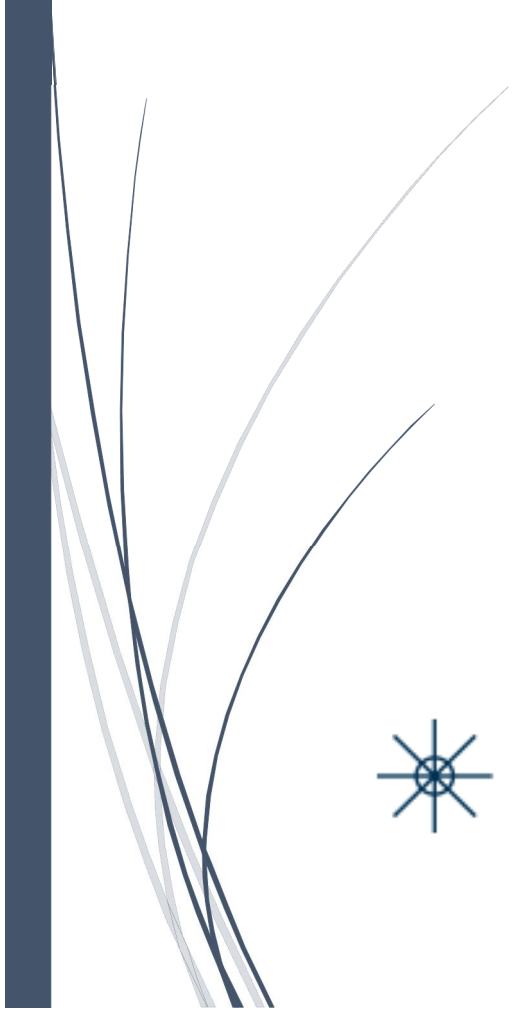
Review of RES perspective in Baltic countries till 2030



Litgrid

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2015

Contents

EXECUTIVE SUMMARY

The purpose of this Review Report is to prepare RES development overview in the Baltic countries till 2030. Report is based on the results of already carried out studies, analyses and the gained experience of each Transmission System Operator.

In the Report review of current RES situation, valid legislation and existing support schemes regarding RES development in each country is presented. This Report reviews the progress made in implementation of the national "20-20-20" targets, assesses whether these objectives will be achieved.

The Report also takes into account the new EU-wide targets and policy objectives for the period between 2020 and 2030, and how these targets could influence RES development in the Baltic countries.

Also summarising of the policy and operational findings regarding possible RES future has been made.

INTRODUCTION

The 2009/28/EC Directive on the promotion of the use of energy from renewable sources sets the objective of reaching at least 20% of the EU's final energy consumption through renewable energy sources by 2020. It sets for each Member State mandatory national targets for the overall share of renewable energy sources (RES) in gross final energy consumption as well as a mandatory share of 10% RES in transport. Each Member State was requested to provide a National Renewable Energy Action Plan (NREAP) by 30 June 2010. The NREAPs set out how each Member State aims to achieve its national target in the three sectors: electricity, transport, heating and cooling. The midway point of the set period has been reached and the majority of Member States are expected to meet their 2020 renewable energy targets.

Renewables will continue to play a key role in helping the EU meet its energy needs beyond 2020. EU countries have already agreed on a new 2030 Framework for climate and energy, including EU-wide targets and policy objectives for the period between 2020 and 2030. These targets aim to help the EU to achieve a more competitive, secure and sustainable energy system and to meet its long-term 2050 greenhouse gas reductions target. On 23 October 2014 EU leaders agreed on a new renewable energy target of at least 27% of final energy consumption in the EU as a whole by 2030.

The most controversial aspect of this new 2030 Framework is that, unlike in the previous 2020 Package, the new EU targets will not be translated into national binding targets through EU legislation. The lack of binding national targets carries the risk that national efforts will not add up to the EU aggregate commitments. This situation raises questions on how the new 2030 Framework will be implemented, and consequently brings the issue of governance into the spotlight. In the absence of binding obligations for member states, only a solid governance structure can guarantee that the 2030 targets will be achieved.

Current RES situation in the Baltic countries

Installed RES generating capacities

Despite quite similar climatic conditions and natural resources for electricity production from renewable energy sources in three Baltic States (Estonia, Latvia and Lithuania), significant differences exist in these countries as to the RES capacity volume. Comparing RES capacities in the three Baltic countries, it is noted that major part of hydropower is located in Latvia, solar capacity energy is the fastest-evolving in Lithuania, and wind power is more attractive in Estonia and Lithuania, while biofuel is more spread in Estonia and Latvia (Table 1).

Table 1. Installed RES generating capacities in Baltics, on 31st December, 2014

Source	Lithuania		Latvia		Estonia		Total
	Total	Connected to transmission network	Total	Connected to transmission network	Total	Connected to transmission network	
	MW						
Biofuel	97	-	118	24	131	97	**346**
Hydro	128	101	1593	1562	8	-	**1729**
Solar	72	-	0.68	-	3	-	**76**
Wind	287	222	67	21	303	274	**657**
TOTAL, MW	**584**	**323**	**1779**	**1607**	**445**	**371**	**2808**

LITHUANIA

The largest biofuel PPs are Fortum Klaipeda with capacity of 20 MW and 11 MW Siauliai CHP. Despite the fact that capacity is medium-sized, all biofuel PP are connected to distribution network. Most of biofuel PP belong to private industrial companies, so they are spread through the whole area of Lithuania.

The biggest and the only one, connected to the transmission network is Kaunas hydro PP. This HPP is located in the central part of Lithuania. The rest of hydro generation capacity is connected to distribution network, respectively spread across Lithuanian territory.

Usually capacity of solar PP do not exceed 300 kW. Consequently, all solar PP are connected to distribution network.

All wind generation capacity is located onshore. The vast majority of existing wind parks, connected to transmission network, are located in the Western part of Lithuania, in Baltic coast region. Capacity of the largest wind park reaches 50 MW. Wind turbines with lower capacity, connected to distribution network, are distributed through the whole territory of Lithuania.

LATVIA:

The highest type of RES in Latvia is run-of-the-river hydro power plants. It is a hydro cascade located on Daugava river and it includes three power plants – Plavinas HPP (with installed capacity 894 MW), Kegums HPP (266 MW) and Riga HPP (402 MW). Historically HPPs on Daugava river are designed for “peak”, “half-peak” and emergency modes of operation, but today all HPP are producing electrical energy for consumers under electricity market conditions, as well as on the Daugava river Latvian Transmission System Operator (further – TSO) is keeping the main reserves for own power system and producing electricity in peak hours. In these hydro power plants, it is possible to increase or decrease the load comparatively quickly as the need arises. In the hydro cascade during water in-flow periods Daugava HPPs are going to work on the base power mode. All power plants on Daugava river are connected to the transmission network. The small hydro

generation in Latvia is located on different type of small rivers and total installed capacity is around 28 MW. Small hydro is connected to the distribution network.

The amount of solar energy is insignificant and Latvian TSO doesn't see significant opportunity for development of this generation in the nearest future. Some experimental solar panels are installed.

The wind parks are mainly located in the western part of Latvia and they are close to the coast side. The possible development of wind parks can be observed close to the coast line in the whole area of Latvia. Currently installed capacity of wind riches around 67 MW from which only 20.7 MW is connected to the transmission network. The future development of wind parks is dependent on RES legislation and subsidy schemes in Latvia. The mostly dependent is the possible development of new off-shore wind farms with comparatively high installed capacity.

The high potential of RES developments is observed in Biomass and Biogas field. Currently there are 97 MW of installed capacity for Biomass and Biogas, from which 23.8 MW is connected to the transmission network. The rest of Biomass and Biogas power plants are distributed in the area of Latvia.

ESTONIA:

The largest RES capacity in Estonia is the 48 MW Aulepa wind PP, which is actually the largest wind power plant in the Baltics. The wind power plants (altogether 303 MW) are located onshore on the north-eastern and north-western and western parts of Estonia. There are no off-shore wind parks in Estonia as of yet.

The largest CHPs are Lohkva CHP and Tallinna CHP with capacity of 25 MW each. The mentioned CHPs use wood chips, natural gas and peat as fuel. Most of the biomass capacities are connected to the transmission network, while most of the biogas capacities - to distribution network respectively. The biofuel capacities are mainly CHPs and thus more likely to be found spread through whole of Estonia near cities that facilitate the heat-consumption. There is 102 MW of biomass fuelled, 17 MW of waste fuelled and 11MW of biogas fuelled capacity known to be connected to the grid.

The capacity of the largest solar PP is 375 kW, while average is 10 kW and all solar PP (altogether close to 4 MW) are connected to the distribution network.

Ongoing projects

LITHUANIA:

Currently there are four ongoing projects for wind PP connection to transmission network. In the south-western part of Lithuania, there are two wind parks under construction with capacity of 73,5 MW and 24 MW. 73,5 MW wind park will be the largest wind park, connected to the electricity network in Lithuania. Both projects are going to be completed by the end of 2015.

In the north-western part of Lithuania, 45 MW wind park is going to be in operation till the beginning of 2016. Works, related to the connection to transmission network are already completed. Currently the rest of windmills are under construction.

In the western part of Lithuania Litgrid is going to connect the first wind park with capacity of 60 MW directly to 330 kV transmission network. Project will be completed in the first half of 2016.

LATVIA:

Currently Latvia does not have significant ongoing projects with RES power plants implementation.

ESTONIA:

In northern Estonia, Tallinna CHP is being expanded with 21MW (totalling 46 MW). The main fuel is biomass (wood chips). Planned commissioning date - September 2016. The heat is intended for use in the capital city (Tallinn) district heating system.

Different wind parks with capacity from 80 MW up to 1000MW are under study, but in 2016 less than 10 MW new capacities will be connected with network.

In central Estonia, Imavere Energia is developing a 10 MW biomass-fuelled (wood chips) CHP in order to use most of its electricity and heat for industrial wood pellet production. Planned synchronization - spring 2016.

Development opportunity for each RES type (expert evaluation)

RES development volume in the country depends on many factors, such as geographical location, climatic conditions, environmental requirements, support schemes, technical and organizational requirements for connection and operation and etc. Taking into consideration aforementioned factors and historical RES development volumes, it is possible to predict the probable RES development after 2020.

LITHUANIA:

Lithuania has very limited energy resources of its own and geographic location has several disadvantages for extensive use of most of the RES. Lithuania is low-lying country, having just 99 km coastline. Climate is transitional between maritime and continental. The rivers do not have large flows and may be frozen up to three months a year during the winter.

Biofuel development

The greatest potential for the development of biofuel PP is expected in the large cities, where is a demand for heat. Procedures, necessary for conducting public procurement and selecting a contractor for the construction of biofuel and waste power plants in Vilnius and Kaunas are already started. A preliminary technical specification for tenderers has been published. Based on evaluations, the thermal capacity of cogeneration power plant complex in Vilnius, fired by waste and biomass, could reach a total of 70 MW the electrical capacity. In Kaunas it is planned to build a high efficiency waste-to-energy power plant. At the present time, no accurate electricity and heat generating capacities of the power plant are determined. According to information provided during project presentation, electrical capacity of new unit could reach about 25 MW. In addition, it is expected modest growth of small scale biofuel PP capacity.

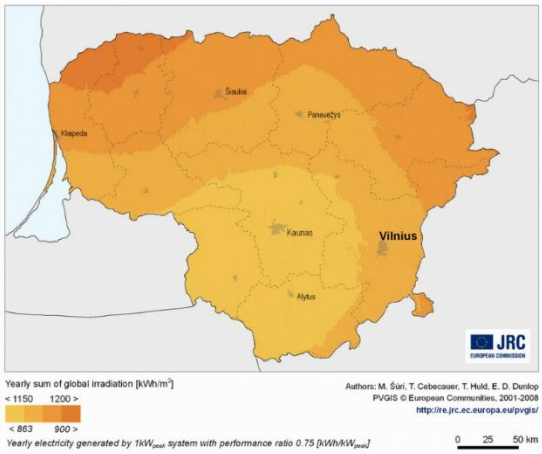
Hydro development

Development of hydropower in Lithuania faces a number of improper restrictions resulting from environmental protection (Picture 1.). Generally, the Lithuanian landscape is not favourable for hydro energy production - high dams are not available in most cases and even comparatively low dams cause flooding of large areas. Therefore, it is possible to augment only small-scale hydropower capacity up to 40 MW.

Picture 1. Lithuanian rivers exempted from damming/hydropower development

Solar development

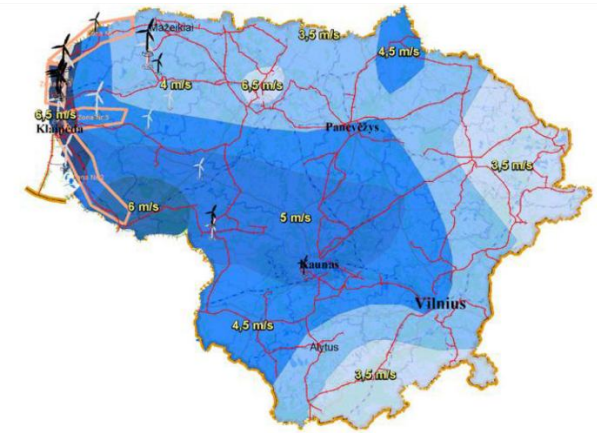
The annual solar energy potential in Lithuania is evaluated to be approximately 926–1042 kWh/m^2. (Picture 2.). The most favourable place for solar energy development is in the western part of the country, where the number of sunny days is the largest. It is assumed that solar energy will be used not only in collectors for preparing hot water and for heating in passive heating systems of buildings but also for electricity production. Installed solar capacity for electricity generation could reach 80 MW.



Picture 2. Global irradiation and solar electricity potential in Lithuania

Wind energy development

The best wind energy potential is in the north-western and western parts of Lithuania, especially on the seashore. Wind energy can be feasible where the average wind velocity is higher than 5–6 m/s. In Lithuania, these are the Baltic shore and Kursiu Nerija. Climatic conditions is the main reason, why the vast majority of wind energy developers submit applications for connection to the grid in the western part of Lithuania (picture 3.). Taking into account natural conditions, free areas and topology of the transmission network, the mainland additionally can be built ~460 MW.



Picture. 3. Wind speed over Lithuania territory

Currently there is no legislation governing the development of off-shore wind farms in Lithuania, therefore any specific development extent cannot be identified. It can be assumed that exactly off-shore wind development will be the main direction in wind energetics, if an appropriate promotion scheme is going to be applied.

LATVIA:

Latvian TSO sees that generally there are no development possibilities for new big and small hydro power plants in the area of Latvia. Therefore developments of new hydro generation (especially big HPP projects) are very unrealistic.

The highest increase of RES generation is expected in wind generation. According to producers' development information, the wind PP development could be possible in nearest future, but it is dependent on RES internal regulation and support (subsidy) scheme in Latvia, that is under development process now. In the future, offshore wind farm development might be possible after 2019, when it is planned to construct transmission infrastructure near the Baltic Sea coast area. Off-shore wind parks could increase installed capacity of wind up to 600 MW.

Biomass and Biogas power plants are developing smoothly, but with stable annual increase and installed capacity could reach 250 MW. As it was mentioned above, subsidy schemes have very significant influence on the future development of this generation type.

Due to very unpredictable climate conditions and small efficiency of sun, very small increase of solar generation capacity anticipated, which could reach amount of 8 MW. Currently climate conditions are strongly influence the developments of this generation field.

ESTONIA:

Objective for Estonia is to have a 17,6% share of renewable electricity in the gross final electricity consumption. As of 2017 there will be a new subsidy scheme for renewables and also electricity production in efficient co-generation mode to achieve the target.

Biofuel has good potential in Estonia to increase the production of electricity and heat from renewable sources. 30% of heating in Estonia is currently based on biomass which a good basis for future developments. Existing local heating plants are actively looking into opportunities to generate electricity in the process and there is potential for additional 100-200 MW biofuel capacity in Estonia in 3-5 years perspective.

There is no available potential to increase the production of electricity from hydro power. The rivers in Estonia are too small in size and flow and due to the flat terrain - the inclination *of rivers* is too small to effectively utilize the Estonian hydro power capacity. In addition the environmental

protection measures currently in effect do not allow the electricity production in some of the possibly favourable places.

Installation of solar panels has been extremely popular during the last couple of years as the installation is relatively easy and quick. Most of installations are less than 11 kW and the general idea behind the popularity of solar panels has been to reduce own consumption. Some bigger solar plants (up to 3 MW) are also being planned and overall capacity of installed solar panels could increase up to 50 MW during the next 3-4 years. The growth number of solar energy depends largely upon whether the national and local policy supports the development and production of solar energy and distributed generation overall. Only electricity produced from solar power is currently being supported, but not solar-powered heating.

Wind energy has the largest growth potential in Estonia as climate conditions for wind are remarkably good in the coastal areas of Estonia. There is potential to increase current production up to 4-5 times. Investors are exploring options to develop new wind parks, but opposition by local people and municipalities has slowed down the developments. As the total production support for wind parks in the effective support scheme is capped at 600 GWh annually, the investment risk for developers is increasing, which means that probably not all projects will reach construction phase.

Applicable RES promotion policy

LITHUANIA:

In Lithuania combination of three policy initiatives is applied to promote use of renewable energy sources: feed-in tariffs, grants, and tax regulation respectively.

Feed-in tariff support scheme for electricity production from RES was started to be applied from 1 April 2002, and will be managed until 31 December 2020. The feed-in tariffs for electricity generated by RES power plants with installed capacity over 10 kW are awarded through the auctions, organized by National Commission for Energy Control and Prices (further – NCC). The auctions are organized as long as there is a free promotion quota. Quota for Biomass, Solar and Wind energy power plants (transmission system) are already allocated. The feed-in tariffs are guaranteed for 12 years after RES producers get a permission to produce electricity. NCC sets a maximum feed - in tariffs for electricity from RES plant with installed capacity over 10 kW.

RES producers with installed capacity up to 10 kW may get a different feed-in tariff, also set by NCC, every quarter (http://www.vkekk.lt/en/Pages/tariffs-for-electricity-from-res.aspx). The producer gets the tariff which is valid for that day when the electricity is supplied to the grid. These producers gets feed-in tariff only for 50 percent produced electricity to the grid through the calendar year, what means that producers must use electricity for their own needs.

Investments in RES energy-efficient technologies are Grant-supported as well as agricultural production (biofuels, bio oil production and crude) and recycling activities.

The third tool used to promote development of RES - compensation of connection costs. In accordance with the obligations set in the Law on RES, actual connection costs are apportioned between the electricity network operator and producer with the proportions, depending on generating capacity:

- 60% covers electricity network operator, 40% - producer, in case capacity of power plant exceeds 350 kW;
- 20% covers electricity network operator, 80% - producer, in case capacity of power plant is higher than 30 kW but do not exceeds 350 kW;
- 100% covers electricity network operator, when capacity of power plant is below 30 kW.

LATVIA:

The Electricity Market Law in Latvia Article 28 point 5, Article 30 point 3, Article 281 point 4 and Article 291 point 4 provides (English version http://vvc.gov.lv/advantagecms/LV/tulkojumi/dokumenti.html?folder=%2fdocs%2fLRTA%2fLikumi%2f&currentPage=3), that compulsory purchase from power plants, producing energy from renewable sources, as well as guarantying payment for power plant installed capacity is compensated by all electrical energy consumers in Latvia pro rata of own electricity consumption.

The compulsory purchase component is included in common invoice receiving by clients for consuming energy and system services. For compulsory purchase collecting in Latvia is responsible distribution system operator (bigger DSO "Sadales tikls" AS), which these incomes further forward to the company directly responsible for compulsory purchase "Energy public trader" (Enerģijas publiskais tirgotājs). Since 1st April 2014 a new company AS "Enerģijas publiskais tirgotājs" has been established which is:

- responsible for estimation of subsidy amount from renewable energy producers;
- responsible for payments to the producers, who have support scheme;
- sell purchasing electrical energy from producers in the power exchange;
- receive compulsory purchasing incomes from consumers in Latvia.

In Latvia the RES promotion is included in electricity price as fixed yearly amount – 0,02679 Euro/kWh. The amount is based on expenses caused by gas power plants producing electricity in cogeneration mode and RES generation. This amount is estimated post factum from previous year, but allocated to current year.

This amount is also accepted by Public Utilities Commission and can be applied for all electricity consumers. Currently the fixed yearly amount is split in two parts:

1) Compensation for cogeneration stations of electricity generation in cogeneration mode – 0,01671 Euro/kWh;

2) Compensation for RES of electricity generation – 0,01008 Euro/kWh.

The support scheme and subsidies for renewable energy production in Latvia are determine in Cabinet of Ministers Regulation of Latvia Nr.262 "Regulation of electrical energy production using renewable energy sources and procedure for energy price calculation" from 2010 March 16. The Act (only Latvian version) can be found: http://likumi.lv/doc.php?id=207458.

Currently in Latvia there's no compensation mechanism of connection and construction costs for RES generation. Costs for connection to transmission network are covered by RES producers themselves.

The previous year's statistics about the amount of subsided energy is available: http://www.eptirgotajs.lv/vairak-par-oi/#/

ESTONIA:

Support scheme

Subsidies are set in §59 of the Electricity Market Act in order to promote the use of renewable energy sources, make the energy sector more efficient, and ensure the security of domestic supply and capacity. The English translation of the Act can be found: https://www.riigiteataja.ee/en/eli/ee/518062015002/consolide/current.

The support scheme for renewable energy is funded by electricity consumers according to the volume of network services used. The fee is determined and the renewable energy charge calculated by TSO annually. Support is handed out:

- To renewable energy, biomass in cogeneration mode or in efficient cogeneration mode. The Electricity Market Act defines renewable sources as water, wind, sun, waves, tidal energy, geothermal energy, landfill gas, sewage treatment plant gas, biogas and biomass;
- From 2013, for the usability of oil-shale operated net-capacity (i.e. to ensure security of supply; conditions depending on the price of CO_2 apply).

Rate of the premiums at the moment is:

- 53,70 EUR/MWh - renewables (except biomass). From 01.01.2011: biomass in efficient cogeneration mode;
- Wind-powered plants may apply for support until 600 GWh production limit has been reached per calendar year;
- 32,0 EUR/MWh - waste in efficient cogeneration mode, peat or oil-shale processing retort gas; also <10 MW power plants operating in efficient cogeneration mode.

Investment support has been known to be given out by the Environmental Investment Centre (investments for the application of wind energy in electricity generation and for extended use of renewable energy sources for the generation of energy and reconstruction of district heating). More info can be found: http://www.kik.ee/en/energy/renewable-energy.

There are no tax exemptions or compensations for connection costs currently in force in Estonia for RES capacities.

To facilitate and promote renewable energy consumption guarantees of origin (GoO) are issued in Estonia to provide proof to a final customer that a given share or quantity of energy was produced from renewable source or in efficient cogeneration mode. TSO has made it possible to mutually transfer GoO electronically with other EU member states that are members of the Association of Issuing Bodies and whose GoO correspond to the European Energy Certificate System rules.

Residual mix. TSO elaborates and publishes the residual mix of the previous year by the 30th of June. 2014 being the first year for which the calculation has been made. Estonia's domestic residual mix represents the shares of electricity generation attributes available for disclosure, after the use of explicit tracking systems (such as GoO) has been accounted for. Due to the international nature of both the electricity markets and tracking systems, the amount of available generation attributes (in MWh) in the national residual mix differs from the volume of untracked consumption. Thus, the calculation needs to be harmonised for the entire Europe, which is achieved through the European Attribute Mix (EAM), the "equalising reservoir" for generation attributes. After the attribute balancing via EAM, the volume of available generation attributes in each country's residual mix is equal to the untracked consumption of the country.

Statistics may be downloaded from: http://elering.ee/dashboard. Some info regarding renewable energy is published: http://elering.ee/renewable-energy-subsidy-2/. Other relevant information can also be found at Statistics Estonia: http://www.stat.ee/energy.

Existing operational policy for interruptible RES

LITHUANIA:

Current RES support scheme in Lithuania foresees following organizational aspects in operational phase:

- Guaranteed purchase of RES generated electricity;
- Exemption to be balance responsible;
- Priority right to transfer of energy from RES.

Current technical requirements for wind generation units that are being connected to transmission network includes possibility for system operator to control and limit power output of particular wind farm. Such technical measure currently can be applied in the situation when imbalance cannot be compensated with other resources and limitation is the last measure in order to do not violate system security limits and endanger reliable operation of Lithuanian power systems.

Technical requirements for wind parks also includes provision of primary regulation and voltage control with possibility for system operator to set control parameters remotely. Currently primary regulation functionality is not used in Lithuania, however system operator frequently uses voltage and reactive power control from wind parks.

LATVIA:

Currently RES share is not cause any trouble or emergency situations for Latvian power system. According the Electricity Market Law of the Republic of Latvia (English version http://vvc.gov.lv/advantagecms/LV/tulkojumi/dokumenti.html?folder=%2fdocs%2fLRTA%2fLikumi%2f&currentPage=3) prescribes that in the electricity market conditions its participants – TSO and Producers (all producers, including RES, connected to the transmission network) shall execute mutual transactions in accordance with the Network Services Agreements concluded in writing. It means that RES producers responsibilities and conditions, including operational policy, are stipulated in the Network Service agreement between TSO and producer (http://www.ast.lv/eng/services_of_transmission_system/electricity_transmission_service_for_producers/), including possible interruptions from the network and balance responsibility of the parties. There are two types of responsibilities between TSO and producers: technical and economical. The technical issues are related to transmission network operational modes and some possible emergency situation. For example, if the producer is connected to the electricity network by radial line, in emergency situations (including black out or system collapses) for system stability, if the other reserves have been used, producer could be disconnected from the network. The economical responsibilities are related with balancing and imbalance issues, where due to not precise forecasting for power system reliable and stable operation TSO, as responsible party for power system balancing in Latvia, could by or purchase energy from/for producer.

All RES producers are balance responsible in Latvia. RES connected to the distribution network are balanced by "Energy public trader", who has "agreement" with TSO for balancing service. Relations between RES producers and Energy public trader are defined in the separate agreement.

Technical requirements for wind parks issued by TSO in Latvia also includes provision of primary regulation and voltage control. Primary regulation for RES is available in Daugava cascade HPP and wind parks connected to the transmission network.

ESTONIA:

RES are considered in operational security analyses in the same manner as any other producer or load. Their influence to the grid operation must not breach the operational security limits. In order to keep the grid operation secure TSO can restrict the production of the RES. The causes of RES restrictions can be divided into two areas – technical issues for grid operation (for instance voltage ranges are breached, transmission system elements are overloaded etc.) and system power balance and reserve issues.

When above mentioned technical issues can be solved simply by restricting the RES, then this is done. For balancing the power system TSO uses the existing contracts possibilities first (reserves for balancing, both for up and down regulation and emergency reserves). Only if all other means for balancing the power system are used (except consumption disconnection the) the TSO comes to restricting the RES. With regard to procurement of special reserve capacity in order to compensate RES, then at the current penetration level of RES in Estonia it is not needed.

There have been some cases were restriction of production of certain wind parks has been considered in operational planning phase, but actual operational practice so far has not caused the need for the restriction of RES.

Technical requirements for RES connection to the grid and testing.

LITHUANIA:

Standard preliminary design specifications for connection to 110 kV transmission network are publically available on TSO website (only the Lithuanian language): http://www.litgrid.eu/index.php/services/connection-to-the-transmission-grid-/connection-to-the-transmission-grid-/585.

In accordance with the provisions of the Law on RES, RES connection to the power grid is treated as service of public interest. Costs associated with the RES connection to the electricity grid, distributed between the generator and the operator of the electricity grid, according to the power grid ownership bound. Generator pays 40 % of the connection costs, respectively, the rest - 60 % goes to the operator costs for connection of RES with installed capacity over 350 kW. For RES producers with installed capacity equal or below 350 kW the share of connection costs is 20 % - for generator and 80 % - for electricity network operator. In case of necessity to expand electricity grid for RES PP connection, the producer compensates for network operator not more than 10 % of the incurred electricity network development costs.

For wind power parks testing, TSO defines test program individually for each wind park, but in generally they are more or less similar. There are no obligation to pay for electricity, produced during the test operation.

LATVIA:

TSO within the operational area and term of its licence is constantly obliged to provide necessary connection to transmission system for power system participants (including producers) in accordance to System Connection Rules issued by Public Utilities Commission (PUC) for the connection fee defined by methodologies developed by PUC, if system participant fulfils technical requirements defined by TSO. RES (as well as other energy producer) connection to the transmission network and testing procedures is described in National Network Code point 2 (available only in Latvian http://likumi.lv/doc.php?id=257943).

New system connections for producers of electric energy are established by TSO in accordance to „System Connection Rules for electrical energy producers“ issued by PUC (available only in Latvian http://likumi.lv/doc.php?id=244670&from=off). The standard connection agreement between TSO and producer have to be concluded (available only in Latvian http://www.ast.lv/files/ast_files/files/Tipveida_Piesleguma_Razotajs_2012-05-02.pdf).

The new market participants (including RES producers) have to cover connection costs to the transmission system and there are no obligation to pay for electricity produced during the test operation.

ESTONIA:

Requirements for power plants are described in the “Grid code”: http://www.legaltext.ee/et/andmebaas/tekst.asp?loc=text&dok=XXXX010K1&keel=en&pg=1&ptyyp=RT&tyyp=X&query=grid.

New market participant has to cover the connection costs.

During the test period is valid “Temporary connection agreement” and there is obligation to cover all costs including electricity cost.

Compliance with the EU 2020 objective.

The Directive 2009/28/EC on the promotion of the use of energy from renewable sources sets the objective of meeting at least 20 % of the EU's final energy consumption with renewable energy sources by 2020. It sets mandatory national targets for the overall share of renewable energy sources in gross final energy consumption for each Member State. Progress towards reaching the 2020 targets is carefully monitored to ensure that the actual developments are not lagging behind the trajectory outlined in the RES Directive.

LITHUANIA:

The national target for RES, set in National Energy Independence Strategy for 2020, is to reach no less than 23 % of renewable energy in final energy consumption, including no less than 20 % of renewable energy in the electricity sector. In the Law on RES specific capacity for each RES which have to be installed (gross capacity) by the year 2020 is set: 500 MW wind, 105 MW biofuel, 10 MW solar, 141 MW hydro.

Taking into account ongoing projects, it is expected to reach 490 MW of installed wind capacity by the end of 2016. Therefore, it can be assumed that 500 MW installed capacity will be reached even earlier than in 2020. Discussions concerning the support scheme for additional 250 MW of wind capacity is already started. For Hydro generation, additional 13 MW is required to meet 2020 target. Taking into account, that during the last few years just 1-2 small-scale hydro PP with capacity of 0,06-0,2 MW were connected to distribution network, installation of additional 13 MW capacity looks quite ambitious target. Solar capacity already has exceeded the target set in National Renewable Energy Action Plan (NREAP). Taking into account interest of the investors and existing support mechanism, in 2020 solar capacity could reach ~80 MW. The highest potential for development in Lithuania is foreseen for biomass power plants. Whereas most of the power plants are old enough and fail to meet the LCP Directive (which will come into force in 2016) requirements, the most likely that some power plants will be rebuilt and adapted to burn biofuel. When reconstruction projects of Vilnius CHP and Kaunas CHP gas units will be implemented, the 2020 goal, set in NREAP, will be exceeded.

Table 2. Net generation capacity in LT in 2020, MW

Power Plant	Net gen. capacity	Fuel
	MW	
Fossil fuel PP	**1139**	
Lithuania PP	570	Gas
Kaunas CHP	102	Gas
Vilnius CHP	160	Gas
Panevėžys CHP	33	Gas
Industrial PP	274	Gas
Kruonis HPSPP	**1125**	
RES	**1205**	
Kaunas HPP	99	hydro
Small HPP	40	hydro
Wind	750	
Solar	80	
Bio	236	Including 37 MW waste
TOTAL	**3469**	

According to the Rules on the Use of Electricity Networks, all electricity producers (including hydro, biofuel power plants and wind parks) whose capacity is equal or exceeds 10 MW are required

to ensure the provision of frequency containment (primary) reserve. Producers with capacity of 50 MW and more, as well as wind parks and hydro PP with capacity of 10 MW and more, are obliged to ensure frequency restoration (secondary) reserve supply. Electricity producers whose unit generating capacity is over 50 MW must ensure possibility to supply replacement (tertiary) reserve. The secondary reserve capacity, covering the biggest unit or DC link loss, will be ensured by Kruonis HPSPP (220+220 MW) and regional balancing market. Tertiary reserve will be ensured by Lithuania PP (445 MW) and cross-border capacities on Elbas and Day-ahead markets.

According to the provisions of the LCP Directive, which comes into force in 2016, no development of fossil fuel generation is foreseen.

LATVIA:

Latvia has set a national target for energy produced from RES for whole energy sector in all fields (heat, transport, electricity). It is defined that 40 % of RES must be in final energy consumption. The figures, presented in the Table 3, are Latvian TSO forecast towards EU targets 2020.

Table 3. Net generation capacity in LV in 2020, MW

Power Plant	Net gen. capacity	Fuel
	MW	
Fossil fuel PP	**1144**	
Riga CHPs	989	Natural gas
Other CHPs	155	Natural gas
RES	**2050**	
Daugava HPPs	1589	Hydro/Run-of-River
Small HPPs	28	Hydro (RES)
Wind PPs	310	Wind (RES)
Biomass and Biogas PPs	170	BioRES
Solar	3	Solar
TOTAL	**3244**	

There are no serious projects for installation a new high capacity hydro power plant in area of Latvia, therefore Latvian TSO is not expecting serious increase of hydro generation. Similar situation is with small HPPs. Due to some delays on the approval of RES support scheme in Latvia and insufficient infrastructure and technical reserve capacity for balancing, the expected wind generation capacity in 2020 in base scenario is up to 310 MW. Due to stopping of support to natural gas cogeneration power plants, increase of biomass and biogas and slow growth of solar generation is expected in Latvia. Biomass and Biogas generation capacity could reach 140 MW and solar capacity - around 3 MW. The amount of solar is very insignificant comparing with other RES sources.

ESTONIA:

The national target for 2020 is that 25 % of final energy consumption should come from renewable energy sources. The target was achieved in 2011 and surpassed in 2012 with 25,2 % of final energy consumption being derived from renewable energy.

Small-scale cogeneration plants around Estonia continue to be under development. Also some wind power plants (although rather modestly, because the 600 GWh yearly cap for supported wind energy is very nearly reached already). No new hydro resources are being utilized. Small-scale solar power continues to be utilized and is deemed rather viable.

In the general long view - clarity of the electricity market design is required to ensure market-based investments to new production devices. The new CFB-technology (circulating fluidised bed

boilers) based oil shale production devices in the Estonia's largest Narva PP shall remain operational after 2015, but the older conventional production units (pulverised oil shale combustion boilers, altogether 220 MW) have been shut down in part due to normal amortization and partly due to the high demands of the LCP-directive. At the moment it is expected that by 2020 the units at Narva PP that have had the derogation from the IED-directive have to be shut down and the remaining conventional units using sulphur-capturing-equipment are to be shut down gradually during 2020-2024. It is still possible that the units may remain operational depending on the environmental requirements.

The remaining available capacity of Estonia would probably drop from around 2000 MW to around 1000MW, or with the addition of variable (due to the fluctuating nature) renewable energy sources, from 2500 MW to 1500 MW.

Table 4. Net generation capacity in EE in 2020, MW

Power Plant	**Net gen. capacity**	**Fuel**
	MW	
Fossil fuel PP	**2185**	**Thermal (oil shale, natural gas etc.)**
RES	**1046**	
	8	Hydro (RES)
	925	Wind, solar etc (RES excl. hydro)
	95	Biomass, biogas
	19	Waste
TOTAL	**3232**	

Compliance with EU 2030 objectives.

The European Council endorsed a binding 40-27-27 target by 2030 within the EU:

- to decrease greenhouse gas emissions by at least 40 % compared with 1990;
- the share of renewable energy, consumed in the EU, must achieve at least 27 %;
- to improve energy efficiency by at least 27 % compared to projections of future energy consumption based on the current criteria.

The framework was adopted by EU leaders in October 2014. It builds on the 2020 climate and energy package. It is also in line with the longer term perspective set out in the Roadmap for moving to a competitive low carbon economy in 2050, the Energy Roadmap 2050 and the Transport White Paper.

LITHUANIA

The strategic guidelines for 2020-2030 for RES development are established in National Energy Independence Strategy of the Republic of Lithuania: <…the State will continue its efforts to ensure sustainable development of the energy sector by encouraging the energy generation from renewable sources…>. But no specific values are set.

If the same target of 27 % share from RES would be set for Lithuania, around 3,83 TWh of electricity should be produces by RES generators (assuming, that consumption in 2030 will be about 14,2 TWh). Taking into account environmental and climatic conditions on the one hand and development potential on the other hand, the necessary amount of electricity produced by RES and capacity of RES power plants, presented in the *Table 5*.

Table 5. RES generating capacity mix for 2030

2030	Generation, TWh	Tmax	Capacity, MW	Comments
RES generation	**3,83**			
Hydro	0,49	3500	141	Limited by environmental conditions
Biofuel	1,49	4500	331	According to public information
Solar	0,09	1100	80	Limited by climatic conditions
Wind	1,76	2200	800	

LATVIA:

According to **Directive 2009/28/EC** of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC on renewable energy Latvia has got one of the highest individual targets for the share of renewable energy by 2020, namely **40%** from total gross final energy consumption. The share of renewable energy sources has traditionally been significant in Latvia's energy supply and it is 52% from total gross electricity consumption (https://www.em.gov.lv/en/sectural_policy/energy_production/). Latvia has set RES targets for 2030 in whole energy field but there are no particular RES targets for electricity field. Detailed share of RES in electricity field will be established later in the next RES targets. Latvian TSO sticks to the conservative scenario which is also described above till 2020. Latvian TSO expects that possible increase could be foreseen in wind (off-shore/on-shore), Biomass and Biogas and Solar RES capacities. The net installed capacity of wind for optimistic scenario could reach 792 MW, in case that off-shore and on-shore wind parks will be developed in the area of Latvia and Baltic Sea. Latvian TSO expects that in the coming future a new high efficiency off-shore wind farms in Baltic

Sea can be installed. In Latvia there is possible increase of Biomass and Biogas capacity up to 227 MW. The amount is around double as today. The possible development of Solar is foreseen up to 7.2 MW. The share of Solar is very unpredictable and dependent on future subsidy schemes.

ESTONIA:

The development plan project (currently is under discussion) includes achieving the target of 45 % of final energy consumption from renewable energy sources. The share of renewables is planned to keep rising in the district heating sector.

Applying the available flexible cooperation mechanisms (most likely statistical transfers) are under discussion to help bring along market-based investments to develop domestic fuel based or even fuel-free capacities and thus ensure energy security.

Currently renewables are planned to account for 30 % of final electricity consumption in 2030 due to the continuing development of the European Emissions Trading System and the planned lowering of investments into the oil shale industry.

The Estonian National Development Plan of the Energy Sector Until 2030 is aimed at ensuring an energy supply that is available to consumers at a reasonable price and effort and with an acceptable environmental condition, while observing the terms and conditions established in the long-term energy and climate policy of the European Union, but the Development Plan is currently still under discussions.

As Estonian security of supply should be viewed on a regional level, it is important to point out that by 2030 according to plans Estonia should have cross-border interconnections totalling in capacity of over 2000 MW, which brings along a greater importing capability than the forecast peak load of Estonia for 2030. This means that the known potential shutdown of local production units does not present a threat to security of supply under normal conditions.

In the long run and in general renewables should start to be integrated to the market with no subsidies or as little additional support as possible so that renewables would help ensure the stability and security of the power grid just like the conventional power plants with the same competitive price.

Possible technical and organizational measures for RES integration

Integration of renewable generation represents a key pillar of the Commission's broader energy and climate objectives in reducing greenhouse gas emissions, improving the security of energy supply and diversifying energy supplies. Wider use of renewable resources face a number of challenges which are solved by using various measures (support mechanisms, technical, organizational measures).

LITHUANIA

In order to increase possibilities for connection of new RES in Lithuania new organizational measures should be applied:

- Balancing responsibility.
  New RES producers should be balance responsible. Therefore balancing service would be not a public service but RES producers would have incentives to minimize imbalances thus preparing precise wind generation forecasts and executing maintenance schedules.
- Curtailment procedure.
  In case there is no available regulation reserves curtailment procedure for wind parks should be available as normal measure to limit generation output of wind parks. Curtailment procedure shall be a non-costly measure for system operators that could be activated in order to maintain reliable system operation.

LATVIA

The RES development volume directly depends on RES legislation and support scheme in Latvia. In existing situation the RES producers are not interested to participate in electricity and in balancing market in Latvia due to guarantying subsidies from end tariff. Technically the RES balancing is feasible but in today situation the difficult process due to some shortcoming in internal RES legislation. AST as TSO in Latvia is ready to provide balancing service to RES producers, but producers are not ready to participate in this because this is economically unfavourably and they select constant incomes from above subsidy scheme through end tariff.

Currently the support scheme is being revised to provide a stable, transparent and predictable investment environment for renewable energy and other industries, as well as reduce the burden of mandatory procurement on the Latvian electricity consumers. The purpose of the activity is to ensure the further development of competitiveness of the economy and prevent the deterioration of living standards. More clarity and predictability of the planned support scheme for subsidized energy production will give investors a clear long-term vision.

ESTONIA

In principle RES can offer balancing services to the Elering. Since currently there is no balancing market in Estonia this cooperation can be organized through bilateral contracts. All RES connected to the main grid must have technical capability to offer for instance such products as frequency containment reserve or automatic frequency restoration reserve. For now (since Estonian Power System operates currently in the same synchronous area with Russia) the automatic reserve products are not needed, but the product that Elering needs is manually activated frequency restoration reserve. The respective product description and requirements are public and RES can also offer balancing bids if they meet the necessary requirements.

Mechanism of controlling the power production from RES by TSO is done through SCADA system. For instance Elering can restrict (control) the power production of all wind parks connected to main grid from our control room in real-time.

The important ancillary service Elering currently uses from wind parks is voltage control. All wind parks connected to main grid must have voltage control functions. This service is used by Elering very actively and it serves the needs of both parties - Elering can keep the voltage levels inside secure limits without restricting the wind parks and wind parks can produce more.

SUMMARIZING FINDINGS

RES Policy issues in Baltic countries

- Taking into account already implemented and ongoing RES development projects, Baltic countries are on track to fulfill or even exceed 2020 RES targets, set on National level.
- Baltic countries have similar RES development potential technology – it is wind and biomass. Off-shore wind potential in Estonia and Latvia is higher. In Lithuania there is no legal basis for off-shore connection. In Estonia and Latvia off-shore connections depend on technical requirements and risk readiness of the producers.
- Conditions for RES production are similar in all countries, so further development depends on political will (for example supporting schemes).
- Feed-in tariffs in all countries are different organized: in Lithuania - auction based, in Latvia and Estonia - based on calculations of companies, responsible for managing of supporting schemes.
- Estonia is planning to implement auction based support system from 2017. Lithuania is moving towards support of investment.
- Elering sees advantages to participate in AIB (Association of Issuing Bodies) which provides common platform for RES trading, harmonization of practical implementation of RES Directive in all European countries.

Operational issues on RES

- There are no unsolved operational issues to meet 2020 RES targets in Baltics.
- Baltic countries have much more similarities, common position and the same targets on RES capability for primary regulation, emergency control, etc.
- In Latvia and Estonia RES producers are balance responsible. Balancing is different in Lithuania – balancing service is provided by Litgrid. The new draft legislation foresees balancing responsibility for new RES in the future.
- Common balancing and regulation market would allow to integrate more RES capacities for all Baltic region.
- Coming off-shore wind parks will challenge current operational practices.
- Regional cooperation is an opportunity to meet 2030 RES targets of Baltic countries.