



Energy

Assessment of Latvia's renewable energy supply-demand economic potential and policy recommendations, VPP-EM-2018/AER_1_0001

Policy recommendations for the Latvian energy supply and transport sector

The study is funded by the Ministry of Economics of the Republic of Latvia, Assessment of Latvia's renewable energy supply-demand economic potential and policy recommendations, project No. VPP-EM-2018/AER_1_0001

**Policy recommendations for the Latvian energy supply and transport sector,
2021, 23 pages**

**Developed by
Institute of Energy Systems and Environment of Riga Technical University**

Authors

Andra Blumberga, Dr.sc.ing.

Dagnija Blumberga, Dr.habil.sc.ing

Ivars Veidenbergs, Dr.habil.sc.ing.

Silvija Nora Kalniņš, Dr.sc.ing.

Sarma Valtere, Dr.chem.

Ruta Vanaga, Dr.sc.ing.

Anrijs Tukulis, M.sc.ing.

Zane Indzere, M.sc.ing.

Armands Grāvelsiņš, PhD

Ketija Bumbiere, M.sc.ing.

Antra Kalnbalkīte, M.sc.

Ilze Vamža, M.sc.

Terēza Bezručko, B.sc.



CONTENTS

1.	General evaluation of policy instruments.....	6
2.	Overview of NECP 2030 measures and recommendations to complement them	9
2.1.	Extending the use of solar and wind energy.....	12
2.2.	To promote the introduction of storage systems and interlinking of sectors	13
2.3.	Expanding the use of hydrogen and improving energy storage	15
2.4.	Use of biomass	16
2.5.	Use of RES in district heating.....	18
2.6.	To reduce societal prejudices.....	19
2.7.	To promote energy security through smart energy supply and long-term planning documents	19
2.8.	To define concrete measures for the establishment and development of RES communities.....	20
2.9.	Expanding the use of geothermal energy.....	21
	List of literature	Kļūda! Grāmatzīme nav definēta.

Introduction

An increase in the share of renewable energy sources (RES) can be promoted in various ways – by introducing support mechanisms, facilitating the equipment installation process, reducing public prejudices, and implementing other policy instruments.

Considering that the main energy sector development guidelines and potential policy measures are currently summarised in the “National Energy and Climate Plan 2030”, the preparation of the recommendations has started with a detailed evaluation of the policy instruments included in the plan. The report identifies the planned support mechanisms related to increasing the share of RES and more efficient use of resources, compares these measures with the measures introduced abroad, and includes recommendations to supplement policy instruments.

This report will summarise the main policy implementation recommendations based on the literature analysis, the discussions organised with stakeholders, and the results of the modelled system dynamics scenarios.

1. GENERAL EVALUATION OF POLICY INSTRUMENTS

The use of renewable energy sources (RES) in the Latvian energy sector is currently traditional and confirmed by historical experience and related to the search for optimal solutions in the near and distant future. Solar and wind energy technologies and their use in different RES systems are rapidly entering the economy.

Problems of sustainable use of RES, when thinking about users, technology, constraints, benefits, innovation, storage, etc., are summarised and illustrated in three different sketches:

- aspects of renewable electricity (Fig. 1.1);
- aspects of renewable heat (Fig. 1.2);
- biomass usage possibilities and potential (Fig. 1.3).

The sketches summarise potential policy instruments by sources and energy types. Some of the identified sources need more research to be sustainably integrated into the energy sector (for example, hydrogen, offshore wind parks, biomethane production). In turn, more rapid deployment of well-studied and economically justified solar and wind energy technologies should be encouraged. Considering that almost all hydro-power potential is exploited, small and high-capacity hydropower plants should pay more attention to increasing overall efficiency.

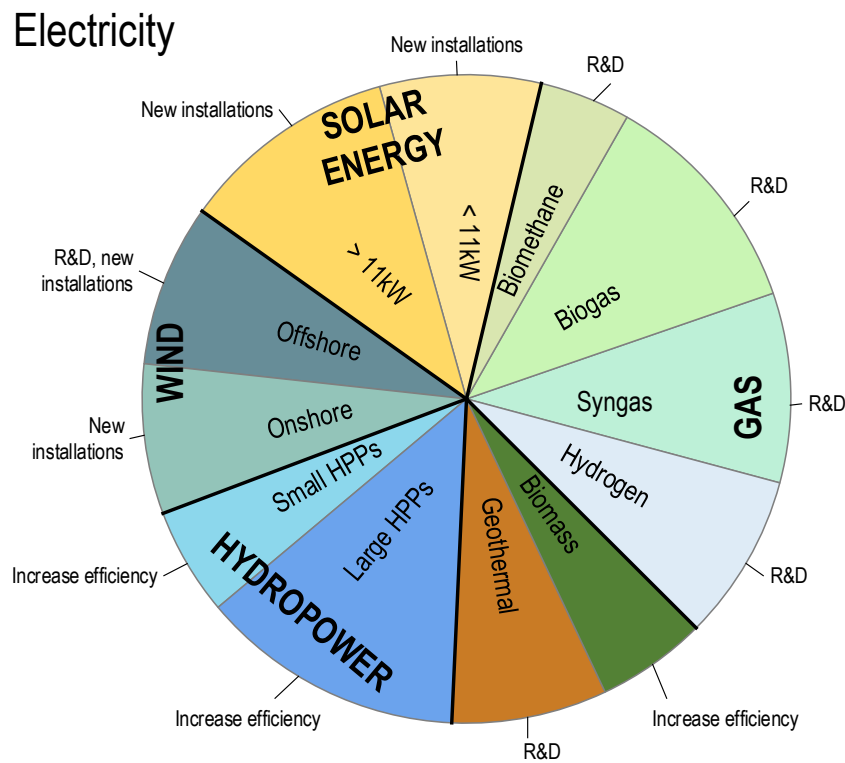


Fig. 1.1. Sketch of problems of renewable electricity for electricity generation

Thermal energy

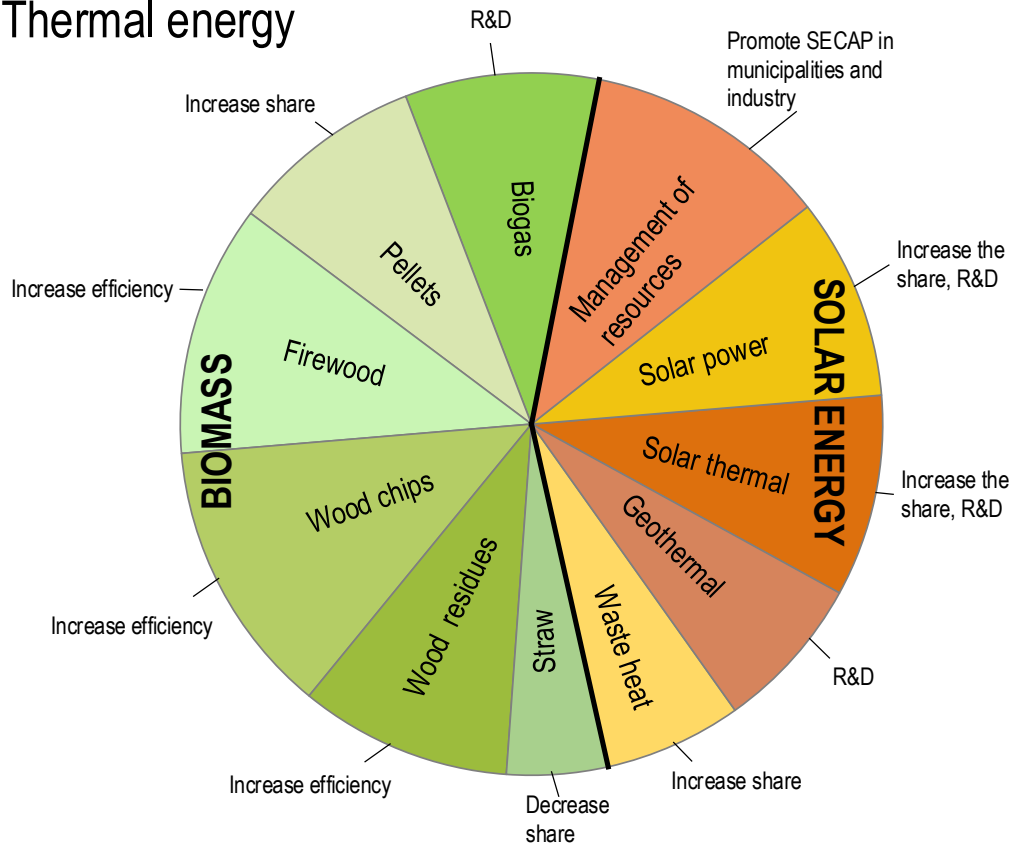


Fig. 1.2. Sketch of problems of renewable heat for heat generation

Biomass sources play and continue to play an essential role in heating. Still, it is necessary that only low-quality wood is used in the energy sector, which cannot be used in the production of various high value-added products. Scientific research into the development of biogas should be continued so that existing biogas plants can be converted from cogeneration to biomethane production. The use of solar energy should be further developed in heating and the share of waste heat used should be increased, and effective resource management should be promoted.

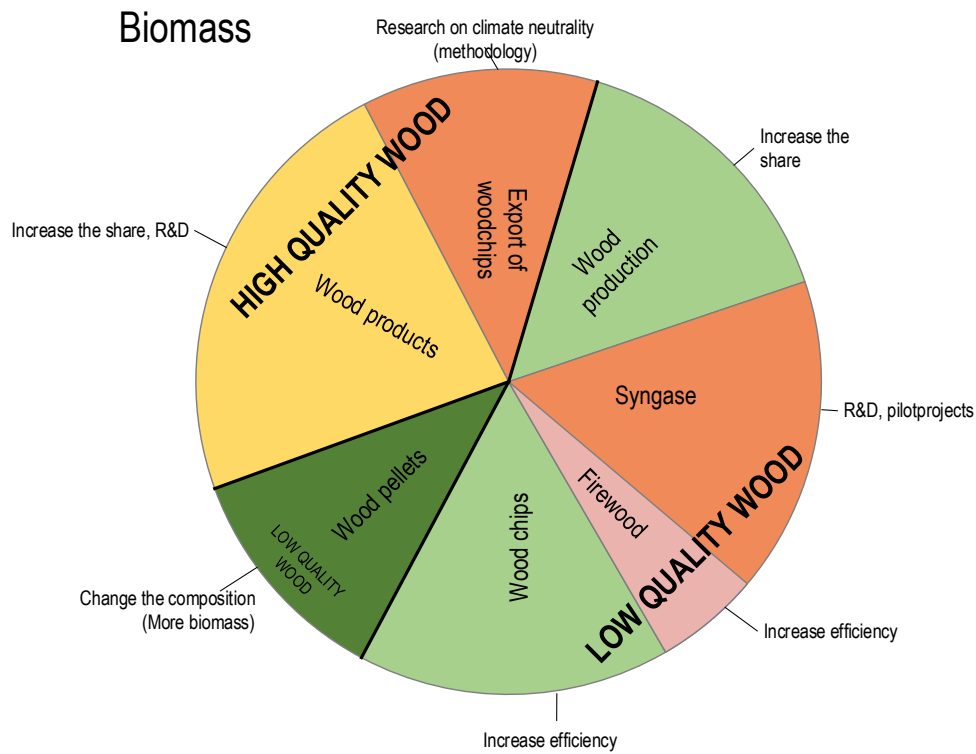


Fig. 1.3. Sketch of biomass usage possibilities and potential

Considering the fundamental principles of sustainable use of resources and the bioeconomy guidelines, the use of wood sources should be made more efficient. It is essential to focus on reducing exports of wood sources to maximise the use of local sources to replace imported heating fuels. To contribute significantly to the entry of innovative solutions and products in the woodworking industry.

2. OVERVIEW OF NECP 2030 MEASURES AND RECOMMENDATIONS TO COMPLIMENT THEM

Proposals and recommendations to increase the share of RES and meet climate targets are widely outlined in the “National Energy and Climate Plan 2030” (NECP 2030). Many of the results obtained within the project are in line with the policy instruments and direction for the development of the energy sector identified by NECP. The results of the system dynamics model show that the implementation of the included support instruments makes it possible to achieve the set RES targets in the electricity and heating sectors. However, a further transition to climate neutrality in 2050 requires different long-term development goals and actions.

RTU IESE recommends addressing problems in general and seeking optimal solutions by grouping existing measures and integrating new ones. It is essential to explore the possibilities for producing, storing and using hydrogen for different energy consumers [1], [2], to assess and optimise the use of biomass in all sectors of the economy and to introduce digital energy management.

An overview of the measures analysed is given in Table 1. An assessment of the policy instruments currently not included in NECP for the broader use of RES and recommendations for the implementation of additional measures are provided further. Different examples of policy instruments implemented in other European countries are provided.

TABLE 2.1 RES PROMOTION MEASURES

No.	Measures	Existing and complementable/partially current and complementable/new measure	Parties involved	Example countries	RES type
1.	To explore the possibility of using solar and wind technologies, promote the installation of adequate infrastructure and technologies, and provide support mechanisms.	Partially existing and complementable measure	Universities	Austria [3], Greece, Portugal, Spain, Denmark [4], Germany, Lithuania, Sweden, Poland, France, Finland [5], Netherlands	SOLAR AND WIND ENERGY
2.	To promote the introduction of storage systems and interlinking of sectors	Partially existing and complementable measure	DH operators, energy producers, public authorities	Austria [3], Greece, Denmark, Sweden	ALL RES
3.	To explore the integration of renewable hydrogen and other biofuels (including biogas) into energy systems (including transport), including infrastructure, storage and potential consumers.	Partially existing and complementable measure	Universities	Recommendations of the European Commission [1], [2] Netherlands, Denmark [4], Portugal, Spain, Luxembourg, Sweden	RENEWABLE HYDROGEN, GAS
4.	To carry out an ecological and climate neutrality analysis for the use of biomass in energy, agriculture and industry (for example, energy exchanges).	New measure	Universities	Austria [3], Denmark [4], Finland [5]	BIOMASS

5.	To promote local RES (including residual heat and residual cold) and energy management in the country, local governments, industry and agriculture by stimulating the transition from fossils to RES (refuse from 30% of fossils in DH).	New measure	Public institutions	Recommendations of the European Commission [1], Austria [3], Denmark [4], Finland [5], Netherlands	ALL RES, USE OF RESIDUAL HEAT AND RESIDUAL COLD
6.	To reinforce the information flow for RES users. To promote the involvement of professionals in working groups, information activities, delegating tasks to EMS participants or other stakeholders.	Partially existing and complementable measure	RES and energy efficiency implementers, universities	Denmark [4], Netherlands	ALL RES
7.	To establish a spatial planning system and develop a monitoring system e-RES for each energy source and energy technology: solar collector field and solar power plant, wind generator, boiler house, HPP, cogeneration plant.	New measure	IT programmers, local governments, universities	Austria [3]	ALL RES
8.	To promote energy security and energy independence through the use of local RES. To provide for measures for the development of smart systems. To explore, analyse and develop methodologies for economic and environmental energy transmission indices.	Partially existing and complementable measure	Energy producers, local governments, electricity transmission networks, heat networks	Lithuania, Portugal, Malta, Luxembourg, France [1], Denmark [4]	ALL RES, ENERGY SECURITY AND ENERGY INDEPENDENCE
9.	To define concrete measures for the establishment and development of RES communities .	Existing and complementable measure	Local governments	Recommendations of the European Commission [1], Austria [3], Denmark	ALL RES, ENERGY COMMUNITIES
10.	To promote exploration of the possibilities of using geothermal energy and to provide support for the use of energy-efficient heat pumps .	Existing and complementable measure	Local governments, universities	Finland [5], Lithuania [1], Denmark [4], Netherlands	GEO THERMAL ENERGY

2.1. Extending the use of solar and wind energy

Latvia is currently a step behind other European countries in the use of solar and wind energy. Still, the results simulated within the project show that these energy sources will play a key role in progress towards climate neutrality.

The policy measures included in the system dynamics (SD) model developed within the project show that simplifying administrative procedures for establishing wind parks is a significant benefit, as the share of wind electricity can be increased further by 2030. However, without such measures, the percentage of wind parks can only be increased significantly by 2050.

The spatial modelling results with the GIS model obtained within the project show that if we exclude areas with environmental, legislative and social constraints (highlands, forest areas, nature protected areas, towns, villages, water bodies, etc.), as well as analyse areas suitable for large wind parks and located close to electricity networks, the total land area in Latvia ideal for the installation of wind parks is 2389.4 thousand km², which could provide 5.5 GW of wind energy. The results of SD modelling show that due to the high proportion of hydropower plants operating in Latvia, it is necessary to install 1.55 GW of wind energy to reach climate neutrality in the energy sector in 2050. Consequently, it can be concluded that there are sufficient land areas to provide such a quantity of wind energy. However, it is essential to reduce administrative barriers and information campaigns to reduce existing barriers to establishing land wind parks in Latvia.

TABLE 2.2 EXISTING NECP MEASURES TO INCREASE THE SHARE OF SOLAR AND WIND ENERGY

3. Promoting the use of zero-emission technologies in electricity generation

AL 3.1. To implement intergovernmental projects to create off-shore wind parks (in cooperation with Lithuania/Estonia).

1. A project of an off-shore wind park has been developed to, among other things, promote the deviation of large-capacity electricity generation plants further from populated areas. Indicators characterising performance: 1) one large-capacity off-shore wind park (at least 800 MW together with measure 3.3) has been created; 2) at least 1600 GWh of wind energy are produced per year on average.

Point 5. The possibility of installing facilities generating hydrogen from wind energy and raising funding of the Innovation Fund for this measure has been evaluated.

AL 3.2. To review spatial conditions, condition of construction regulation and land-use restrictions to create RES technologies.

3. Territorial conditions for the development of solar parks have been developed, evaluating the possibility of restrictions and determining potential and prospective territories for the creation of solar parks.

AL 3.4. To promote the use of solar energy.

1. The possibility has been evaluated, and, if relevant, and ALTUM loan or guarantee programme has been created within the scope of EU structural funds and other sources of funding for solar electricity generation and storage installations for undertakings and local authorities.

Examples of facilitating measures

Wind energy

Recommendations of the European Commission for the EU Member States: NECPs fall short of identifying the potential of offshore renewables available to them and the related challenges. The European Commission is planning to remember key actions in the area of maritime planning, upscaling technologies, and a new approach to infrastructure planning.

Denmark: the measures provide for investment to reach 4 GW offshore wind energy capacity in Denmark [1], [4].

France: six offshore wind energy tenders are expected to be announced by 2023 to get a capacity of 3.7 GW [1].

Solar energy

Austria: The creation of 100,000 rooftop solar panels and establish small-scale storage programmes [3]. The installation of large-capacity solar panels in the industry, providing for the installation of solar panels on the roofs of large-scale industry companies and integrating them into the facades.

Greece, Portugal: construction of solar panel parks and hydrogen infrastructure in former lignite mining sites [1].

Spain: planning to build 100 MW photovoltaic unit in Puertollano

The European Commission has concluded that the largest number of jobs per each million EUR invested is generated by the solar electricity sector.

France: six offshore wind energy tenders are expected to be announced by 2023 to get a capacity of 3.7 GW [1].

Recommending measures

1. To promote the installation of onshore wind turbines by reducing disadvantageous constraints on the economy. To reduce the restrictions mentioned in NECP and to provide support to local governments reducing the resistance of local communities to the construction of wind parks.
2. To implement the measures included in NECP and to provide for exploration of the possibilities for offshore wind use, to promote the installation of appropriate infrastructures and technologies.
3. To provide for concrete measures and support mechanisms to promote micro-generation by increasing the net payment system for legal persons and introducing a virtual netting system.

2.2. To promote the introduction of storage systems and sector coupling

As the share of variable energy sources (solar and wind) in the overall energy balance increases, the flexibility of the energy sector should be increased by integrating storage systems and by aligning sectors. The results of the generation of the SD model hourly electricity generation for the Latvian energy sector indicate that if large wind power capacities are installed, approximately 30% of the electricity produced is generated in periods without a sufficient demand profile and electricity surpluses are generated.

To make optimal use of these electricity surpluses, it is necessary to introduce storage systems and to align sectors, for example, to integrate high-capacity heat pumps into district heating, which would use electricity when consumption is lower than electricity generated. Closer integration of electricity supply and district heating sectors using heat pumps is also essential because thermal energy storage has significantly lower costs compared to electricity storage. Consequently, it is important to support investments in the construction of storage systems in boiler houses and cogeneration plants, where they would in addition provide for the increase in heat generation efficiency and to cover generation at peak loads and allow for the integration of solar heat.

An additional benefit might be provided by the introduction of the concept of consumption management and the integration of aggregators as market participants. Modelling results show that if load shifts follow the generation of RES electricity, the electricity surplus can be reduced by around 5%. In this case, however, all consumers have to participate in consumption management and use aggregator services.

TABLE 2.3 EXISTING NECP MEASURES FOR THE INSTALLATION OF STORAGE SYSTEMS

<p>2. Improving energy efficiency and promoting the use of RES technologies in heating and cooling, and industry</p> <p>AL 2.2. To promote the use of RES and improvement of energy efficiency in district heating.</p> <p>2. Respective CM regulations have been drafted.. to ensure the implementation of the following activities..:</p> <ul style="list-style-type: none"> • ...ensuring energy storage opportunities in DH companies;
<p>3. Promoting the use of zero-emission technologies in electricity generation</p> <p>AL 3.4. To promote the use of solar energy.</p> <p>1. The possibility has been evaluated and, if relevant, an ALTUM loan or guarantee programme has been created within the scope of EU structural funds and other sources of funding for solar electricity generation and storage installations for undertakings and local authorities.</p>
<p>5. Energy security, reducing energy dependency, full integration of energy markets and modernisation of infrastructure</p> <p>AL 5.1. To ensure energy security and reduce energy dependency, to ensure full integration of energy markets</p> <p>3. Establishing a common framework for the market of the Baltic States to introduce demand response services in the balancing market through aggregation</p> <p>4. Modernisation of natural gas meters has started and is performed evaluating the possibility of introducing smart meters for registration of natural gas consumption</p>

Examples of facilitating measures

The European Commission has concluded that batteries will play an equally prominent role for the EU's transport decarbonisation and power sector to keep system costs low (by providing emissions free balancing and flexibility and reducing grid expansion needs). More than 20 battery plants are being built in EU Member States [1].

Austria: promoting energy storage is the focus of Austria's energy innovation plan. One of the measures envisaged by the Austria's NECP is to ensure large-scale heat storage and the establishment of seasonal heat storage units [3].

Greece plans to implement "smart" policies for islands that cannot be interconnected in a cost-effective way, for instance by setting up innovative hybrid renewable power generation with storage systems [1].

Recommending measures

1. To promote the implementation of heat storage systems and heat pumps in district heating systems through capital costs support.
2. To develop a national energy supply development strategy for the transition to smart energy supply, identifying the main objectives, tasks and actions to connect the heating, energy supply and transport sectors.
3. To promote the introduction of consumption response services in the balancing market through aggregation following RES electricity generation profiles. To promote the installation of smart electricity meters so that consumers can participate in the management of the consumption load.

2.3. Expanding the use of hydrogen and improving energy storage

The importance of hydrogen energy is growing rapidly across Europe and around the world. Hydrogen can be widely used as an energy source, both in the energy and transport sectors and in industry. The use of hydrogen does not lead to CO₂ emissions, and therefore this is one of the effective solutions for decarbonising industrial processes and the economy. All of this makes hydrogen essential in achieving climate neutrality in 2050 [1], [2].

The impact assessment of innovative solutions carried out within the project concludes that when hydrogen is produced using electricity from the grid, in several categories the impact is higher than in the reference system without biogas purification and biomethane production, for example, by creating higher water and land toxicity, by occupying larger land areas. This is due to the high electricity consumption for hydrogen production. On the other hand, if hydrogen is produced using RES, the indicators are lower in several categories than in the reference system, such as global warming and land use. Consequently, it is important that only electricity from renewable sources is used in the production of hydrogen.

TABLE 2.4 EXISTING NECP MEASURES FOR THE PROMOTION OF THE USE OF HYDROGEN

4. Improving energy efficiency, promoting the use of alternative fuels and RES technologies in transport

AL 5.1. To support the sustainable creation of infrastructure

Point 2 – Respective CM regulations have been drafted to ensure the creation and development of infrastructure for other fuels (hydrogen as a priority) after 2021 within the scope of EU structural funds and other sources of funding.

AL 5.4. To increase the number of low-emission and zero-emission vehicles in the services and deliveries through public procurement

Point 2 – The possibility has been evaluated to reduce in public procurements in large cities from and after 2030 purchasing of such vehicles, which do not use transport energy obtained from RES (for example, electricity, biomethane, hydrogen).

3. Promoting the use of zero-emission technologies in electricity generation

AL 3.1. To implement intergovernmental projects for the creation of offshore wind parks (in cooperation with Lithuania/Estonia)

Point 5 – The possibility to install facilities generating hydrogen from wind energy and the possibility to raise funding of the Innovation Fund for this measure have been evaluated.

5. Energy security, reducing energy dependency, full integration of energy markets and modernisation of infrastructure

AL 6.2. To modernise the infrastructure

Point 5 – A research has been conducted on decarbonisation of the gas network – the possibilities to adapt the natural gas transmission system to RES hydrogen and other gaseous fuels (nonmethane).

Point 6 – An action plan for the creation of hydrogen infrastructure and market conditions has been drafted.

Examples of hydrogen use related measures of EU Member States

Most NECPs of EU Member States acknowledge the role of hydrogen in the energy transition

The European Commission concludes that half of the plans mention concrete hydrogen-related objectives for the domestic generation of renewable or low-carbon hydrogen, for end-use in industry and hard-to-electrify transport sectors. The European Commission's recommendations to EU Member States are to promote electrification based on the use of renewable energy in transport [1].

Austrian Hydrogen Strategy: renewable hydrogen will play a key role in transforming the energy system in the future. The strategy includes measures to promote the transition from fossil energy and replacing it with renewable hydrogen [3].

Austria: production of hydrogen from renewable electricity. To develop and provide for short-term and long-term hydrogen storage [3].

Spain: it is planned to build a 20 MWh lithium-ion storage system and a hydrogen production system that uses electrolysis.

Denmark and Germany: building at Bornholm a 3-5 GW offshore wind park, including an electrolysis facility to produce fuel for trucks, busses, ships and aircraft [1], [4].

Luxembourg: aims to make steel more sustainable through renewable hydrogen use [1].

Recommending measures

1. Within the framework of the measures, as a matter of priority considering the specifics of hydrogen, first to carry out research on the possibilities of use and storage of hydrogen, also identifying possible safety measures by designating universities as a responsible party in the research.
2. The existing measures related to the promotion of hydrogen energy in the current version of NECP have been broken down by different action lines, such as the promotion of wind energy development in AL 3.1 and in the transport sector (AL 5.1, AL 5.4 and AL 6.2), etc. (measures for the use of zero-emission technologies in AL 6.2). Therefore, we recommend revising, combine and concretise measures by setting clear and measurable indicators to be achieved for the integration of hydrogen into the economy.
3. To provide for measures for the integration of the energy system, including appropriate infrastructure, storage, and renewable hydrogen. To conduct research in cooperation with universities and to provide concrete measures for the storage of renewable energy, including renewable hydrogen, and creation of storage places.
4. To promote the gradual transition of public transport to the use of RES. To promote the use of the hydrogen strategy in the transport sector – using hydrogen as fuel in public transport.

2.4. Use of biomass

The RES most used in the European Union is biomass from renewable energy sources, 70% of which are obtained from forests [1]. However, the growing global demand forces to increase added value of bioresources by reducing the availability of bioresources to the energy sector, which is a low value-added use. At the same time, replacement of fossil fuels with biomass is one of the main reasons for the increase in RES in Latvia in recent years. Policy makers should therefore harmonise the use of bioresources in the energy sector with a more efficient use of bioresources as a material in different industries.

Widely used technologies for heat generation in Latvia are biomass boilers and cogeneration plants. However, the principles of sustainable development and biotechnology should be considered when planning capacity building for biomass plants. Bioresources should be used effectively and with maximum benefits throughout their life cycle. Agricultural land should primarily be used for growing cultivated plants, not for energy crops, such as maize cultivation to produce biogas. In addition, biomass resources should be used mainly to produce high-value products, rather than for the production of energy.

Biomass (e.g. food, feedstock, forestry felling, energy crops, etc.) is a key element in the concept of the bioeconomy, which connects economic sectors such as agriculture, forestry, logging and fishing, industry and energy transformation sectors. The cross-sectoral nature poses a challenge for the management of the bioeconomy. Decision-making should be based on systemic thinking, considering different policy objectives in different sectors.

The results of the SD model show that the use of biomass for energy generation will continue to grow, but these resources are limited mainly due to land availability. Therefore, different renewable energy technologies should be introduced in the energy sector in order to increase overall resilience to various adverse external effects, such as limited availability of biomass or rapid price increases.

TABLE 2.5 EXISTING NECP MEASURES FOR THE SUSTAINABLE USE OF BIOMASS RESOURCES

2. Improving energy efficiency and promoting the use of RES technologies in heating and cooling, and industry

1. It is determined in the laws – horizontal regulations, industry laws drafted in order to determine support conditions for the measures implemented within the scope of EU structural funds and other sources of funding or in the spatial planning of municipalities that prior to the introduction or implementation of the measure funded from the said sources of funding or municipal budget an evaluation of the efficiency (compliance) of the measure is conducted taking into account economic, technical and legal opportunities having evaluated:

- whether it is technically possible, whether it is economically justified, whether it is legally possible to install high efficiency biomass boilers or replace existing biomass boilers with high efficiency biomass boilers
 - to include prioritisation principles in the regulation together with the ‘energy efficiency first’ principle and to comprehensively introduce in all programmes of EU structural funds.
-

Example of a successful biomass exchange

The Lithuanian woodchip exchange is one of the successful examples of establishment of a biomass energy sources exchange. The creation of a biomass exchange in Lithuania improved market transparency and increased efficiency. Biomass prices decreased up to 40% depending on the region, as did the difference in biomass prices between municipalities. The operator of the biomass energy sources exchange is the Lithuanian electricity transmission system operator “Baltpool”. One of the tasks of the exchange is to determine a fair biofuel price for end users. Baltpool is trading biomass in Baltic, Scandinavian and Polish ports.

Article 19 of the Law on the Energy Resources Market of the Republic of Lithuania provides that the purchase of biomass for heat generation: 1. Heat producers, regulated independent heat producers and combined heat and electricity producers using biomass for heat and/or electricity generation should prefer the biomass exchange to purchase the biomass required for the generation of heat and/or electricity in the following amounts:

- 1) at least 10 per cent in 2014;
- 2) at least 50 per cent in 2015;
- 3) not less than 100 per cent in 2016 and beyond.

Transactions can be concluded within one day.

Result 3 years after the introduction of the exchange: biomass prices equalised and low market concentration is observed [6].

Recommending measures

1. In cooperation with universities, to analyse ecological and climate neutrality of biomass for use in different sectors, including in industry, agriculture, and energy, looking at the possibility of setting up energy sources exchanges. To provide that participants of the biomass exchange trade – buy and sell biomass – through supply and demand.
2. To introduce cascading of biomass resources and to determine that only low-quality biomass resources can be used in the energy sector for energy generation.

3. To promote the diversification of energy sources and to improve the efficiency of existing biomass combustion plants.
4. To promote the purification of flue gases of individual biomass heat sources by reducing the environmental and human health impacts through local government planning documents or local regulations.
5. When evaluating the installation of new biomass combustion capacities, to consider sustainable development criteria and the integration of other alternative energy sources, such as waste heat, solar heat, to cover the base load.

2.5. Use of RES in district heating

A well-developed district heating infrastructure is the basis for further increasing the share of RES in the overall energy balance. It is therefore necessary to promote the integration of local RES (including waste heat) into energy supply and to introduce energy management in the country, local governments, industry, and agriculture by stimulating the transition from fossil sources to RES.

The results of the SD model show that it is possible to reach a climate neutral and economically justified DH system by 2050, and ambitious targets should therefore be set to refuse from 30% of fossil fuels in DH by integrating waste heat, solar energy, storage systems and heat pumps using renewable electricity, while covering peak loads with biomass combustion equipment.

TABLE 2.6 EXISTING NECP MEASURES IN DISTRICT HEATING

2. Improving energy efficiency and promoting the use of RES technologies in heating and cooling, and industry

AL 2.2 Point 1 – To promote the use of RES and improvement of energy efficiency in district heating. The result of the activity is that respective CM regulations have been drafted so that after 2021 the following activities are provided within the scope of EU structural funds and other sources of funding, taking into account the need to observe the laws and regulations governing air quality: for improvement of energy efficiency and promotion of the use of RES in DH.

6. A study has been conducted for the evaluation of a transition to low-temperature DH systems and integration of residual heat.

7. If relevant, respective laws have been drafted to ensure a transition to low-temperature DH systems and integration of residual heat after 2021 within the scope of EU structural funds or other sources of funding.

AL 2.3. To promote the use of RES and improvement of energy efficiency in industries and undertakings, to adapt DH to cold supply in buildings.

Examples of measures

European Commission's recommendations to EU Member States: to explore and maximise possibilities for integrating waste heat and waste cold

Austria: to provide long-term measures for switching from fossil natural gas to the use of RES sources in district heating [3]. To promote measures to ensure efficient heating and cooling using available energy sources (including waste heat). Use of local sources of waste heat in densely built districts. Technology development for the use of low exergy waste heat in industry.

Complementary recommending measures

1. To include specific measures to promote transition from natural gas to RES technologies in district heating systems, specifying the need for diversification of energy sources.

2. To explore and provide concrete measures to promote the use of waste heat. To promote cooperation with heat supply companies by seeking common synergies to promote support with heat supply companies by supporting sustainable heat supply development strategies for municipalities.
3. To provide incentives and support mechanisms and incentives for the use of waste heat in industrial companies and for cooperation with district heating.

2.6. To reduce societal prejudices

The results of the SD model show the need to reinforce the flow of information to RES users and local government employees to reduce the barriers to infrastructure installation. Educational measures for development of wind projects are essential in order to reduce the negative attitudes of society to wind turbines, which hampers the process of coordination of wind parks.

It would also be necessary to promote the involvement of professionals in working groups, information activities, delegating tasks to energy management system participants or other stakeholders.

TABLE 2.7 EXISTING NECP MEASURES IN DISTRICT HEATING

12. Informing, education, and awareness-raising of the public

AL 12.1. Improving knowledge, information and raising public awareness of the reduction of climate change, use of RES and resource efficiency.

Point 1 – Information campaigns implemented at least once a year on ways of reducing the use of the various resources used daily, on the role of and need for RES and its contribution and benefits to the economy, society, nature and climate, on the principles of socially responsible use of RES.

Recommending complementary measures

1. To implement the measures included in NECP to raise awareness of RES technologies.
2. To provide for measures promoting the availability of information directly to RES users, involving professional energy experts in the transfer of information and measures, delegating tasks, including to EMS participants. To specify universities, RES and energy efficiency introducers as the responsible parties.

2.7. To promote energy security through smart energy supply and long-term planning documents

Energy security is an essential aspect under the circumstances of different variable aspects. Changes in fuel and energy prices, differences in climate conditions, growing environmental requirements pose risks to unnecessary investment and increased additional costs. As a future solution for energy security, diversification of energy sources should be used maximising local energy sources, increasing energy efficiency, and reducing final consumption, and interlinking of sectors.

To achieve this, the first step is to establish a detailed energy sector database by providing public access to vital output data such as energy final consumption, energy output and fuel consumption in different sectors and regions. Gathering such information would allow the identification of synergies between energy producers and consumers at local, regional, and national levels.

The next important step is the development of long-term planning documents for the transition to smart energy supply, which are underpinned by policy support instruments. The

European Union Fund should support innovative solutions that would allow both the transition to the use of RES in the long term and the increase in energy security and independence.

TABLE 2.8 EXISTING NECP MEASURES FOR ENERGY MARKET DEVELOPMENT

Energy security, reducing energy dependency, full integration of energy markets and modernisation of infrastructure

AL 6.1. To ensure energy security and reduce energy dependency, to ensure full integration of energy markets.

AL 6.3. To develop an efficient and optimal regulation for partial support to protected users for covering energy supply costs.

Example of measures

The European Commission concludes that only five Member States have proposed measures in the chapter on energy security. Malta, Luxembourg, France, Lithuania and Portugal have identified energy efficiency and local renewable energy as important factors contributing to national energy security.

Austria: smart systems would allow local and regional energy supply to become up to 100% based on renewable energy sources in the foreseeable future. To maximise the use of renewable energy through efficient use of existing and new infrastructures, the flexibility of the energy system should be promoted, including:

- flexibility in promoting energy storage (e.g. electricity, heating and gas storage facilities);
- flexibility through smart grid management (e.g. smart grids, flexible heat networks) [3].

Recommending complementary measures

1. To establish a spatial planning system and develop a monitoring system e-RES for each energy source and energy technology: for solar collector field and solar power plant, wind generator, boiler house, HPP, cogeneration plant, etc.
2. To develop spatial energy planning, focusing on locally available renewable energy (local government level), including the use and integration of waste heat in existing systems. To provide measures for the use of waste heat, including in the industrial sector, using energy spatial planning tools.
3. To specify universities, IT programmers and local governments as the persons responsible for the spatial planning system and the monitoring system.
4. To provide for measures for the development of smart systems. Such systems are one of the key factors in making energy systems more flexible. To carry out research and analysis in cooperation with universities, to develop a methodology for economic and environmental indices by specifying universities, energy producers, local governments, electricity transmission networks and heat network companies as the responsible party.
5. To promote energy security and energy independence through the use of local RES. To provide for measures for the development of smart systems. To explore, analyse and develop methodologies for economic and environmental energy transmission indices

2.8. To define concrete measures for the establishment and development of RES communities

Decentralized renewable electricity generation is steadily increasing in the European Union. Solar and wind power plants are increasingly being installed for self-consumption by both households and businesses, and these renewable energy facilities could play an important role in the transition to climate neutrality by 2050. All Member States of the European Union need to

develop national regulation to enable energy communities to play an active role in the energy market and further stimulate the use of renewable energy.

The legislation currently in place in Latvia provides a good basic mechanism for energy communities and electricity sharing, as well as for mutual trade. In view of future electricity shortages in Latvia, energy communities have good potential, but more detailed requirements still needed to be developed to ensure the security of the electricity grid. For the further development of national legislation, it is important to involve society as much as possible to understand current experience and opportunities and to create as efficient legal framework as possible.

Funding, such as granting subsidies, is one of the main steps to provide for the development of energy communities. Funding, an appropriate legal framework, technology costs and interlinked repayment times, as well as public responsiveness will have an impact on the role of energy communities in increasing the amount of energy produced locally.

TABLE 2.9 EXISTING NECP MEASURES FOR THE PROMOTION OF THE RENEWABLE ENERGY COMMUNITIES

Promoting economically justified self-generation, self-consumption of energy and RE communities
<p>AL 4.3. To promote the creation of energy communities and RE communities. Result of the activity:</p> <ol style="list-style-type: none"> 1. A regulation has been developed for the creation of energy communities and RE communities. 2. A regulation has been developed, which provides for inclusion of RE communities in RES support measures, 3. To conduct research on at least one viable business model for functioning of an energy community and RE community.

Example of measures

European Commission's recommendations to EU Member States: to ensure that citizens are entitled to become a renewable self-consumer (including in combination with storage systems) and be part of renewable energy communities.

Lithuania: financial support to prosumers for installation of small-scale power plants in Lithuania, with an expected outcome of 696 MW of installed capacity as from 2024 [1].

Recommending measures

1. To define concrete measures for the establishment and development of renewable energy communities, involving local governments. To include measures that enable citizens to become a renewable self-consumer (including in combination with storage systems) and be part of renewable energy communities. To focus on the use of energy produced jointly in communities.
2. To carry out an assessment of the potential for the development of renewable energy communities and existing barriers to identify in a timely manner barriers to the establishment and development of energy communities. To specify local governments as the main responsible party.

2.9. Expanding the use of geothermal energy

In early 1990s, geothermal mapping was carried out with the support of the German government in Latvia. The mapping by areas with geothermal potential assessed in Dobele and Liepāja revealed that water temperatures in the groundwater layers reached 55°C, but the volumes were considered to be small. Klaipeda operates a geothermal plant (with support for

investment during construction). The information available shows that the temperature of geothermal groundwater in Latvia has been assessed as low and the economic advantage is difficult to justify. However, low-temperature geothermal resources in Latvia are used in the form of heat pumps for heating buildings and hot water preparation [7]. To calculate the potential of geothermal energy, it is necessary to assess not only the potential of groundwater and earth heat, but also the range of technologies for its use. Current experience shows that heat pumps operate without monitoring and registration, which could help to understand why performance ratios are mainly low.

TABLE 2.10 EXISTING NECP MEASURES RELATED TO THE PROMOTION OF GEOTHERMAL ENERGY

H.10. To conduct a research on the use of RES available in territorial waters and geothermal waters of Latvia for extraction of energy (except wind energy), incl. a research for the creation of infrastructure.

1. When conducting respective research, the potential of use of RES from territorial waters of Latvia – the use of sea warmth in populated coastal areas has been analysed.
 2. When conducting respective research, the potential of use of RES from territorial waters of Latvia – the use of sea biomass (algae, seaweed, etc.) for extraction of biofuel / biogas and production of energy, the potential of waves, tides, etc. for production of electricity has been analysed.
 3. Taking into the results of the research, prospective measures have been included in the updated draft Plan in 2023 and respective financing mechanisms for the implementation of prospective projects are expected to be developed.
-

Examples of measures for the promotion of use of geothermal energy

Austria: geothermal energy as a renewable energy source capable of operating in baseload capacity can contribute significantly to security of supply. Particular emphasis is placed on promoting applied research projects through pilot facilities in pilot projects [3].

Finland: support programmes (Promotion of heat pumps) for the promotion of heat pumps in households. Implemented in Finland, where they have been assessed as effective in promoting heat pumps at household level. Regular promotional activities for heat pumps are being carried out in cooperation with industry experts to improve the energy efficiency of residential buildings and promote the use of renewable energy [5].

Recommending measures

1. The use of ground heat in heat pumps is one of options. Research on the efficiency of heat pumps and possible improvements needs to be carried out in cooperation with universities, as equipment installed in Latvia often has a low performance ratio (COP 2-2.5). To include specific measures/actions to improve the efficiency of heat pumps, e.g. following Finland's direction in the household sector. To promote support programmes for the installation of heat pumps. To provide funds from the Structural Funds to support heat pumps.
2. In cooperation with universities, a methodology should be developed to assess and determine where heat pumps can be used, the methodology should be incorporated into regulations of the Cabinet of Ministers. To specify local governments and universities as the main responsible party.
3. To collect and publish information on heat pumps installed in Latvia and their main technical indicators to carry out a comprehensive assessment of existing heat sources in different sectors.

REFERENCES

- [1] European Commission, "An EU-wide assessment of National Energy and Climate Plans," 2020.
- [2] European Commission, "COMMITTEE AND THE COMMITTEE OF THE REGIONS A hydrogen strategy for a climate-neutral Europe," 2020.
- [3] Federal Ministry Republic of Austria, "Integrated National Energy and Climate Plan for Austria 2021-2030," 2019.
- [4] E. and U. Danish Ministry of Climate, "Denmark's Integrated National Energy and Climate Plan under the REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the Governance of the Energy Union and Climate Action," 2019.
- [5] Ministry of Economic Affairs and Employment, "Finland's Integrated Energy and Climate Plan," 2019.
- [6] V. Jonutis, "THE BIOMASS EXCHANGE-virtual transmission grid in biomass market," 2019.
- [7] Dobeles novada dome, "Dobeles novada pašvaldības ENERĢĒTIKAS RĪCĪBAS PLĀNS 2018. – 2025.gadam," 2018.