in the final stage of their design life, as well as for promoting new construction. Energy savings and improvement of the indoor climate depend on the scope and level of renovation of the housing stock, as well as the stringency of the requirements applicable to new buildings. However, in addition to establishing stricter legal regulations for new buildings, the state should also act as a role model in implementing them and, if possible, adopt additional measures to promote achievement of the desired goals.

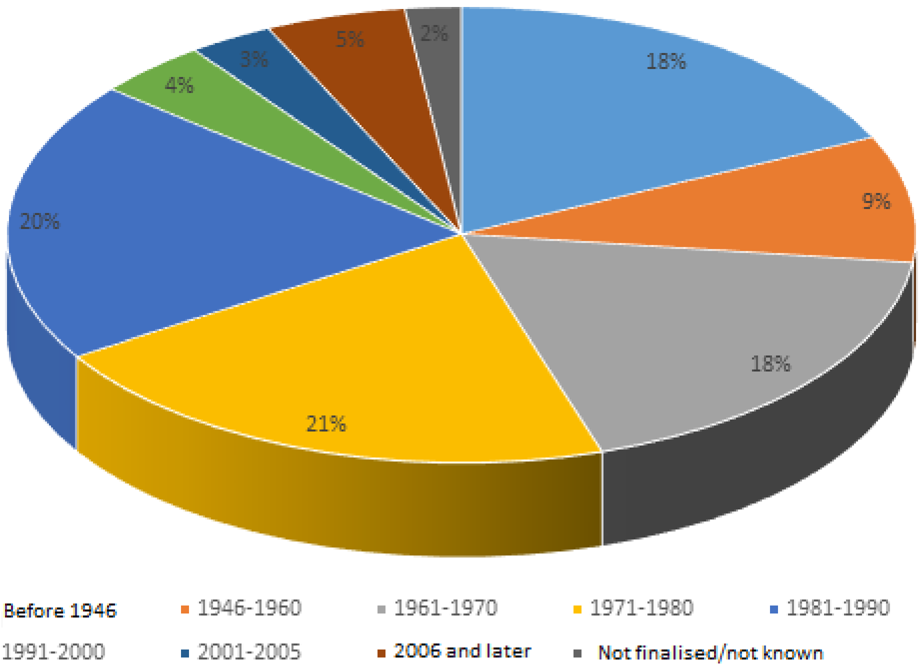


Figure 3.19. Breakdown of the housing stock by age[50]

The underlying studies of the NDPES 2030 indicate a great technical potential for energy savings from heating – 9.3 TWh/y, which is about 80% of the current heat consumption of the housing stock. The most influential input criteria in the selection of the scenarios for the housing sector include the potential energy savings achievable by integrated renovation of the existing housing stock, the improvement of the indoor climate, and the energy savings achievable in the construction of new buildings. To ensure sustainability of the housing stock in the coming decades, energy efficiency investments in existing buildings need to be supplemented by increased promotion of new construction. To achieve energy savings in this context, it is important to use both regulations as well as feasible support measures to stimulate implementation of the regulations in practice.

The theoretically sufficient housing stock renewal rate would be 1% of new buildings and up to 2% of renovations per year, but those levels have not been achieved in the past ten years. The number of new construction projects depends on the banks’ lending policy and global economy, but the average annual share has been around 0.5% of the housing stock in the past ten years. The majority of residential property projects are developed for sale and most of the investments are made in the regions of Tallinn and Tartu, which inhibits the development of smaller regional centres (Figure 3.20).

[50] Ministry of Economic Affairs and Communications 2016

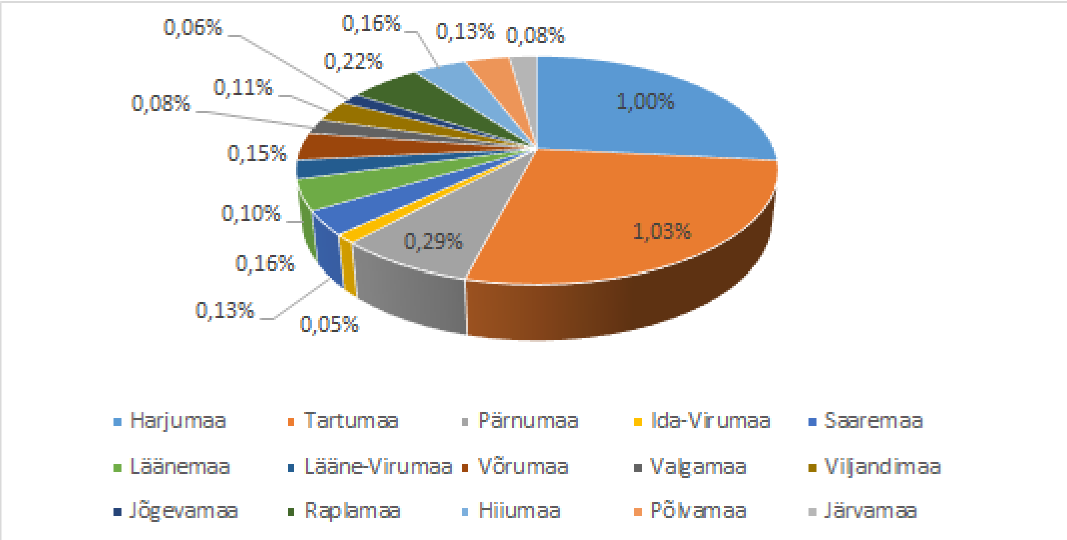


Figure 3.20. Share of permits for use issued for new residential units in 2015 in different counties[51]

The inevitable problem at the current rate of construction is that the volume of new construction is insufficient to offset the loss of housing units due to the end of design life. The residential buildings constructed during the era of mass construction in the 1960s are in the final phase of their design life. A systematic and holistic approach to residential areas facilitates engagement of high-level expertise in the renovation of buildings, ensures attractiveness of the sector for private businesses and financial institutions, and promotes economic efficiency in modernisation of buildings and residential areas. The studies have identified options for extending the design life and improving energy efficiency of buildings, but the investments required for modernisation of housing are only affordable to a part of the population and the housing business itself is not very attractive for the private sector. Improvement of the current situation is not feasible without a carefully considered national housing policy; otherwise, the increase of the average age of the housing stock is likely to continue.

Furthermore, considering the commitment arising from the Energy Performance of Buildings Directive, which has been transposed by Estonia, to design all public sector buildings from 2019 and all new buildings from 2021 as nearly zero-energy buildings (nZEB), it is important to ensure that all parties involved in the construction of those buildings (designers, builders, persons exercising owner supervision) have relevant competence. **In addition, sample nZEB designs will be ordered and made available, while the legal framework will be modified to facilitate construction of new buildings in both public and private sectors.**

[51] Ministry of Economic Affairs and Communications 2016

It is crucial to continue with activities that contribute to increased availability of integrated renovation expertise, as well as stronger construction supervision. Finally, it is important to improve the quality control procedures of projects that receive public grants.

3.4.2.4. Optimised planning of the housing environment

The quality of the housing environment can be increased by combining the technical, social, environmental and economic aspects of urban planning with assessment of energy use to ensure that energy intensity of the planned housing environment does not exceed the permitted levels. The impact assessments in the current planning process do not take into account energy use of the planning area in terms of energy consumed in the buildings, as well as fuel and time resources associated with daily mobility needs (workplace-home-kindergarten-school). **A methodology to estimate energy consumption and impact will be developed**, and it will be easily accessible, simple to understand and use.

Planning can be optimised by making active use of areas with partially or completely abandoned residential buildings. The residents of several former industrial regions have left the area after the local industrial plant was closed. As a result, many apartments in buildings with privatised apartments are now unoccupied and unheated. This creates a difficult situation for the remaining residents who still intend to use their dwellings. **The priority in such residential buildings is to identify options for energy efficient use of residential spaces (for instance, by moving residents from semi-abandoned buildings into a single renovated or new energy efficient building), while also making sure that completely abandoned and amortised residential buildings are dismantled in cooperation with municipalities and/or owners.**

3.4.2.5. Diversifying the range of rental housing offers

The 2003 analysis of housing policy measures[52] indicates that the state is able to guide the development of the housing sector through measures that support demand and supply. The results of this analysis are still relevant. So far, Estonia has implemented mainly measures to support demand (Figure 3.21), such as grants and tax incentives for private owners of dwellings or for apartment associations. Measures to increase supply have been implemented only to a very limited extent in Estonia, e.g., by offering some support to municipalities for renovation and procurement of rental apartments.

[52] Kährik, A; Tiit E-M; Kõre J; Ruoppila S. 2003 Praxis Working Paper No 10

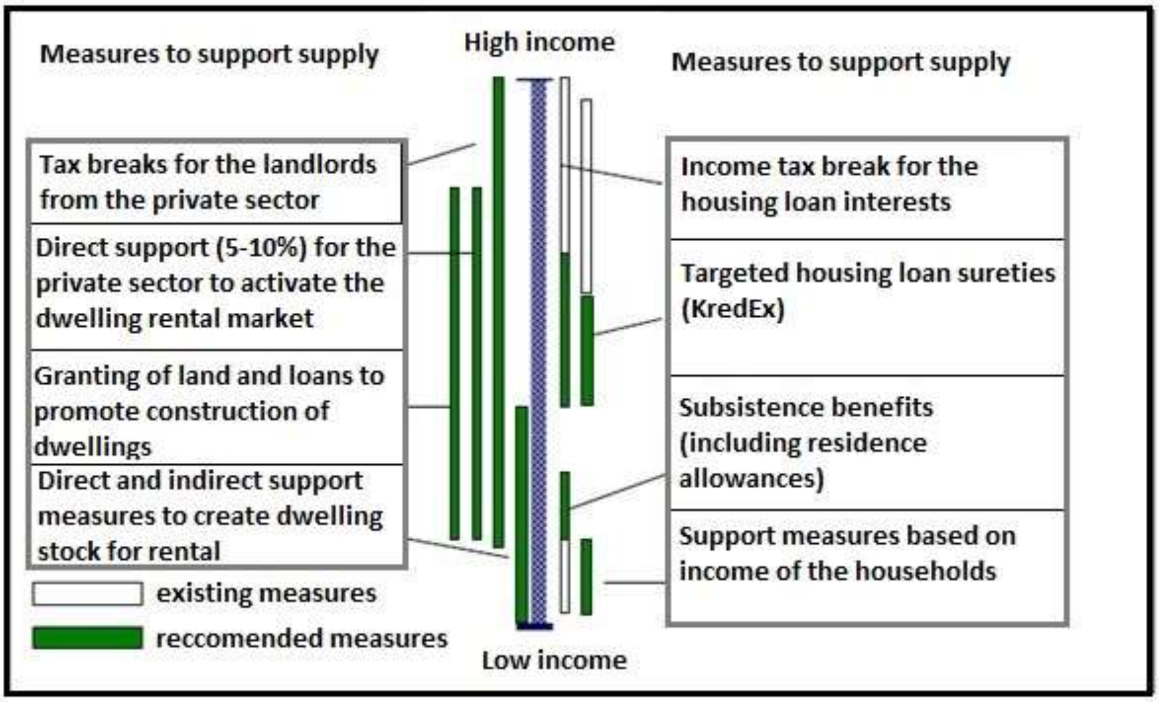


Figure 3.21. Measures to support supply of and demand for housing services[53]

The volume of new construction in the past ten years has been about 3,000 residential units per year, whereas the sufficient renewal rate of the housing stock would be about 6,000 new residential units in a year. One way to promote new construction would be diversification of the sale and rental offers by the private and public sectors, incl. through public support measures to address demand.

A situation where the public sector owns less than 4% of the housing stock imposes a significant restriction on the government in implementing various housing and social policies. The share of subsidised rental housing is significantly lower in Estonia compared to many other EU Member states (Figure 3.22).

[53] Kährik, A; Tiit E-M; Kõre J; Ruoppila S. 2003 Praxis Working Paper No 10

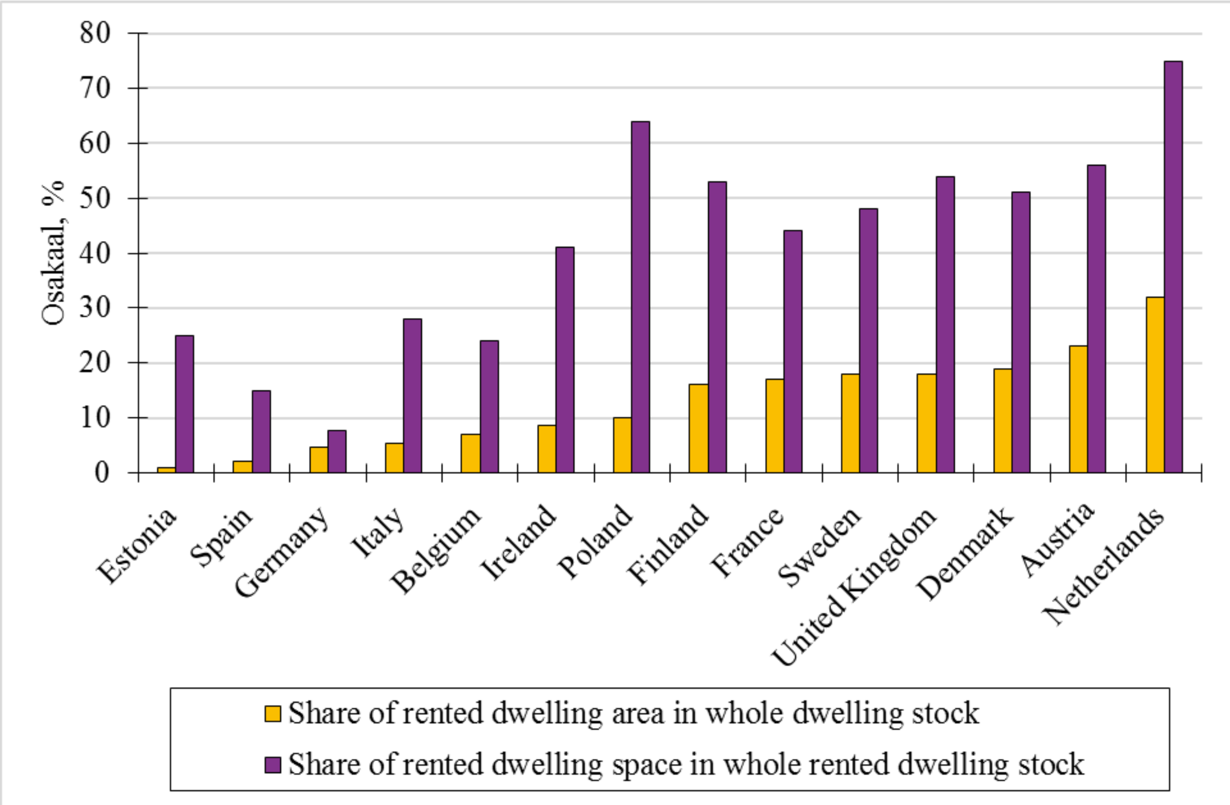


Figure 3.22. Public rental housing stock in selected EU Member States[54]

The problems associated with housing availability have increased with each year. They mainly affect mobile young people, who are about to enter the housing market but are, for various reasons, unable or unwilling to buy a dwelling. The current structure and differentiation of the housing stock facilitates emigration of working-age population as well as urban agglomeration, which contributes to the marginalisation of many areas. Consequently, a public intervention is required to modify housing regulations and differentiate the range of housing services. It is important to ensure that local government units are able to compete for mobile labour and, among other conditions, this requires availability of diverse legal options for using residential units according to the needs of different households in regional centres of various levels.

Public support for construction of rental housing and renovation of existing buildings for the purpose of renting in cooperation with local authorities and the private sector would enable the government to serve as a role model in improving the quality of housing and energy efficiency indicators while also implementing new construction regulations. This would provide the government with an instrument for guiding people's residential and employment decisions and for supporting the development of regions outside the capital. Furthermore, it would facilitate implementation of other energy efficiency support measures in existing buildings.

[54] Housing Europe Review 2012, CECODHAS Housing Europe's Observatory, Brussels (Belgium)

One of the key aspects associated with public rental housing is the requirement of excellent energy efficiency – compliance with the requirements for low-energy buildings or, in regions where it would facilitate labour mobility and would be cost-effective in terms of applicable rental rate, even with the requirements for nearly zero-energy buildings. The requirements for nearly zero-energy buildings will be applicable to all new public sector buildings from 2019 and to all new private sector buildings from 2021. As these are challenging targets for both the public and the private sector, the creation of residential housing could be used as a model case by the public sector as well as an instrument for introducing best construction practices to pave way for achievement of those targets. The construction of rental housing will involve scientific research to make sure that, by the time the requirements are applicable, we have access to the best possible and widely distributed knowledge about cost-effective solutions.

New construction is not the only way to create residential housing; support should also be allocated to renovation of existing buildings for the purpose of offering them as rental apartments. In particular, renovation should be facilitated in the regions where it is more cost-effective than new construction while ensuring good energy efficiency indicators. The development of renovation solutions should also involve research and development and facilitate implementation of relevant experience in wider renovation practice. This will create preconditions for innovation in the construction sector and will facilitate energy savings on a larger scale than before.

Possibilities to make development of rental housing more attractive to the private sector should be considered as well. The bottlenecks identified so far include taxation issues and the high level of risk in rental development projects compared to apartment sale projects.[55] Some stakeholders have also pointed to the need to amend the regulations governing rental business. Despite the aforementioned bottlenecks, it would be a new business niche and a successful market launch would require both a review of regulations as well as model initiative by the government. The experience of other states indicates that public guarantees have primarily influenced management of the financing risk in the construction of rental housing, whereas direct state support is of primary importance for private-sector developers in less attractive regions.

Increased availability of rental housing, coordinated with other public development programmes for entrepreneurship and jobs, would facilitate the creation of an optimally attractive business and living environment in Estonia. In a longer term, the creation of rental housing would increase the likelihood of development of the living environment in other functional regions and their centres of gravity in cooperation with the business sector. The intervention would facilitate implementation of measures for general renewal and renovation

[55] EEEL ja EKFL 2014 Soovitused elukondliku üürituru süstemaatiliseks arendamiseks era- ja avaliku sektori koostöös [the Estonian Association of Construction Entrepreneurs and the Association of Real Estate Companies of Estonia: Recommendations on systematic development of the residential rental market in cooperation of the private and public sectors]

of the housing stock throughout Estonia. The exact measures for diversification of rental housing offers will be specified in a separate development document.

3.4.3. Links between the key development needs and targets in the housing sector and the specific targets and measures of the NDPES 2030

The key development needs of the housing sector, described in Chapter 3.4.2, have been partially taken into account in the measures of the NDPES 2030. The measures of the NDPES 2030 address the problems that are directly related to the energy sector and have been described in the following parts of section 3.4.2:

- Reducing energy intensity of the housing stock (both existing and new buildings);
- Improving the indoor climate of buildings;
- Promoting construction of high-quality and energy efficient new buildings;
- Optimised planning of the housing environment.

For more detailed clarification of the problems described under the heading “Diversifying the range of rental housing offers” in the previous section and for an analysis of potential solution, the Ministry of Economic Affairs and Communications will prepare a separate development document on diversification of rental housing offers.

3.5. Energy use in the transport sector

3.5.1. Vision for the development of energy use in the transport sector until 2050

Energy use in the transport sector will be economical and less dependent on the state of the economy. The measures implemented to reduce energy use in transport will increase the competitiveness of Estonian businesses, reduce expenditure on transport fuels and production of local fuels will improve Estonia's trade balance.

Energy efficiency and environmental cleanliness of transport will increase as a result of the combined effect of different measures, utilisation of energy efficient technologies, using more alternative fuels and transferring some cargo flows to the railway. A higher level of awareness among the population and a smart tax environment established by the government will lead to increased energy efficiency of the vehicle stock. Reduction of transport expenditure for Estonian residents will support increase in Estonia's gross domestic product.

Comprehensive planning of the living environment will reduce the need for forced commuting, increase the usage of public transport and the share of light traffic. Technological development will lead to improved possibilities for teleworking.

3.5.2. Overview and challenges of energy use in the transport sector

Over the past 16 years, the use of energy and fuels in the transport sector has increased more than 33%, with a slight dent registered only during the economic recession in 2008 and 2009 (see the Figure below). Road transport accounts for almost 90% of the consumption and increase in the consumption of fuels.

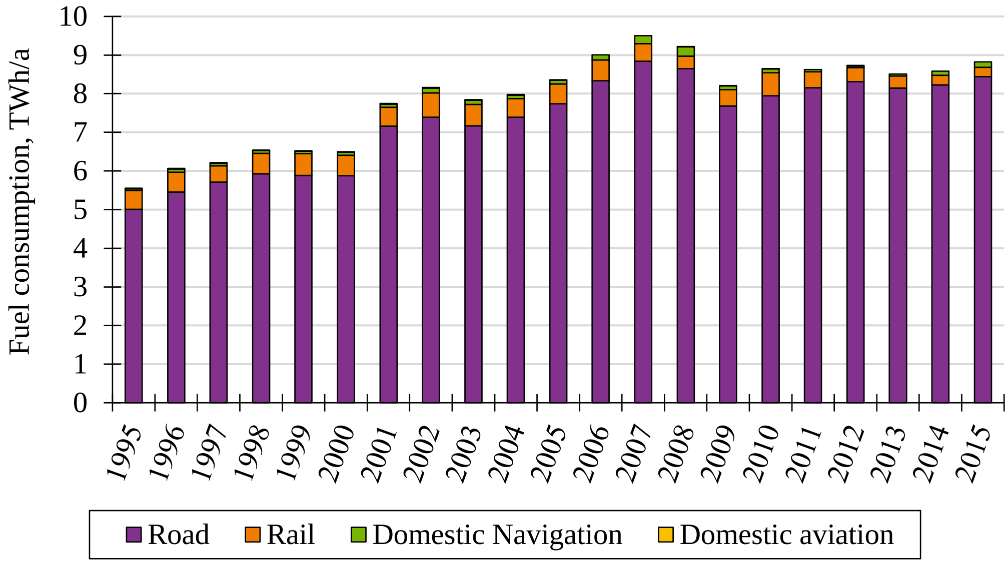
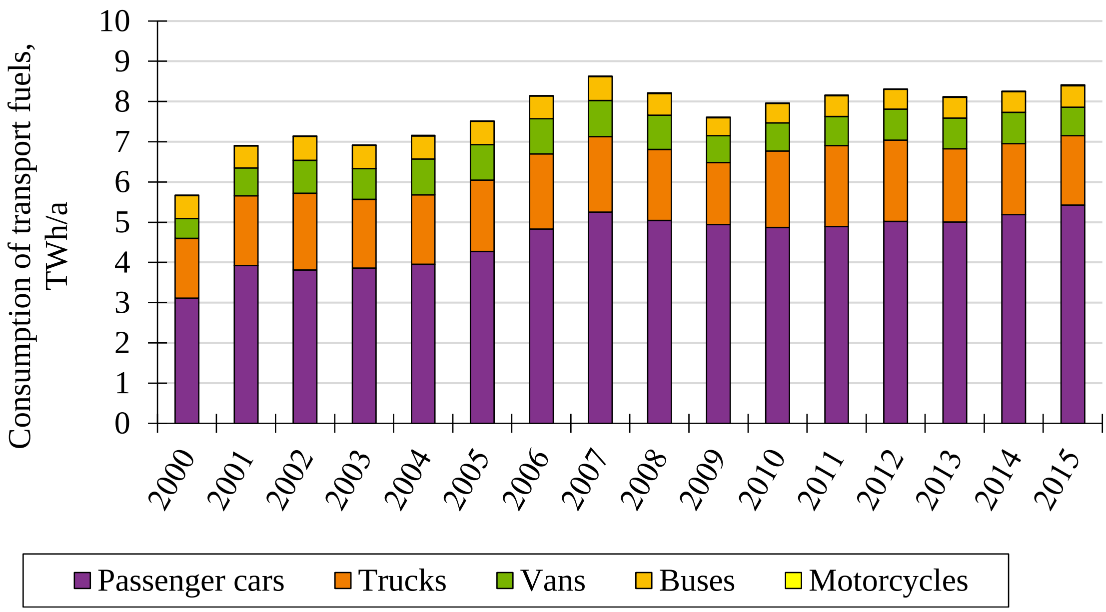


Figure 3.23. Energy use in Estonian transport sector 1995…2015[56]

The increase in fuel consumption has been particularly fast due to the growing number of diesel-fuelled passenger cars, minivans and trucks. Fuel consumption in transport depends mainly on the mode of travel and type of freight transport, the demand for transportation, energy use of vehicles and the energy sources used. Over the past 10 years, the number of passenger cars in Estonia has increased almost 50% and the number of public transport users has decreased.



[56] Eurostat

Figure 3.24. Energy use in road transport 2000…2015[57]

The energy use in Estonia's transport sector, which accounts for nearly one quarter of final energy consumption, and the related greenhouse gas emissions were examined in greater depth in the 2010 report of the Government Office on sustainable transport (Jüssi et al. 2010), which concluded that transport fuel consumption in Estonia has increased due to a growing use of passenger cars and road transport, combined with the decreasing share of public transportation and light traffic. **Road transport and fuel consumption in transport have increased at the same rate as the economy, which is why Estonia has one of the most transport intensive and fuel intensive economies in Europe – for instance, Estonia uses twice as much transport fuel per unit of GDP than the EU average.** Furthermore, road transport accounts for 94% of the total GHG emissions of the transport sector. This includes 67% of GHG emissions from passenger cars. In addition, road transport is a major source of fine particulate matter and noise, and causes fragmentation of the natural environment. **Consequently, reducing the environmental impact of road transport offers the greater potential for meeting the European climate policy targets and for reducing the negative impact on human health and the environment.**

While upgrading of the vehicle stock is usually associated with addition of eco-friendly vehicles, the analysis of the mileage travelled and GHG emissions in the past 18 years indicates only modest improvement – for instance, the average GHG emission of passenger cars was 206 g/km in 1990, 199 g/km in 2008 and 188 g/km in 2011. Energy efficient vehicles (energy classes A, B and C) no longer account for only a marginal share of all vehicles – nearly one third of new cars belong to this category[58], but the level of this indicator is still low compared to the majority of EU Member States (see figure 3.25). Estonia has a very high share of inefficient vehicles – more than 51% of new cars belong to energy classes E-G where fuel consumption is not much different from the car brands that were popular 20 years ago.[58] **In order to meet the EU climate and energy targets, the transport sector needs to move towards a vehicle stock with more efficient fuel consumption which would, in combination with other implemented measures, help to reduce GHG emissions from the transport sector.** Similar principles were assured also in Resolution of the Riigikogu on General Principles of Climate Policy until 2050 in 5.04.2017.

[57] Jüssi, M., Rannala, M. Transport ja liikuvus. ENMAK stsenaariumid 2030+. 2014. Available at: http://www.energiatalgud.ee/img_auth.php/4/4d/ENMAK_2030%2B_Transpordi_ja_liikuvuse_stsenaariumid.pdf (12.10.2014) and Estonia's Environment Agency (28.03.2017).
[58] Jüssi, M., Poltimäe, H., Luts, H., Metspalu, P. Energiasäästupotentsiaal Eesti transpordis ja liikuvuses. ENMAK 2030+ taustauuring. 2013. http://www.energiatalgud.ee/img_auth.php/d/d2/J%C3%BCssi,_M.,_Poltim%C3%A4e,_H._jt._Energias%C3%A4%C3%A4stupotentsiaal_Eesti_transpordis_ja_liikuvuses.pdf

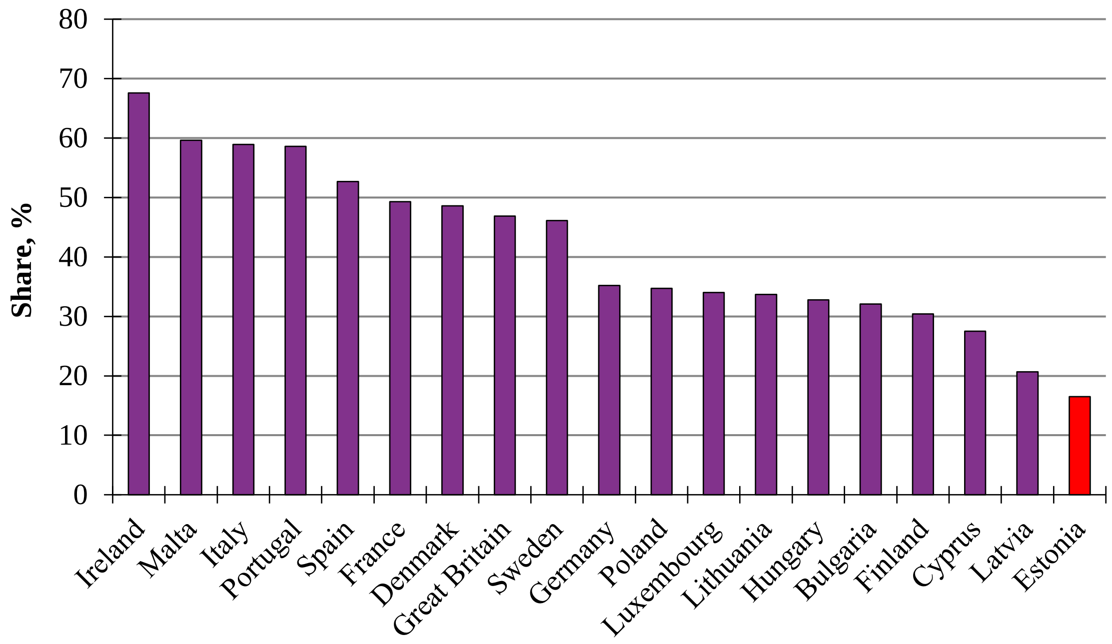


Figure 3.25. Share of vehicles with GHG emissions lower than 130 g/km as percentage of all registered vehicles in selected EU countries in 2013[59]

Based on the target for the transport sector, specified in the EU Renewable Energy Directive (2009/28/EC), Estonia will have to ensure that 10% of liquid fuels used in the transport sector come from renewable sources by 2020. Previous measures have not led to any considerable progress towards this target. The target can be met by using an optimal combination of various measures – the obligation to supply biofuels in the market of liquid fuels, promoting the use of biomethane in vehicles, use of biofuels with high renewable energy content in transport, etc. Estonia's transport sector is also affected by the requirement of Directive 2009/30/EC for fuel suppliers to reduce greenhouse gas emissions of supplied fuels or energy at least 6% by 31 December 2020.

The plans for meeting this target are based primarily on imposing the obligation of biofuel addition on fuel suppliers. At the time of preparing the Development Plan, there was no exact information on the continuation of the requirement to add biofuel in the European Union beyond 2020. However, it would be rational to retain this requirement at the national level (incl. the 10% share of renewable energy in transport). The use of biofuels in transport and the associated targets for 2030 have to be reviewed before 2020 by assessing the environmental and socio-economic impacts of maintaining the requirement to add biofuels to fuel mixtures.

Market participants have been consulted as regards to market barriers and the results are used to develop a vision for a long-term excise duty policy for transport fuels – this is one of the main market barriers, which prevents infrastructure investments according to market participants. It is also reasonable to specify in public transport procurements that transport undertakings have to use biomethane to a certain percentage in order to provide biomethane

[59] Odyssee database. http://www.indicators.odyssee-mure.eu/market-diffusion.html#market-diffusion/efficient-new-cars-130g-CO2-sales.html (17.10.2014)

producers with a market they need, while also developing measures for promoting supply of additional biomethane volumes to the natural gas network as necessary. Public transport sector has a socio-economically justified opportunity for using biomethane. In a long-term perspective, biomethane will probably be a more cost-effective alternative to liquid fuel[60]. In order to prevent problems associated with sustainability of biomethane production, the sector could be supported in cases where a chain from biogas production to consumers has been specified in advance, making the support available to operators in any part of the chain if they have a justifiable need for support. Due to the general plans to promote methane fuels in the transport sector, the current analyses do not confirm the feasibility of supporting biomethane through a feed-in tariff.

It is likely that other domestic alternative fuels, which are based on renewable energy sources or enable reduction of greenhouse gas emissions (such as nitrogen, methane or other carbon-neutral fuels produced from renewable sources), can be utilised in a longer term in addition to biomethane. The study of those options continues in the context of research and development.

The market of motor fuels continues to face problems with tax revenue and ensuring fair competition. The need for increased scrutiny and effective implementation of new regulations in the market of motor fuels by market surveillance authorities will remain relevant in the coming years.

3.6. Fuel sector

3.6.1. Vision for the development of the fuel sector until 2050

Estonia's energy needs will be met mainly through the use of local fuels, which are the pillars of energy independence and economic welfare of the country. Estonia will promote the use of alternative fuels and move towards solutions with higher added value. In case of gaseous fuels, the share of local methane fuels will increase to one third in Estonia's final gas consumption. Estonia will export liquid fuels produced from oil shale. In addition to being used for heat production and industrial processes, gas use in the transport sector will increase considerably as well.

3.6.2. Overview and challenges of the fuel sector

Estonia's relatively high level of energy independence is based on the national fuel sector, with oil shale as its backbone, which covers nearly 65% of the supply of primary energy in Estonia. Wood and peat as two other important domestic fuels cover nearly 15% of the domestic supply of primary energy. Notably, the utilisation of waste and agricultural biomass has increased in recent years. Transport fuels used in Estonia are imported.

[60] See also the public benefits associated with biogas production, http://www.energiatalgud.ee/index.php?title=Biogaas&menu-47

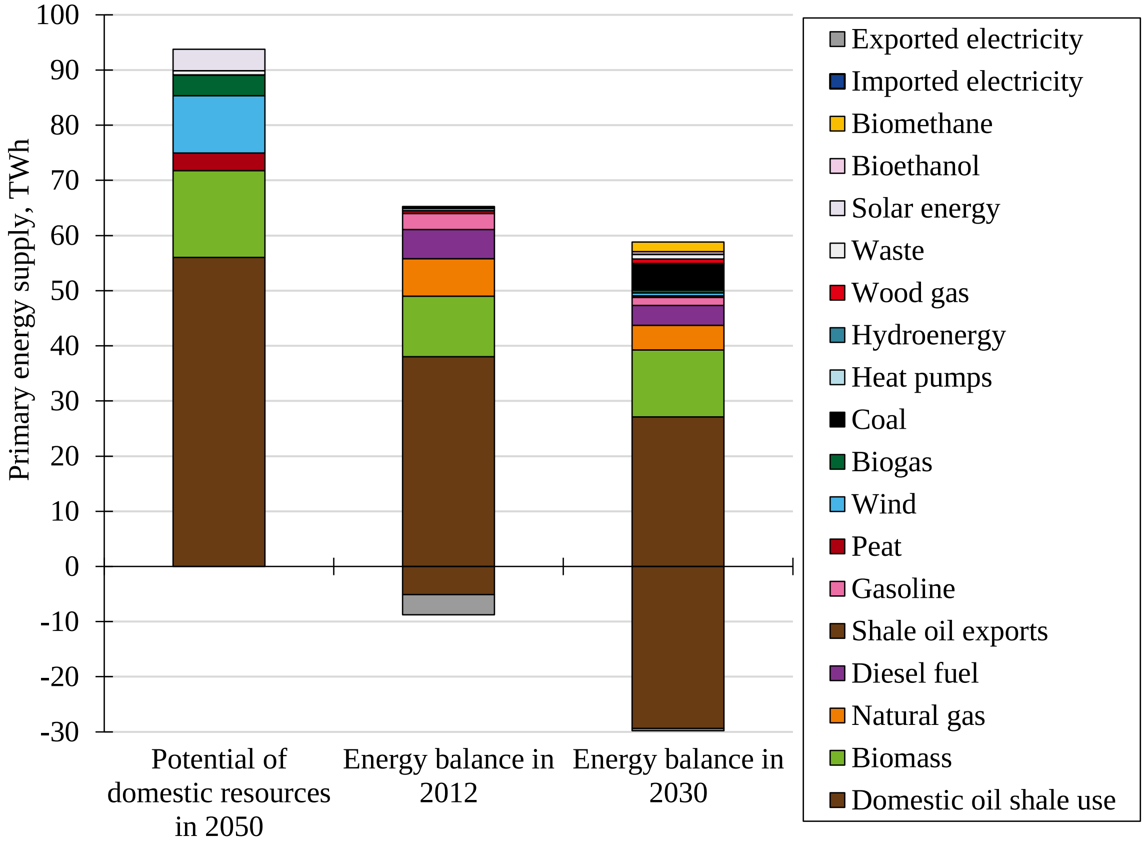


Figure 3.26. Potential of Estonia's primary energy sources and usage projection in energy transformation (incl. import and export)[61, 62]

Depending on the future development of global oil prices, there could be possibilities for investment in the oil shale sector, which would result in the replacement of the previously predominant direct combustion method for electricity generation by a combined production of shale oil and electricity from 2030 to 2035. **Estonia's energy independence would be further improved after implementation of the plans of the business operators in the oil shale sector (incl. construction of a shale oil refinery). This would lead to a realistic prospect of Estonia becoming a net energy exporter, with the redoubling of the share of the oil shale sector in the gross domestic product.**

[61] Estonian Development Fund. 2013. Final Report. Energy Resources of Estonia. Available at: http://www.energiatalgud.ee/img_auth.php/3/3f/Energy_resources_ENG_ENMAK_uusmets_140213.pdf (20.10.2014).

[62] Results of source studies for NDPES 2030. Available at: http://www.energiatalgud.ee/index.php?title=ENMAK:Ajakava_ja_tegevused (20.10.2014)

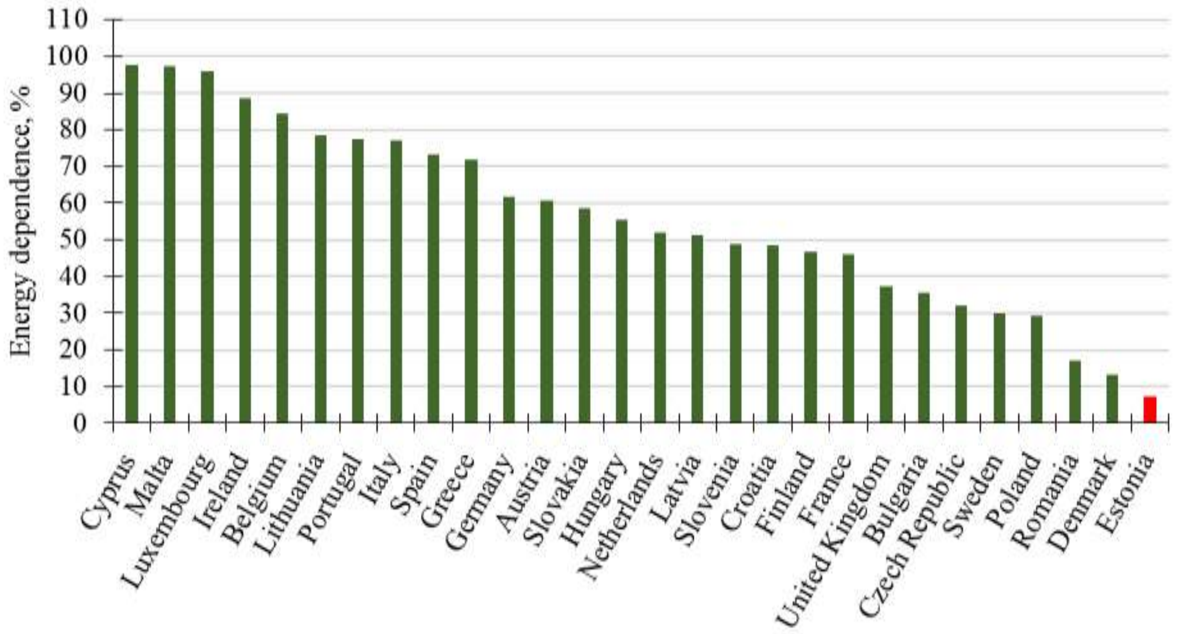


Figure 3.27. EU Member States' dependence on imported energy in 2015[63]

The use of local fuels helps to stabilise the price level of energy carriers compared to imported fossil fuels, enabling a more even distribution of energy generation between regions. In addition, the activities of numerous associated businesses make a significant contribution to Estonian economy. However, the use of local fuels is also associated with more visible and complex domestic environmental impacts, compared to imported fuels.

While imported solid fuels are not significant for Estonia's energy sector, the situation is currently reversed in the market of liquid and gaseous fuels. Most of the liquid and gaseous fuels used in Estonia are imported. While Estonian market operators have access to international liquid fuel markets, a similar access in case of gas is only ensured by the liquefied natural gas terminal in Klaipeda and the gas connection between Lithuania and Poland that is expected to be completed in 2021.

The level of public intervention in the fuel retail market through regulation or related legislation is sufficient in Estonia and there is no need for fundamental changes. The amendments in fuel market regulations, made in recent years, have been made primarily as a consequence of amended EU legislation. The amendments of the Liquid Fuel Act have been associated with domestic problems, such as ensuring receipt of tax revenue. The regulatory legislation is operative and sufficient in the wholesale market of liquid fuels. Main challenges in the gas market are associated with achieving true competition.

[63] Eurostat. Available at: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=1&language=en&pcode=tsdcc310 (5.04.2017).

3.6.3. Gaseous fuels

3.6.3.1. <u>Gas market</u>

Estonia's gas market was opened to all consumers on 1 July 2007. Estonian natural gas market operators import natural gas mainly from Russia but, after completion of the liquefied natural gas terminal of Klaipeda in 2014, Estonian market participants also have the option of using this additional source of supply where the price of gas is not tied to the price of oil products but is determined in *a spot market*.

In the procedure for adopting Directive 2009/73/EC of the European Parliament and of the Council concerning common rules for the internal market in natural gas, Estonia applied for an exemption from the provision on unbundling of the transmission system operators, referring to the status of an isolated gas market with a single supplier. Article 49 of Directive 2009/73/EC grants Estonia the exemption and does not require Estonia to separate the ownership of the transmission system from the supplier or seller of gas until any of the Baltic countries or Finland is directly connected to the interconnected natural gas system of any Member State other than Estonia, Latvia, Lithuania and Finland.

Based on the experiences of other countries, the analysis of economic impact of European Commission's energy package in implementing the electricity and gas market package, the Government of the Republic reached the conclusion, in the course of drafting an act to amend the Natural Gas Act, that actual competition can only be ensured through the separation of ownership. Furthermore, the most proportional model in terms of development of the gas market in Estonia would be a model based on a *transmission system operator* that is independent from the seller and importer. Separation of ownership is necessary to create competition, because there are no guarantees that an unbundled provider of natural gas transmission services would make sufficient investment to facilitate access to the transmission network for competing natural gas suppliers.

The legislative amendment, in which the Riigikogu made the decision on refraining from future application of the exemption referred to in Directive 2009/73/EC and opted to implement the Directive through full separation of ownership, entered into force on 8 July 2012. This amendment created the preconditions for a true natural gas market in Estonia.

Cooperating with the gas transmission system operator, the government has to contribute to improving the security of gas supply, incl. capability to cope with supply disruptions, and diversification of supply chains.

Diversification of supply chains and effective competition are contingent on close cooperation with the neighbouring countries and future implementation of the gas market of the three Baltic countries and Finland, operating according to shared principles, that is also connected to the Central European gas market via Poland. Network codes concerning the gas system of the European Union constitute a good foundation for the creation of a functioning regional market based on shared principles.

3.6.3.2. Gas consumption

The consumption of natural gas has essentially been on a downward curve since 2006. The main reason for the reduction is suspension of consumption in the largest gas user, AS Nitrofert. Recent events in Georgia and Ukraine have made users cautious when it comes to natural gas and they tend to prefer other energy sources to natural gas.

The consumption of natural gas is illustrated in the following Figure.

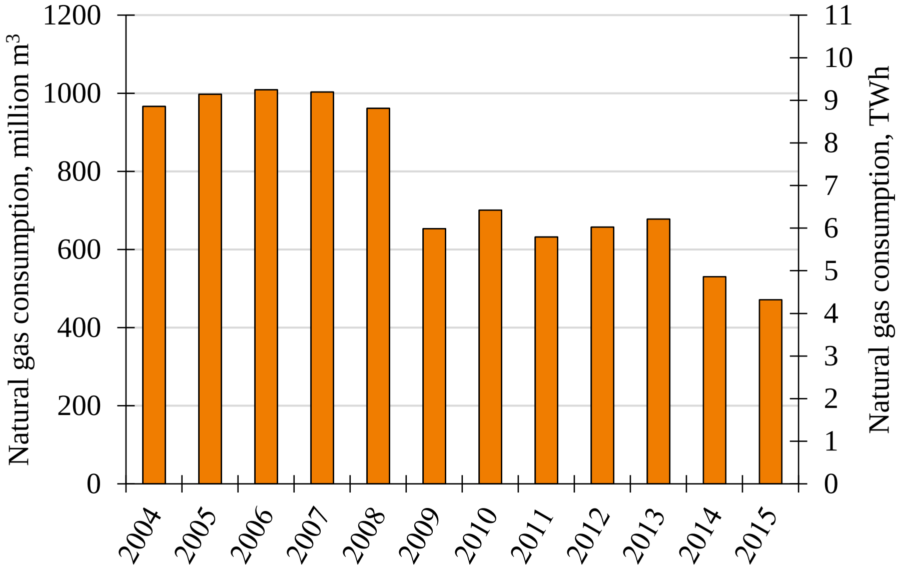


Figure 3.28. Natural gas consumption in Estonia 2004...2013[64]

Despite decreased consumption volumes, natural gas has growth potential due to its environmental cleanliness, usage automation potential and tradability in global markets. The extent of this potential depends on the development of global prices in relation to other fuels and on successful launch of a competitive gas market with multiple suppliers.

A diversified supply chain serves as the foundation for competitiveness of the gas price in comparison to alternative fuels and is the key for increasing consumption volumes.

3.6.3.3. Security of gas supply

Security of gas supply in Estonia is ensured through three connections: Narva (from 2012, 3m m^3 per day), Karksi (7m m^3 per day) and Värska (4m m^3 per day). Considering the fact that the peak level of natural gas consumption in the past 10 years was registered in January 2006 at 6.7m m^3 per day, the value of Estonia's security of supply criterion N-1 would be 104.5%. In order to reduce any risks to the security of gas supply and to cope with any gas supply disruptions, the minister responsible for the field approves a relevant plan, which is regularly updated.

[64] Statistics Estonia. FE023: Energy balance sheet by type of fuel or energy. Available at: http://pub.stat.ee/px-web.2001/Dialog/varval.asp?ma=FE023&ti=ENERGY+BALANCE+SHEET+BY+TYPE+OF+FUEL+OR+ENERGY&path=../I_databas/Economy/07Energy/02Energy_consumption_and_production/01Annual_statistics/&search=KE&lang=1 (15.10.2014).

The security of gas supply will be increased in the future after completion of the BalticConnector pipeline in the Gulf of Finland and the regional terminal for liquefied natural gas on the shore of the Gulf of Finland. **A gas interconnector between Poland and Lithuania (GIPL) is expected to be completed by 2021 and it would also increase Estonia's energy independence from Russia by creating a new chain of gas supply from Central and Western Europe.**

3.6.3.4. Biogas

The studies conducted in connection with the Development Plan and before that confirm that biogas has large unused energy potential. In addition to operational heating installations and power plants that produce heat and electricity from biogas, biomethane produced from biogas can be an important resource for increasing the use of renewable energy in the transport sector. **Additional utilisation of the biogas resources is currently not required to meet Estonia's overall target for renewable energy by 2020, but there is a need to identify cost-effective options for meeting the renewable energy target of the transport sector. A suitable measure to meet this target would be increased utilisation of methane fuels and biomethane from biogas in Estonia's transport sector.** Inspiring examples of the use of methane fuels in transport can be found from several European countries. Based on the experiences of those countries, the *Renewable Energy Action Plan until 2020* includes measures for placing biomethane, or 'green gas', on the market and those measures are also listed among the actions for the implementation of the NDPES 2030 measures.

3.6.4. Liquid fuels

From 1 January 2010, Estonia meets the obligation of maintaining a 90-reserve of liquid fuels. This reserve enables the government to ensure availability of fuels for at least three months in case of disruptions in the supply of liquid fuels.

The liquid fuel stocks (mainly gasoline and diesel fuel) are established and managed by the Estonian Oil Stockpiling Agency (OSPA). The activities of OSPA are guided by Council Directive 2009/119/EC of 14 September 2009 imposing an obligation on Member States to maintain minimum stocks of crude oil and/or petroleum products, by the requirements of the Liquid Fuel Stocks Act, by the implementing provisions adopted under the Act and, from 19 November 2013, the requirements for reserve stocks in the energy programme agreement of the International Energy Agency (IEA).

Estonia joining IEA in 2014 and amendment of the Liquid Fuel Stocks Act in 2013 created the possibility to meet the stockpiling requirement also on the basis of net import, in addition to domestic fuel consumption, while taking into account the shale oil production and export volumes. A more detailed description of the consumption of liquid fuels is provided in the section 3.5 on energy use in the transport sector.

Taking into account shale oil exports, the final requirement for Estonia as of 1 November 2013 was to keep stocks of at least 167,000 tonnes (incl. 10% of 'tank bottom residue').

Considering the sale of stocks in November and December of 2013, the actual liquid fuel stocks in the balance sheet date amounted to 195,700 tonnes, 44% of which was stored in Estonia. Liquid fuel stocks are stored, in addition to Estonia, also in Finland, Sweden and Denmark. While the main activities of OSPA until 2010 were associated with the active establishment of stocks, and considering that stocks have been established on an annual basis, the future activities will focus on maintaining the quality and ensuring effective rotation of stocks.

The impact of the geopolitical situation on fuel supply should increasingly be taken into account in the coming years. Therefore, attention should be paid to the capability of ensuring efficient movement of information between countries and prompt supply of fuel to resellers in case of supply problems.

Local production of shale oil and motor fuels from oil shale is discussed in subsection 3.6.5.1.2 of the Development Plan.

3.6.5. Domestic solid fuels

Domestic solid fuels include primarily wooden and agricultural biomass, oil shale, peat and various types of waste. The use of local solid fuels facilitates diversification of energy sources, ensures even regional distribution of energy generation and supports reduction of environmental impact of energy production. Furthermore, the price of local solid fuels can be expected to have greater stability compared to imported fossil fuels.

3.6.5.1. Oil shale

3.6.5.1.1. Use of oil shale in the energy sector

The principles of development of the oil shale industry are specified in the *National Development Plan for Oil Shale Use 2016-2030*. The goal of the oil shale development plan is to ensure environmental and financially efficient extraction and use of oil shale, securing the supply of oil shale for the oil shale industry while reducing negative environmental impact.

The use of oil shale, as well as any other mineral resources, is governed by the Earth's Crust Act, which specifies that oil shale is a mineral resource owned by the state and is not subject to immovable property ownership; the annual extraction rate of the geological reserve is 20,000,000 tonnes. Extraction at this rate means that approximately 24 million tonnes of oil shale, with a total energy value of roughly 200 PJ (55,6 TWh), reach the market. The economic impact analysis for NDPES 2030 indicated that, if oil shale extraction rates were based only on energy sector considerations, it would not be reasonable to restrict oil shale extraction as far as the future of the energy sector is concerned. The amendments to the Earth's Crust Act, adopted in June 2015, introduced greater flexibility in the principles of applying the annual extraction rate limitation on the geological oil shale reserves.

According to the aggregate balance of mineral reserves as of 31 December 2013, the oil shale reserves in the Estonian oil shale deposit amounted to 4,750.4m tonnes, including

1,040.0m t of active proved reserves, 302.6m t of active inferred reserves, 1,683.8m t of passive proved reserves and 1,724.0m t of passive inferred reserves. In 2014, Estonia had four companies in the oil shale extraction business: EE Kaevandused AS, VKG Kaevandused OÜ, Kiviõli Keemiatööstuse OÜ, AS Kunda Nordic Tsement.

Estonia's electricity market was fully opened in the beginning of 2013. As a result, oil shale as the primary resource of electricity generation in Estonia is no longer subject to administered electricity prices. Consequently, going forward, the goal should be maximising the added value of oil shale, which will depend on the state and future dynamics of the market prices of electricity and oil. **From the perspective of energy security, instead of continuous generation of electricity from oil shale, it is important to ensure oil shale extraction capacity, which would make it possible to use oil shale for electricity generation should the need arise. Maintaining the competitiveness and investment capacity of the oil shale sector is therefore important for energy security. The government's role is development of prudent resource policies that facilitate creation of added value in the oil shale sector.** The course change towards producing liquid fuels from oil shale supports the general energy independence objective of the Development Plan in the context of liquid fuels.

3.6.5.1.2. Production of shale oil

The current shale oil production technologies enable utilisation of 40-45% of the organic matter contained in oil shale. One tonne of oil shale yields approximately 0.112 tonnes[65] of shale oil. Unlike petroleum, shale oil contains compounds with high oxygen, sulphur or nitrogen content. Synthetic petroleum can be produced by separating the mineral and organic components of oil shale and hydrogenating the intermediate product. Synthetic petroleum can then be used for the production of motor fuels, which would increase Estonia's energy independence and create added economic value.

There are three main producers of shale oil in Estonia: VKG Oil AS in Viru Keemia Grupp, Eesti Energia Õlitööstus AS and Kiviõli Keemiatööstuse OÜ. VKG Oil AS is Estonia's largest producer or shale oil and oil shale chemicals, with a projected 2012 market share of 49% in shale oil production; the respective market shares of Eesti Energia Õlitööstus AS and Kiviõli Keemiatööstuse OÜ were 41% and 10%.

The study conducted for the Development Plan indicates that, subject to realisation of the plans of shale oil producers, the realistic annual production could be more than 2.5 million tonnes of shale oil. The industry provides approximately 6% of the total added value created in Estonian economy. Approximately 12,000 jobs are directly or indirectly connected to the sector[66]. The amount of investments in the oil shale industry, required for realisation of the plan, is over 5 bn euros.

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[65] Siirde, A. 2014. Põlevkiviõli tootmise erinevate stsenaariumite realiseerimisega kaasnevate mõjude hindamine [Assessment of impacts associated with different scenarios of shale oil production]. Available at: http://www.energiatalgud.ee/img_auth.php/4/40/Siirde,_A._P%C3%B5levkivi%C3%B5li_tootmise_erinevate_stsenaariumide_realiseerimisega_kaasneva_m%C3%B5jude_hindamine.pdf (15.10.2014)

[66] EY. 2014. Estonian oil shale mining and oil production: macroeconomic impacts study.

3.6.5.1.3. Taxation of oil shale

Estonia is the only country in the world that uses large quantities or oil shale to produce liquid fuels and electricity. The use of oil shale for energy has enabled Estonia to achieve the best ranking among EU Member States in terms of energy independence. However, having one of the highest CO_2 emission levels per capita or GDP unit among EU Member States and the significant environmental impacts of the energy sector are the downsides of energy independence based on oil shale. Despite gradual reduction of the environmental impact through utilisation of novel and more efficient technologies, the negative environmental impact associated with oil shale will always remain the price that has to be paid for energy security and the security of supply.

Assuming prudent and wise actions, the use of oil shale can provide Estonian state with stable long-term proprietary and tax income, profit for Estonian businesses and jobs for Estonian people.

The ability of business operators to pay the resource fee on oil shale depends on the added value gained from the sale of the final product. Depending on the movement of global oil prices and wholesale electricity prices, higher added value can be achieved on occasions either from electricity generation or from shale oil production. The market price of electricity depends on many factors but, knowing that investments will be required everywhere in Europe to replace obsolete generation capacities and meet the increasing demand for electricity, there are no reasons to assume a long-term decrease in the market price of electricity. The planned new interconnections between Scandinavia and Western and Central Europe indicate a potential increase in the market prices of electricity in a medium term (10-20 years). **Consequently, it is difficult to project the level of ability to pay the resource fee on the production of oil and electricity from oil shale in the coming decades or to identify the periods when greater added value can be gained from electricity generation and the periods when shale oil production is more profitable.** A review of the mechanism of resource fees for oil shale has been initiated with a view of binding it to the reference values of relevant global prices of the final oil shale products (average power exchange price, global oil price, etc.) in order to provide operators with the confidence required for investment.

Public revenue from the oil shale sector is currently fragmented between different direct and indirect fees and taxes payable by the operators in the oil shale sector. The charges payable as compensation for the damage caused to the natural environment by the oil shale sector (environmental charges) cannot be distinguished at the moment from the proprietary income of the state as the resource owner for allowing operators to process the resource. Furthermore, this situation prevents and adequate estimation of the level (if any) of proprietary income of the state as the resource owner or assessment of whether the benefit from the revenue is greater than the damage to the environment caused by the extraction and use of oil shale. **In order to create a better overview and facilitate policy development by the state as the resource owner, the fundamental principles of taxation of state-owned mineral resources should be modified to enable a clear differentiation between fees, which are accounted for as income of the resource owner, and environmental**

charges, which are collected as compensation for the environmental damage caused by the oil shale sector.[67]

3.6.5.2. Wood fuels

Wood, including forestry and timber industry waste, makes a significant contribution to Estonia's fuel sector. Low-quality wood and timber waste are increasingly used in heat and electricity generation. The wood used in Estonia's energy sector is mainly obtained from Estonian forests but the development of renewable energy has turned wood fuels (pellets, wood chips, etc.) into commodities traded in the global market, with prices based on the balance between supply and demand.

Estonian Forestry Development Plan until 2020 was prepared to coordinate forestry efforts in Estonia to ensure productivity and viability, as well as diverse and efficient use, of the forests. A connection to the energy sector can be found in the following formulation of the climate change objective in the forestry development plan: "The use of wood as renewable raw material and source of renewable energy is preferred to the use of products with higher CO_2 emissions and non-renewable energy sources." **The specified indicators for monitoring this objective include, among others, the volume of usage of wood fuels**, according to which the use of wood fuels should increase from 6.1 TWh (2009) to 8.3 TWh (2020). It should be noted that this volume was calculated only on the basis of stem wood volume and excludes wood from non-forest land and timber industry waste. Due to the rapid development of the renewable energy sector where wood is used as an energy source (incl. utilisation of logging waste), the current use of wood in the energy sector has already exceeded the level envisaged for 2020 in the forestry development plant.

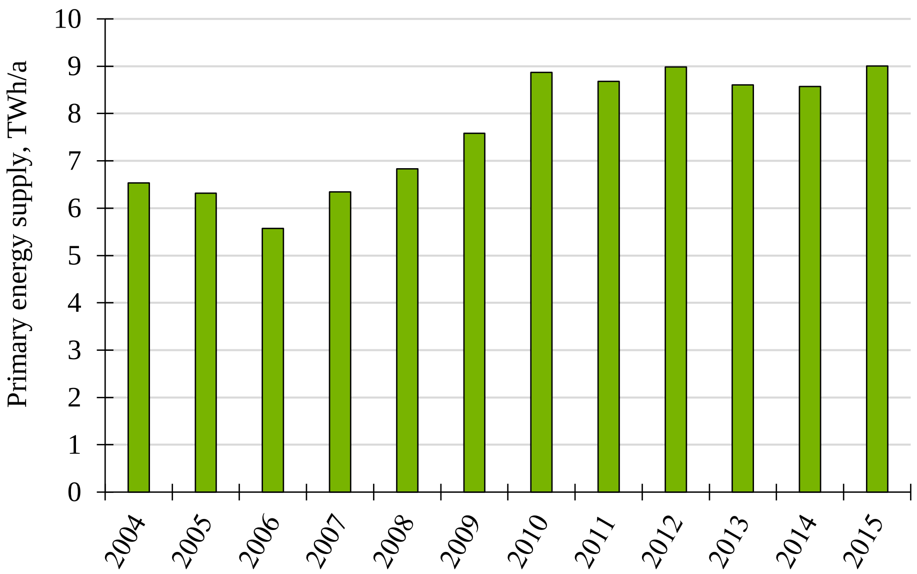

Figure 3.29. Primary energy supply: fuel wood 2004…2016[64]

[67] Ministry of the Environment will analyse the external costs of the oil shale industry to estimate the monetary value of the environmental impact.

However, the studies conducted during preparation of the Development Plan indicate that the use of wood in the energy sector can be expanded further and the total energy potential of wood is as high as 18 TWh per year.

The market of energy wood can have an impact on the raw material base of several other sectors. The preferential development of renewable energy has not resulted in drastic drops of competitiveness in other industries competing for the same resource. The market prices of wood fluctuate depending on situation.

The wood market is also affected by developments in the neighbouring countries. The countries in the northern parts of the European Union do not have obvious problems meeting the domestic renewable energy targets for 2020, but Central European countries still have to make some serious efforts to meet them. This will also mean an increased demand for wood. Estonia's wood fuels will have a considerable export potential even in the perspective of 2030 and realisation of that potential will depend on regional and global market outlook.

When it comes to using wood for energy, we cannot ignore the relevant aspects of sustainability. In Estonia, sustainable management of forests is ensured by the Estonian *Forestry Development Plan until 2020* and the Forest Act. It is possible that additional legislative instruments of the European union will be adopted in the future to regulate the accounting for the origin of wood for the purposes of national renewable energy targets and supporting the use of wood. The increased use of wood in the energy sector can have a negative impact on the carbon sequestration capacity and greenhouse gas emissions, with the consequence of reducing Estonia's opportunities for meeting its international obligations and participating in the international market of greenhouse gas emissions.

3.6.5.3. Waste as fuel

Transforming the energy contained in waste and reusing it either as heat or energy is one of the options of waste recovery. The volume of waste used for energy production has shown a strong increase in recent years. The electricity and heat co-generation block of Iru Power Plant, completed in 2013, alone utilised 220,000 tonnes of the estimated annual 300,000 tonnes of mixed municipal waste for energy generation, transforming more than 80% of the energy contained in waste into usable electricity of heat. Production of energy from landfill gas can be expected to increase somewhat in the coming years. The following table shows the energy resource potential of waste.

Table 3.2. Energy resource potential of waste[68]

Energy carrier	Volume	Unit
Municipal waste (Iru TPP)	220,000	t
Other waste (RDF, MBT, etc.)	100,000	t
Calorific value	2.2	MWh/t
Landfill gas	90.7	GWh/y
Total from waste	**704.0**	**GWh/y**
Total	**794.7**	**GWh/y**

According to the design, the waste incineration block of Iru Power Plant, Estonia's largest energy installation that uses waste, can use 220,000 tonnes of waste per year. The analysis of the energy potential of waste, prepared in connection with the Development Plan, suggests that additional 100,000 tonnes of waste could be used in the energy sector. The total energy potential of waste, including landfill gas, is in the region of 0.8 TWh.

3.6.5.4. Peat

The specification of usable peat reserves and annual use rates is based on the Earth's Crust Act. The maximum annual use rate of peat in Estonia is 2.65m tonnes (including peat substrate). The average level of peat use in the energy sector in the past ten years has been slightly above 0.3m tonnes per year, which corresponds to 30% of total extracted peat (approximately 1m t). If the entire annual use rate of peat would be utilised and the percentage of peat used in the energy sector would remain the same, then 0.8 tonnes of peat, with a total energy content of 3 TWh, could be potentially used for energy generation. **Consequently, there is significant unused potential in the use of peat for energy generation at the current annual use rate. It should be remembered in this context that any plans for wider utilisation of peat in the energy sector cannot include drainage of new bogs, which have not been exploited before, because peat is a non-renewable natural resource[69].**

In peat-based district heating systems, the price of heat is often lower than Estonia's average. Even though peat as a source of energy has an affordable price, the other incentives for using peat in the energy sector have lacked clarity.

Wider utilisation of peat has been hindered, for instance, by restrictions on its use in heating installations and electricity and heat co-generation plants that were built using investment support from the state. These restrictions were associated with the requirement that support funds should be used for the development of renewable energy, which excluded the possibility of using peat. Nevertheless, there are several electricity and heat co-generation

[68] Estonian Development Fund. 2013. Final Report. Energy Resources of Estonia. Available at: http://www.energiatalgud.ee/img_auth.php/3/3f/Energy_resources_ENG_ENMAK_uusmets_140213.pdf (12.10.2014).
[69] See also NDPES 2030 SEAR report, Chapter 9, http://www.energiatalgud.ee/img_auth.php/7/7e/ENMAK_2030_KSH_aruanne.pdf

plants and heating installations where peat is used as one of the fuels or even as the only fuel.

Considering the significant energy potential, local origin, good availability and low price of peat compared to other energy carriers, improved opportunities are needed to facilitate utilisation of peat-based equipment in a similar manner to other local fuels.

Any incentives for investment in affordable local fuels, which will be included in district heating regulations, should further strengthen the position of peat as a local, and relatively affordable, source of primary energy.

3.7. Research and development in the energy sector

The capacity to implement changes in the energy sector is strengthened by a strong sectoral potential in research and development (*R&D*). The Estonian energy technology programme (ETP) was launched in 2008 in the framework of the Estonian research, development and innovation strategy "Knowledge-Based Estonia 2007-2013" to increase research and development capacity in the energy sector and achieve other related objectives. The following table summarises the main outcomes of implementation of ETP[70].

Table 3.3. Main outcomes of implementation of ETP

Expected outcome or impact of ETP	Actual outcomes or impacts achieved
Improved research potential in the energy sector and greater economic utilisation of research results	The review of ETP development directions resulted in concrete specification of the needs of businesses. The ETP measure[71] implemented by SA Archimedes contributed to improvement of research potential in the field and a shift of funding towards the important economic projects specified in ETP. The total support allocated to projects under the ETP measure was €7.1m. Motivated by the programme, several research groups participated in the calls for proposals of the ETP measure.
Creation of technical preconditions for utilisation of resource-efficient technologies and reduction of waste emissions in the economy	Implementation of ETP resulted in the development of sets of proposals for wider use of methane fuels (incl. biomethane) in transport. The ETP measure also included funding of an inter-university research group to achieve a significant increase in the capacity of providing actors in the biogas field with research support.

[70] The summary is based on "Analysis of the impact of the Estonian energy technology programme (2007 to 2013)" (a report from the programme manager to the steering committee, 2014). The outcomes and impacts were broken down by the main expected results and impacts specified in ETP.
[71] Measure "Supporting the development of R&D of energy technology", see also https://www.riigiteataja.ee/akt/119062013008 and http://tartu.archimedes.ee/projektid/ (see measure 3.2.5)

Expected outcome or impact of ETP	Actual outcomes or impacts achieved
Increased flexibility of the use of financial instruments in preparation and implementation of energy projects	There was a shift between ETP actions in the analysed period and the use of the funding of the EU programming period, which is why the impact of ETP on the use of funds for the benefit of energy R&D remained modest. However, the ETP measure implemented by SA Archimedes is a good example of an ETP programme contributing to more flexible utilisation of resources invested in R&D. Even though the ETP measure is not a financial instrument in the traditional sense, it probably facilitated greater private sector funding for energy R&D.
Contribution to achievement of the objectives specified in the strategic documents of the energy sector and approved by the European Council	A more immediate outcome of ETP is the development of suggestions on utilisation of methane fuels, which can contribute to meeting the 2020 renewable energy target for the transport sector. The ETP measure was used to fund R&D projects on renewable energy. In addition, the organisation of the implementation of ETP, which included diverse partners, has helped shape the principles of implementation of this Development Plan.

An interim assessment of ETP[72] was conducted in 2012 in the context of ETP implementation and it included a broader treatment of the context of energy R&D. The report highlights the following issues:

- Cooperation of businesses and research institutions is affected by insufficient number of new experts on the energy sector;
- Material and technical resources of R&D are not sufficient for research and development at a good quality level;
- Funding is fragmented and hinders the development of sufficiently productive research potential in research institutions and businesses. Coping with new development needs is a challenge for businesses and research institutions, contributing to a situation where businesses procure R&D competencies from outside of Estonia. The research groups at research institutions cannot create additional R&D capacity due to insufficient funding, which means that they are unable to provide the required capacity in case of increased demand for the R&D service;
- There is too much emphasis on research publications and citations in the assessment of the level of research institutions and research groups, while solutions to actual problems of the economy, developed in the context of applied research, are overlooked;
- Greater efforts should be made in connection with increasing the qualifications of energy experts and providing further education, because Estonia needs more energy experts with higher or vocational education. There should be more cooperation

[72] Energiatehnoloogia programmi vahehindamine [*Interim assessment of the energy technology programme*] (MKM - ÅF-Consulting AS, 2012), https://www.mkm.ee/sites/default/files/inno_energia_2012_pdf.pdf

between businesses and R&D institutions for improvement of energy education, and ETP has an important role in this context;
- It is important to continue the dialogue of business operators and R&D institutions on the future of research and development;
- Businesses and R&D institutions need increased capacity for preparing high-quality funding applications that conform to requirements.

In addition to the listed general observations, the report provides specific recommendations on advisable and inadvisable ETP development directions. The process of preparing this Development Plan included identification of the requirements for additional R&D, which should be met if the measures of the Development Plan are to be successfully implemented. Transport and buildings are two new fields of R&D, which were not covered in the context of ETP but which require actions closely related to the energy sector. The previous ETP implementation principles include many useful aspects that should be continued, such as public discussions of the coordinating authorities, research institutions and business operators on the priorities and implementation of the programme.

Implementation of the measures of this Development Plan is associated with R&D needs in all fields of NDPES 2030, i.e., electricity supply, local fuels, transport and mobility, energy efficiency of buildings, and heat supply. All five measures of NDPES 2030 include specific actions that require particular R&D as preconditions for successful implementation of the actions; these needs will be listed in a R&D programme to be annexed to the operational programme of NDPES 2030. These R&D needs have an applied character and require quick results that could be implemented in practice at once. In order to meet the needs of NDPES 2030, R&D activities have been mapped for the period 2015-2020 (estimated costs and funding sources of R&D activities are specified in the R&D programme annexed to the operational programme of NDPES 2030, the initial R&D cost projection is provided in Table 7.1 and it will be further specified in the R&D programme annexed to the operational programme of NDPES 2030).

The objective of **electricity generation R&D measures** is ensuring efficient generation of electricity and R&D is required to create the necessary preconditions for increased competitiveness of electricity generation through the use of oil shale and renewable fuels, optimisation of production processes, reduction and recovery of emissions. Together with optimisation of power transmission and consumption management, R&D should also work on integration of micro-generation in the electricity system.

The selection of **R&D actions for the transport sector** is largely based on the background study on energy efficiency of transport and the analysis of transport scenarios in the context of preparing this Development Plan and they should support efficiency increase in resource usage. Development of energy- and resource-efficient transport and mobility arrangements is by its nature a very interdisciplinary field, which is why many R&D actions in the transport sector are related to most of the transport measures in this Development Plan.

The objective of R&D on energy efficiency of **buildings** is to create capabilities for achieving the energy savings envisaged in NDPES 2030 though sustainable long-term without harming public or occupational health. This requires development of core competencies and know-how to prevent design and construction errors (crumbling façades, humidity damage and mould, inadequate ventilation, insufficient energy savings, etc.) in renovation at a new and higher technological level of energy efficiency on the one hand and to develop affordable solutions for the construction of new nearly zero-energy buildings on the other hand.

The objective of the **heat supply R&D** measures is ensuring efficient production and transmission of heat. The R&D goal is to create the preconditions for increasing competitiveness of heat production through the use of renewable fuels, optimisation of production processes and reduction of emissions.

3.8. Estonia in international and regional energy cooperation

In the interests of meeting its energy policy targets and contributing to international and regional energy cooperation, Estonia participates in a number of international and regional multilateral cooperation forums – the International Energy Agency (IEA), the Energy Charter Treaty, BASREC, the energy committee of the Baltic Council of Ministers, the International Renewable Energy Agency (IRENA). These organisations and cooperation networks provide venues, in accordance with their specified goals, for global and regional energy cooperation, identification of common solutions to sectoral problems, exchange of experiences and creation of new expertise. Estonia's goals in participating in international cooperation include strengthening of energy security in Estonia and in the regional and global level, maintaining and increasing Estonia's competitiveness, managing risks to security of supply, promoting research development and mediating intellectual property created through the use of Estonian domestic resources.

3.8.1. International Energy Agency (IEA)

The International Energy Agency (IEA) is an intergovernmental energy organisation, which works to ensure reliable, affordable and clean energy supply, providing authoritative statistics, analyses and recommendations. Estonia became a full member of the organisation in May 2014.

The initial role of the IEA was coordinating the development and implementation of measures to respond to disruptions in fuel supply, communicating information on oil and fuel reserves, developing methodologies for consumption management, and analysing the situation in the international energy market. The IEA has since then expanded its activities and the main areas of focus include:

- Energy security (promoting diversity in energy supply), efficiency and flexibility in all energy sectors);
- Economic development (ensuring stable supply of energy to the IEA members and supporting free markets to foster economic development and reduce energy poverty);
- Environmental awareness (promoting international knowledge on options for tackling climate change);

- Engagement worldwide (working closely with non-members, especially major supplying and consuming economies, to find solutions to shared energy and environmental concerns).

Promotion of energy innovation and technological cooperation is important as well.

For Estonia, the IEA is a strategic cooperation organisation and our participation supports the achievement of the objectives of our energy policy on the widest possible scale. The IEA as the focal point of global energy dialogue offers an opportunity for cooperation between global energy market participants to increase energy security while improving conservation of the environment. Participation in the work of the IEA can provide Estonia with a stronger voice in the development of global energy policies. By starting cooperation with the IEA, Estonia has improved its readiness for quick and flexible response to disruptions of fuel supply, incl. through shared actions and mechanisms. Regular cooperation with the IEA helps to strengthen the system of liquid fuel stock management and establishes a firmer foundation for response to crisis situations. Furthermore, as the IEA acknowledges the importance of domestic solid fossil fuels, incl. oil shale, for ensuring security of energy supply, Estonia will have more opportunities to present its experience of efficient use of oil shale and development of shale oil production technologies.

As a member of the IEA, Estonia has access to extensive market analyses and data, which can be used for resolving domestic energy issues and for policy development. Estonia also contributes to the development of analyses by submitting statistical data and field-specific information on the energy sector. The IEA regularly prepares in-depth analyses of energy policies of its member states and reviews of operational capacity in case of fuel supply disruptions. The analyses concerning Estonia contribute to improved development of our energy policies, while our experts can gain experience by participating in the creation of analyses on other countries.

Estonia needs a more detailed analysis of the potential of the cooperation opportunities in the IEA framework in order to identify priority fields of participation that would simulate the development of Estonia's energy sector, as well as research and technological development, and to find funding options for actions.

Development of new environmentally-friendly energy technologies is an important objective of the IEA. In order to support technological cooperation, the IEA has created a multilateral technological cooperation framework, where partners operate through mutual *technology-related implementing agreements*. These technological cooperation initiatives enable governments, businesses, industries, research institutions, international organisations and NGOs to engage in cooperation and share information on breakthrough technologies, to fill the gaps in existing research, to conduct pilot projects and to advance widespread implementation and promotion[73].

[73] www.iea.org

3.8.2. Energy Charter

The idea of greater energy cooperation between the European Union and the republics of the former Soviet Union was born in June 1990. The political declaration of the Energy Charter was signed in The Hague on 17 December 1991; it was followed by the Energy Charter Treaty and the Protocol on Energy Efficiency and Related Environmental Aspects, which were signed in Lisbon in December 1994 and entered into force in April 1998. An amendment to the trade-related provisions was also agreed in the same year to bring the Energy Charter Treaty in line with the rules of the World Trade Organization (WTO). The Energy Charter Treaty is the primary international treaty on energy trade, transit and investment. Estonia signed the Energy Charter on 18 May 1992 and the Energy Charter Treaty on 17 December 1994. Estonia is a full member of the Energy Charter Conference since 2 August 1998.

The main areas of the Energy Charter include trade in energy products and goods of the energy sector, ensuring equal treatment, promoting efficient energy use and reducing negative environmental impacts of energy production and use, resolution of disputes between states or between states and investors, protection and facilitation of foreign investments in the energy sector, ensuring freedom of transit through access to oil and gas pipelines, power networks and other energy transmission systems. Protection of investments and transit are issues that are not covered by any other international organisations. As these issues are important for Estonia, we have an opportunity to influence policy development in those fields. As a member of the Energy Charter Conference, Estonia has a legal basis for responding to energy disruptions together with other countries, as Estonia participates in the Transit and Industry groups of the Energy Charter and contributes to ensuring security of energy supply.

3.8.3. International Renewable Energy Agency (IRENA)

The International Renewable Energy Agency (IRENA) is an international organisation that develops renewable energy and promotes its wider utilisation worldwide. One of the main functions of IRENA is to offer advice to its member states as regards to selection and adaptation energy sources, technologies, business models, organisational and regulatory frameworks. In this context, IRENA emphasises better legal regulation of renewable energy in its member states, development of renewable energy technologies and better financing for research, and implementation of necessary structural reforms.

Estonia signed the IRENA Statute on 11 June 2009. The Riigikogu ratified the IRENA Statute on 21 March 2012. Estonia became full member of the organisation on 30 June 2012.

The cooperation in IRENA contributes to the diversification of the ways how Estonia can meet its commitments (general development of renewable energy and use of liquid biofuels in transport in accordance with the Renewable Energy Directive of the EU climate and energy package). IRENA and the contacts established there provide opportunities for obtaining more information on new cooperation possibilities and for making preparations for new cooperation schemes, which would support the meeting of Estonia's renewable energy targets. Diverse opportunities ensure that targets are met economically in the most advantageous manner.

We see development of renewable energy technologies and better financing for research through this cooperation framework as areas with important prospects for Estonia.

Furthermore, the cooperation in IRENA contributes the increased sectoral administrative capacity – the information available through the Agency enables Estonian authorities to learn more about the experiences of sectoral policy implementation and to provide advice on developing the renewable energy sector to other members. Estonia has valuable experiences, deserving presentation at the international level, in connection with the use of local fuels in the district heating sector, organisation of the respective transition and implementation of joint implementation projects based on the Kyoto Protocol of the UN Framework Convention on Climate Change.

3.8.4. BASREC

BASREC (Baltic Sea Region Energy Cooperation) is an intergovernmental cooperation network of the Council of the Baltic Sea States and its members are the 11 countries[74] and the European Commission. The network was established in 1998.

BASREC unites the countries of the Baltic Sea region, both members and non-members of the European Union, and it is an important addition to Estonia's main international cooperation efforts in promoting internal energy market in the EU.

Estonia contributes to the development of a shared regional understanding of energy issues in BASREC by presenting its domestic solutions and vision, thereby shaping, together with partners, the future of the energy sector in the entire region.

3.8.5. Estonian Committee of the World Energy Council (WEC)

Founded in 1923, WEC is the largest and leading global organisation that brings together different energy sectors. Estonia joined WEC on 29 June 1937 in Paris. Estonia's membership status was restored in 1998 in Houston at the 17th congress of WEC.

The Estonian Committee of the World Energy Council was established on 16 July 2003 as a joint effort of the Ministry of Economic Affairs and Communications, the Academy of Sciences, Estonian Power and Heat Association, Tallinn University of Technology, Eesti Energia AS and AS Eesti Gaas.

The tasks of the WEC Estonian Committee include promotion of sustainable energy supply and use in accordance with the principles of WEC, participation in the work of WEC, and promoting international energy experiences that support Estonia's national interests.

WEC collects and analyses different types of data from all over the world, conducts thematic research, analyses different operational policies and strategies and issues recommendations

[74] Denmark, Estonia, Finland, Germany, Iceland, Latvia, Lithuania, Norway, Poland, Russia and Sweden.

on specific policies, prepares local and global energy development scenarios, and facilitates all initiatives to transform recommendations into practical outcomes for the development of the energy sector in the world.

In order to perform its main functions, WEC organises or helps to organise energy conferences and meetings, technical research and implementation programmes, regional energy forums, establishment and operation of cooperation networks.

Furthermore, WEC prepares authoritative reports and analyses, conducts various studies, prepares short- and long-term development scenarios, analyses individual cases that could serve as examples for others, makes recommendations in the field of energy development, operational policy and strategy, creates general energy development projections for medium and long term, conducts comparative analyses of different regions of the world and develops international energy standards.

WEC works on key issues of the energy sector, such as reorganisation of energy markets, efficiency of energy generation and use, financing for energy systems and large energy investments projects, energy tariffs, pricing principles and cross-subsidies, energy shortage, security of supply and supply disruptions, greenhouse gases, pollution problems and emissions trading, global warming and environmental problems, ethical behaviour, social ethics and global ethical problems in the energy sector, research and practical implementation of new energy generation technologies, specific energy issues in developed countries, transition countries and developing countries.[75]

The role of the Estonian Committee of the World Energy Council is to communicate this knowledge to support better development of Estonia's energy policies.

[75] WEC Estonia homepage http://www.wec-estonia.ee/

4. Overall objective, specific targets and progress indicators

4.1. Overall objective and specific targets of the Development Plan

The overall objective of the Estonian National Development Plan of the Energy Sector until 2030 is:

Ensuring energy supply with market-driven prices and availability for consumers in line with the long-term energy and climate targets of the European Union, while contributing to the improvement of Estonia's economic climate and environmental status and increased long-term competitiveness.

Progress in meeting the overall objective of NDPES 2030 is monitored on the basis of overarching indicators (overall objective indicators). The following table provides an overview of the overarching indicators, which were selected in the course of the NDPES 2030 and SEAR NDPES process. The indicators of specific measures are described at the corresponding measure. The overarching indicators are necessary to describe the changes in Estonia's energy sector that occur as a result of the combined impact of the actions.

Table 4.1. Progress indicators for the overall objective of NDPES 2030

Indicator	Baseline	Indicative target level 2030[76]
Ensuring energy security, incl. security of supply		
Final energy consumption, TWh *Source: Statistics Estonia*	33.2 (2012)	≤32.8
Share of renewable energy in final energy consumption, % *Source: Eurostat*	25.8% (2012)	50%
Primary energy supply, TWh *Source: Statistics Estonia*	64.1 (2012)	57.7
Share of renewable energy in primary energy supply, % *Source: Statistics Estonia*	17.7% (2012)	32%
Share of imported fuels, % *Source: Statistics Estonia*	23% (2012)	≤25%
Net import of electricity, % *Source: Elering AS*	0% (2012)	0%
Reduction of health impact		
Disability-adjusted life years (disease burden), 1000 DALY *Source: Internationally accepted calculation model*	18 (2012)	11
Number of early deaths caused by atmospheric particulate matter with diameter <2.5 µm $PM_{2.5}$ *Source: Internationally accepted calculation model*	543 (2012)	285
Improved competitiveness of the economy		
Energy intensity, MWh/(1,000 $€_{GDP2012}$) *Source: Statistics Estonia*	5.6 (2012)	2
Greenhouse gas emissions in the energy sector per GDP, tCO_2-eq./$€_{GDP2012}$	0.96 (2012)	0.35

[76] The specification of indicative target levels is based on the results of the source studies for NDPES 2030 (Ch. 8).

Indicator	Baseline	Indicative target level 2030[76]
Source: Statistics Estonia, Ministry of the Environment		
Change in GDP vs. base scenario, %[77] *Source: Economic impact analysis model of NDPES 2030*	0%[78] (2012)	3.6%
Change in foreign trade balance in relation to GDP vs. base scenario, %[77] *Source: Economic impact analysis model of NDPES 2030*	0%[78] (2012)	2.8%
Change in productivity vs. base scenario, %[77] *Source: Economic impact analysis model of NDPES 2030*	0%[78] (2012)	2.7%
Change in employment vs. base scenario, persons/y[77] *Source: Economic impact analysis model of NDPES 2030*	0[78] (2012)	15,900
Competitiveness of final energy price for large consumers *Source: Eurostat*	-[79]	-
Reduction of impact on the natural environment		
Greenhouse gas emissions in the energy sector, m tCO_2-eq./y *Source: Ministry of the Environment*	16.8 (2012)	10.5
Nitrogen oxides in the energy sector, NO_x kt/y *Source: Ministry of the Environment*	21.9 (2012)	20.9
Sulphur dioxide in the energy sector, SO_2 kt/y *Source: Ministry of the Environment*	52.4 (2012)	37.8
Polycyclic aromatic hydrocarbons in the energy sector, PAH t/y *Source: Ministry of the Environment*	0.2 (2015)	0.2
Hexachlorobenzene in the energy sector, HCB kg/y *Source: Ministry of the Environment*	0.8 (2015)	0.8
Volatile organic compounds in the energy sector, VOC kt/y *Source: Ministry of the Environment*	4.5 (2015)	3.0

Monitoring should focus on the following indicators of efficient reduction of negative impact of the energy sector and specified indicators in accordance with Chapter 10 of the strategic environmental assessment report on NDPES 2030[80]:

- Improvement in resource- and energy efficiency of energy technologies: reduced consumption of primary energy in district and local heating, incl. at municipality level (heating installations, monitoring of the cooling demand of district heating, increase in the use of solar energy in the construction of new and renovation of old buildings);

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[77] In relation to the outcomes of the non-intervention scenario (minimum regulation and support) in the economic impact analysis model of NDPES 2030.
[78] The value of the baseline before the implementation of NDPES 2030 is 0, as the outcomes are compared to the non-intervention scenario.
[79] The indicator will be specified (incl. baseline and target levels) at the time of drafting of the monitoring plan.
[80] Strategic environmental assessment report on NDPES 2030, http://www.energiatalgud.ee/img_auth.php/7/7e/ENMAK_2030_KSH_aruanne.pdf

- Estonia meets the targets of the Energy Efficiency Directive (2012/27/EU) – meeting the overall energy efficiency target at the level of 7,101 GWh by the end of 2020 and meeting the target of renovation of public buildings;
- Preservation of biological diversity – impact of sustainable forest management techniques, monitoring the impact of land use;
- Impact of the modernisation of heating and ventilation installations, incl. local heating equipment, on indoor climate and health;
- Reduction of the health impact of $PM_{2.5}$ in larger cities and Ida-Viru County;
- Long-term monitoring of energy use in renovated buildings (incl. submission of proposals for additional energy efficiency measures if necessary);
- Use of energy efficient vehicles and public transport (incl. for commuting) as a result of implementation of the MDPES 2030 measures;
- Monitoring of administrative capacity and environmental awareness (incl. monitoring the municipal development plans for the heating sector);
- Monitoring of changes in NDPES 2030 inputs, outcome indicators and consumption;
- Monitoring of changes in the reference system (fuel prices in the global market, market price of electricity, price of CO_2, prices of technologies, development of technologies, incl. nanotechnology).

Based on the overall objective, this Development Plan has the following specific targets:

1. **Security of supply: Continuous energy supply is ensured in Estonia**
2. **Increased efficiency in the use of primary energy: Estonia's energy supply and consumption is more sustainable**

The third aspect of the overall objective (status of the economy) is not included among the specific targets, because the implementation of the measures of the specific targets of security of supply and efficient use of primary energy should result in a contribution of the energy sector to the economic development and good level of welfare of Estonian residents.

4.2. Specific target for security of supply

The specific target for security of supply – continuous energy supply is ensured in Estonia – was established on the basis of the issues and challenges highlighted in the following sections of the analysis of the situation:

- 3.2.4 Development trends and principles in electricity generation;
- 3.2.5 Electricity generation and generation capacity;
- 3.2.7 Transmission of electricity;
- 3.2.8 Electricity distribution grids;
- 3.3.3.2 Use and production of district heat;
- 3.6.3.3 Security of gas supply;
- 3.6.4 Liquid fuels.

The following measures will be implemented to meet the specific target for security of supply:

1.1 Development of electricity generation;
1.2 Efficient transmission of electricity in line with economic demand;
1.3 Ensuring the supply of gas;
1.4 Maintaining fuel stocks;
1.5 Efficient production of heat;
1.6 Administrative capacity and foreign cooperation in the energy sector.

An overview of the specific indicators for particular measures and the indicative target levels is provided in the measure descriptions and tables below.

4.2.1. Measures of the specific target for security of supply

This section describes the measures of the specific target for security of supply. The list of measures is indicative, i.e., other measures can be added in the course of drafting operational programmes if they are needed for meeting the specific target and/or the measurable target levels.

The indicators associated with the specific target for security of supply are listed in the following table. A detailed description of the measures and particular actions to be implemented for the specific target can be found below.

Table 4.2. Progress indicators for the NDPES 2030 specific target for security of supply

Indicator	Baseline	Target level 2020	Target level 2030
Measure 1.1. Development of electricity generation			
1. Availability of local generation capacities to satisfy the N-1-1 criterion *Source: Elering AS*	Achieved (2012)	Achieved	Achieved
2. Share of fuel-free energy sources (solar, wind, hydro power) in final electricity consumption, % *Source: Statistics Estonia*	0.75% (2012)		>10%
3. Closure of production plants that do not conform to the Industrial Emissions Act *Source: Ministry of the Environment*	Not closed	Closed (2024)	
4. Electrical capacity of co-generation plants supplying a district heating network, MW_{el} *Source: Elering AS*	742.5 (2014)	792.5	817.5
5. Share of imported fuels in electricity generation *Source: Statistics Estonia*	0.5% (2013)		<50%
6. Share of domestic electricity under open market conditions *Source: Statistics Estonia*	161% (2013)		>60%
7. Share of renewable energy in final electricity consumption	14.6% (2014)		>50%

Indicator	Baseline	Target level 2020	Target level 2030
Source: Eurostat SHARES model, Statistics Estonia KE03			
Measure 1.2. Efficient transmission of electricity in line with economic demand			
1. Annual System Average Interruption Duration Index (SAIDI) of the distribution grid per consumption point, minutes *Source: Competition Authority*	413 (2013)		≤90
2. Volume of electricity supply losses in the transmission network, MWh *Source: Elering AS*	58 (2013)		≤150
3. Availability of trans-boundary interconnections, % *Source: Elering AS*	>96% (2014)		96%
4. Share of weather-proof networks in the distribution grid, % *Source: Elering AS*	44% (2012)		75%
5. Creation of new 330 kV lines (Sindi-Riga and Sindi-Harku) *Source: Elering AS*		Complete d	
6. Estonia is connected to the Central European synchronous grid area *Source: Elering AS*			Connected
Measure 1.3. Ensuring the supply of gas			
1. Meeting the infrastructure standard (N-1) *Source: Competition Authority*	Achieved	Achieved	Achieve d
2. Share of the largest gas supply source *Source: Competition Authority*	100% (2012)		70%
3. Market share of the largest gas seller *Source: Competition Authority*	100% (2012)		32%
4. Meeting the security of supply standard (N-1) *Source: Competition Authority*	100%		Achieve d
5. Gas market concentration (HHI)3 *Source: Competition Authority*	10,000 (2012)		<2,000
6. BalticConnector gas pipeline between Estonia and Finland *Source: Elering AS*		Complete d (2019)	
Measure 1.4. Maintaining fuel stocks			
1. Availability of required fuel stocks *Source: OSPA*	Ensured	Ensured	Ensured
Measure 1.5. Efficient production of heat			
1. Share of renewable energy in district heat production, % *Source: Statistics Estonia*	33% (2011)		≥80%
2. Share of import fuels in the heating industry, % *Source: Statistics Estonia*	34% (2013)		≤30%
3. Use of primary energy for heat production, TWh *Source: Statistics Estonia*	20.4 (2012)		≤19

Indicator	Baseline	Target level 2020	Target level 2030
Measure 1.6. Foreign cooperation and administrative capacity in the energy sector			
1. Accuracy and sufficiency of the information on Estonia *Source: MEAC*	Ensured	Ensured	Ensured
2. Created domestic preconditions for international cooperation for renewable energy development *Source: MEAC*		Created (2016)	
3. Generation of renewable energy for the performance of cooperation agreements on international development of renewable energy *Source: MEAC*		-	
4. Development of legislation required for implementation of the Development Plan *Source: MEAC*		Ensured	Ensured
5. Monitoring the implementation of the Development Plan *Source: MEAC*	Ensured	Ensured	Ensured
6. Availability of required energy sector development plans in county governments *Source: MEAC*	3 (2014)	-	
7. Availability of required heating sector development plans in local governments *Source: MEAC*	0 (2014)	200 (2022)	

Measure 1.1	Development of electricity generation	**Target level (year)**
Field	Supply of electricity	
BACKGROUND OF THE MEASURE	Estonia is becoming increasingly integrated in the regional electricity market, which ensure availability of electricity at roughly the same prices as in the other countries constituting the regional electricity market. Furthermore, improved interconnections with other regions of the EU enable Estonian electricity generators to participate in a larger market. If this is taken into account in the assessment of sufficiency of generation capacity, there will be reduced need to burden the electricity tariff with charges for establishing and maintaining new generation capacities in Estonia. The issue of dispersing generation capacities and utilising the potential of co-generation remains relevant in Estonia. Viability of the oil shale sector can be ensured by increasing resource efficiency of the oil shale sector.	

	Development of renewable energy is one of the cost-effective ways to reduce greenhouse gas emissions; Estonia can make a contribution to meeting the long-term climate and energy targets by cooperating with other countries on the development of renewable energy.	
RATIONALE FOR THE EXTENT OF INTERVENTION	The new electricity generation capacities in Estonia must be competitive in the open electricity market without additional subsidies of the state or consumers. The support schemes for the establishment of new generation capacities are specified in the Electricity Market Act and they are directed primarily towards renewable energy and co-generation, as well as satisfying the criterion of available local generation capacities. Upon application of new support schemes, the need for support is assessed in the light of the trends in the electricity market and the efficiency of support is analysed in comparison to other measures for reduction of greenhouse gas emissions.	
INDICATORS	1. Availability of local generation capacities to satisfy the N-1-1 criterion	Achieved until 2030
	2. Share of fuel-free energy sources (solar, wind, hydro power) in final electricity consumption, %	10% (2030)
	3. Closure of production plants that do not conform to the Industrial Emissions Act	Closed by 2024
	4. Electrical capacity of co-generation plants supplying a district heating network, MW_{el}	Additional co-generation capacity: 50 MW_{el} (2020) Additional co-generation capacity: 25 MW_{el} (2020-2030)
	5. Share of imported fuels in electricity generation, %	< 50 % (2030)
	6. Share of domestic electricity under open market conditions, %	> 60 % (2030)

	7. Share of renewable energy in final electricity consumption, %	>50% (2030)
MAIN ACTIONS	● Closure of generation capacities that do not conform to environmental requirements ● Construction of new co-generation plants ● Construction of new power plants fuelled by biomass ● Construction of new micro and distributed generation capacities ● Construction of new wind farms ● Installation of required regulating capacities ● Participation in the creation of the market of regulating capacities ● Legislative amendments for ensuring efficient electricity generation and increasing the share of renewable electricity ● Legislative amendments for ensuring sufficient generation capacity in combination with trans-boundary interconnections (satisfying the N-1-1 criterion) ● Expanding the range of fuels usable in existing power plants, incl. the use of biofuels and peat ● Ensuring operational continuity of services of vital importance ● Research and development	

Measure 1.2	Efficient transmission of electricity in line with economic demand	**Target level (year)**
Field	Supply of electricity	
BACKGROUND OF THE MEASURE	The background of the measure can be described with the following keywords: the need to reduce interruptions in networks (especially in regions where interruptions cause major socio-economic losses), movement towards connection to the Central European power system, integration of electricity markets, ensuring availability of electricity in major urban centres, utilisation of smart meters and smart grids, cooperation between different fields required for the development of smart grids and consideration for special characteristic in the structuring of network tariffs.	

RATIONALE FOR THE EXTENT OF INTERVENTION	The development of the domestic network is financed through network charges and the fixed component of the charges is applicable to all market participants that use a network connection. The price of the network service should not increase faster than the consumer price index. The opportunities offered in the context of EU support schemes are used to finance trans-boundary interconnections.	
INDICATORS	1. System Average Interruption Duration Index (SAIDI) per consumption point, minutes/year	90 (2030)
	2. Volume of electricity supply losses in the transmission network, MWh	<150 (2030)
	3. Availability of trans-boundary electricity interconnections, %	96%
	4. Share of weather-proof networks in the distribution grid, %	75% (2030)
	5. Creation of new 330 kV lines (Sindi-Riga and Sindi-Harku)	Completed (2020)
	6. Estonia is connected to the the synchronous grid coordinated in EU	Connected (2030)
MAIN ACTIONS	● Raising the quality of network services (compliance with standards EVS-EN 50160, EVS-IEC 61000), specification of liability of those who cause disturbances and implementation of measures to eliminate disturbances. ● Replacement of exposed overhead lines with weatherproof solutions in the distribution grid ● Creation of new 330 kV lines (Sindi-Riga and Sindi-Harku) ● Establishment of new power plant connections (110 kV, 330 kV) ● Utilisation of new technical solutions (smart grid solutions; operating as an independent frequency network, i.e., in case of permanent or short-term disconnection from the grid) ● Implementation of settlements based on hourly balances	

	- Establishment of fixed transmission network and distribution grid charges, based on fixed costs of network operators - Determination and implementation of optimal investment principles and maintenance standards for different types of network regions - Making provisions for large connection capacities in the planning process - Making needs-based concessions in grid connection charges to electricity consumers and generators of special importance for Estonian economy - Creation of large connection capacities - Connection to the the synchronous grid coordinated in EU - Analysing the need for differentiation of network tariffs and other electricity price components for different consumer groups - Ensuring operational continuity of services of vital importance - Research and development	

Measure 1.3	Ensuring the supply of gas	**Target level (year)**
Field	Fuel sector	
BACKGROUND OF THE MEASURE	The importance of the measure can be described with the following keywords: dependence of the gas supply on a single supplier, readiness for the development of an LNG terminal, agreements for development of new trans-boundary interconnections, the need to increase air purity in larger cities, increased use of biomethane and natural gas as alternative fuels in the transport sector	
RATIONALE FOR THE EXTENT OF INTERVENTION	The dependence on the single supplier has not be resolved through market mechanisms, the government focuses on overcoming the market failures related to the security of gas supply in order to provide opportunities to use gas under economically most advantageous conditions.	

INDICATORS	1. Meeting the infrastructure standard (N-1)[81]	100%
	2. Share of the largest gas supply source	<70% (2030)
	3. Market share of the largest gas seller	<32%
	4. Meeting the security of supply standard[82]	100%
	5. BalticConnector gas pipeline between Estonia and Finland	Completed (2019)
	6. Market concentration level (HHI)	<2,000
MAIN ACTIONS	• Drafting of the gas network code • Introducing the regulation on maintaining gas reserves for protected consumers • Construction of BalticConnector • Development of agreements on Baltic and Finnish gas transit and on ensuring that Estonian gas market participants have access to regional LNG terminals and gas storage facilities • Introduction of a tariff component based on connection capacity • Analysing the feasibility of implementing the entry/exit model	

[81] Article 6 (1) of Regulation 994/2010 specifies the N-1 criterion of the gas infrastructure standard, according to which by 3 December 2014 at the latest, each Member State has to ensure operational continuity of their gas infrastructure in the event of a disruption of the single largest gas infrastructure element under the conditions of the maximum gas demand of the past 20 years. The N-1 criterion refers to a situation where the single largest gas supply connection is interrupted. The N-1 criterion is satisfied if supply can be reorganised without supply disruptions in case of interruption. N-1 criterion is satisfied when the result is at least 100%.

[82] Article 8 (1) of Regulation 994/2010 specifies that the Competent Authority shall require the natural gas undertakings, that it identifies, to take measures to ensure gas supply to the protected customers of the Member State in the following cases:

a) extreme temperatures during a 7-day peak period occurring with a statistical probability of once in 20 years;
b) any period of at least 30 days of exceptionally high gas demand, occurring with a statistical probability of once in 20 years; and
c) for a period of at least 30 days in case of the disruption of the single largest gas infrastructure under average winter conditions.

Measure 1.4	Maintaining fuel stocks	Target level (year)
Field	Fuel sector	
BACKGROUND OF THE MEASURE	Minimum stocks of imported liquid fuels have to be maintained. Estonia has created a well-functioning system for managing the liquid fuel stocks. The valid international obligations for maintaining liquid fuel stocks should be continually met.	
RATIONALE FOR THE EXTENT OF INTERVENTION	Availability of the minimum required liquid fuel stocks will be ensured.	
INDICATORS	1. Availability of required fuel stocks	Ensured to the extent required by legislation
MAIN ACTIONS	• Management of the fuel stocks	

Measure 1.5	Efficient production of heat	Target level (year)
Field	Heat supply	
BACKGROUND OF THE MEASURE	The importance of the measure can be characterised with the following keywords: wider utilisation of the potential of co-generation and residual heat, promoting utilisation of local fuels, reducing dependence on imported energy carriers, reducing price differences between district heating services in different regions.	
RATIONALE FOR THE EXTENT OF INTERVENTION	Case-by-case approach to the assessment of the condition and future prospects of district heating systems and to the implementation of measures; reduction of price differences.	
INDICATORS	1. Share of renewable energy in district heat production, %	> 80% (2030)

	2. Share of import fuels in the heating industry, % 3. Use of primary energy for heat production, TWh	< 30% (2030) < 19 (2030)
MAIN ACTIONS	● Converting boiler plants to burn cheaper fuels (e.g., wood, straws, peat, etc.) ● Replacement of boilers (replacement or renovation of boilers without changing the fuel) ● Transition to local heat supply ● Application of legislation to stimulate investment and partial liberalisation of the market ● Drafting of heating sector development plans ● Research and development	

Measure 1.6	Foreign cooperation and administrative capacity in the energy sector	**Target level (year)**
Field	Administrative capacity and foreign cooperation in the energy sector	
BACKGROUND OF THE MEASURE	The importance of the measure can be characterised with the following keywords: ensuring adequate information for the implementation of the Development Plan, ensuring availability of experts for implementation of the Development Plan measures at national and municipality level, using the opportunities and meeting the energy sector commitments arising from membership of the European Union and other international organisations, participating in the development and implementation of other policies that have an impact in the energy sector.	
RATIONALE FOR THE EXTENT OF INTERVENTION	Ensuring competence and capability of the public sector (incl. local governments) in the energy sector. Ensuring adequacy of the information used in international overviews. Promoting oil shale as a source of energy. Developing cooperation on the low-carbon energy sector. Creation cooperation opportunities for Estonian businesses.	
INDICATORS	1. Accuracy and sufficiency of the information on Estonia	Ensured

	2. Created domestic preconditions for international cooperation for renewable energy development	(Q1, 2016)
	3. Generation of renewable energy for the performance of cooperation agreements on international development of renewable energy	20% of final electricity consumption in Estonia (2030)
	4. Development of legislation required for implementation of the Development Plan	Ensured
	5. Monitoring the implementation of the Development Plan	Implementation report
	6. Availability of required energy sector development plans in county governments	3 (2030)
	7. Availability of required heating sector development plans in local governments	100% (2019)
MAIN ACTIONS	● Ensuring administrative capacity of the management structure for the implementation of the Development Plan ● Ensuring administrative capacity of the public authorities that work with the Development Plan and ensure applicability of energy market regulations and other legislation associated with the energy sector ● Analysing aggregation of energy sector competences ● Ensuring administrative capacity in the energy sector at the local level ● Offering basic advisory services on energy issues to small consumers ● Strengthening construction supervision ● Ensuring and developing availability of public energy statistics ● Participation in the work of the International Renewable Energy Agency ● Participation in the work of the International Energy Agency ● Participation in the Baltic Sea energy cooperation ● Participation in the work of the World Energy Council ● Participation in the work of the Energy Charter	

	• Drafting legislation and creating other preconditions for international cooperation for renewable energy development • Research and development	

4.3. Specific target for increased efficiency in the use of primary energy

The specific target for increased efficiency in the use of primary energy – Estonia's energy supply and consumption is more sustainable – is based on the need to resolve the problems and challenges specified in the following sections of the analysis of the situation:

- 3.1 Energy consumption and energy efficiency
- 3.2.3 Consumption of electricity
- 3.3.2 Consumption of heat in Estonia
- 3.4 Energy use in the transport sector

The following measures will be implemented in order to meet the specific target for increased efficiency in the use of primary energy:

2.1 Increasing the use of alternative fuels in transport;
2.2 Reducing demand for motorised individual transport;
2.3 Efficient vehicle stock;
2.4 Increasing energy efficiency of the existing building stock;
2.5 Increasing expected energy efficiency of new buildings;
2.6 Efficient heat transmission;
2.7 Exemplary role of the public sector
2.8 Energy efficiency in other sectors

The indicators associated with the specific target for increased efficiency in the use of primary energy are listed in the following table. A detailed description of the measures and particular actions to be implemented for the specific target can be found below.

Table 4.3. Progress indicators for the NDPES 2030 specific target for increased efficiency in the use of primary energy

Indicator	Baseline	Target level 2020	Target level 2030
Measure 2.1. Increasing the use of alternative fuels in transport			
1. Share of renewable sources in the energy consumption of the transport sector, % *Source: Statistics Estonia, Environmental Agency*	0.1% (2013)	10%	
2. Share of methane fuels in the energy consumption of road vehicles *Source: Statistics Estonia, Environmental Agency*	0% (2012)		10%
Measure 2.2. Reducing demand for motorised individual transport			
1. Transport demand for the use of passenger cars in comparison to 2010, %	-		<5%

Indicator	Baseline	Target level 2020	Target level 2030
Source: Competition Authority			
2. Share of public transport usage among the employed population 2020 *Source: MEAC*	22.9 (2013)	≥25%	
Measure 2.3. Efficient vehicle stock			
1. Share of eco-friendly vehicles (energy class A-C) among new vehicle purchases by 2020 *Source: Road Administration*	36% (2011)	≥50%	
2. Fuel consumption of the vehicle stock, TWh *Source: Statistics Estonia, Eurostat*	8.3 (2010)		8.3
Measure 2.4. Increasing energy efficiency of the existing building stock			
1. Net area of residential buildings that have undergone additional renovation with public support, m m^2			
Apartment buildings	1.97 (2014)		17
Small residential buildings	0.040 (2014)		10.4
Source: SA Kredex			
2. Number of households with improved energy consumption class (apartments and small residential buildings) *Source: SA Kredex*	30,000 (2014)		320,000
3. Energy savings achieved in buildings renovated with support funds			
Apartment buildings (energy class C)	5.8%		50%
Small residential buildings (energy class C or D)	0.2%		40%
Source: Register of construction works			
4. Number of apartment buildings that have deteriorated or have been demolished after becoming unfit for use *Source: MEAC*	0	98	250
Measure 2.5. Increasing expected energy efficiency of new buildings			
1. Number of nearly zero-energy buildings based on a standard design *Source: MEAC*	0 (2014)	5	
2. Guidance manual on assessing the impact of energy consumption and CO_2 of buildings and transport in the planning process *Source: MEAC*		2018	
3. Area of nearly zero-energy residential buildings constructed with the help of public support or concessions, m m^2/y *Source: MEAC*	0 (2014)	0.16	
4. Availability of legislation to enable operation of energy associations *Source: MEAC*		2018	
Measure 2.6. Efficient transmission of heat			
1. Reduction in heat losses in district heating, TWh *Source: Statistics Estonia*	-	0.04	0.1
Measure 2.7. Exemplary role of the public sector			

Indicator	Baseline	Target level 2020	Target level 2030
1. Share of the net area of buildings used by the central government and meeting the minimum requirements for energy efficiency that entered into force in 2013, % *Source: SA Kredex*	0 (2014)	20%	37%
2. A green labelling system has been developed *Source: MFin*	In development	2020	
3. Development of guidance manuals, in cooperation with the National Heritage Board, on ensuring energy efficiency during renovation of buildings of cultural and environmental value or subject to heritage conservation *Source: MEAC*	In development	Completed	
4. All counties have prepared strategies for creation of energy efficient residential blocks in the framework of their energy sector development plans *Source: MEAC*	-	Completed	
Measure 2.8. Energy efficiency in other sectors			
1. Energy efficiency in manufacturing plants, GWh *Source: MEAC*	-	460 (2023)	
2. Number of renovated street lighting points, pcs *Source: MEAC*	-	22,000 (2023)	

4.3.1. Measures of the specific target for increased efficiency in the use of primary energy

Measure 2.1	Increasing the use of alternative fuels in transport	**Target level (year)**
Field	Fuel sector	
BACKGROUND OF THE MEASURE	The importance of the measure can be described with the following keywords: the renewable energy target for the transport sector and potential contribution of Estonian business operators to meeting this target, diversification of rural economy, resource efficiency in agriculture and waste handling, reduction of dependence on imported motor fuels, other biofuels: considering the need to promote local production facilities	
RATIONALE FOR THE	Determining the competitiveness of domestic methane fuel in the perspective of the next two years; facilitating	

EXTENT OF INTERVENTION	marketing of alternative fuels under the conditions of balanced competition	
INDICATORS	1. Share of renewable sources in the energy consumption of the transport sector 2. Share of methane fuels in the energy consumption of road vehicles	10% (2020) 10% (2030)
MAIN ACTIONS	• Creating a motivating economic environment for business operators and investors to facilitate production and consumption of biofuels and other alternative fuels • Ensuring long-term security of investments through public taxation policy • Analysing the use of alternative fuels in the public sector and utilisation of those fuels where it is justifiable by socio-economic considerations • Research and development	

Measure 2.2	Reducing demand for motorised individual transport	**Target level (year)**
Field	Transport	
BACKGROUND OF THE MEASURE	The importance of the measure can be characterised with the following keywords: high level of the consumption of motor fuels in the energy balance, increasing demand for motor fuels, the excise duties on fuels alone do not provide sufficient incentive for changing the vehicle stock usage structure, opportunities to control the use of motor fuels through planning or modification of the structure of the modes of transport, meeting the long-term targets for controlling final energy consumption can be problematic when the transport sector is ignored.	
RATIONALE FOR THE EXTENT OF INTERVENTION	Reducing energy consumption in the transport sector, which will result in primary energy savings.	

INDICATOR	1. Transport demand for the use of passenger cars in comparison to 2010, % 2. Share of public transport usage among the employed population by 2020[84]	Growth ≤5% (2030)[83] > 25% (2020)
MAIN ACTIONS	● Stimulating energy efficiency through taxation policy and other measures, incl. facilitating energy efficient consumer choices ● Increasing the share of public transport services ● Development of light traffic infrastructure in the cities ● Directing land use towards reduction of urban sprawl and dependence on cars, incl. directing planning activities to reorganise city streets and roads for promotion of public transport and light traffic ● Development of mobility arrangements in cities, between centres and hinterlands, and for businesses ● Promotion of teleworking ● Promotion of car sharing and short-term rental ● Research and development ● Road usage charges for heavy vehicles ● Concessions on fuel-efficient cars	

Measure 2.3	Efficient vehicle stock	**Target level (year)**
Field	Transport	
BACKGROUND OF THE MEASURE	The importance of the measure can be characterised with the following keywords: high level of the consumption of motor fuels in energy balance, advanced age of the vehicle stock, relatively high fuel consumption of the vehicle stock, relatively high fuel consumption in new vehicles	
RATIONALE FOR THE EXTENT OF	Stabilisation or reduction of the consumption of motor fuels	

[83] The transport demand on passenger cars was 6,100m passenger kilometres in 2010, http://www.energiatalgud.ee/img_auth.php/4/4d/ENMAK_2030%2B_Transpordi_ja_liikuvuse_stsenaariumid.pdf
[84] The indicator is monitored in the framework of implementing the 5th specific target of the Transport Development Plan 2014-2020 (Comfortable and modern public transport).

INTERVENTION		
INDICATORS	1. Share of eco-friendly vehicles (energy class A-C) among new vehicle purchases 2. Fuel consumption of the vehicle stock	50% (2020) 8.3 TWh (2030)
MAIN ACTIONS	● Stimulating energy efficiency through taxation policy and other measures, incl. facilitating energy efficient consumer choices ● Development of rail infrastructure ● Increasing the share of alternative fuels in public transport vehicles ● Promotion of ecodriving ● Research and development	

Measure 2.4	Increasing energy efficiency of the existing building stock	**Target level (year)**
Field	Energy efficiency	
BACKGROUND OF THE MEASURE	The importance of the measure can be characterised with the following keywords: high energy intensity of the existing housing stock, indoor climate is not up to standard, insufficient rate of housing stock renewal, ensuring the ability of the population to pay for housing costs, demolition of buildings that are unfit for use, valorisation and renovation of residential buildings in areas of cultural and environmental value	
RATIONALE FOR THE EXTENT OF INTERVENTION	Ensuring active renovation of buildings, incl. modernisation of heating and ventilation systems, reducing regional differences in renovation intensity, preventing increase of maintenance expenses in renovated buildings, identifying the most efficient methods for reducing energy use in buildings	
INDICATORS	1. Net area of residential buildings that have undergone additional renovation with public support, m^2	Apartment buildings: 17m m^2; small residential

		buildings: 10.4m m^2 (2030)
	2. Number of households with improved energy consumption class (apartments and small residential buildings)	320,000 (2030)
	3. Share of buildings that have undergone energy efficient renovation in the total building stock	Small residential buildings: 40% (energy class C or D); apartment buildings: 50% (energy class C)
	4. Number of apartment buildings that have deteriorated or have been demolished after becoming unfit for use	250 (2030)
MAIN ACTIONS	• Intensification of renovation of apartment buildings through support/loan facilities • Intensification of renovation of small residential buildings through support/loan facilities • Transfer of residential buildings from the old voltage system to the new voltage system • Intensification of renovation of non-residential buildings through awareness-raising initiatives • Implementation of demolition support for abandoned and unused residential buildings as an action under the *Nature Conservation Development Plan until 2020* • Increasing sectoral competence by organising training for experts in the field • Developing legislation for energy associations to promote production of renewable energy • Research and development, incl. commissioning studies and analyses of the housing sector	

Measure 2.5	Increasing expected energy efficiency of new buildings	**Target level (year)**
Field	Energy efficiency	

BACKGROUND OF THE MEASURE	The importance of the measure can be characterised with the following keywords: insufficient rate of renewal of the housing stock, the need to ensure quality and construction supervision for new structures, the need to improve the competences of experts, inefficiency in the planning of the residential environment, lack of cooperative construction initiatives and energy associations	
RATIONALE FOR THE EXTENT OF INTERVENTION	Ensuring implementation of the new requirements, ensuring availability of competent experts	
INDICATORS	1. Number of nearly zero-energy buildings based on a standard design	5 (2017)
	2. Guidance manual on assessing the impact of energy consumption and CO_2 of buildings and transport in the planning process	2018
	3. Area of nearly zero-energy residential buildings constructed with the help of public support or concessions, m^2/y	40,000 (until 2021)
	4. Availability of legislation to enable operation of energy associations	2018
MAIN ACTIONS	● Developing standard designs for nearly zero-energy buildings ● Increasing professional competence of the experts in the field ● Legislative drafting to promote energy production in energy associations ● Preparation of guidance manuals on the drafting of plans and construction designs that support utilisation of energy efficient solutions	

Measure 2.6	Efficient transmission of heat	**Target level (year)**
Field	Heating sector	

BACKGROUND OF THE MEASURE	The importance of the measure can be characterised with the following keywords: the need to improve the efficiency of heat distribution, potential increase in parallel production, decreasing heat demand as a result of energy efficiency measures, case-by-case approach to each district heating system to determine justifiability of continuing with district heating	
RATIONALE FOR THE EXTENT OF INTERVENTION	The state intervention will ensure continued efforts on providing consumers with affordable solutions in those district heating systems where district heating is assumed to be sustainable. The preference in state interventions is resolving problems on the basis of the District Heating Act, i.e., by creating a favourable investment environment for implementation of sustainable solutions. Investment support is used to facilitate actions that are important for the preservation of the system, but have long payback periods, particularly in smaller district heating systems. In systems where providing the district heating service is not feasible, the provision of the service will be terminated through gradual transition to individual solutions.	
INDICATORS	1. Reduction in heat losses in district heating, TWh	0.1[85] (2030)
MAIN ACTIONS	• Replacement of heating pipelines of district heating systems • Legislative amendments to facilitate efficient transmission of heat • Research and development	

Measure 2.7	Exemplary role of the public sector	**Target level (year)**
Field	Energy efficiency	
BACKGROUND OF THE MEASURE	The importance of the measure can be characterised with the following keywords: higher demands on the public sector in EU directives, the important role of the public sector during the market development stage, the need for	

[85] By 2030 compared to 2012.

	life cycle cost estimates, the need to facilitate implementation of innovative solutions in the construction sector	
RATIONALE FOR THE EXTENT OF INTERVENTION	Meeting the obligations arising from the EU directives (Energy Performance of Buildings Directive, Energy Efficiency Directive), efficient use of national and local budget resources, promoting the use of innovative technological solutions.	
INDICATORS	1. Share of the net area of buildings used by the central government and meeting the minimum requirements for energy efficiency that entered into force in 2013, % 2. A green labelling system has been developed 3. Development of guidance manuals, in cooperation with the National Heritage Board, on ensuring energy efficiency during renovation of buildings of cultural and environmental value or subject to heritage conservation	37% (2030) 2020 By 2020
MAIN ACTIONS	● Pilot projects for designing and constructing nearly zero-energy buildings in the public sector, incl. implementation of innovative technological solutions ● Renovation or replacement of central government buildings ● Intensification of the renovation of schools and kindergartens ● Supporting the conservation of urban design and other cultural value in energy efficiency renovation of residential and other buildings that have architectural or heritage conservation significance or are located in areas of cultural and environmental value ● Developing the green labelling system and using green public procurements (with environmental impact as a quality criterion) ● Research and development, incl. commissioning studies and analyses of the building sector	

Measure 2.8	Energy efficiency in other sectors	**Target level (year)**
Field	Energy efficiency	
BACKGROUND OF THE MEASURE	The preliminary assessments of the energy efficiency situation in other sectors indicate that potential for energy savings exists even in sectors where the government interventions for implementation of energy efficiency measures have been limited. Such sectors include, for instance, street lighting, industry, water economy, etc. Active implementation of energy efficiency measures in the industrial sector would help prevent a decrease in competitiveness and constitute a part of the leadership role of the public sector. The following Estonian industries are the highest consumers of energy: wood processing, manufacturing of paper and paper products, chemical industry, food industry, manufacture of other non-metallic mineral products (mainly construction materials). The total energy consumption of these industries amounts to about 4.4 TWh. Implementation of the measures in planned in the context of the use of EU structural funds.	
RATIONALE FOR THE EXTENT OF INTERVENTION	Implementation of the measure will focus on supporting initiatives that cannot be realised under market conditions (e.g., extensive reconstruction of street lighting, industrial energy efficiency measures with a long payback period). Preference is given to initiatives and projects where the support cost to achieve the desired unit of energy savings is lowest for the particular user group. A favourable environment will be developed for the implementation of energy efficiency measures, e.g., through awareness raising and improving the competence of experts.	
INDICATORS	1. Energy efficiency in manufacturing plants, GWh/y 2. Number of renovated street lighting points	36 (2020) 22,000 (2023)
MAIN ACTIONS	• Energy efficiency in manufacturing plants • Energy efficiency in street lighting • Research and development	

5. CONNECTIONS WITH OTHER DEVELOPMENT DOCUMENTS

5.1. Connections with development documents adopted in the Republic of Estonia

The Development Plan has direct connections with the following strategic plans and decisions:

Estonian National Sustainable Development Strategy "Sustainable Estonia 21" – the connection is based primarily on the increased quality of life, as the development of the energy infrastructure ensures the supply of electricity required for businesses, the economy, households and the public sector.

General Principles of Climate Policy until 2050 – foresees transformation to low-carbon economy and enhancing state's preparedness and ability to minimise negative effects of and make use of positive aspects climate change. In the development of energy sector, a principle of holistic approach to energy system should be used that endeavours efficient interaction of individual parts of the energy system above all. In addition, the decision describes clear principles to achieve greenhouse gas emission reductions industry, energy supply of buildings, energy networks, oil shale use, large-scale energy industry or with the deployment of domestic renewable energy sources.

National Health Plan 2009-2020 – the general objective of the plan is to extend health-adjusted life expectancy to 60 years on average for men and 65 years on average for women, and the average life expectancy to 75 years and 84 years, respectively. Implementation of the NDPES 2030 measures can be expected to reduce the health impact (incl. premature mortality) of $PM_{2.5}$, improve the indoor climate, increase the energy efficiency of the vehicle stock and the share of public transport and light traffic. NDPES 2030 supports the objective of the National Health Plan.

National Reform Programme "Estonia 2020" – the NDPES 2030 measures were developed in line with the programme objectives for the economy and the energy sector until 2020.

National Development Plan for Oil Shale Use 2016-2030 – it provides input data for NDPES 2030 in the form oil shale volume that can be used for energy generation and the restrictions on permissible environmental impact caused by the oil shale industry.

Development Plan on the Promotion of Biomass and Bioenergy Use for 2007-2013 (invalid) – it is connected with the NDPES 2030 measure for production of alternative motor fuels; the plan aims to create favourable conditions for the development of domestic biomass and bioenergy production to reduce Estonia's dependence on imported resources and fossil fuels, reduce the pressure on the natural environment, use land resources efficiently and sustainably, and contribute to employment in rural areas.

Estonian Energy Sector Development Plan until 2018 – NDPES 2030 replaces the Estonian Energy Sector Development Plan until 2018. An overview of achievement of the targets of this development plan is provided in Section 2.2 of this document.

Estonian Renewable Energy Action Plan for 2020 – specifies the national renewable energy targets and measures, including support, until 2020. The targets and measures of the action plan were taken into account in the preparation of NDPES 2030.

Estonian Environmental Strategy 2030 – objectives include sustainable use of natural resources and reduction of waste generation (waste disposed to landfills will have decreased by 30% by 2030 and the harmfulness of generated waste will have been reduced significantly), preservation of the diversity of landscapes and biodiversity, climate change mitigation and quality of ambient air, outdoor environment that spares and supports health**.** A reduction in the assumed impacts of the energy sector over the period 2012-2030 was taken into account in the planning of the NDPES 2030 measures. A comparison was prepared on the environmental impact of different fuels and fuel-free energy generation technologies.

Estonian Forestry Development Plan until 2020 – suggests an annual timber cutting rate of 12-15 million m^3 to ensure productivity and viability of the forests and diversity and efficiency of use. According to estimates, an equivalent volume of timber is added to the forests each year through the growth process. The energy potential of forests has been taken into account in the envisaged NDPES 2030 measures for efficient generation of energy.

Nature Conservation Development Plan until 2020 – protecting the ecological network of habitats and following the ecosystem principles in the use of natural resources; the results of Natura impact assessment were taken into account in the planning of NDPEs 2030 measures; Estonia's energy resources were estimated and the resource use associated with energy generation was projected until 2050. A comparison was prepared on the impact of different fuels and fuel-free energy generation technologies on the quality of ecosystems.

Transport Development Plan 2014-2020 – the targets and measures of this plan were used as the basis for developing the NDPES 2030 measures for energy use in transport.

Estonian National Development Plan for Housing Sector 2008-2013 – this is partially replaced by NDPES 2030. An overview of achievement of the targets of this development plan is provided in Section 2.2 of this document.

Estonian Research and Development and Innovation Strategy 2014-2020 – identifies efficient use of resources as a potential area of economic growth in smart specialisation. The NDPES 2030 measures are designed to increase resource and energy efficiency of the current energy sector.

National Waste Management Plan 2014-2020 – 79% of the total waste generated in Estonia comes from oil shale. The main environmental hazard of oil shale extraction waste is associated with combustion. The impact of waste on the environment appears primarily in case of improper generation and handling. According to the Waste Management Plan, all landfills, incl. the landfills of the oil shale industry, have to conform to environmental requirements by the end of 2015. The aim of the plan is to prevent waste generation, or if this is not possible, ensure recovery of as much waste as possible. Improvement of production technologies is required for increasing the efficiency of resource use and reducing the hazard level of waste materials. No separate obligations for reduction of waste in the oil shale sector or the energy sector were specified. The NDPES 2030 measures for energy generation and use are designed to increase energy efficiency and resource efficiency, which can be expected to result in decreased waste generation. The planned measures include the possibility of using retort gas, a residue of shale oil production, for the generation of electricity. NDPES 2030 covers oil shale waste and ashes, but the NDPES 2030 SEAR does not examine any other waste created in the combustion processes of energy generation, the used oils and tyres associated with vehicles or construction and demolition waste from renovation of buildings.

National Spatial Plan "Estonia 2030+" – is a strategic document that aims to achieve an expedient utilisation of space in Estonia (to ensure that any settled location in Estonia is liveable, low-density urbanised space), including availability of energy infrastructure (diversified and sustainable energy generation, higher share of renewable energy, availability of high-quality energy at acceptable prices, international connections, energy efficiency and conservation, decentralisation of energy generation), reduction of distances in time and space in a green manner with good, convenient mobility facilities (facilitating preservation of settlements and use of spaces, ensuring the availability of jobs and services), quality of the living environment (compactness of larger settlements, making their internal structure denser, functioning networks of green areas, network for light vehicles). In 2010, 160,000 persons engaged in daily commuting to a workplace located in a different municipality; based on mobile positioning data of their mobility patterns, 19 daily activity spaces were identified in 2011 and 15 in 2030. Public transport plays a significant role in ensuring cohesiveness of the activity spaces. In 2030, rail traffic will constitute the backbone of Estonia's transport network (nearly 80% of Estonian population are living in the vicinity of railway routes). The costs of mobility should not become excessive in rural areas where public transport is insufficient and using a private car is unavoidable. The NDPES 2030 measures are designed to ensuring supply of energy, to increase energy efficiency of buildings and to reduce energy use in transport (land transport), thereby contributing to the implementation of the national spatial plan.

National Defence Strategy – the Ministry of the Interior, in cooperation with other ministries, organises operational continuity of services of vital importance in the context of national defence preparations. The vitally important services in the energy sector include supply of electricity, supply of liquid fuels and functioning of the transport infrastructure – these services are in the area of governance of the Ministry of Economic Affairs and Communications. The energy security measures of NDPES 2030 were developed for a normal situation, while energy security in emergency situations is explained in the *Non-Military Part of the National Defence Development Plan 2013-2022* prepared by the Ministry of Defence[86].

[86] Non-military part of the National Defence Development Plan
http://www.kaitseministeerium.ee/files/kmin/nodes/14029_Riigikaitse_arengukava_mittesojaline_osa.pdf

Non-Military Part of the National Defence Development Plan 2013-2022 – the plan specifies actions for ensuring operational continuity of the services of vital importance, including the supply of electricity, in a situation of war or emergency. Based on the comprehensive defence concept, the actions envisaged in NDPES 2030 are necessary for crisis situations. While NDPES 2030 does not specify separate targets for crisis or war situations, readiness for war or crisis situations is an important principle for the development of energy systems. These principles are also taken into account in the implementation of NDPES 2030, e.g., in Measures 1.1 and 1.2.

National Security Concept of Estonia – implementation of security policy and drafting of sectoral plans is based on the key concepts and directions specified in the Security Concept. This document, adopted by the Riigikogu in 12 May 2010, also specifies directions for operational continuity and cohesiveness in the development of transport infrastructure and ensuring energy security. A military attack against Estonia is unlikely in the present and near future. Nevertheless, this possibility cannot be excluded in the longer perspective. Services that are essential in ensuring the functioning of society and the state are considered critical services. The priority is to reconstruct or construct the ports, airports, railways and roads, which for, part of the Trans-European Transport Networks. Energy security is ensured through the security of supply, the security of infrastructure, interconnection with energy networks of other EU Member States, and diversity of sources of energy. To reduce dependence on the energy imports, it is vital for Estonia to enhance energy efficiency. Estonia's efforts are supported by strengthening of the EU energy policy. The EU trend towards maximum use of domestic energy resources adds to security of supply in Europe. In case of Estonia this means rational use of oil shale and extensive introduction of renewable energy technologies. Development of the production of liquid fuels from oil shale, and the measures implemented by the European Union for preserving liquid fuel stocks ensure sufficient operation of the liquid fuel market. Estonia's interconnection with the EU electricity and gas system will reduce dependence on a single supplier or a limited number of suppliers. A more balance proportion of the energy sources used should be ensured in heat production. By 2020, no single source of energy should have a share higher than 30%, Options must be introduced for switching major heat producers from natural gas to other fuels. This National Security Concept was taken into account in the planning of the NPDES 2030 measures.

5.2. Connections with EU development documents

The Development Plan has connections with communications of the European Commission:

A Roadmap for moving to a competitive low carbon economy in 2050: to keep global warming below 2˚C, the European Council approved in 2011 the target of the European Union to reduce greenhouse gas emissions by 80-95% by 2050 compared to 1990 levels. The reduction of GHG emissions as a result of the NDPES 2030 measures has been projected until 2050.

Energy Roadmap 2050: describes how to reduce GHG emissions by 80-95% by 2050 compared to 1990 levels and how to decrease energy demand by 41% by 2050 compared to the peaks in 2005-2006. By 2050, the share of renewable energy sources should reach 75% in final electricity consumption and 97% in electricity consumption. The reduction of GHG emissions as a result of the NDPES 2030 measures, as well as energy consumption and share of renewable energy have been projected until 2050.

European Energy Security Strategy: Mandated by the European Council, the Commission published on 28 May 2014 the Communication on European Energy Security Strategy[87].

The strategy highlights sectors where specific actions are needed in the short, medium and long term. The strategy is based on eight 'key pillars' that promote closer cooperation at the EU level, respecting national energy choices and underpinned by the principle of solidarity:

1. Immediate actions aimed at increasing the EU's capacity to overcome potential supply disruptions in 2014/2015;
2. Strengthening emergency/solidarity mechanisms, including coordination of risk assessments and protecting strategic infrastructure;
3. Moderating energy demand;
4. Building a well-functioning and fully integrated internal market;
5. Increasing energy production in the EU;
6. Further development of energy technologies;
7. Diversifying external supplies and related infrastructure;
8. Improving coordination of national energy policies and speaking with one voice in external energy policy.

Short-term strategic objectives:

- Ensure the EU's preparedness for potential gas supply disruptions in the coming winter;
- Infrastructure construction by dominant suppliers in the territory of the EU must adhere to internal market and competition rules;
- The EU should work closely with the members of the Energy Community, notably Ukraine and Moldova, to ensure energy security.

Medium to long term strategic objectives include:

- Ensure an integrated energy market;
- Eliminate energy islands;
- Reduce external dependence on external suppliers and diversify the EU's energy sources, suppliers and infrastructure;
- Reinforce partnership with Norway and accelerate development of the Southern Gas Corridor;
- Prioritise energy security and transition to a low carbon economy in the EU's next budget period (2014-2020);

[87] http://ec.europa.eu/energy/doc/20140528_energy_security_communication.pdf

- Improve cooperation between Member States in the implementation of energy policies.

Renewable Energy: a major player in the European energy market: it is important that we continue to use every tool at our disposal to drive down costs, to ensure that renewable energy technologies become competitive and ultimately market driven. Policies which hinder investment in renewables should be revised and in particular, fossil fuel subsidies should be phased out. In view of the complementarity of climate and renewable energy policies, a well-functioning carbon market is necessary. At the same time renewable energy should be gradually integrated into the market with reduced or no support, and should over time contribute to the stability and security of the grid on a level footing with conventional electricity generators and competitive electricity prices. In the longer term, a level playing field needs to be ensured. The measures of NDPES 2030 have been planned without assuming state support for energy investments. The countries that produce electricity for the NordPoolSpot market assume that support payments will stop after 2020; the market entry of energy production technologies has been made dependent on fuel and carbon price projections (by the International Energy Agency). The heat supply measures are projected to result in an increase in the share of wood, as it is a more affordable fuel than natural gas, until 2050; in electricity generation, the share of wind energy will increase after decommissioning of the existing generation technologies, i.e., probably after 2030.

5.3. Connection with the international climate treaty

The text of the new climate agreement[88] was approved at the Paris Climate Conference of the UN in December 2015. The 195 participating countries have committed to reducing greenhouse gas emissions. The aim of the agreement is maintaining the increase in global average temperature below 2 °C and limiting the increase to 1.5 °C. According to the agreement, the parties have to review their climate policy targets and actions on a regular basis. The agreement foresees support for developing countries to tackle problems associated with climate change. Estonia participates in the agreement with other EU Member States. The current common target of the European Union is to reduce air emissions of greenhouse gases by 40% by 2030 compared to 1990 levels.

The communications[89], which were submitted for discussion in March 2011 and describe the targets of the EU's climate and energy policy until 2050 and the milestones to 2030, were taken into consideration in the analyses preceding the drafting of NDPES 2030 as well as during the drafting of NDPES 2030. The possible target of 40% reduction of carbon emissions by 2030 was mentioned for the first time in those communications. The need to discuss the issues of EU's climate and energy policy was also highlighted in the proposal for the Development Plan. The preparatory work for the drafting of the Development Plan created sufficient confidence for agreeing with the overall greenhouse gas reduction target in the European Council in October 2014. The changes in Estonia's energy sector until 2030,

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[88] http://www.cop21.gouv.fr/wp-content/uploads/2015/12/l09r01.pdf
[89] A Roadmap for moving to a competitive low carbon economy in 2050; Energy Roadmap 2050

as envisaged in the Development Plan, are aligned with the EU climate policy targets and enable meeting the target levels of Estonia and the EU by 2030, i.e., in accordance with the targets of the international climate agreement.

6. MANAGEMENT STRUCTURE FOR IMPLEMENTATION OF NDPES 2030

The Development Plan will be implemented in accordance with the Government Regulation No. 302, of 13 December 2005, "The types of strategic development plans and the procedures for preparing, amending, implementing, assessing and reporting them". By the Government Order No. 371, of 8 August 2013, the Ministry of Economic Affairs and Communications (MEAC) was appointed as the ministry in charge of the drafting of the Development Plan.

The Development Plan of the Energy Sector will be implemented on the basis of operational programmes, which have to be updated by 1 March of each year. The operational programmes include descriptions of measures and outcomes, specify the institutions responsible for the implementation of measures, and determine the level and sources of funding. An operational programme should cover the next four years. The operational programmes will be used as sources of input data for the state budget.

The energy sector, as well as economy as a whole, is characterised by increasing integration between different fields of activity so that the impact of one field becomes directly apparent in the other. However, integration increases the technical complexity of business activities, creating a need for consolidation of the experts of different fields (in case of the state, experts from different ministries and government agencies) to achieve the desired objectives. The preparatory materials for this Development Plan were drafted in a close cooperation between different ministries; meeting the targets of the Development Plan will depend on the efforts of different ministries; and implementation of the Development Plan will have a significant impact on the work of several ministries. **Therefore, substantial cooperation between relevant ministries and government agencies plays a key role for implementing and updating the Development Plan.**

NDPES 2030 has two steering bodies, established by the Minister of Economic Affairs and Infrastructure:

- the Energy Sector Committee;
- the Energy Council of the MEAC.

The Energy Sector Committee includes authorised representatives of the relevant ministries, the Government Office, AS Elering and local government associations. In addition to the Energy Sector Committee, the **Energy Council of the MEAC**[90] participates in the implementation of the NDPES 2030 as an advisory body, with members representing

[90] The members and functions of the Energy Council of the MEAC were approved by the Minister of Economic Affairs and Infrastructure on 22 December 2015.

various umbrella organisations operating in the energy sector, research institutions, large energy undertakings and major energy consumers.

The Energy Sector Committee performs the following functions:

- Coordinating the division of work required for meeting the targets, and assessing the projected demand of resources required for implementation;
- Making proposals for allocation of resources required for meeting the targets of the Development Plant or for making adjustments in the implementation of other development plans;
- Monitoring the progress of implementation of the Development Plan and productivity of other parties, and making proposals for adjustment of actions if necessary, describing the connections between targets and productivity of actions;
- Issuing opinions on proposals for amending operational programmes of the Development Plan.

As a general rule, the Energy Council of the MEAC discusses the same subject matters before they are examined in the Energy Sector Committee. In addition, the members of the Energy Sector Committee can consult with the Energy Council of the MEAC as regards to important measures to be taken for implementation of the Development Plan. The Ministry of Economic Affairs and Communications provides technical support to the Energy Council of the MEAC.

These are only preliminary management principles for implementation of the Development Plan and they can be adjusted based on analyses that clarify further improvement needs in the energy sector management structure.

The following table describes the different parties involved in the implementation of the NDPES 2030 measures. Table 6.1 reflects the opinion of the authors of the Development Plan as regards to the measures that require important contributions of a particular ministry or the Government Office to the management of implementation. The table also provides an indicative overview of the participation of government agencies in the implementation of measures. The particular functions of the agencies in the implementation of the Development Plan are specified in the operational programme.

Table 6.1. Parties that need to be involved in the implementation of NDPES 2030 (X indicates involvement of a party under the respective measure) in the opinion of the MEAC

Parties of NDPES 2030	Security of supply						Increased efficiency in the use of primary energy							
	1.1. Development of electricity generation	**1.2. Efficient transmission of electricity**	**1.3. Ensuring the supply of gas**	**1.4. Maintaining fuel stocks**	**1.5. Efficient production of heat**	**1.6. Administrative capacity and foreign cooperation in the energy sector**	**2.1. Production of alternative fuels and utilisation in transport**	**2.2. Reducing demand for motorised individual transport**	**2.3. Efficient vehicle stock**	**2.4. Increasing energy efficiency of the existing building stock**	**2.5. Enhancing energy efficiency of new buildings**	**2.6. Efficient transmission of heat**	**2.7. Exemplary role of the public sector**	**2.8. Energy efficiency in other sectors**
	Research and development													
Management and implementation of NDPES 2030														
MEAC	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MEnv	X				X		X	X	X				X	X
MRA	X				X		X	X					X	X
MER													X	X
MFin		X	X	X			X	X	X	X	X	X	X	X
MCul										X	X		X	
Government Office						X							X	X
County and local gov.		X	X		X		X	X		X	X	X	X	X
Monitoring of coordination and implementation of NDPES 2030														
MEAC	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Implementation of NDPES 2030 measures that are financed from the state budget[91]														
EIC	X	X			X		X	X	X			X	X	X
Kredex										X	X		X	
EE					X		X	X	X				X	
Archimedes	X	X			X		X	X	X	X	X	X	X	
ERC	X	X			X		X	X	X	X	X	X	X	X
ARIB	X				X		X	X					X	
Related authorities and organisations														
Competition Authority	X	X	X		X		X		X			X		
Environmental Board	X	X	X		X		X	X						
Road Administration								X	X					
TRA	X	X	X		X		X							
OSPA				X										
Heritage Board										X	X		X	

[91] The references to final beneficiaries are only indicative; management and implementation of activities belongs to the governance area of the ministry that has authority over the respective final beneficiary

7. SECTORAL DEVELOPMENT PLAN COST ESTIMATE

7.1. Estimate of costs based on the impact assessment of the Development Plan for 2015-2030

The assessment of the impact of the development plan included detailed modelling of the costs and revenues associated with potential measures. The impact assessment indicated that the total cost of energy sector actions in the period of 2015-2030 can be up to €6bn/year. This would entail application of active implementation measures by the government sector as well as continuation of the existing government regulation and support facilities. As NDPES 2030 will reduce the expenditure on fuels and energy, the total cost will be essentially the same as in a situation of continuing with the existing measures and actions. The projected costs of energy sector actions include both governance expenditure and private sector expenditure (investments in energy generation, fuel costs, building renovation costs, the costs of vehicle stocks, energy and transport infrastructure), which is why they do not reflect only direct expenditure in the energy sector.

The results of modelling indicate that implementation of NDPES 2030 will result in an increase in direct and indirect revenue of the government sector by €330m/year[92]. The projected increase in the government sector revenue is based on increased income in the sectors associated with the energy sector as a result of full implementation of NDPES 2030 (active public measures in the housing and heating sectors, reduction of energy consumption in the transport sector and promoting introduction of local biofuels (biomethane)). The change will result from changes in consumption or production (incl. investments) and includes, in addition to direct impacts, some revenues caused by indirect and induced impacts. Among other outcomes, the actions would result in an increase of GDP in market prices by €1bn/year (average of the period 2015-2030) and creation of ~13,500 new jobs in the related sectors. In this case, the cost of additional actions by the government sector,

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[92] Grünvald, O., Lokk, A. 2014. ENMAK 2030 majandusmõju analüüs. Arvutusmudel. [Calculation model for the economic impact assessment of NDPES 2030]

In the model used for calculating economic impact, the impact caused by changes in consumption and/or production (incl. investments) is converted into quantitative production volumes of different sectors. The impact of sectoral production volumes on macro-economy – gross domestic product (GDP), foreign trade balance, employment – was then estimated by using a methodology, which is based on economic coefficients of symmetric input-output tables. This input-output framework enabled to determine the degrees of three different impact types (direct, indirect, induced), the sum of which showed the described aggregate impact. The induced impact was calculated through end use coefficients (households, government sector and fixed capital formation). The calculation formula of induced impact included, in addition to the impact arising from changed production volumes of economic sectors, also the impulses based on product taxes and changes in purchasing power.

A description of the principles and underlying assumptions used in the economic impact assessment can be found in "Energiamajanduse arengukava aastani 2030 stsenaariumide majandusmõju analüüsi" [*Report on economic impact assessment of the scenarios of the Development Plan of the Energy Sector until 2030*].

required for implementation of NDPES 2030, would amount to about €177m/year (~3% of the total cost of actions) (see Table 7.1).

Table 7.1 shows the annual average projection of cost and revenue for the entire period (2015–2030). The exact measures to be implemented, the corresponding cost and revenue will be specified in the course of drafting the operational programme for the next state budget period.

Table 7.1. Projected costs and revenues in the sectors associated with the energy sector in the period 2015…2030[93,94] an a selection of other significant economic impacts

<table>
<tr><th rowspan="2">Sector</th><th colspan="2">Costs of actions related to the energy sector in 2015…2030, m €/y[95]</th><th rowspan="2">Projected government sector cost of additional actions in case of implementation of NDPES 2030, m €/y</th><th rowspan="2">Projected change in government sector revenue as a result of NDPES 2030 in 2015…2030, m €/y[96]</th></tr>
<tr><th>Continuation of existing measures // actions</th><th>NDPES 2030[97]</th></tr>
<tr><td>Electricity sector</td><td>700</td><td>780[98]</td><td>-[99]</td><td>120[100]</td></tr>
<tr><td>Heating sector</td><td>1,440</td><td>1,300</td><td>-[101]</td><td rowspan="2">47[102]</td></tr>
<tr><td>Housing stock</td><td>960</td><td>1,165</td><td>121[103]</td></tr>
<tr><td>Transport</td><td>2,920</td><td>2,530[104]</td><td>40</td><td>114</td></tr>
<tr><td>Fuel sector</td><td>-[105]</td><td>230[106]</td><td>12[107]</td><td>56</td></tr>
</table>

[93] Org, M., Uiga, J. 2014. ENMAK 2030 teekaartide mudel.
[94] Grünvald, O., Lokk, A. 2014. ENMAK 2030 valdkondade stsenaariumide majandusmõju analüüsi aruanne.
[95] Includes both governance expenditure and private sector expenditure (investments in energy generation, fuel costs, building renovation costs, the costs of vehicle stocks, energy and transport infrastructure), which is why it does not reflect only direct expenditure in the energy sector. Does not include the cost of excise duties.
[96] Based on the analytical model for the economic impact of NDPES 2030. Does not include revenue from excise duties.
[97] Cost of actions associated with the energy sector as a result of full implementation of NDPES 2030 (active public measures in the housing and heating sectors, reduction of energy consumption in the transport sector and promoting introduction of local biofuels (biomethane)).
[98] Includes investments in electricity generation capacities and power networks and fuel costs (does not include the cost of new oil manufacturing plants)
[99] No new support measures are planned in addition to the existing ones. The existing support schemas are being reviewed.
[100] Compared to the outcomes of the Liberal generation scenario under NDPES 2030.
[101] The planned level of SF (structural funding) until 2020 is €12m/year (€78m in total for the period 2014-2020).
[102] The housing and heating sectors were combined, because a decrease in the heat demand of buildings has a direct impact on the developments in heat supply. The decrease in public revenues is partially caused by reduced volume of fuels required for heating of buildings.
[103] The planned level of SF (structural funding) for renovation of apartment buildings until 2020 is €17m/year (€102m in total for the period 2014-2020), while €250,000 can be used for preparation of model designs of nearly-zero-energy buildings. Financial instruments can be used if relevant.
[104] Total expenditure on fuels, purchase and maintenance of vehicles, infrastructure investment and maintenance, etc. Incl. €63m/year as the cost of energy efficiency actions in transport.
[105] Alternative fuels are not produced in the non-intervention scenario.
[106] Does not include investment in oil production or the cost of maintaining fuel stocks. Does not include costs of manufacturing bioethanol, which have been discussed in the SEAR report.
[107] The planned level of funding is €7m/year until 2020 (including a total of €9m of SF support for the entire period of 2014-2020).

Research and development[108]	-	12	4	-
Administrative capacity and international cooperation in the energy sector	-	2	2	-
Total	**6,010**	**6,030**	**177**	**337**
Change in GDP 2015-2030, m €/y	-	1,000	-	-
Change in employment 2015-2030, persons[109]	-	13,500	-	-
Change in productivity	-	1.4%	-	-
Change in foreign trade balance	-	3%	-	-

7.2. Projected cost of the Development Plan in 2018-2021

The following table includes an overview of the cost of implementing the Development Plan in 2018-2021, broken down by specific targets, governance areas and funding sources, based on the State Budget Strategy 2018-2021.

The largest amount of funding is required for financing energy efficiency measures for buildings, where the funding should be increased 2.5 times in order to meet the established targets. The MEAC will try to identify additional options and funding sources for that purpose. For several energy research and development projects, there is insufficient confidence that funding can be obtained, so that they cannot be included in the operational programme. As the level of funding that has been planned for the first years of implementation of NDPES 2030 does not guarantee meeting all the targets of NDPES 2030, the MEAC as the organiser of implementation has to find additional funding sources or alternative ways for implementing the measures or, if necessary, adjust the operational programme of the Development Plant in the context of preparing the state budget strategy or the annual state budget.

Table 7.2. Preliminary projected cost of the Development Plan in 2018-2021 by specific targets

	2018	2019	2020	2021	Total
1. Security of supply: Continuous energy supply is ensured in Estonia	**9,85**	**10,84**	**10,84**	**10,34**	**41,87**
Measure 1.1. Development of electricity generation					
Measure 1.2. Efficient transmission of electricity in line with economic demand					
Measure 1.3. Ensuring the supply of gas					

[108] The costs of R&D activities are shown for the period 2015-2020, combined for all sectors.
[109] Period-average change in employment in energy-related sectors according to the results of the model of economic impact analysis of NDPES 2030.

	2018	2019	2020	2021	Total
Measure 1.4. Maintaining fuel stocks					
Measure 1.5. Efficient production of heat	9,03	10,00	10,00	9,50	38,53
Measure 1.6. Administrative capacity and foreign cooperation in the energy sector	0,82	0,84	0,84	0,84	3,34
2. Increased efficiency in the use of primary energy: Estonia's energy supply and consumption is more sustainable	**110,34**	**111,60**	**76,98**	**38,85**	**337,76**
Measure 2.1. Increasing the use of alternative fuels in transport	9,70	7,22	6,48	2,50	9,70
Measure 2.2. Reducing demand for motorised individual transport					
Measure 2.3. Efficient vehicle stock					
Measure 2.4. Increasing energy efficiency of the existing building stock	39,00	32,01	7,93	2,00	80,94
Measure 2.5. Increasing expected energy efficiency of new buildings	12,50	20,00	18,75	8,75	60,00
Measure 2.6. Efficient transmission of heat	9,50	9,50	3,41		22,41
Measure 2.7. Exemplary role of the public sector	17,24	15,27	14,81		47,32
Measure 2.8. Energy efficiency in other sectors	22,40	27,60	25,60	25,60	101,20

Table 7.3. Preliminary projected cost of the Development Plan in 2017-2020 by governance areas and funding sources

	2016	2017	2018	2019	Total
Total budget of the operational programme, incl.	**120,187**	**122,437**	**87,817**	**49,190**	**379,632**
Gov. area of MEAC	87,343	91,567	57,412	33,590	269,913
Gov. area of MFin	17,244	15,270	14,805		47,319
Gov. area of MEnv	15,600	15,600	15,600	15,600	62,400
Funding by sources of financing					
Revenue from the EU emissions trading system	25,939	20,487	24,517		70,943
Budget of the Ministry of Economic Affairs and Communications	14,718	22,140	20,690	10,990	68,539
Operational programme of cohesion policy funds – energy	63,330	63,610	26,410	22,000	175,350
Operational programme of cohesion policy funds – environment	15,600	15,600	15,600	15,600	62,400
Operational programme of cohesion policy funds – other	0,600	0,600	0,600	0,600	2,400

8. STUDIES AND ANALYSES USED FOR THE PREPARATION OF NDPES 2030

8.1. Cross-scenario studies and analyses

1. Grünvald, O., Lokk, A. 2014. ENMAK 2030 valdkondade stsenaariumide majandusmõju analüüsi aruanne.
2. Grünvald, O., Lokk, A. 2014. ENMAK 2030 valdkondade stsenaariumide majandusmõju analüüs. Arvutusmudel.
3. Estonian Development Fund. 2014. ENMAK 2030 valdkondade meetmete elluviimiseks vajalikud teadus- ja arendustegevused.
4. Möldre, I. 2014. Energiamajanduse arengukava aastani 2030 (ENMAK 2030) keskkonnamõju strateegilise hindamise programm.
5. Möldre, I. 2014. „Energiamajanduse arengukava aastani 2030“ keskkonnamõju strateegiline hindamine. Aruanne.
6. Org, M., Uiga, J. 2014. ENMAK 2030 teekaartide mudel.
7. Org, M., Uiga, J. 2014. ENMAK 2030 teekaartide mudel. Juhend.
8. WEC-Eesti. 2014. Energiajulgeolek. ENMAK uuendamise eeltöö.
9. Oja, A.. Estonian Development Fund 2013. Energy resources of Estonia. Final report.
10. Org, M., Jüssi, M. ENMAK 2030. Energy consumption. Final report.

8.2. Electricity sector

1. Elering AS. 2014. Eesti pikaajalised elektritootmisstsenaariumid.
2. Vali, L. 2014. Aruanne energiamajanduse arengukava elektrimajanduse (elektrivõrgu) tegevuskava koostamisest.
3. Vali, L. 2013. Kaugkütte energiasääst.
4. EA Energy Analyses. 2013. Long-term energy scenarios for Estonia, Scenarios for 2030 and 2050.
5. Kurnitski *et al*. 2013. Eesti elamumajanduse arengukava ENMAK-i uuendamise hoonete energiasäästupotentsiaali uuring. Hoonefondi energiatõhuse parandamine - energiasääst, ühikmaksumused ja mahud.
6. Konist, A., Siirde, A., Soosaar, S. 2014. Põlevkiviõli tootmisel tekkiva uttegaasi kasutusvõimaluste uuring.
7. Siirde, A. 2014. Põlevkiviõli tootmise erinevate stsenaariumide realiseerimisega kaasnevate mõjude hindamine.
8. AS Elering. 2013. Eesti elektrisüsteemi tarbimisnõudluse rahuldamiseks vajaliku tootmisvaru hinnang.

8.3. Heating sector

1. Vali, L. 2014. Aruanne energiamajanduse arengukava soojusmajanduse tegevuskava koostamisest.
2. Vabamägi, A. 2013. 5 väikeasula kaugkütte võrgupiirkonna tehnilis-majanduslike audititite „Kaugkütte võrgupiirkonna jätkusuutlikkuse, efektiivsuspiiri ja energiasäästupotentsiaali määramine“ läbiviimine”.

3. Vali, L. 2013. Kaugkütte energiasääst.
4. Kurnitski *et al*. 2013. Eesti elamumajanduse arengukava ENMAK-i uuendamise hoonete energiasäästupotentsiaali uuring. Hoonefondi energiatõhuse parandamine - energiasääst, ühikmaksumused ja mahud.

8.4. Housing Sector

1. Kurnitski, J., Arjakas, P. 2014. ENMAK 2030 elamumajanduse valdkonna arengukava stsenaariumite aruanne.
2. Kurnitski *et al*. 2013. Eesti elamumajanduse arengukava ENMAK-i uuendamise hoonete energiasäästupotentsiaali uuring. Hoonefondi energiatõhuse parandamine - energiasääst, ühikmaksumused ja mahud.
3. Arjakas, P., Kurnitski, J. 2014. Hoonestuse (elamumajanduse) valdkonna arengukava 2030+ lähteolukorra analüüs.

8.5. Fuel sector

1. Oja, A. 2014. ENMAK 2030 kohalike transpordikütuste stsenaariumid.
2. Siirde, A. 2014. Põlevkiviõli tootmise erinevate stsenaariumide realiseerimisega kaasnevate mõjude hindamine.
3. Kask, Ü. 2013. Bioetanooli kasutamise eeldused ja võimalused Eestis (energia- ja kütusemajandus).
4. Kask, Ü. 2013. Biodiislikütuse tootmise ja kasutamise võimalused Eestis.
5. Oja, A. 2013. Biometaani kasutamise avalikud hüved.

8.6. Transport

1. Jüssi, M., Rannala, M. 2014. ENMAK 2030+ transpordi ja liikuvuse stsenaariumid.
2. SEI Tallinn. 2014. Energiasäästupotentsiaal Eesti transpordis ja liikuvuses. Energiamajanduse arengukava 2030+ taustauuring.