

IPO Support – Market Advisory

Final Report

August 2020





Executive Summary (1/2)

Lithuania

- The largest economy in the Baltic region is expected to see GDP grow at a CAGR of 2% from 2020 to 2040. This growth is largely driven by the manufacturing and industrial sectors, however, there is an expected progression towards science and pharmaceuticals in the future
- Despite near term uncertainty as a result of the COVID-19 impact, electricity demand is expected to grow over the forecast period at a CAGR of 1% topping at 15TWh in 2040 compared to 12TWh in 2020. This demand is served mostly through thermal generation plants and hydro with some amounts of renewable energy, which makes up ~1.9GW of installed capacity
- With the decommissioning of the Ignalina nuclear power plant in 2009, Lithuania went on to become a net importer of power depending heavily on Russia and Belarus. Since then major efforts have been made to improve and expand interconnections with neighboring countries Poland and Sweden to reduce dependency on the Russian and Belarusian imports
- Decisions have been put in place to ban imports from Belarus surrounding the Astravets Nuclear facility, which Lithuania strongly opposes. This has also led to Latvia voicing concerns as the agreement between the three Baltic countries allows for flows only through Lithuanian connections
- Key policies and regulations are being put in place to make a stronger push for growth in Renewable Energy Sources (RES). Lithuania has achieved an adoption of RES at a rate that is faster than the EU average. There is also a positive attitude of the public towards adopting RES, with favorable conditions and policies in place to promote faster adoption
- The country aims to have RES make up 45% of final electricity consumption by 2030 and 100% by 2050. The country is exploring strong possibilities within offshore wind having identified areas to develop 700MW of capacity in the near future. Auctions are expected later in 2023 or later
- On the generation side of the market, the Ignitis group dominates the country with a market share of 63% (2.1GW of installed capacity) spread across thermal and renewables generation. Within renewables, the group once again tops the list with a market share of 57% (~1.1GW) of capacity with the bulk of it being hydro. In retail, on the other hand, there is a bit more competition with other players such as Elektrum and Inter Rao with 19% and 10% market share respectively. However, Ignitis again dominates the sector with a 47% as of 2019

Poland

- Poland, backed by strong EU support has seen consistent growth over the years and is expected to see GDP grow by a 2% CAGR from 2020 to 2040
- Power demand will see a CAGR of 1% from 2020 to 2040 going from levels of 172TWh in 2020 to 223TWh in 2040. The country has had sufficient generation capacity, although served mostly by coal fired power plants, which has been a major discussion point across the EU in recent years
- With increasing pressure on the country to reduce its dependence on coal, Poland will see a slow yet steady shift towards renewables with a focus on offshore wind over onshore. The onshore sector, however, is seeing a small resurgence in development activity since the implementation of the 10h distance rule, which is being reviewed and the reduction in property tax that saw costs increase significantly
- The country is aggressively pursuing offshore wind opportunities, making big announcements in the recent past. A first draft of the offshore wind act proposes a CfD style approach with a target to award ~11GW of capacity by 2027. Developers will be eligible for premium payments for 25 years from the government as opposed to just 15 years for other renewable projects
- Poland is looking to reduce their share of coal in the energy mix from 80% to 60% by 2030 and increase RES consumption to 21% in the same period
- The overall generation market in total is dominated by a handful of big players such as PGE, Enea and Tauron that have 37%, 13% and 10% share respectively. PGE also has a majority share in just the renewable generation sector albeit smaller at 23%. Orlen has a 5% share of the ~10GW renewable generation market

Executive Summary (2/2)

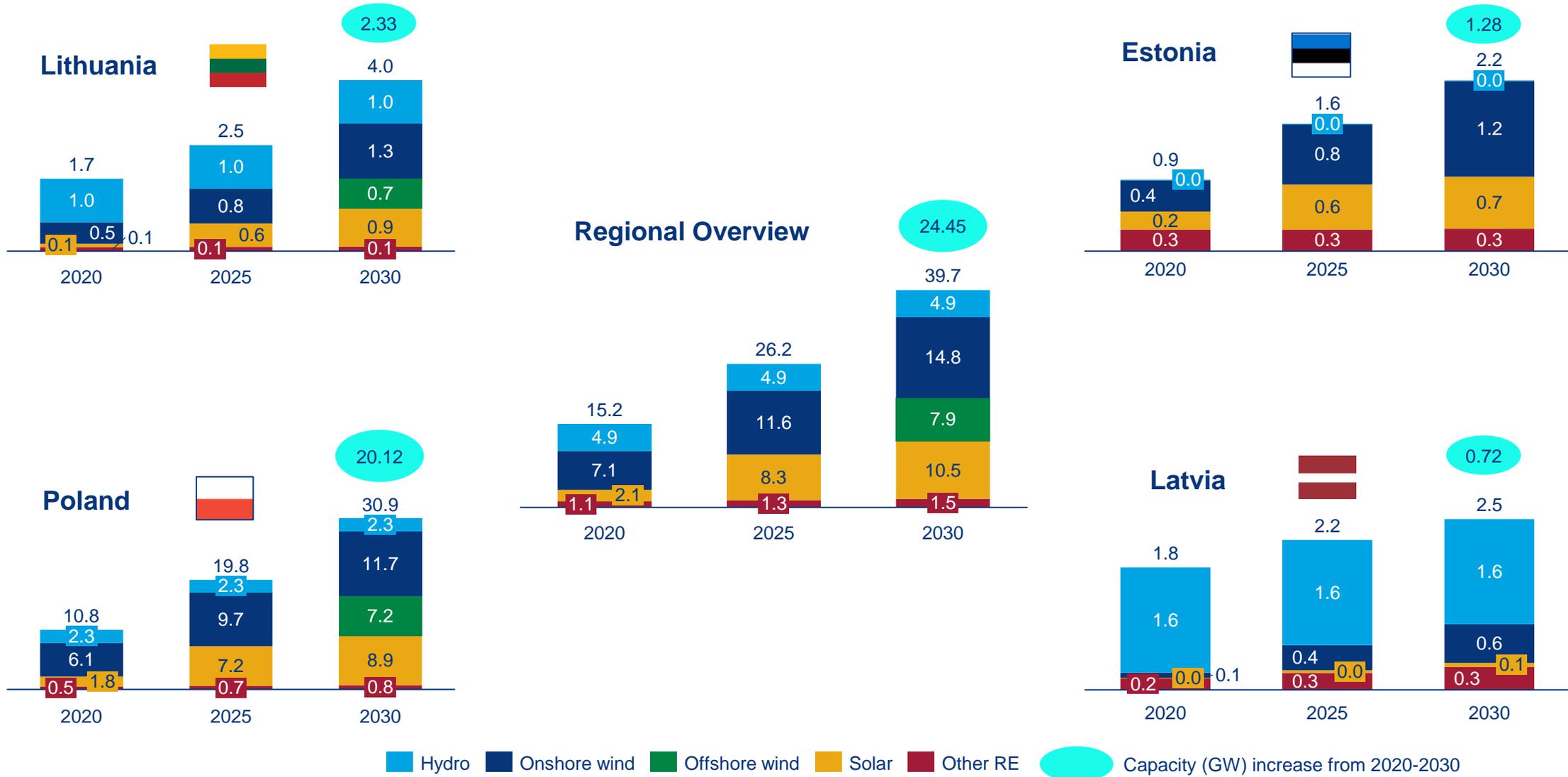
Estonia

- Estonia is the smallest of the three Baltic states. In recent years, growth has been driven by the service sector. Improving labor and productivity rates has fueled consistent growth over the years
- Estonia's power demand will grow from 10TWh in 2020 to 13.5TWh by 2040. The largest increase in demand is expected from the transport sector as EV's gain a foothold
- Traditionally, oil shale has been the main source of electricity in the country, however with pressure from the EU to reduce carbon emissions, the largest energy producer in the country Eesti Energia shut down four plants totaling 600MW
- The country has seen steady progress towards renewable energy development where in 2020, 17% of electricity consumption was from renewable sources. A target that was met ahead of deadline.
- 2020 saw the launch of auctions for renewable energy development with Estonia aiming to achieve 50% final electricity consumption from RES by 2030
- Efforts are being made to increase interconnection synchronization with Europe and reduce flow from Russia
- 82% of the generation capacity in Estonia is controlled by Eesti Energia. Similarly, the renewables capacity in the market is also mostly controlled by Eesti Energia, which has a market share of around 40%. Other notable players owning / developing RE assets are Utilitas and Fortum who have a 7% and 6% share respectively
- Eesti Energia also has a majority share of the retail market with 60% as of 2019 and saw volumes of 4.2TWh of electricity sold in the year. Other players in the retail sector are Elektrum and Alexela (which recently acquired 220 Energia) that have a 14% and 7% share respectively

Latvia

- The Latvian economy is driven by the manufacturing and services sectors. Some of the main activities involve the manufacturing of machinery and electronic devices. Similar to most other markets assessed, Latvia will see GDP grow at a CAGR of 2% from 2020 to 2040. Domestic demand is expected to play an important role in the growth of Latvia's economy
- Hydro plays a big role in the overall energy mix in Latvia. Power demand is expected to grow at a CAGR of 1% with demand to touch 9TWh in 2040 compared to 7TWh in 2020
- Less aggressive policies in the market is limiting RES development when compared to the other markets. Most of the development is focused in the interconnection synchronization with Europe
- Despite a lack of major policies, Latvia remains ahead of its renewables targets with the abundance of Hydro and Biomass in the country. The original 2030 target of 50% of gross final consumption from RES has been reduced as per the latest draft
- Expectations are that Latvia will follow its neighbors and implement auctions for the development of renewables, which will be technology neutral. However, no clear updates to policies have been made
- The generation market in Latvia is dominated by Latvenergo with an installed capacity of 2.6GW making up 80% of the market. Production plants are largely Hydro and combined cycle power plants
- It is a similar situation in the renewable generation market and retail where Latvenergo once again dominates with shares of 85% and 58% respectively. There is some competition in the retail market with Estonia's Eesti energy controlling 14% of the market as of 2019 and the other party being Elenger that sold 1TWh in 2019

Green energy installed capacity evolution in Ignitis Group's market (GW)



1. Macro view on commodities and lock stringency



The Oxford stringency metrics are some of the most reliable measures on Covid-19

Stringency has a strong correlation with lock-down economic impact

The Oxford COVID-19 Government Response Tracker (OxCGRT) provides a systematic cross-national, cross-temporal measure to understand **how government responses have evolved over the full period of the disease's spread**. The project tracks governments' policies and interventions across a standardized series of indicators and creates a composite index to measure the stringency of these responses.

- We expect the stringency of response measures to broadly track the spread of the disease. However, the **rate at which such measures are adopted plays a critical role in stemming the infection**. Differential responses can also be seen across the entire period
- As governments continue to respond to COVID-19, it is imperative to study what measures are effective and which are not. While the data presented previously do not measure effectiveness directly, they can be **useful input to studies that analyse factors affecting** manufacturing prospects of countries
- We find significant variation in both the measures that governments adopt and when they adopt them. It remains unclear as to how effective lockdown measures will be vs. economic damage to GDP

Covid Economic Stimulus Index (as of Jun 18)

Country	Date	Fiscal Stimulus	Rate cuts	Reserve requirements and buffers	Macro finance	Other Monetary	Bop GDP	Other BoP	Economic Stimulus Index (Positive means strong stimulus, Negative means weak stimulus)
Lithuania	18-Jun	17.9	0	100	15.0	1	0	0	1.33
Latvia	18-Jun	11.3	0	0	12.1	1	0	0	1.01
Estonia	18-Jun	11.3	0	100	13.0	1	0	0	1.66
Poland	18-Jun	9.6	93	85.7	4.2	1	0	0	1.12

In a recent paper (Elgin et al. 2020), prominent economists conducted a comprehensive **review of different economic policy measures adopted** by 166 countries as a response to the COVID-19 pandemic and **created a large database including fiscal, monetary and exchange rate measures.**

The economic policy package database we created includes six policy variables classified under three categories: **fiscal policy, monetary policy, and balance of payment/exchange rate policy.**

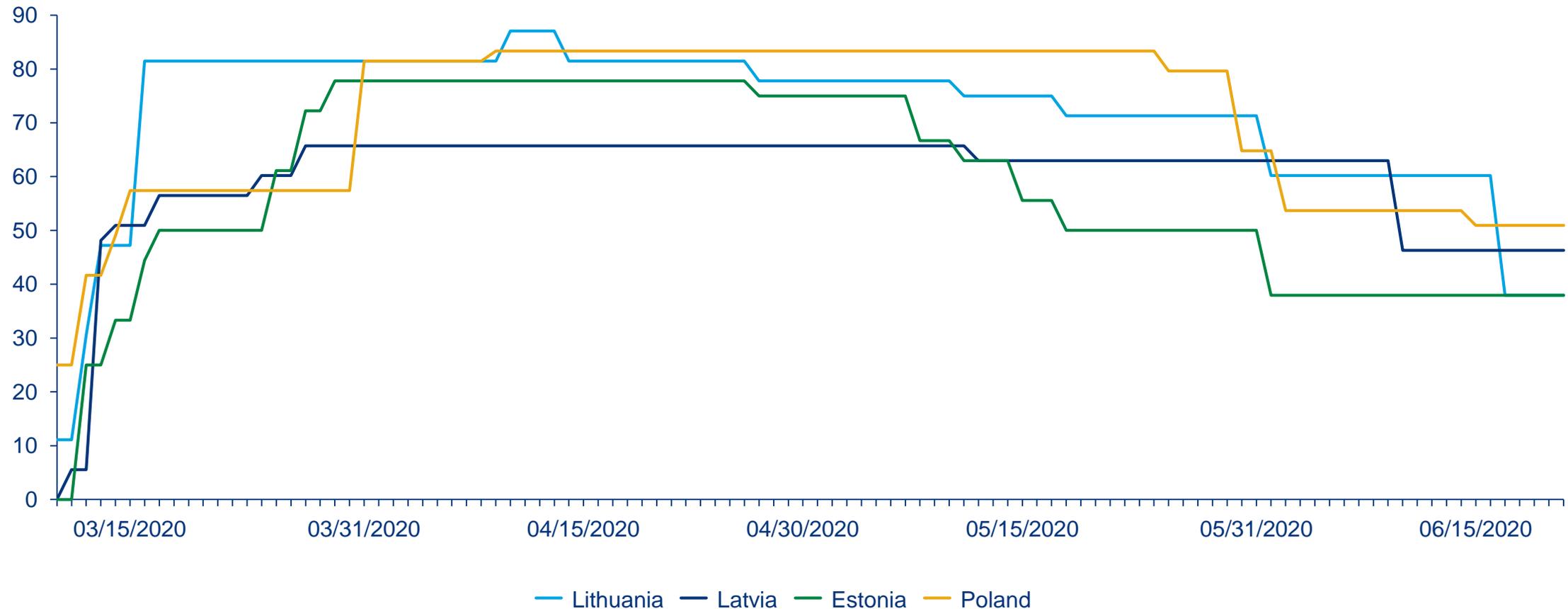
The **fiscal policy package** includes all the adopted fiscal measures and is coded as a percentage of GDP.

The **monetary policy category** includes three variables: (1) interest rate cuts by the monetary policy authority (coded as a percentage of the ongoing rate on 1 February 2020); (2) the size of the macro-financial package (coded as a percentage of GDP); and (3) other monetary policy measures (coded as a dummy variable taking the value of 1 if there are such measures and 0 otherwise).

Finally, the **balance of payment (BoP) and exchange rate policy** category includes two variables. The first reports specific BoP measures coded as a percentage of GDP, while the second is a dummy variable taking the value of 1 if there are other reported measures and 0 otherwise.

The government stringency index – which takes into account 13 different factors – points to a productivity loss yet to fully recover to start of March levels

(Index scaling:
0 = No constraints
100 = High constraints)

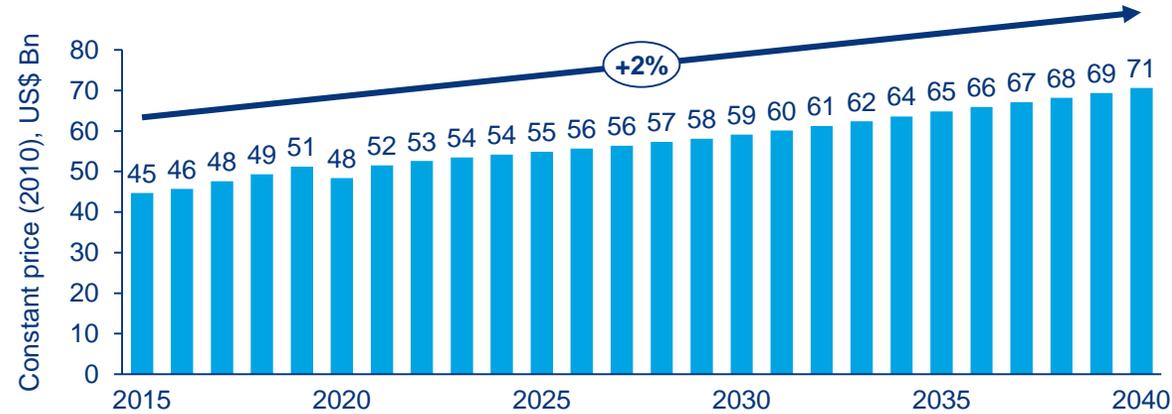


Source: Wood Mackenzie, Oxford University

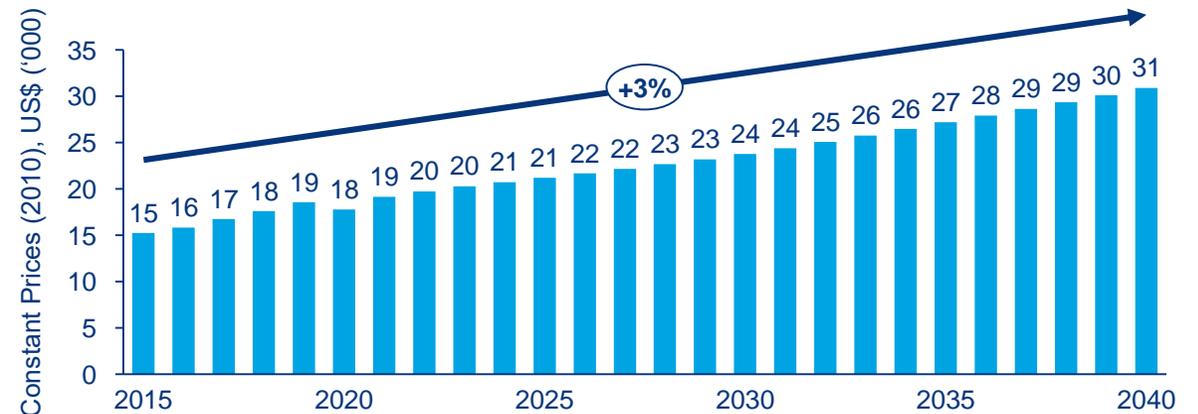
Lithuania

Macroeconomics Summary - Lithuania

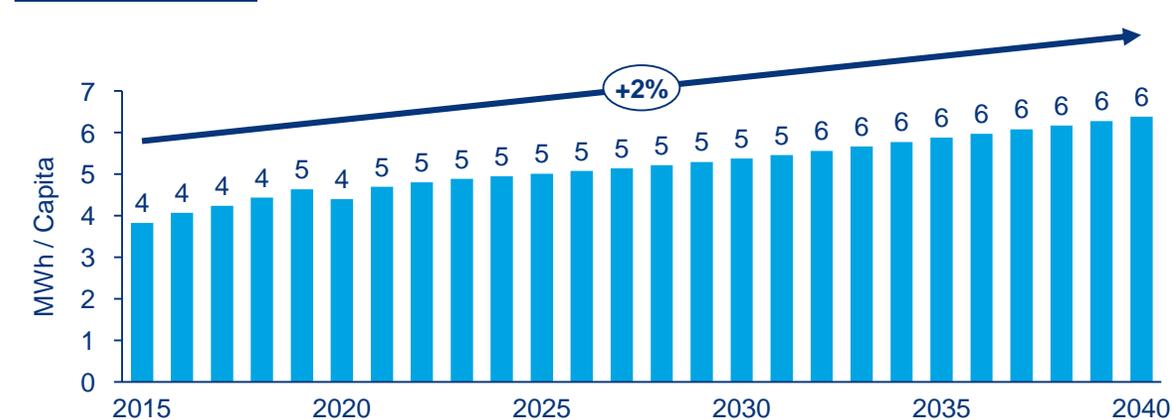
Annual GDP



GDP Per Capita



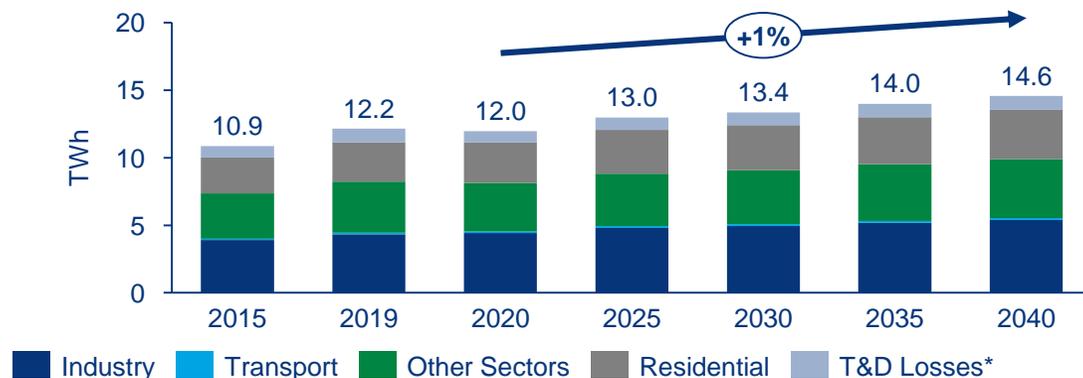
MWh Per Capita



- Lithuania has the largest economy among Baltic states.
- Annual GDP is expected to grow by CAGR of 2%. GDP is largely driven by manufacturing / industrial sector, and growth is expected to continue with progression into high-tech sectors like life science, pharmaceutical and laser.
- GDP is expected to face a hit in 2020, but recovery is expected from 2021 onwards and growth trajectory is expected to continue given strong stimulus.
- MWh / Capita is expected to grow by CAGR of 2% by 2040 as electricity demand is picks up with increase in standard of living as economy develops.

Power demand is expected to grow over time, and eventually reducing dependency on energy imports from neighboring countries

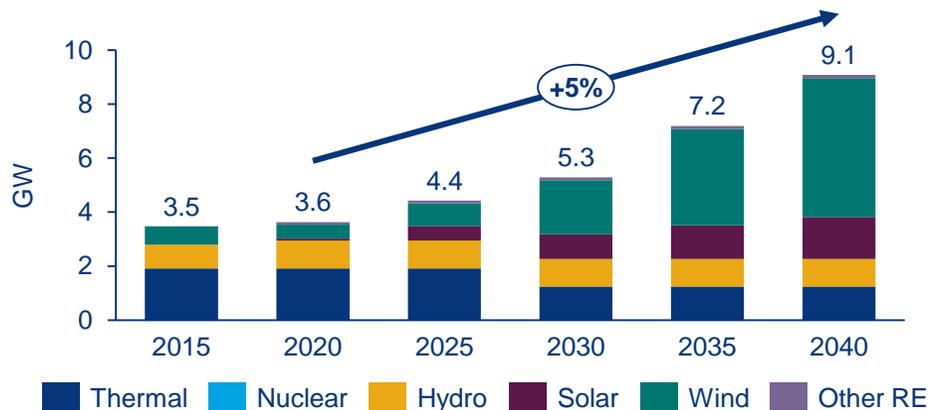
Power Demand Outlook



Power Generation Mix

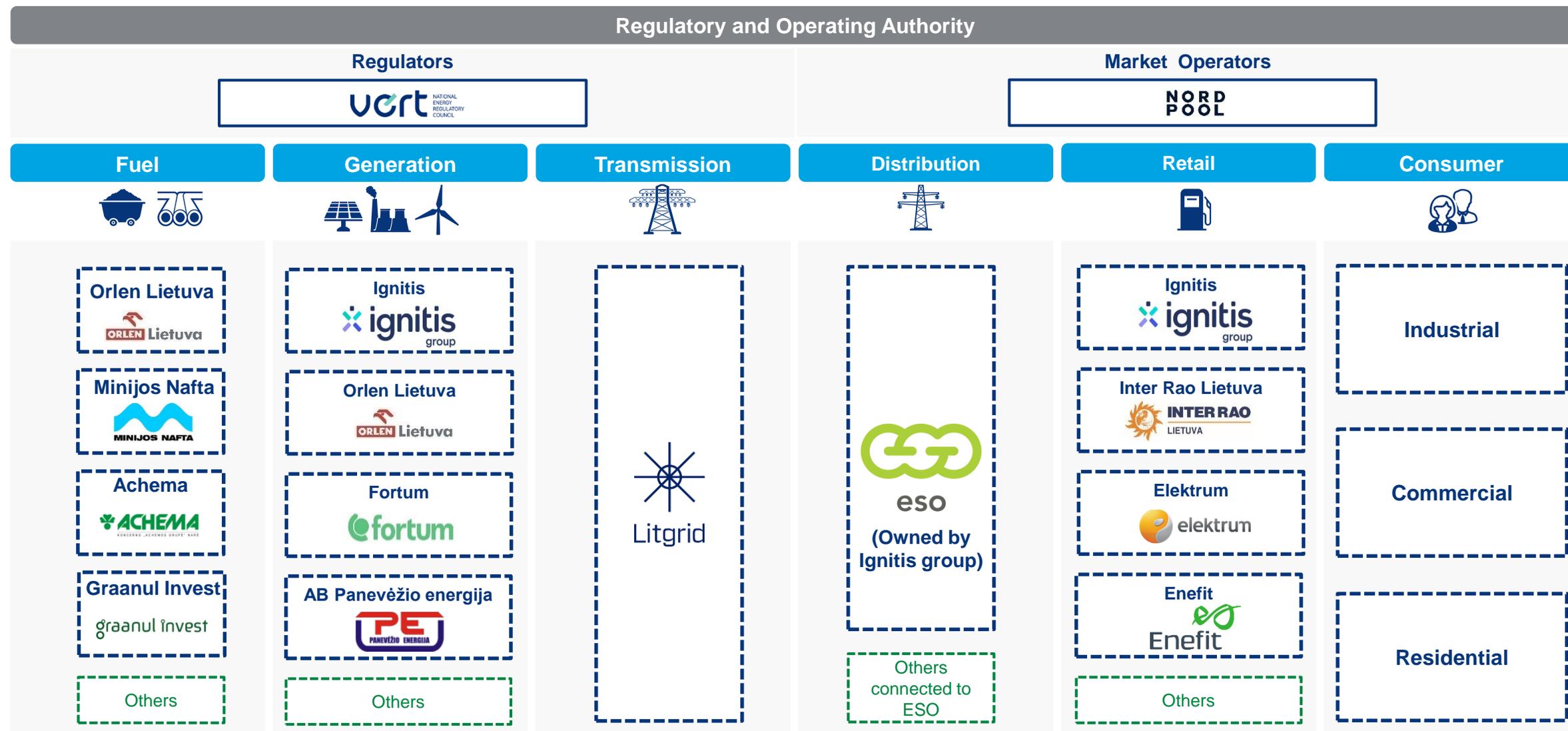


Installed Capacity Outlook



- Power demand in Lithuania is expected to grow over time. The increased demand of electric vehicles can be potentially be canceled out by energy efficiency measures.
- Lithuania and the entire Baltic region became a net importer of power ever since the decommissioning of the Ignalina nuclear power plant in 2009.
- With the introduction of both onshore and offshore wind in Lithuania, it is expected that Lithuania will be eventually be able to meet most of their energy demand domestically with active cross-borders trades (both imports and exports) continuing to strengthen the Baltic grid.
- The following assets are expected to be retired based on Litgrid's latest ten year plan
 - » Lietuvos elektrinė – 595 MW
 - » Vilniaus elektrinė 3 – 360 MW
 - » Kaunas – 170 MW

Lithuania Power Market Structure



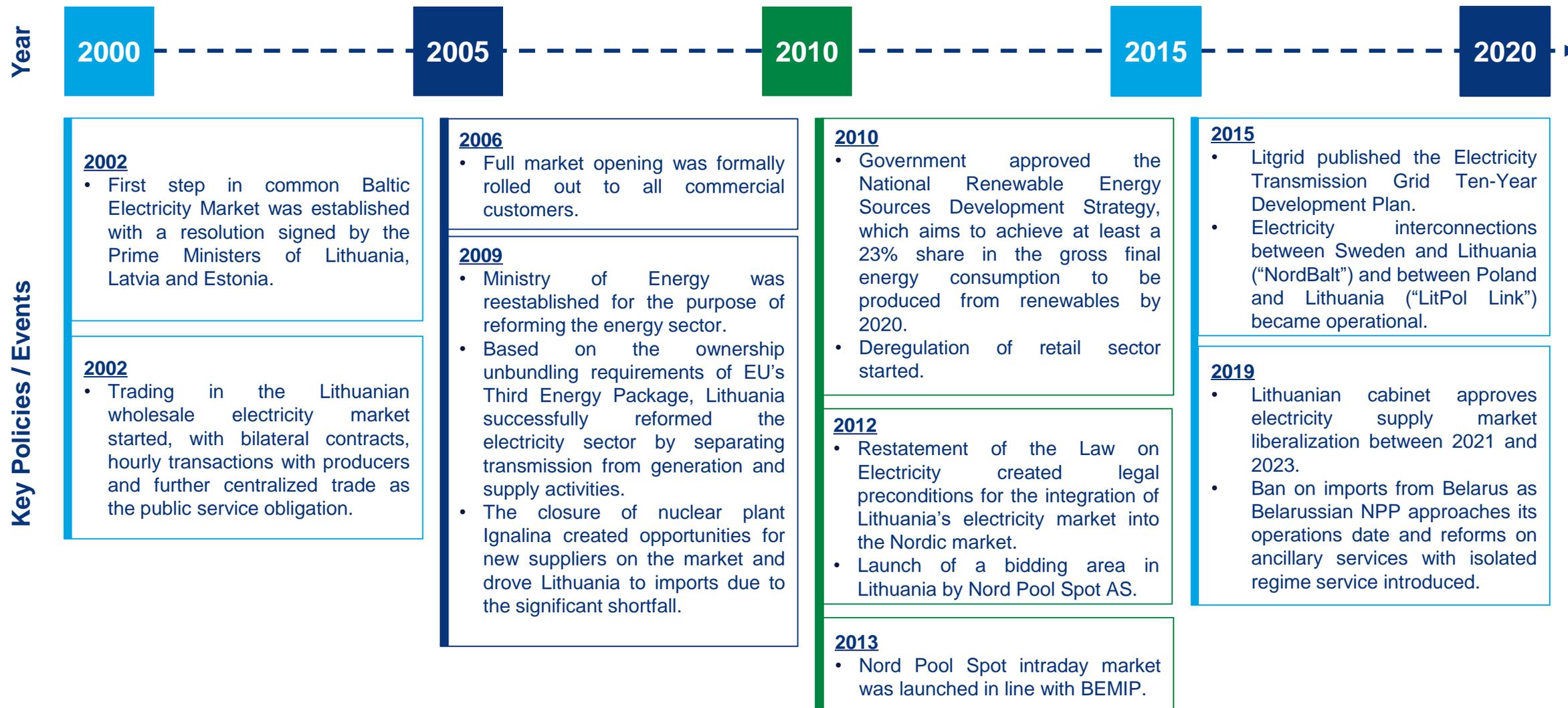
Note: Others under generation include green energy generators such as Enefit Green, Renerga and Stemma Group

Source: Wood Mackenzie

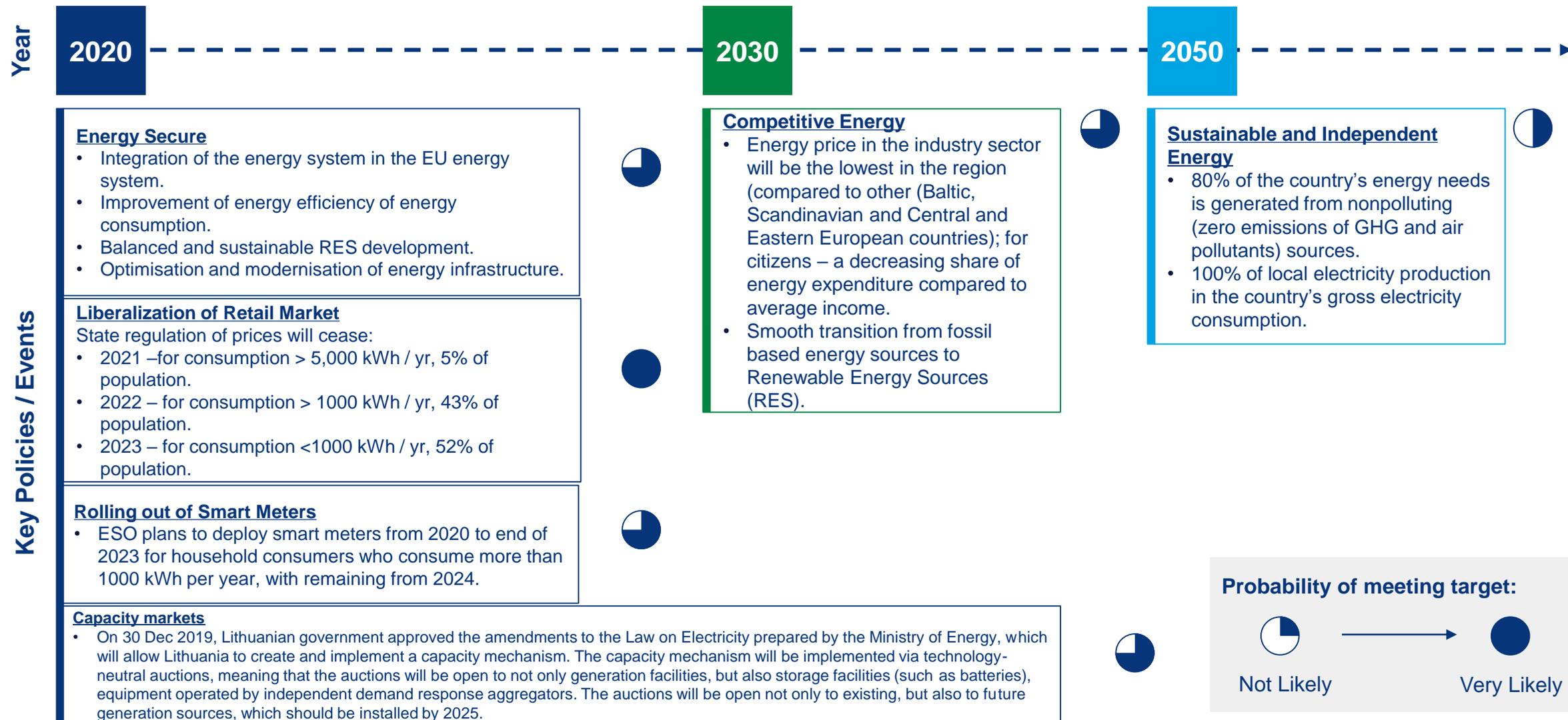
Power Market Key Stakeholder Overview

Stakeholder	Roles and Responsibilities
 <p>Ministry of Energy</p>	<p>Ministry of Energy of the Republic of Lithuania was reestablished for the purpose of reforming the Lithuanian energy sector. The ministry oversees policy in fuel, electricity, thermo-energy production and supply for Lithuania's economy. Since its establishment, Ministry of Energy has overseen a number of reforms within the energy sector and was the key driver for the renewed energy strategy with a focus on renewable energy.</p>
 <p>National Energy Regulatory Council</p>	<p>National Commission for Energy Control and Prices (NCC) is an independent national regulatory authority (in the European Union law's sense) regulating activities of entities in the field of energy and carrying out the supervision of state energy sector. NCC's mission is to ensure the quality and availability of energy services to consumers, creating equal conditions for all market participants. It aims to create a credible, independent economic regulatory framework of electricity, natural gas, district heating, drinking water supply and wastewater treatment sectors, ensuring the quality and availability of energy services to consumers.</p>
 <p>eso Energijos Skirstymo Operatorius AB (ESO)</p>	<p>ESO is the Lithuanian distribution network operator (owned by Ignitis group), and was established on 1 January 2016 through merger of the Lithuanian electricity distribution network operator LESTO AB and the gas company Lietuvos dujos (now Ignitis group). ESO distributes electrical power throughout the entire country and is a distribution network operator. The grid is made up of low and medium voltage lines and equipment. Ignitis is the majority shareholder and controls ESO. The electrical power provided through ESO distribution grid reaches more than 1.8 million clients.</p>
 <p>Litgrid Litgrid</p>	<p>Litgrid AB is the electricity transmission system operator of Lithuania and it maintains stable operation of the national power system, controls electricity flows and enables competition in an open domestic electricity market. Litgrid is responsible for integrating the national power system into the European power infrastructure and electricity market. The company also operates NordBalt and LitPol, the strategic cross-border electricity links with Lithuania.</p>

Power market has undergone multiple reforms over the years...



... and the next stage will focus on security, competitiveness and sustainability



Key policies and targets for adoption of renewable energy and market liberalization

Key Features

National Energy Independence Strategy

Discontinue to purchase unsafe nuclear power

Summary

- The National Energy Independence Strategy establishes the vision of Lithuanian energy sector, its implementation principles, strategic directions, objectives and tasks. Notable goals include:
 - Achieve lowest prices in the region for industrial customers and decreasing proportion of energy expenditure compared to the average income for residential customers.
 - Increase market liquidity, simplified conditions for launching an energy business or start using energy services
 - The principles of sustainable development will be referenced against for the switch to clean energy, but there must not be any adverse economic consequences for the state, industry, and households.
 - Roll-out electricity smart meters by 2023.
 - In **2020 - 30%** of the country's total final electricity consumption will be from Renewable Energy Sources (RES), in **2030 – 45%**, and in **2050 – 100%**. RES will become the main source of energy in electricity, heating and cooling, and transport sectors. In 2030, the intensity of primary and final energy will be 1.5 times lower than in 2017 and in 2050, 2.4 lower than in 2017. 1 TWh of electricity should be saved across Lithuania's industries by 2030.
 - Greenhouse gas emissions produced by fixed installations which participate in the EU Emission Trading Scheme (ETS) will reduce by at least 43% by 2030 vs 2005, reduce by 9% by 2030 compared to the 2005 for sectors not participating in ETS, and emissions by the energy and transport sectors to reduce by more than 95% by the year 2050 compared to the 1990 level.
 - In recognizing that the Astravyets Nuclear facility is unsafe, the Lithuanian governments has blocked companies from importing electricity from the nuclear facility in Belarus
 - In 2017, a law was adopted to ban the imports of electricity from unsafe nuclear facilities
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- Wood Mackenzie's expectations
 - Lithuania has achieved an adoption of RES at a rate that is faster than EU average. There is also a positive attitude of the public towards adopting RES, with favorable conditions and policies in place to promote faster adoption (refer to the next page). It is still dependent largely on imports which are perceived as more economical than domestic supplies. Nonetheless, government had set aside funds for the production of electricity from RES and has track record of adhering to European best practices. Tenders for smart meters are up and installation is expected to commence in 2021. As such, **targets up to 2030 are expected to be met, but 2050 is less likely currently.**



Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Baltic Energy Market Interconnection Plan

- The Baltic Energy Market Interconnection Plan (BEMIP) was established to achieve an open and integrated regional electricity and gas market between EU Member States in the Baltic Sea region, tackling their energy isolation.
 - A Roadmap was defined highlighting the process and introducing concrete solution for synchronizing the Baltic grids with the European network. The BEMIP High-Level Group's endorsement allowed for the Polish and Baltic States' Transmission System Operators (TSOs) to launch a formal procedure to undertake the synchronization. This is managed by the European Network of Transmission System Operators (ENTSO-E).
 - Notable goals include:
 - Baltic States' electricity system is targeted to be fully synchronized with the continental European network by 2025
 - Gradual phasing out of regulated prices for households as part of market liberalization
 - The current 500MW LitPollink overland interconnector between Poland and Lithuania will be replaced by 700MW Harmony link on the Baltic seabed by 2025
-
- Wood Mackenzie's expectations
 - Lithuania has prepared for de-regulation of electricity prices for households. Given the clear time-line and multiple press releases on the topic, the government is committed to achieving the target and we expect de-regulation process to be on track and **completed in 2023**.
 - Capacity market mechanism has been approved by parliament, sending a strong signal to power generators. The mechanism will be implemented in the form of technology neutral auctions
 - Original infrastructures were based on initial self sufficiency targets and did not take into consideration the supply and demand differences of other markets and flow opportunities after BEMIP was implemented. Litgrid has published the **Electricity Transmission Grid Ten-Year Development Plan** with investments into the electricity transmission network during the 10-year plan expected to reach EUR 870 million. Interconnection like NordBalt Link and LitPol Link have been operational since 2016.
 - Integration with rest of EU has begun and current capacity is shown in the **next page**.

Installed Power Transmission Capacity in Baltic Region (Lithuanian focused)

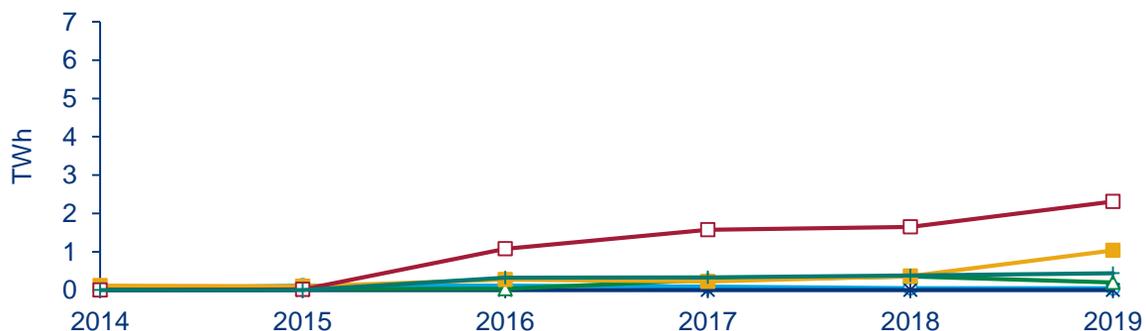
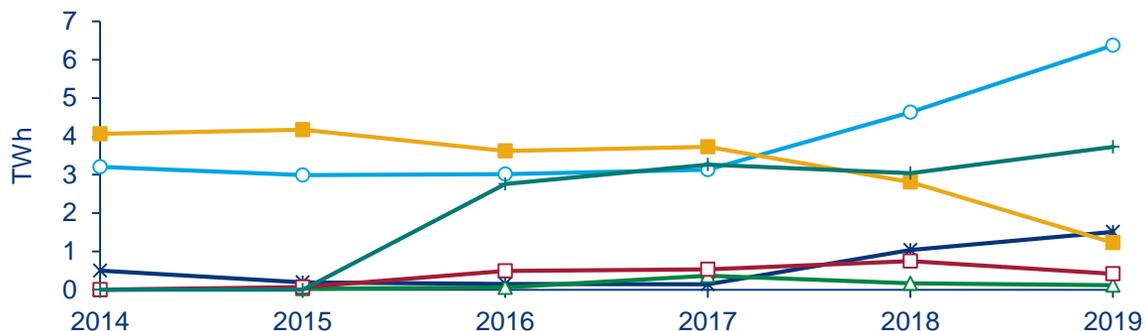


Connection	Flow from	Flow to	Capacity (MW)	Capacity – Opposite (MW)
1	Estonia (EE)	Russia (RU)	N/A	0
2	Latvia (LV)	Estonia	879	1000
3	Lithuania (LT)	Latvia	684	1,234
4	Lithuania	Belarus (BL)	1,350	1800
5	Lithuania	Poland (PL)	500	500
6	Lithuania	Kaliningrad	680	600
7	Lithuania	Sweden (SE)	700	700
8	Estonia	Finland	1016	1016
9 (UC)	Lithuania	Poland	700	700

- Lithuania has several transmission lines connected to the Baltic region as part of the European Union’s market integration plans.
- The current 500MW LitPollink overland interconnector between Poland and Lithuania will be replaced by 700MW Harmony link on the Baltic seabed by 2025. Wind captured prices will be somewhat positively supported by this development. The Lithuania-Belarus interconnector is set to 0MW from 2020 in our base case
- Lithuania is expected to reduce dependency on imports from Russia and Belarus while power exchanges within the European Union is expected to increase over time. The government has imposed bans on Belarusian imports already

Lithuania has seen imports increase by 80% from 2015, the bulk of it from Russia

Lithuania imports (top) vs exports (bottom)



—○— Russia —*— Belarus —△— Estonia —■— Latvia —□— Poland —+— Sweden

- Lithuania has depended a lot on Russian imports, which has seen a significant increase since 2017. Estonia and Belarus are other countries contributing towards Lithuania's imports, however, new steps are being put in place to stop imports coming in from Belarus from 2020 onwards
- The decision to reduce dependencies on Russia and Belarus was taken on the back of the 2.2GW Astravets Nuclear facility, which is planned to come online in 2020, over safety concerns of the plant
- Lithuania is however, facing pressure from Latvia as the trade agreement between Lithuania, Estonia and Latvia allows for trading power only via Lithuania
- The three countries, however, agreed on further synchronization of their power systems with Europe by 2025
- Agreements on modernization and strengthening of domestic transmission systems will continue until 2021 and has received maximum financing from the European Union
- Lithuania's flows will increase with the strengthening of the LipolLink and the Harmony link, which is expected to be online in 2025
- Further build out of renewables capacity will be a major step towards strengthening security of supply and lower dependence on imports coming in from Russia
- Similarly the gas interconnection with Poland and Lithuania expected to be completed by 2021 will play a key role in improving security of supply in the country

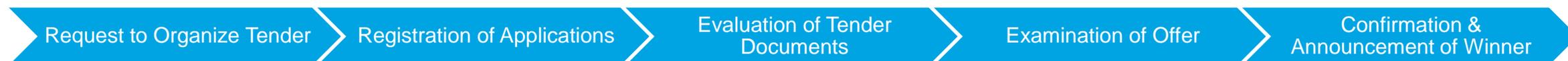


Key policies and targets for adoption of renewable energy and market liberalization

Key Features	Summary
Sliding feed-in premium	<ul style="list-style-type: none"> Tariff rates for RES plants with a generating capacity of up to 10 kW are set by the NCC. This scheme is no longer available for new RES plants. From 2019, this will be replaced by technology neutral tenders in combination with a fixed feed-in premium (refer to Auction Structure slide).
Tender	<ul style="list-style-type: none"> For RES plants with a total installed capacity greater than 10 kW, they may acquire guaranteed tariffs (sliding feed-in premium) by taking part in tenders. Every 6 months, NCC reassesses tariff levels for these RES plants for upcoming tenders. The quota for 2020 has been met since 2016, and is no longer available for new RES plants. From 2019, this will be replaced by technology neutral tenders with a fixed feed-in premium (refer to Auction Structure slide). Based on the plan, tenders for 2.4 TWh delivery annually by 2023 is expected, sending a strong signal to renewable energy developers.
Climate Change Special Program	<ul style="list-style-type: none"> The Climate Change Special Programme supports projects aiming to reduce greenhouse gas emissions. All technologies used for renewable electricity generation are eligible for this scheme. This fund provides support in the form of loans and subsidies.
Net Metering	<ul style="list-style-type: none"> Eligible for net-metering are solar, wind and biomass power installations operated by natural persons, including farmers whose annual income from agricultural activities accounts for less than 50% of all income received (≤ 10 kW), and legal persons, including farmers whose annual income from agricultural activities accounts for more than 50% of the received income (≤ 100 kW).
Exemption from Excise Duty	<ul style="list-style-type: none"> Electricity from renewable sources is exempt from Excise Duty.

Auction Structure

Element	RES Auction
Determined value through auction	The outcome of the tendering procedure determines a reference price level per kWh for FiP.
Available Types	Technology neutral. Can include Hydro, Wind, Biogas, Biomass, Solar.
Pricing Rule	The maximum price is calculated as costs, necessary to produce 1 MWh electricity of renewable sources, using the most efficient technologies (in 2020 the solar and wind technologies were evaluated). Reference price is calculated as weighted average of 3 years market price, i.e. price, that person reasonably expects to get selling electricity of renewable sources at the pool. The maximum premium , for which is announced the auction, is calculated as difference between maximum price and reference price. The participant of Auction provide the offers for wished price premium (it can be equal or less then maximum price premium).
Participation Size	All projects over 10 kW must participate in auctions.
Key Selection Criteria	Tenders are conceived as single criteria price-based schemes. In case of bid price equality, the larger offered capacity is selected as a second criterion.
Realization Time	The realization time is between 2.5 and 3 years. Delays lead to the full loss of a support entitlement. Realization rate is very high in Lithuania.
Duration of Support	In Lithuania, support is granted for 12 years.
Upcoming Tenders	0.7 TWh of RES (no specific renewable source) per year for 2021 and 2022.





Capacity Markets

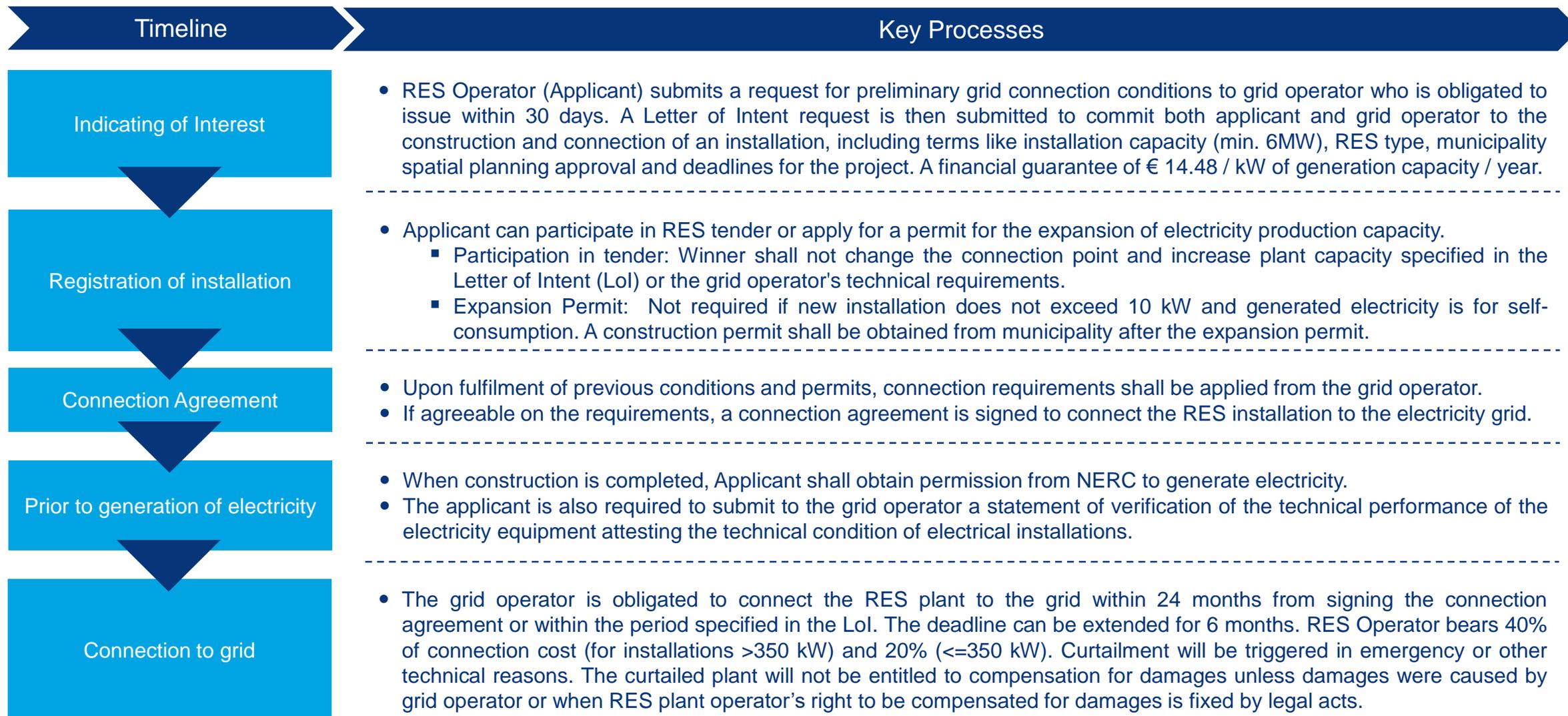
Key Features

Summary

Development and Implementation of Capacity Mechanism

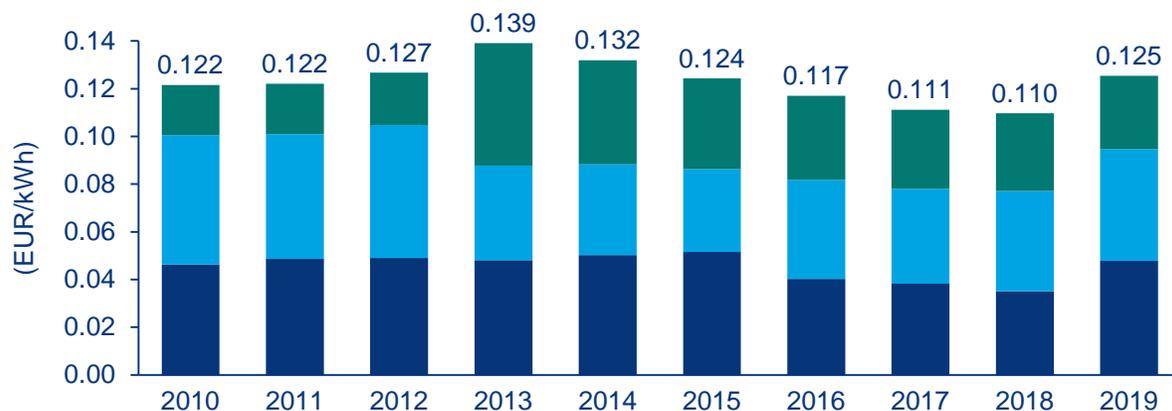
- Ministry of Energy has put in place mechanism to ensure the adequacy and reliability of the power system, encourage investment in the emergence of new capacities, and further operation or development of existing capacities. This will create a transparent, technologically neutral and competition-based system through which the state promotes the capacities necessary to ensure a reliable electricity supply in the country. Notable points include:
 - Capacity auctions will be open not only to electricity generating units but also storage (such as batteries) facilities and independent electricity demand response aggregators, and participants will be able to use on existing and future generation facilities to be installed by the launch of the capacity delivery period. Electricity consumers managing demand response facilities will be able to participate in capacity auctions and become capacity suppliers.
 - The capacity mechanism will also be open to other EU Member States connected to the Lithuanian power system, natural persons or legal entities, other organizations or their subdivisions operating existing capacity facilities in that Member State to increase competitiveness in the system.
 - European Commission preliminary agreed (pending finalization) with proposed market reforms but provided some recommendations to assess the possibilities of including additional measures to promote more efficient market development. Lithuania is currently amending the Electricity Market Development and Implementation Plan and will publish an updated version for finalization.
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- Wood Mackenzie's expectations
 - The proposed capacity mechanism has underwent multiple public consultations and European Commission has agreed to Lithuania's market reform plans. We believe Lithuania will incorporate additional measures proposed by European Commission in their updated draft and there is high probability of it becoming finalized in 2020.

Overview of connecting to the grid

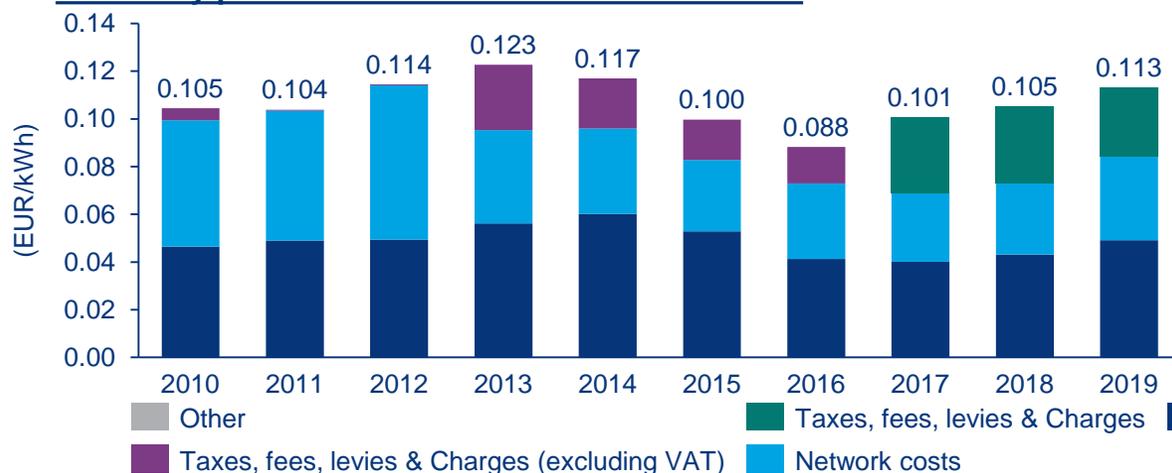


Electricity prices in Lithuania

Electricity prices for residential consumers*



Electricity prices for non-residential consumers**



Other
 Taxes, fees, levies & Charges
 Wholesale energy and supply
 Taxes, fees, levies & Charges (excluding VAT)
 Network costs

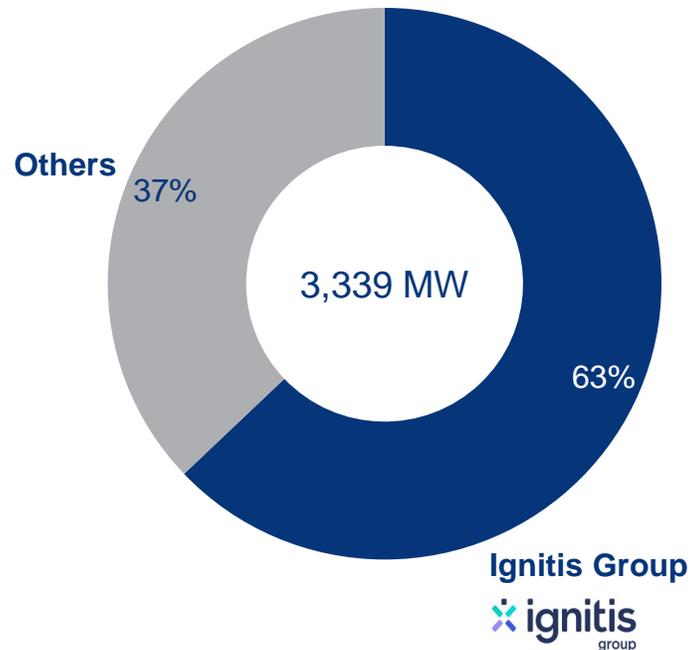
- Overall retail price is made up of acquisition price (fuel charges), price cap of transmission service, system service price, public interest service price, public supply price, price cap for distribution, and VAT.
- Acquisition price and fuel charges are the key drivers of retail price.
- Prices for non-residential consumers have been more volatile whereas prices for residential consumers have stayed relatively stable over the years.
- Residential prices are regulated by the government and as a result prices are stable over the years. Gradual phase-out of regulated electricity prices is expected for households and there are already plans for its effective implementation. This will enable all consumers to choose the desired electricity supplier and to ensure lower electricity prices and better services for customers

Note: Taxes, fees, levies and charges include VAT, Environmental taxes, Capacity taxes and Renewables taxes

Note: *prices are indicative of medium standard residential consumption between 2500-5000 kWh. **prices are indicative of medium standard non-residential consumption between 500-2000 MWh

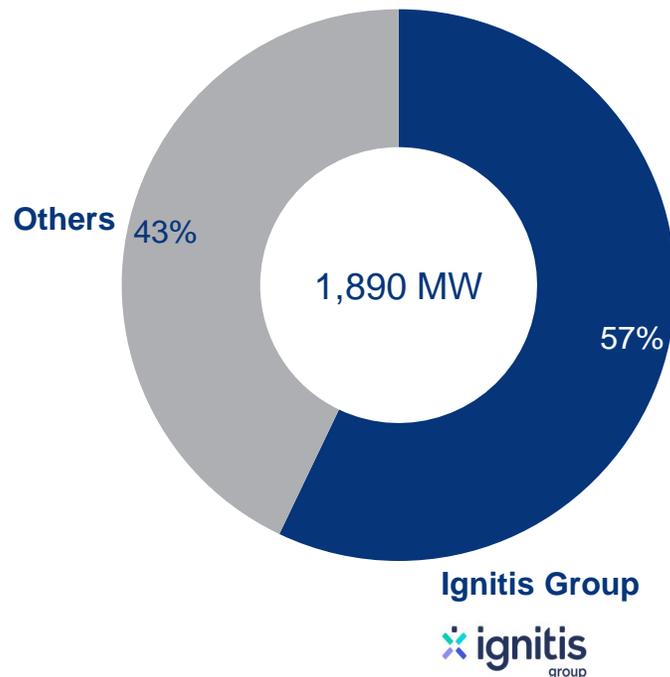
Source: Wood Mackenzie, Eurostat

Ignitis holds the largest share of installed generation capacity in Lithuania



Name / Owner	Overview
<p>Lietuvos Elektrinė / Ignitis</p> 	<p>Lietuvos Elektrinė is the largest thermal power plant in Lithuania. After the closure of the Ignalina Nuclear Power Plant, Lietuvos Elektrinė became the main producer of electricity in the country. It has been operational since 1962, and underwent multiple reconstructions given the importance to Lithuania.</p>
<p>Kruonis HAE / Ignitis</p> 	<p>The Kruonis Pumped Storage Hydroelectric Plant (KPSHP) is situated north of the town of Kruonis in the district of Kasiadorys, and is the only power plant of its type in the Baltic region. It is one of the new-generation energy units and is intended to balance electricity supply and demand. It helps to prevent energy system accidents and liquidates its aftermath.</p>
<p>Kaunas CHP / Clement Power Venture</p>	<p>The plant has an installed capacity of 170 MW, and was previously owned by Gazprom before it was sold to Clement Power Venture in 2012.</p>

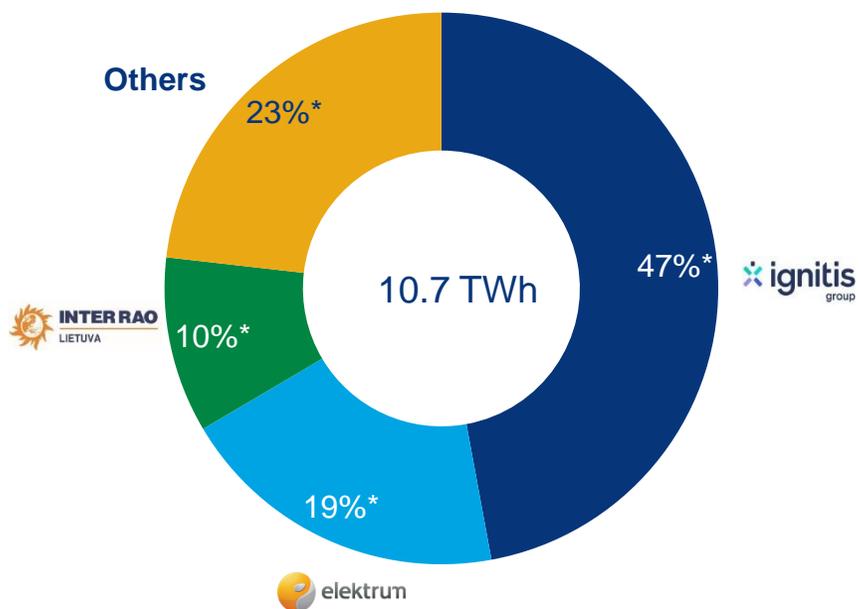
Ignitis also has a leading position in renewable energy* supply (YE2019)



Other notable players	Overview
<p>Renerga</p>  <p>UAB RENERGA KONCERNAS „AČIEMŲ GRUPĖ“ NAŠE</p>	<p>Renerga manages Pastrėvys and Kavarskas hydroelectric power stations, Benaičiai wind energy park, wind energy park Benaičiai-1, solar park Benaičiai and the adjacent experimental small wind and solar power stations. Generation Type: Wind, Hydro, Solar.</p>
<p>Enefit Green (owned by Eesti Energia)</p>  <p>Enefit Green</p>	<p>Although headquartered in Estonia, Enefit green owns generation capacity in Lithuania as well. It currently owns one of the largest wind farm in the country that has an operational capacity of 60MW. The company overall is also involved in Solar, Waste to Energy, Biomass and Hydropower within the Baltic region</p>
<p>Stemma Group</p> 	<p>A large renewable energy investor with diversified business activities. It operated a fairly sizeable wind portfolio of 108MW of which 34MW has not been sold to Ignitis. Stemma, however, continues to operate the largest wind farm in Lithuania, which is the 73.5MW Pagegiai wind farm</p>

Note: * In addition to wind and solar the capacity shown above includes, hydro, biomass and waste to Energy
Source: Wood Mackenzie, NCC "list of producers who use renewable resource", Company Sites.

Top 3 Electricity Retailers (YE2019)



Retailer	Overview
<p>Ignitis</p> 	<p>Ignitis Group is the largest group of energy companies in the Baltic States by revenue. It supplies power and natural gas to about 1.7 million business and private customers, and is the largest public retailer in Lithuania.</p>
<p>Elektrum Lietuva</p> 	<p>Elektrum is owned by one of the largest electricity suppliers that is Latvenergo, in the Baltic States. With 80 years of operations in Baltic Region and 10 years operating in Lithuania. It has around 5 – 10k B2B customers in Lithuania.</p>
<p>Inter RAO</p> 	<p>AB INTER RAO Lietuva is a leading player in the electricity market in the Baltic countries and one of the largest independent suppliers of electricity in Lithuania. INTER RAO Lietuva began operations in 2002 when the Lithuanian electricity market was liberalised and independent suppliers of electricity and other open market players were allowed.</p>

*Proportion based on NCC latest annual report published in 2020

Summary table of top 10 renewable energy asset owners

Owner	Business model	Largest project to date	Market share*	Description
	Owner/operator	Kruonis Pumped Storage Hydroelectric Plant (900 MW Hydro)	57%	Ignitis Group by revenue is the largest group of energy companies in the Baltic States. It owns wind, hydro, and waste-to-energy power plants in Lithuania. Ignitis is currently developing a 60 MW wind farm and two waste-to-energy plants of a total 116 MW power capacity.
	Owner/operator	Silute (60 MW Wind)	7.3%	Enefit is a subsidiary of Estonian, Eesti Energia – a large group of electricity generation and trading companies in the Baltic States. Enefit has stated that they are currently developing three projects in Lithuania of a total ~350 MW.
	Owner/operator	Pagegiai (73.5 MW Wind)	3.9%	Stemma is a renewable energy and real estate developer active in Lithuania. Stemma currently has no power projects under development.
	Owner/operator	Benaičių - 1 vėjo elektrinių parkas (34 MW Wind)	3.9%	Renerga is the renewable energy arm of Achemos Grupe. It manages hydroelectric power stations, wind energy parks, solar park and experimental small-scale wind and solar power stations.
	Owner/operator	Kretinga Park (30 MW Wind)	2.7%	Vėjų spektras is one of the leading wind power plant operators and owners in Lithuania and Baltic States. It provides renewable and alternative energy solutions for customers. Veju Spektras (UAB) was sold to Quaero European Infrastructure Fund managed by the Swiss company Quaero Capital.

Note: * Of total biomass, biogas, wind, large hydro, and solar capacity

Source: Wood Mackenzie, Company Websites

Summary table of top 10 renewable energy asset owners

Owner	Business model	Largest project to date	Market share	Description
	Owner	Mazeikiai (45.6 MW Wind)	2.4%	IKEA is a large furniture supplier who owns the Mazeikiai wind farm which is operated by OX2
Energogrupė	Owner/operator	Kreivenai (20 MW Wind)	1.1%	Energogrupė UAB owns and operate power generation units in Lithuania.
	Owner/operator	Klaipėda (20 MW Biomass)	1.1%	UAB Fortum Klaipėda was founded in 2007 and produces heat and electricity using sorted municipal and industrial waste. UAB Fortum Heat Lietuva owns 95% of UAB Fortum Klaipėda.
Sūdėnų vėjo elektra	Owner/operator	Sūdėnų vėjo jėgainių parkas (14 MW Wind)	0.7%	UAB Sūdėnų vėjo Elektra operates a 14 MW wind park in Lithuania.
Aivaras Stumbras	Owner/operator	Oakwill (5.4 MW Wind)	0.7%	Aivaras Stumbras of INIKTI owns three small projects of a combined 13 MW. All projects are developed using second-hand equipment.

Note: * Of total biomass, biogas, wind, large hydro, and solar capacity

Source: Wood Mackenzie, Company Websites

Summary of Technologies

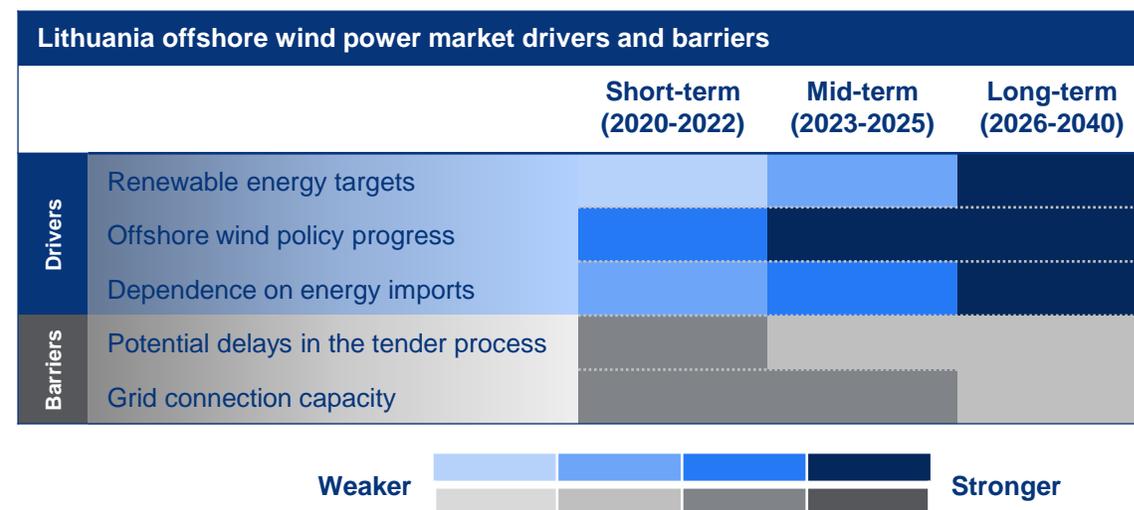
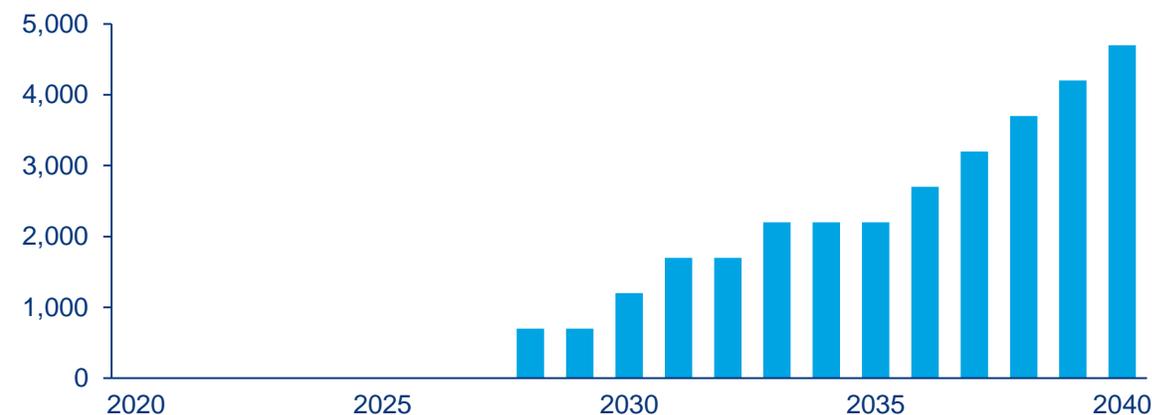
	Offshore Wind		Onshore Wind		Solar	
	Current	Beyond 2030	Current	Beyond 2030	Current	Beyond 2030
	Policy Support					
Cost Competitiveness						
Construction Time						
Ease of Starting-up						
Overall Competitiveness						



Offshore Wind

- Lithuania aims to lay the foundations for the development of offshore wind in the Baltic Sea. The country’s National Energy Independence Strategy targets a 45% renewables share of the country’s power mix by 2030, rising to 100% by 2050, a lower dependence on energy imports and a fully independent operation of the Baltic power networks by 2025.
- As the process to develop an offshore wind-specific policy is still at an early stage, the tender is subject to the potential risk of delays or even cancellation. Grid upgrades will be necessary to host future offshore wind capacity.
- Legislative amendments adopted by Parliament in 2017 provide an initial plan for offshore wind development. It is rumored that a government decree taken in June 2020 indicates that the auction date has been set
- The site for developing up to 700MW of capacity has been selected. It is 138km2 with water depths of 35 meters and is ~30km from shore
- State-controlled utility Ignitis Group – is looking to develop an additional 3GW of renewable energy by 2030 – it is looking for an international developer to help it build offshore wind projects in Europe, e.g., in Lithuania, as a first step to develop a footprint in the Baltic Sea.

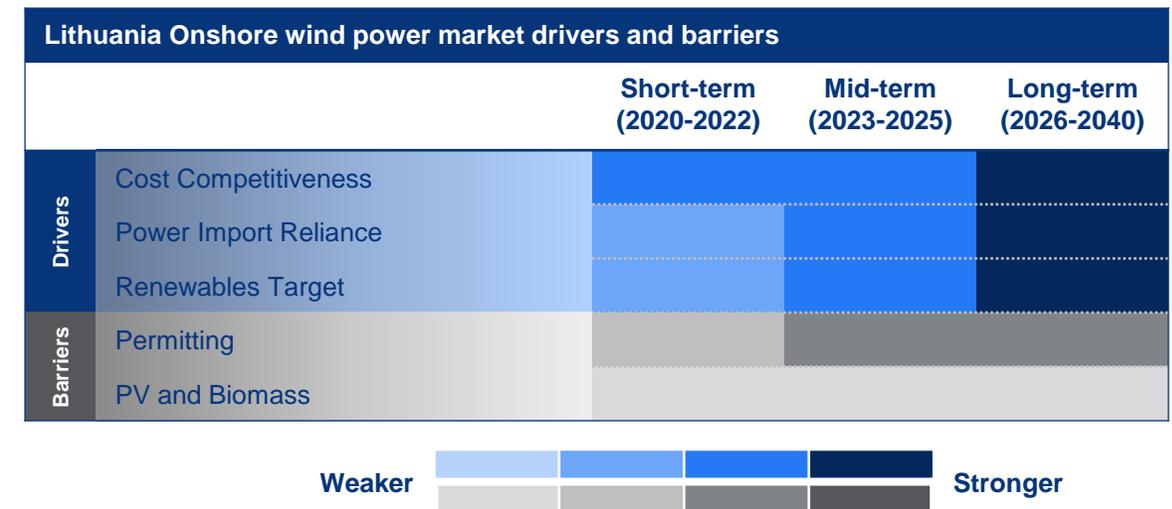
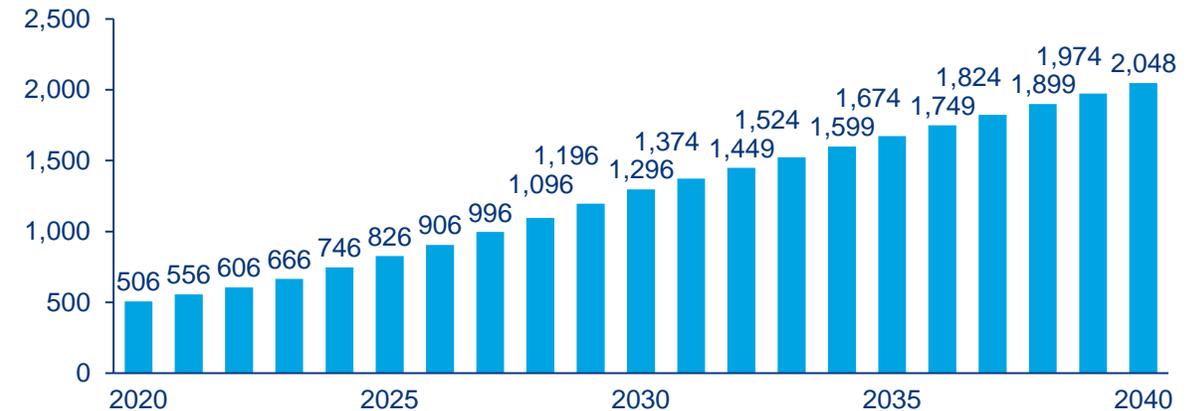
Offshore Wind Cumulative Capacity (MW)



Onshore Wind

- Lithuania relies on power imports for more than 60% of its domestic demand. Based on Lithuania’s National Energy Independence Strategy, domestic power generation will represent 70% of the total consumption, rising to 100% in 2050
- Synchronisation of Lithuania’s energy system with the European energy system will be complete by 2025 and will enhance the country’s energy independence setting the requirements for adequacy of capacities
- The strategy targets 45% renewables (at least 50% of which from wind) in the power mix by 2030, growing to 100% (at least 18TWh) by 2050. Developed technologies (onshore wind, PV and biomass) are prioritized on a cost basis
- The government ran the first tech-neutral tender in September 2019. A 75MW onshore wind project won the auctioned 300GWh annual power generation with no subsidy, but priority grid access. It puts onshore wind in a strong position to outperform other forms of renewables in the future rounds
- Defence constraints constitute the main planning barrier, resulting in exclusion zones – particularly in the East of the country – and tip height restrictions
- In 2017, Lithuania signed an agreement on the statistical transfer of renewable energy with Luxemburg. The deal will help Luxemburg reach its 11% EU 2020 renewable energy target, and the sum of the transfer will be re-invested into small renewable energy projects in Lithuania
- A 700MW offshore wind tender scheduled for 2023 is not expected to affect the onshore wind sector in the 10-year outlook because it’s tech-specific

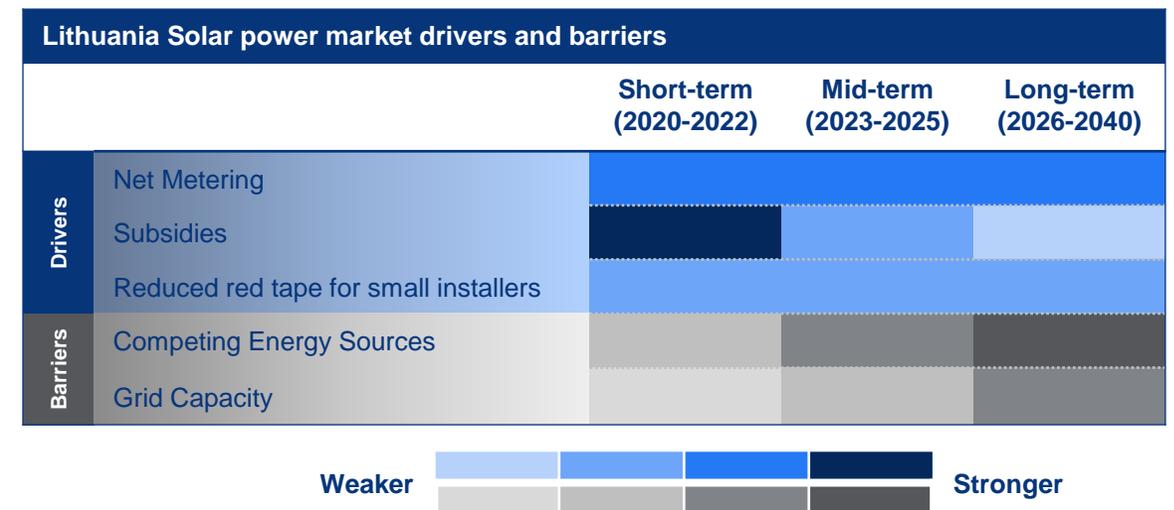
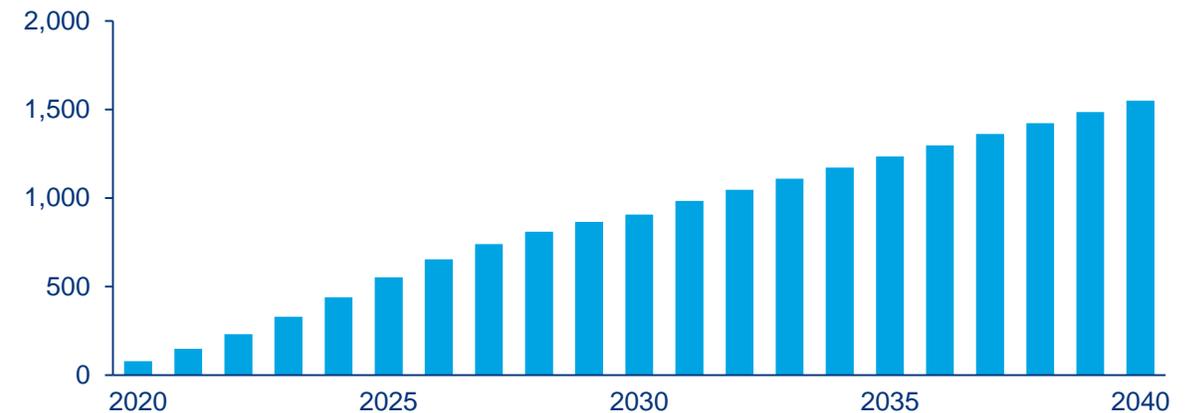
Onshore Wind Cumulative Capacity (MW)



Solar PV

- Lithuanian solar growth had traditionally been driven by generous feed-in tariffs, but it has stalled significantly ever since these scheme ended.
- In recent years, government has introduced multiple policies aimed at rejuvenating solar demand and growth, and potential is promising.
- Significant growth is also expected to come from DG solar PV with improved net metering policies and CAPEX support.
- In 2019, government of Lithuania introduced €4.5 million for solar rebates targeted at home owners with up to 10 kW installed capacity, supporting the initial investments including buying and installing solar arrays. Up to 80% CAPEX subsidy is available for DG systems
- ESO has also acted more friendly to prosumers and together with the local Ministry of Energy, announced plans to reduce administrative and technical burdens for new small installations, making it more attractive for DG solar adoption.

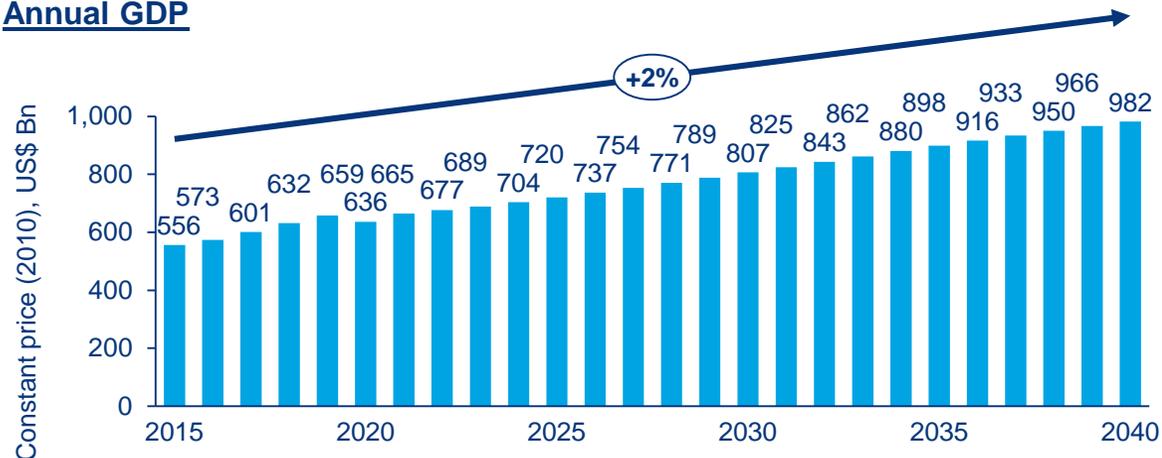
Solar PV Cumulative Capacity (MW)



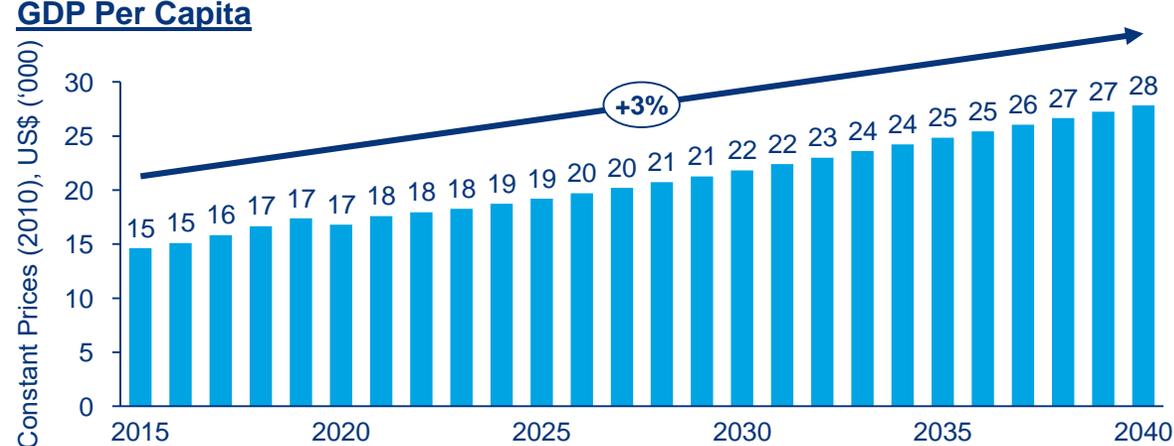
Poland

Macroeconomics Summary - Poland

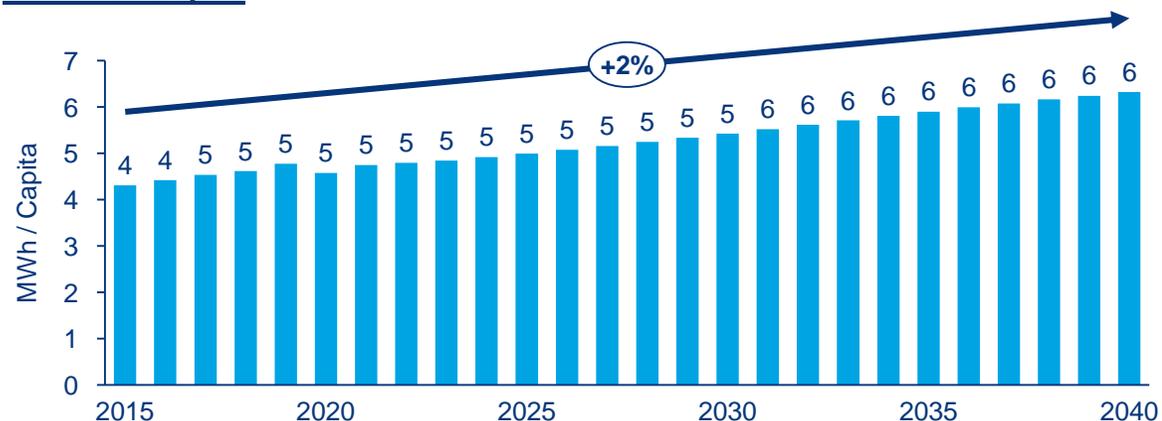
Annual GDP



GDP Per Capita



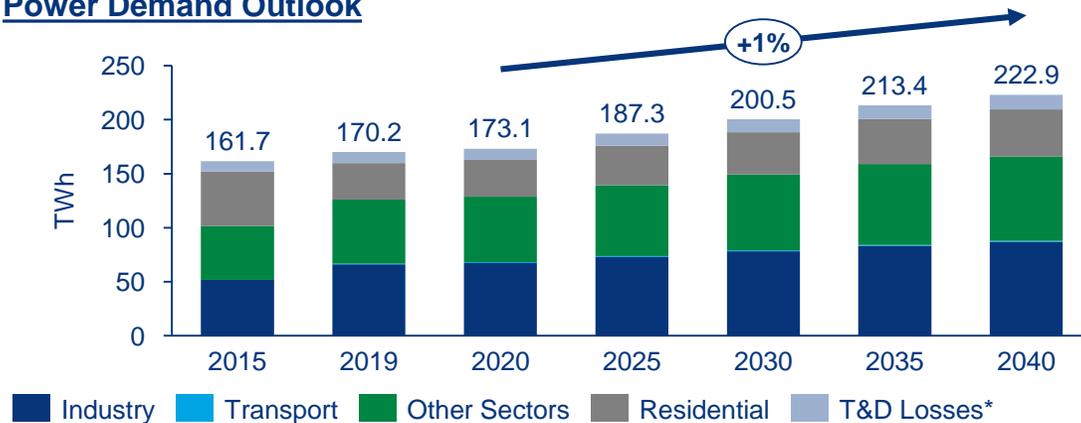
MWh Per Capita



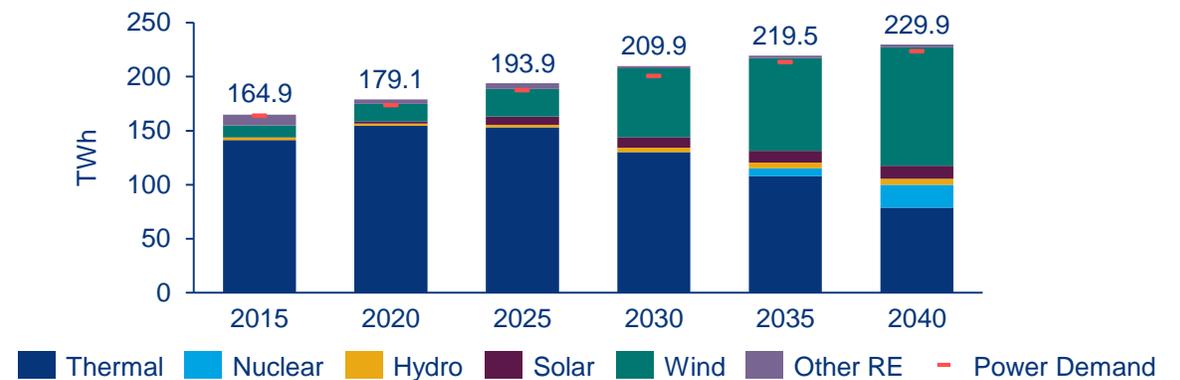
- Poland has enjoyed consistent growth over the years driven by strong and large domestic market, early economic reforms and support from European Union that laid the path for strong growth. It is expected to continue on growth trajectory at a CAGR of 2% up to 2040.
- GDP level expected to dip in 2020 due to Covid-19, but expected to recover from 2021 onwards with government stimulus in place to support.
- MWh Per Capita is expected to grow at a CAGR of 2%. Sustained economic growth is expected to be a key driver for electricity consumption.

Power demand is expected to grow over time, with renewables meeting most of the increasing demand as pressure to reduce coal continues

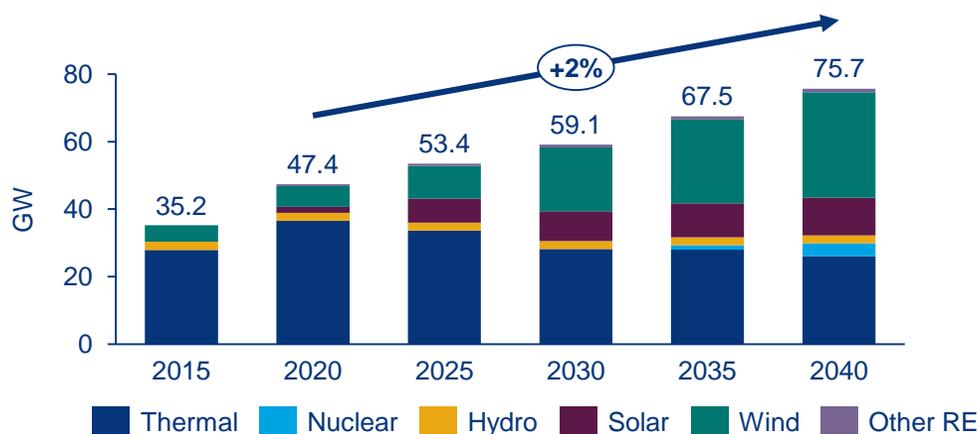
Power Demand Outlook



Power Generation Mix

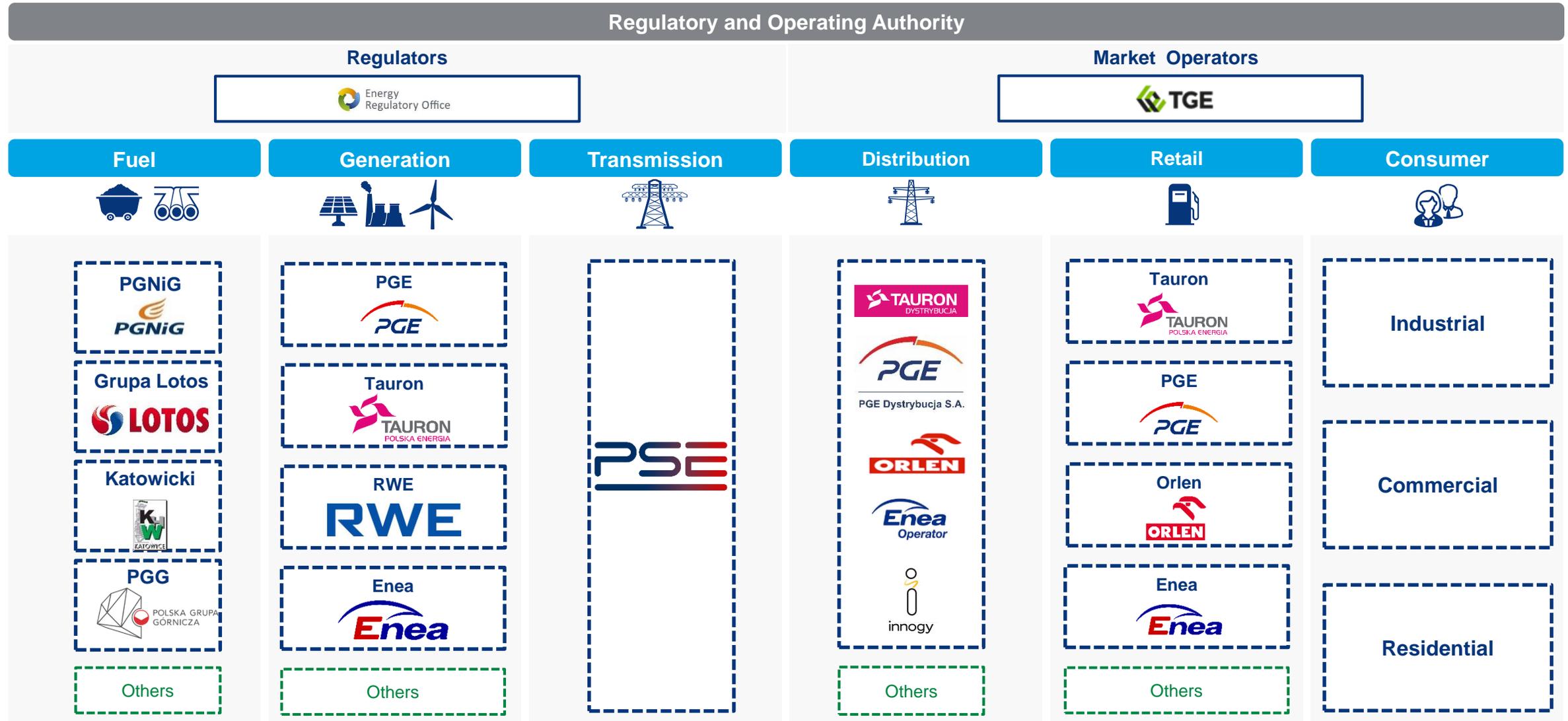


Installed Capacity Outlook



- Power demand in Poland is expected to grow over time. The increased demand of electric vehicles can be potentially canceled out by energy efficiency measures.
- Poland is expected to be sufficiently meeting its power demand via domestic generators, mainly supported by the huge fleet of coal fired power plants in the countries.
- However, as pressure from the European Union to decommission emission-intensive coal fired power plants increases will result in earlier retirements of the coal plants in Poland.
- Poland is expected to increase its power supply via offshore wind farms along with dispatchable thermal plants such as gas based CCGT plants and eventually having a nuclear plant coming online in 2033.

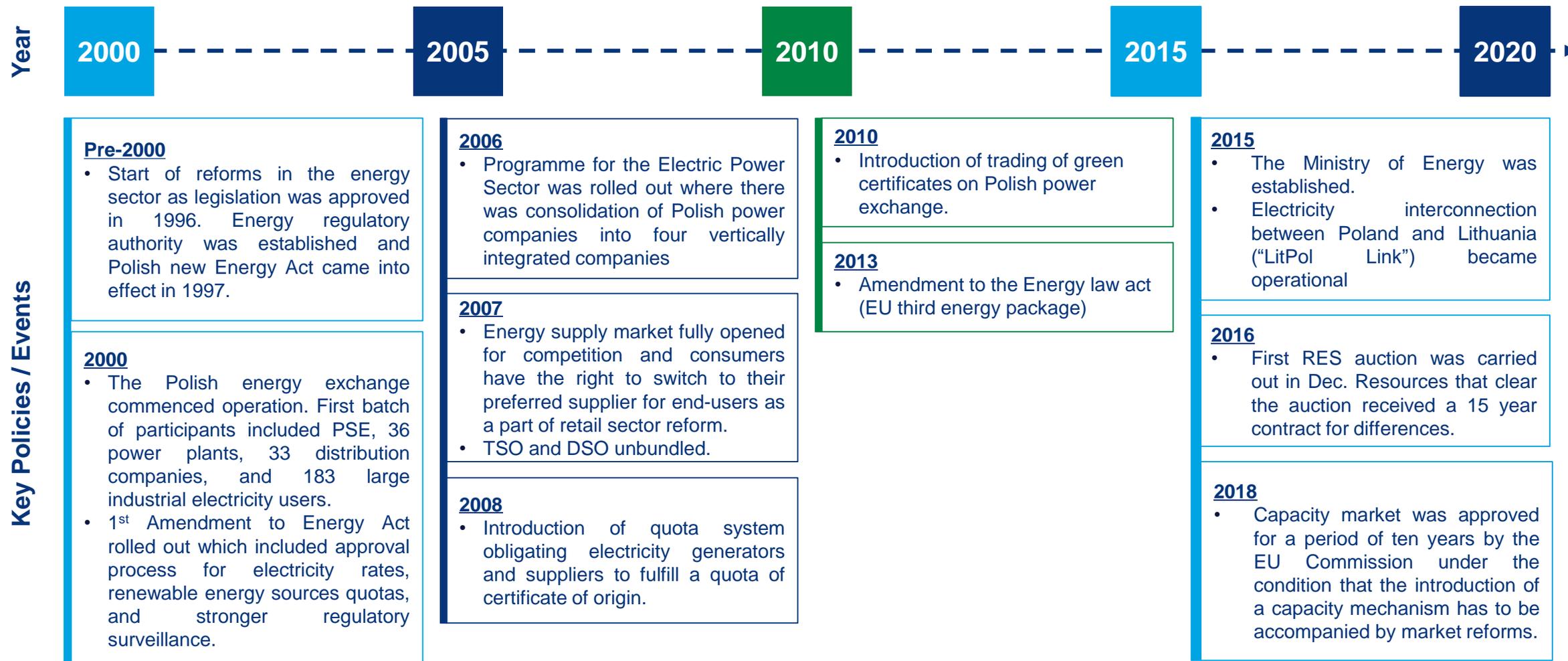
Poland Power Market Structure



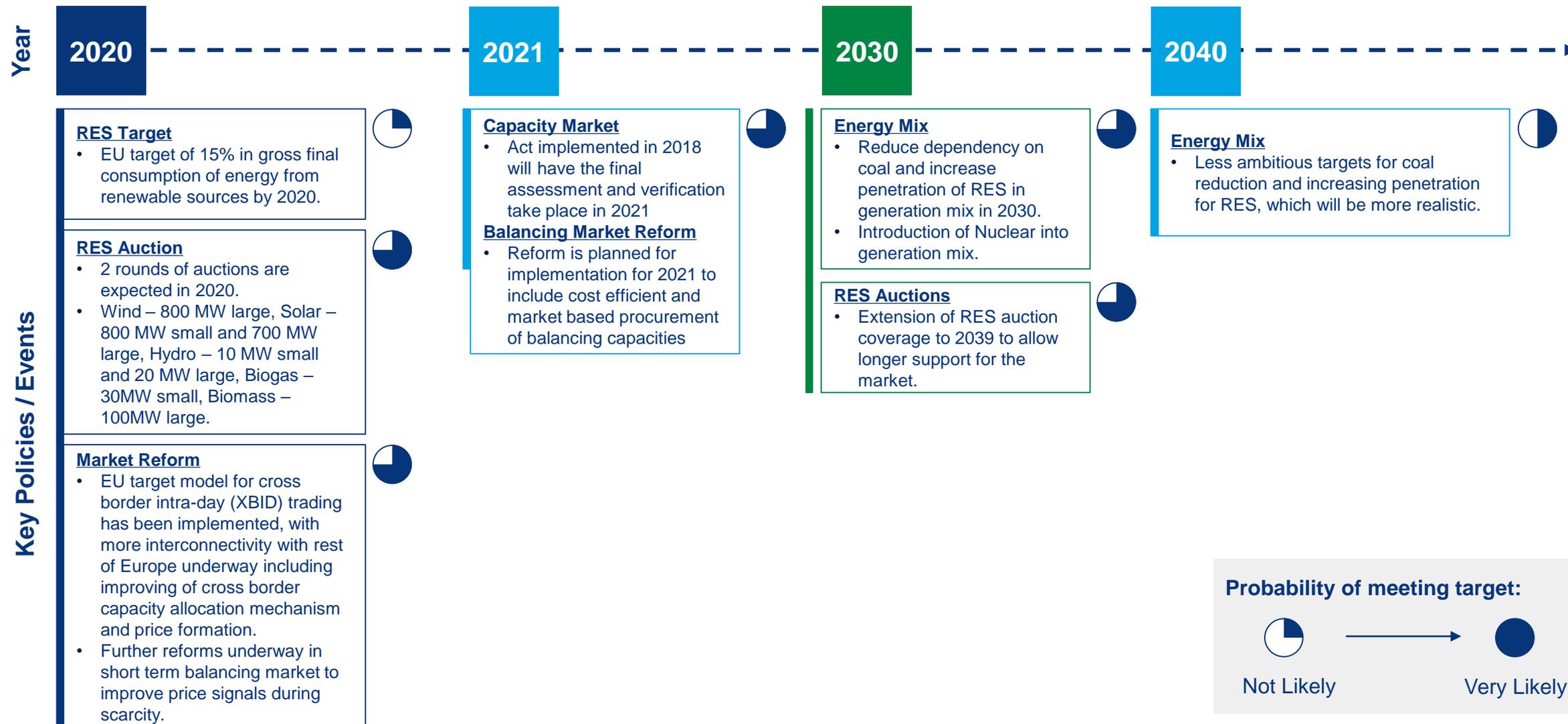
Power Market Key Stakeholder Overview

Stakeholder	Roles and Responsibilities
 <p>Ministry of Economic Development</p>	<p>The Ministry of Economic Development is responsible for the overall energy policy, improving energy efficiency and supply security, developing competitive fuels and energy markets, introducing nuclear power, increasing use of renewable energies, reducing the energy impact on the environment, defining priorities in Poland's Power Policy until 2030, implementing tasks to shape the energy policy and regulatory environment, coordinating the energy policy, energy carrier and source diversification.</p>
 <p>Ministry of Environment (Climate)</p>	<p>The ministry of Environment is responsible for creating and implementing the country's climate policy, reporting and verifying projects and also creating inventories of greenhouse gas emissions and sinks. Above all, the ministry is responsible for the protection of and rational use of environmental resources when</p>
 <p>Energy Regulatory Office Energy Regulatory Office (URE)</p>	<p>URE is the regulator for energy in Poland and is responsible for coordinating the energy sector and its prices, issuing operating licenses, monitoring developments in prices and tariffs, and promoting energy efficiency.</p>
 <p>Ministry of State Assets</p>	<p>The ministry was created amending the establishment of the ministry of energy. The sole responsibility of the body is the management of state assets and mineral deposits. The department controls matters related to the management of state property and protects the interests of the state treasury</p>

Power market has undergone multiple reforms over the years...



... and the next stage will focus on reducing coal and increasing RES





Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Polish Energy Policy 2040 (Draft)

- EPP2040 is a response to the key challenges faced by the Polish energy sector in the nearest decades and sets the strategic directions for the energy sector, taking into account the actions that need to be delivered in the medium-term. A total cost of Eur140bn was estimated. 8 key strategic directions have been laid out: (1) Optimal use of domestic energy resources, (2) Development of power capacity and transmission infrastructure, (3) Diversification of natural gas and oil supply, and network infrastructure development, (4) Development of energy markets, (5) Launch of nuclear, (6) Development of RES, (7) Development of heating and co-generation, (8) Improving energy efficiency.
- Notable targets include:
 - Reduce coal share of energy mix from 80% to 60% in 2030, with gradually phasing out of lignite to 3.4GW in 2040.
 - Increase RES in final electricity consumption to 21% in 2030
 - Improve energy-efficiency by 23% by 2030 vs 2007 forecasts and reduce CO2 emissions by 30% by 2030 vs 1990.
 - Introduction of Nuclear Energy in 2033, with 2040 target of 3.9 GW.
 - Capacity of gas-fired installations is 12.4 GW in 2040.
 - Key RES targets in 2040 : Onshore wind - 9.761 GW, Offshore wind – 10 GW, Solar – 16 GW.

-
- Wood Mackenzie's expectations
 - The latest draft is a more realistic expectations for Poland given that URE has announced that Poland is doubtful of meeting its 2020 EU target of 15% final energy consumption from RES. Most of the targets in previous draft have been adjusted downwards with lower targets for RES and slower phasing out of coal. This highlighted Poland's reluctance to move away from coal.
 - Significant investment is required as existing and less efficient generation capacities are decommissioned as a result of EU regulations. To integrate new RES installations, current transmission and distribution networks have to be upgraded to allow for more new connections.



Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Renewable Energy Sources Act 2019

- The Renewable Energy Sources Act was amended in 2019 and introduces several significant changes that served to promote the adoption of renewable energy. Notable points of the act include:
 - The development ministry is looking into the amendment of the 10h distance rule that has impeded onshore wind development in Poland since 2015. Changes to the rules are expected sometime later in 2020 with implementation in 2021
 - A first draft of the offshore wind act proposes a CfD style approach with a target to award ~11GW of capacity by 2027. Developers will be eligible for premium payments for 25 years from the government as opposed to just 15 years for other renewable projects
 - Extension of coverage and availability of auction scheme to 2039 instead of 2034 originally.
 - Extension of deadline to start electricity sales for winners of auctions.
 - Simplification of pre-qualification process for obtaining certificate of admission to the auction system, where On-shore installations are no longer required to submit local zoning plan extracts and Offshore installations are no longer required to submit environmental decisions.
 - After winning an auction and before the commencement of commercial operation, the winner can update the offer submitted in the auction once if (1) auction was awarded based on pre-amended Act and previous winners will like to follow the new extended deadline to start electricity sales, (2) winner will like to change their annual production schedule submitted in their auction bid will be allowed as long as total volume over 15 years stays unchanged.
 - Feed-in premium for hydro and biogas will be extended.
-
- Wood Mackenzie's expectations
 - The amended Renewable Energy Sources Act in 2019 has made conditions more favourable for growth of RES adoption in Poland. The extension of RES auction and deadlines incentivizes more participants to join the auctions and create more competition for potential new entrants. This further reinforces Poland's ambitions and pressure to meet EU targets to prevent incurring fines.



Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Offshore Wind Bill 2020

- The Offshore Wind Bill governs offshore wind investments and defines support mechanisms for offshore wind projects. Developers can secure offtake agreements via a contract-for-difference (CfD) model in 2 phases. In the instance where market price is lower than the guaranteed price, project owners would be compensated for the deficit, and developers would refund the difference if the market price is higher than the guaranteed price.
 - Up to 5.9GW will be selected by Energy Regulatory Office by the end of June 2021, and 5GW of further capacity will be competitively auctioned across two tenders in 2025 and 2027. In the instance where more capacity is needed, there is a placeholder for additional round with at least 500MW.
 - Developers would be eligible for government premium payments for 25 years compared to 15 years for other types of RES projects. Developers are responsible for building and financing the grid connection for offshore wind farms, and have 7 years to commission the plant after support is granted. Offshore wind farm tax is also introduced at PLN 23,000 / MW of installed electrical capacity / year (subjected to annual indexation).
 - The bill is aimed to be passed end of 2020.
-
- Wood Mackenzie's expectations
 - The updated bill from first draft at the start of 2020 proposes more ambitious targets and desire to increase renewables penetration in Poland. Offshore wind has a large potential to increase renewables share within energy mix and stability of supply is higher compared to onshore wind and solar. Furthermore, with priority given to projects that are already in advanced stages on the offshore wind pipeline for Phase 1, it can be seen that Poland plans to secure investment worthy projects and meet these installation goals in time. This will be a big step for Poland to meet their 2030 renewables target after the potential miss in 2020.



Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Feed-in Premium

- Feed-in premium is available for unused electricity from biogas and hydropower installations above 500 kW and below 1 MW, where the electricity generator submits a declaration of intent to sell unused electricity at a fixed feed-in premium price. This removes concerns of unused capacity and incentivizes adoption of biogas and hydropower.

Priority Program RES Stork (Loan)

- Low interests loans (lower of WIBOR or 2%) are granted from a budget of PLN 570 million (€ 132.7 m) to support the purchase and installation of RES installations. The max duration is 15 years and max cover is 85% of eligible costs. This is eligible for Biogas, Wind, Solar, Hydro and Biomass installations.

Renewable Portfolio Standards (RPS)

- Selected companies are obligated to meet a certain quota of green certificates under the Energy Law. If unmet, penalty will be enforced unless they pay a substitution fee.
- Selected companies include Industrial customers who in the calendar year preceding the year of the obligation consumed at least 100 GWh of electricity, Energy companies producing or selling electricity to end users, End-users who are members of the commodity exchange, and Commodity brokerage houses or brokerage houses. Electricity suppliers licensed to supply electricity to households without a chosen supplier are obliged to purchase electricity from renewable sources from producers within their area of service at the mean electricity price of the previous quarter.
- Plant operators generating electricity from RES receive one Green Certificate (certificate of origin) per MWh generated, which can be offered to companies to meet their obligations. The obligated companies will then present the certificates to URE for proof of fulfilment.
- Certificates issued are not allowed to be traded internationally.



Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Prosumer Loans and Subsidies (Ended in 2019)

- National Fund for Environmental Protection and Water Management (NFOŚiGW) grants low interests loans (interest rate of 1% and maximum of 15 years for loan support) and subsidies (up to 30% of investments costs) to support the purchase and installation of small and micro-RES installations for the needs of residential single-family or multi-family houses (Prosumers).
- A meter must be installed to allow for collection and presentation of data on electricity generated.
- The last subsidies were administered until 2019 with PLN 144.088 million (€ 33.53 m) set aside for subsidies and PLN 194.312,2 million (€ 45,21 m) set aside for loans.

Prosumer Support Scheme

- Prosumers are allowed to exchange any surplus energy produced (e.g. during high solar penetration days) for gaps in energy production in the future, at a ratio of 1 to 0.8 for micro-installations with capacity up to 10 kW, and 1 to 0.7 for micro-installations with capacity above 10 kW (but below 50 kW).
- The prosumer signs an agreement with the energy seller who will be responsible for calculating the difference between the prosumer's produced and consumed energy.

Tax Exemption

- Electricity from renewable sources is exempted from consumption tax, and electricity generators and suppliers are exempted from paying excise tax on renewable energy sold to end-users.
- This is applicable to all RES types.

Tenders

- Tenders are held to guarantee prices for 15 years. Further details will be explained in the next page.

Auction Structure

Element	RES Auction
Determined value through auction	The outcome of the tendering procedure determines a reference price level per kWh via contract-for-difference (CfD).
Available Types	Categorized into 5 different basket types. (1) Biogas other than agricultural, hybrid systems, installations of thermal combustion (2) Hydropower, bioliquids, geothermal energy, offshore wind energy (3) Agricultural biogas (4) Onshore wind & Solar (5) Hybrid RES installation. Further restrictions may vary with tenders.
Pricing Rule	The bidder who offers the lowest price will be awarded the tender. It will be in the form of guaranteed price per kWh.
Participation Size	There are 2 different categories – installations above 1 MW (large) and installations below 1 MW (small).
Key Selection Criteria	Tenders are conceived as single criteria price-based schemes. In case of bid price equality, the larger offered capacity is selected as a second criterion. Tenders are conducted separately for both existing and planned installations.
Realization Time	Solar – 24 months, Onshore wind – 33 months, Offshore wind – 84 months, all others – 42 months.
Duration of Support	In Poland, support is granted for 15 years, or until 2039 whichever comes first. 25 years granted for offshore wind.
Upcoming Tenders	In 2020 : Wind – 800 MW large, Solar – 800 MW small and 700 MW large, Hydro – 10 MW small and 20 MW large, Biogas – 30MW small, Biomass – 100MW large.
Additional Points	Prior to the commencement of a plant’s commercial operation, winners can update the offer submitted in the auction once.





Capacity Market

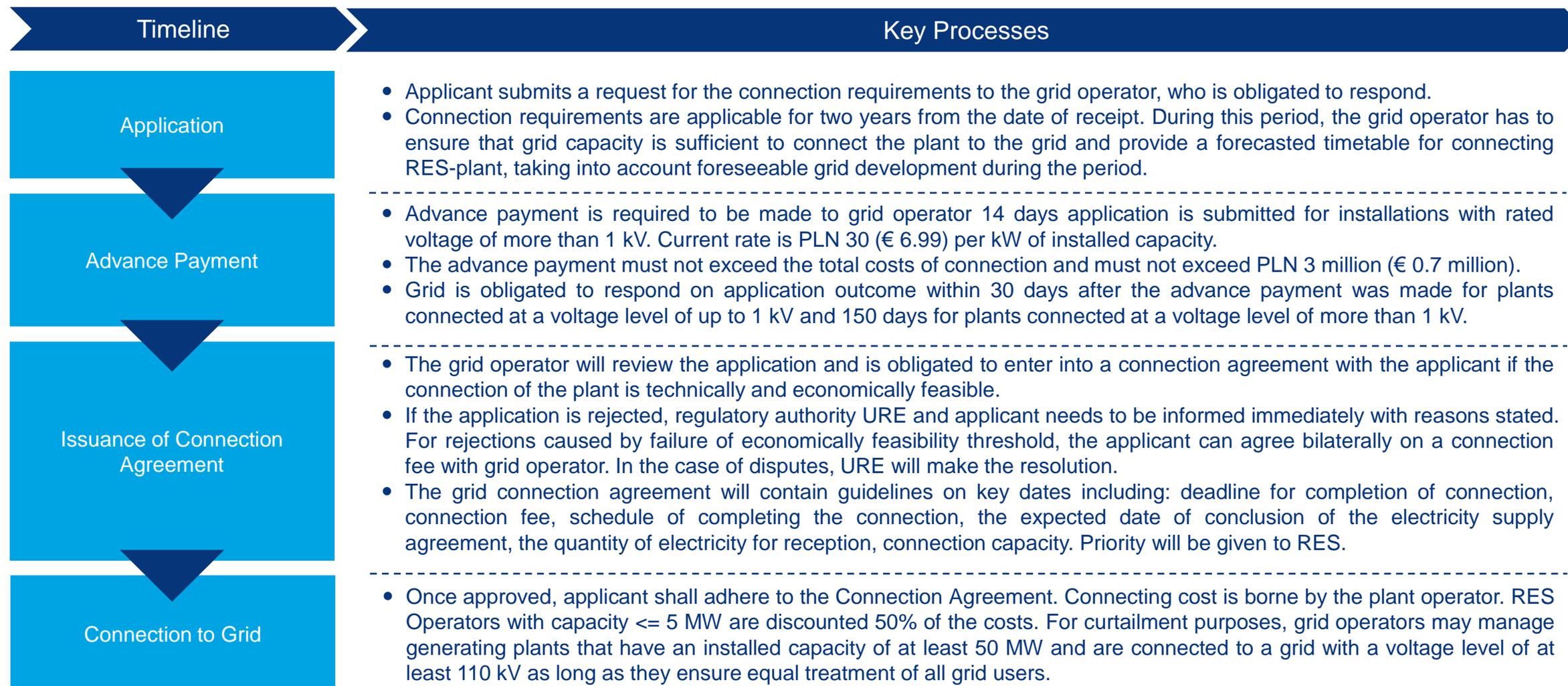
Key Features

Development and Implementation of Capacity Mechanism

Summary

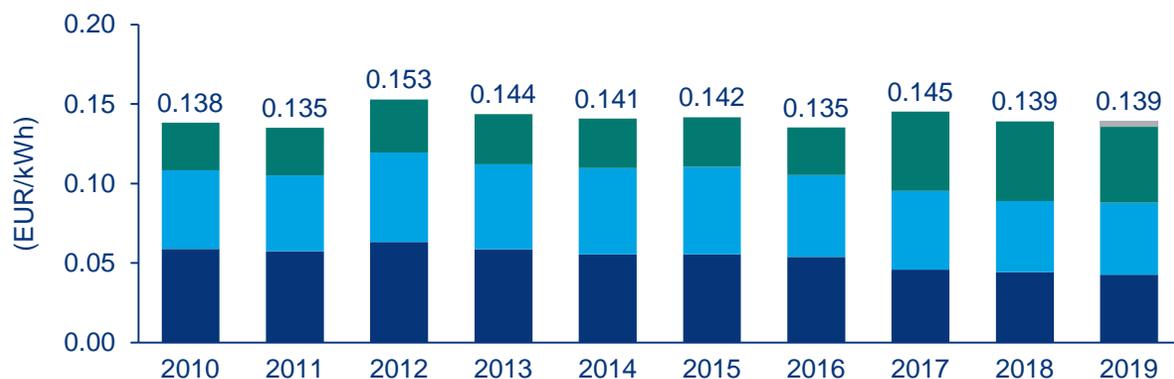
- Poland has introduced market wide and technologically neutral capacity market based on capacity auctions. It comprises a primary and secondary market.
 - Primary Market is the main auction conducted for delivery 5 years later, i.e. for a given delivery year x, auction is carried out during the last two months of the year x-5. Additional auction consisting of four simultaneous auctions (each for separate quarter of delivery year) are carried out in Q1 of the year before delivery, i.e. year x-1.
 - Secondary Market complements the primary market to allow for secondary trading and volume reallocation once the primary market has been cleared.
 - The capacity market is open for all electricity generation types including Demand Side Response (DSR) and energy storage. Energy storage is treated as a generating unit, so it can participate in the capacity market as a physical generating unit or a part of DSR unit. It is open to foreign capacity from neighboring EU countries, whose power systems are connected with Polish power system via interconnectors.
-
- Wood Mackenzie's expectations
 - Four main capacity auctions have already conducted with capacities up to 2024 already in place. Contracted capacities have been consistently ~22 – 23 GW. In the latest auction held in 2019 for 2024 capacities, modernized capacity market units have exceeded existing capacity market units for the first time, indicating promising shift of the market to adopt new systems and technology. We expect this trend to continue as costs for modernized capacity market units fall over the years.

Overview of connecting to the grid



Electricity price in Poland

Electricity prices for residential consumers*



Electricity prices for non-residential consumers**



- Electricity prices for residential consumers are constantly higher than prices for non-residential consumers.
- Poland regulates electricity prices for households who did not switch to free markets by choosing their preferred supplier. Many residential consumers have not made the switch.
- Furthermore, households are more expensive to supply compared to industrial customers given higher distribution costs and higher peak-load demand requirements.
- Between 2017 – 2019, there was an increase in electricity prices for non-residential customers due to rising carbon emission costs and surging wholesale power prices. Residential tariff was not impacted as PiS capped household power prices to prevent a spike in prices and launched a compensation scheme for the energy companies to recover any losses.
- URE approved a move for Tauron to hike prices for 2020 after concluding that their higher costs justify a price hike for their customers, while the other three companies' (PGE, Enea and Energa) price remain unchanged

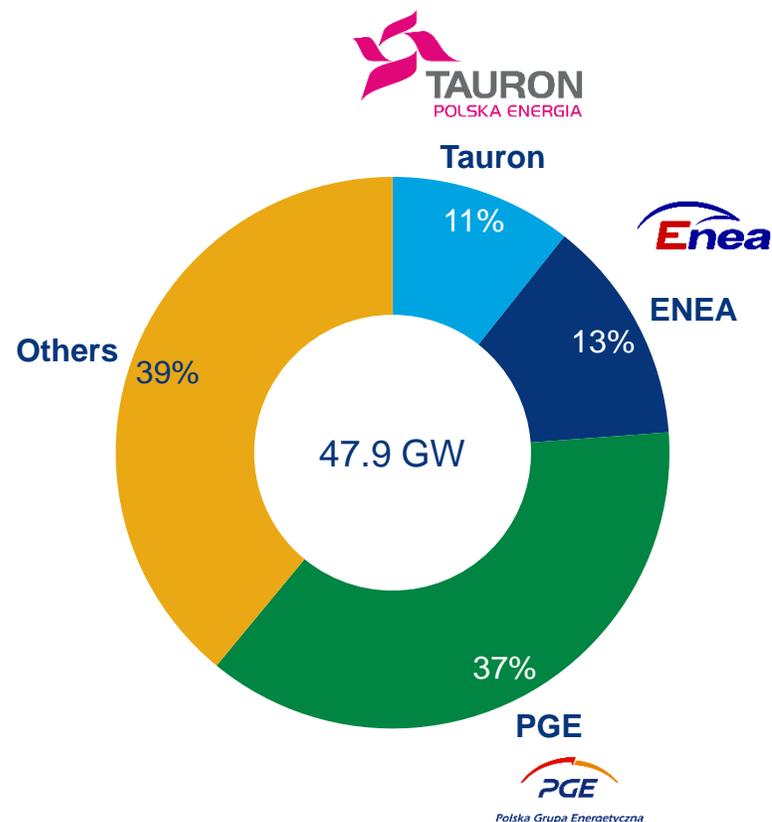
*PiS refers to the Polish Law and Justice Party

Note: Taxes, fees, levies and charges include VAT, Environmental taxes, Capacity taxes and Renewables taxes

Note: *prices are indicative of medium standard residential consumption between 2500-5000 kWh. **prices are indicative of medium standard non-residential consumption between 500-2000 MWh

Source: Wood Mackenzie, Eurostat

PGE has the largest share of generation capacity in Poland



Notable plants

Belchatow Power Plant / PGE



Polska Grupa Energetyczna

Kozienice Power Station / Enea



Opole Power Plant / PGE



Polska Grupa Energetyczna

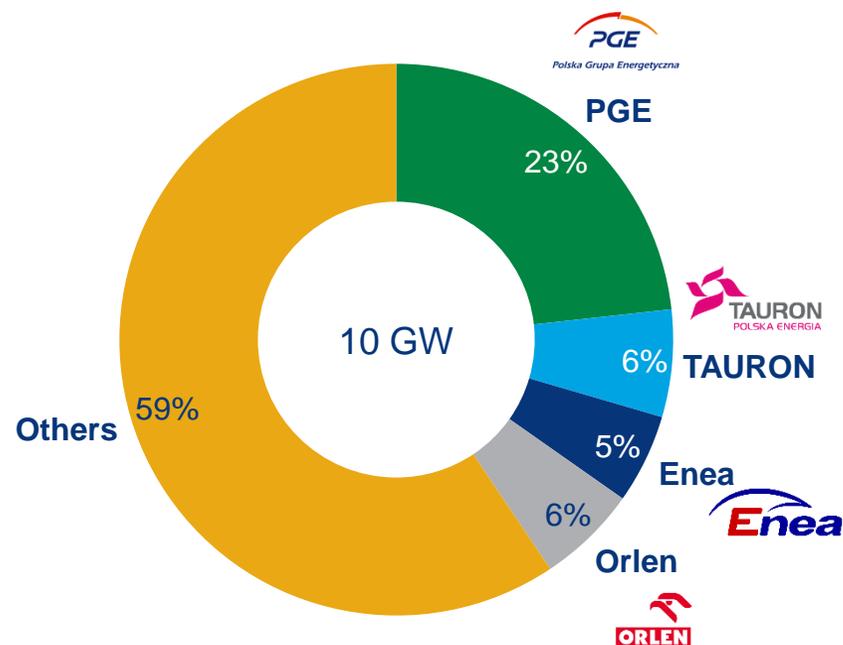
Overview

The 5,298MW Belchatow power plant is the biggest coal-fired power plant in Europe. It has 13 lignite-fired power generating units and emits more than 30 mt of CO2 a year, making it one of the most polluting plant in Europe. PGE announces in 2020 that starting from 2030 they will be decommissioning Belchatow power plant. Type: Lignite.

The 4,016 MW Kozienice Power Station comprises 11 generating units with the newest of the units adopting supercritical technology that reduces CO2 emission and improves efficiency. Type: Coal.

The 3,332MW Opole power plant comprises 4 older units of coal boilers and 2 ultra-supercritical boiler with a steam turbine generator which were commissioned in 2019. CO2 emission is reduced by ultra-supercritical technology, making it more efficient compared to other similar plants. Type: Coal.

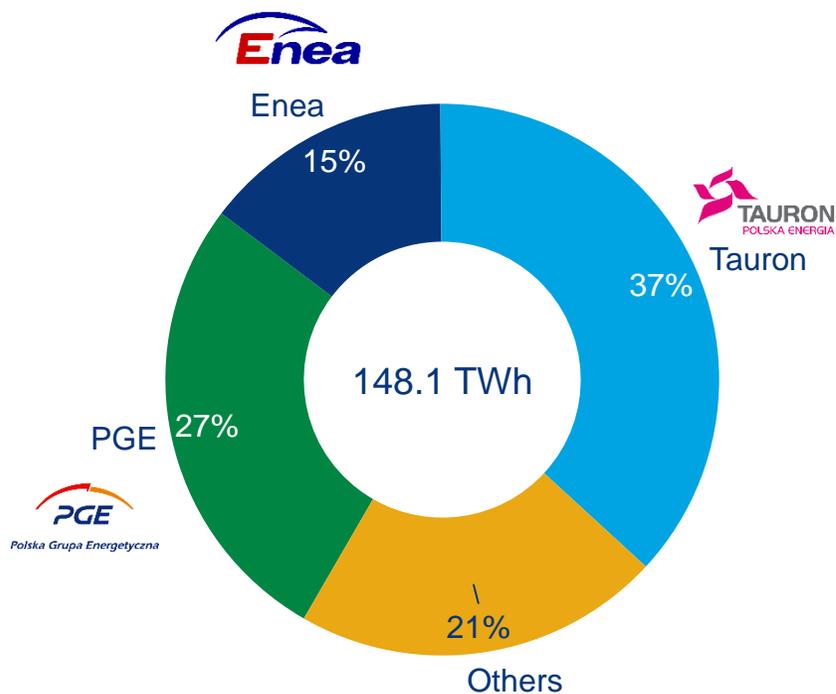
PGE has the largest share of renewables installed capacity



Notable RES	Overview
<p>PGE</p>  <p>Polska Grupa Energetyczna</p>	<p>PGE is Poland's largest energy sector company with respect to sales revenues and net profit. RES Installed Capacity: 2,286 MW, comprising 34 hydro, 16 wind, 1 solar plant. Available type: Wind, Hydro, Solar.</p>
<p>Orlen</p> 	<p>Orlen acquired Energa in April 2020. The company was planning to build offshore wind farms and is interested in Energa's renewable assets. RES Installed Capacity: 575 MW, comprising 46 hydro, 5 wind, and 2 solar plants. Available type: Wind, Hydro, Solar.</p>
<p>TAURON</p>  <p>POLSKA ENERGIA</p>	<p>TAURON supplies approximately 49.7 TWh of electricity to over 5.6 million customers per year which makes it the largest distributor of electricity in Poland. RES Installed Capacity: 619 MW, comprising 34 hydro and 9 wind plants. Available type: Wind, Hydro.</p>

* Based on current installed capacity

Poland's major electricity retailers



Major Retailers	Overview
<p>PGE</p>  <p>Polska Grupa Energetyczna</p>	<p>PGE is Poland's largest energy sector company with respect to sales revenues and net profit. Utilizing a combination of its own fuel resources, power generation and distribution networks, PGE provides safe and reliable power supply to over 5 million households, businesses and institutions.</p>
<p>TAURON Group</p>  <p>TAURON POLSKA ENERGIA</p>	<p>TAURON supplied approximately 50 TWh of electricity to over 5.5 million customers in 2019 making it the largest distributors of electricity in Poland. It is also one of the largest electricity generators and supplier in Poland and the largest supplier of heat in Upper Silesia.</p>
<p>Enea</p> 	<p>Enea is one of the largest energy groups in Poland, producing, transmitting and selling electricity to homes and businesses. Enea sells electricity to 2.4 million customers, including individual consumers, small and medium-sized companies, as well as large industrial plants.</p>

Summary table of top 10 renewable energy asset owners

Owner	Business model	Largest project to date	Market share*	Description
	Owner/operator	Lotnisko (90 MW Wind)	23%	PGE (Polska Grupa Energetyczna S.A.) is a state-owned public power company and the largest power producing company in Poland. PGE has entered into a credit agreement with the EIB with the purpose of financing three projects of a total 97 MW. A 500 MW PV project is also in early stage development
	Owner/operator	Jaworzno III (50 MW Biomass)	6%	Tauron is a state-owned energy group. Renewables makes up 15% of its power generation portfolio. Tauron is currently developing a 5 MW PV project on a former coal power station site.
	Owner/operator	Wloclawek (162 MW Hydro)	5.6%	Orlen acquired Energa's core activities which include energy generation, distribution, and trading. In 2020, Energa Group signed a contract for EU funding for a hydrogen fuel cells production plant.
	Owner/operator	Polaniec (205 MW Biomass)	5%	Enea is a generator, distributor and trader of energy. Enea and Iberdrola have signed a Letter of Intent (LoI) to jointly develop offshore wind projects with a possible total capacity of up to 3.3 GW.
	Owner/operator	Tymien (50 MW Wind)	2.7%	Invenergy is a US based clean energy developer, owner, and operator. Since 2005, Invenergy has been one of the largest foreign investors in Poland.

Note: * Of total biomass, biogas, wind, large hydro, and solar capacity

Source: Wood Mackenzie, Company Websites

Summary table of top 10 renewable energy asset owners

Owner	Business model	Largest project to date	Market share	Description
 POLENERGIA	Owner/operator	Mycielin (48 MW Wind)	2.3%	Polenergia SA is the first Polish vertically integrated private power industry group. Polenergia have plans of a total of 821 MW of renewables by 2024 including it's first offshore wind project.
 RWE	Owner/operator	Nowy Staw (45.1 MW Wind)	2.1%	RWE operates eight onshore wind projects in Poland. Furthermore, in 2019, RWE acquired a 1.5GW offshore development pipeline.
 edp renováveis	Owner/operator	Margonin (61.2 MW Wind)	2.0%	With more than 10 years in the Polish market, EDPR operates seven onshore wind projects. In 2019, EDPR secured 307 MW of wind power through Poland's auction – the 11 projects are expected operational in 2021 and 2022.
 CTG	Owner/operator	Margonin (58.8 MW Wind)	1.9%	China Three Gorges entered the Polish market through acquisition of a 49% stake in a Polish-Italian EDPR portfolio in 2015.
 IKEA	Owner	Lubartow (52.8 MW Wind)	1.7%	IKEA is a large furniture supplier who owns six Polish wind power projects. The projects were developed by Martifer Renewables and Geo Renewables.

Note: * Of total biomass, biogas, wind, large hydro, and solar capacity

Source: Wood Mackenzie, Company Websites

Summary of Technologies

	Offshore Wind		Onshore Wind		Solar	
	Current	Beyond 2030	Current	Beyond 2030	Current	Beyond 2030
	Policy Support					
Cost Competitiveness						
Construction Time						
Ease of Starting-up						
Overall Competitiveness						

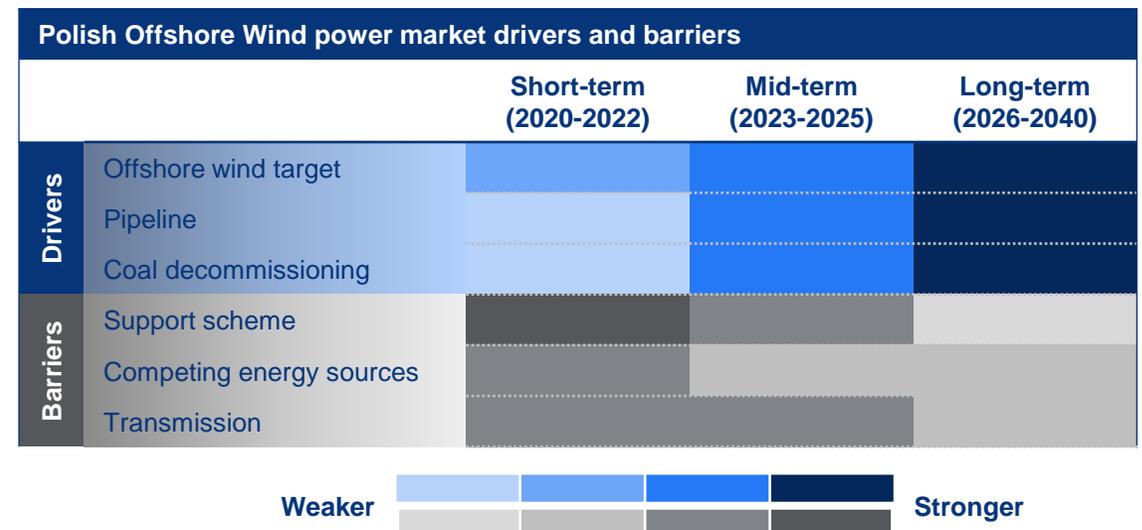
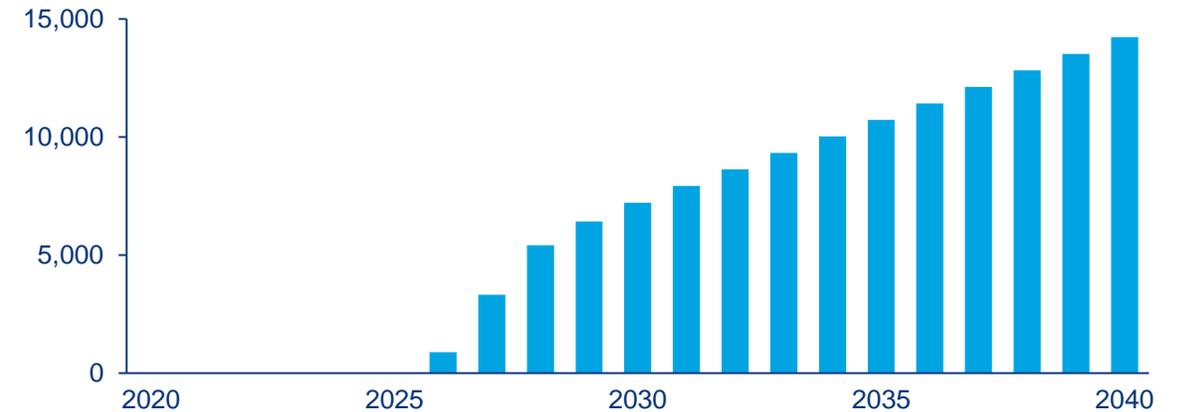


Offshore Wind

- Developments in Poland’s energy landscape offers a strong case for offshore wind. Firstly, because power demand is set to grow due to increased wealth, economic growth and population growth. Secondly, coal constitutes more than 80% of Poland’s power mix today. More than half of the coal fleet is more than 30 years old and with rising decarbonisation policies. Wood Mackenzie forecasts Poland’s coal capacity to drop by 6.5GW towards 2030
- However, coal is a large part of Poland’s economy as ~100,000 people are employed in the coal industry and a further ~200,000 rely on pensions from the coal industry. Consequently, coal is still attractive politically – especially for the PiS* which won its second term in 2019.
- Offshore wind is meanwhile set to play a large role in the energy mix with the with the Offshore wind act being introduced. Ambitious targets in the bill is set to drive strong growth for offshore wind.
 - It will follow a CfD model which will be in two phases
 - The Polish energy regulator will auction 5.9GW of capacity by the end of 2021 and a further 5GW spread across two round in 2025 and 2027
 - PGE has already secured environmental permits for two offshore wind farms totalling ~2.5GW
- Growing pipeline and involvement from experienced developers, combined with favourable area characteristics, further drives a large potential for cost-competitive offshore wind in Poland.

*PiS refers to the Polish Law and Justice Party

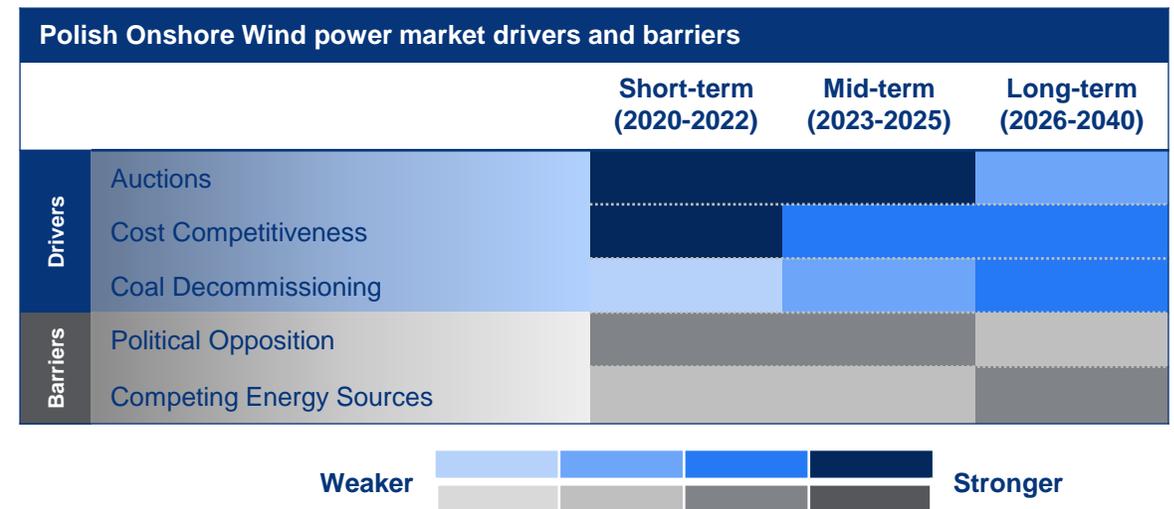
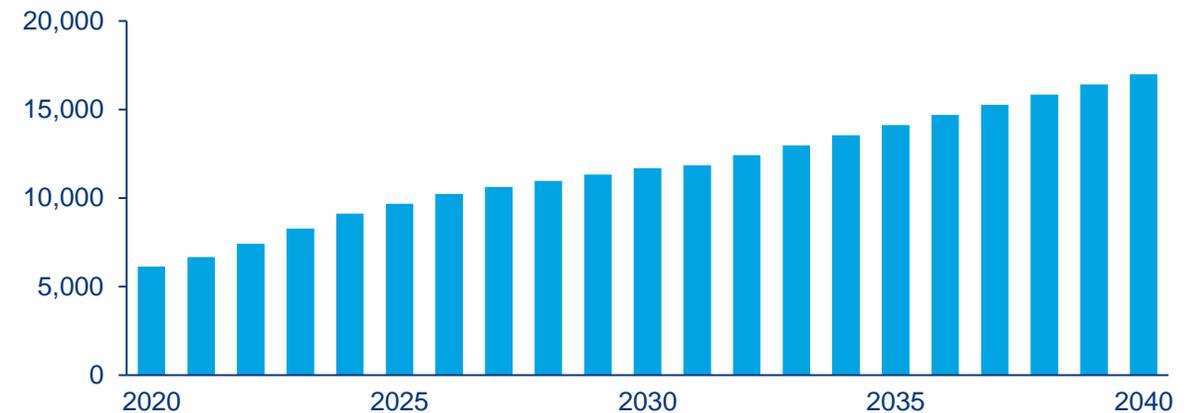
Offshore Wind cumulative Capacity (MW)



Onshore Wind

- Auctions drive short term installations, but lack of onshore wind support dampens longer term outlook. At the end of 2019, Poland held the largest European dedicated onshore wind auction ever with a total volume of 2.2GW with bids averaging below wholesale electricity price. This served as a large boost of confidence on competitiveness of wind energy in energy mix.
- Around 4GW of auctioned capacity is expected by end-2020 which will stimulate wind market growth through 2024.
- The Polish government announced plans to ease restrictions for onshore wind projects with new rules set to take effect from 2021. Distance restrictions are expected to be eased, which will increase attractiveness of auctions and increase size of bids with tighter concentration of installations.
- Onshore wind had faced much political oppositions over the past years and this is not expected to change dramatically in the long-run. Offshore wind and solar are more favored when it comes to the long-term policy support. Due to the higher cost-competitiveness, however, onshore wind has received more support than solar in the auction scheme (large-scale basket) over the last two rounds, making it still the more attractive option.

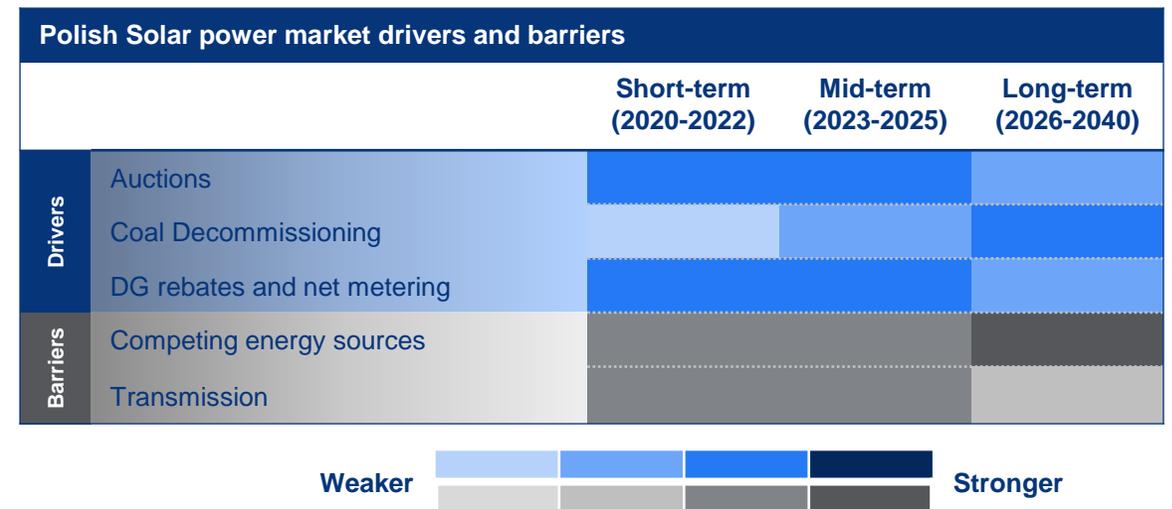
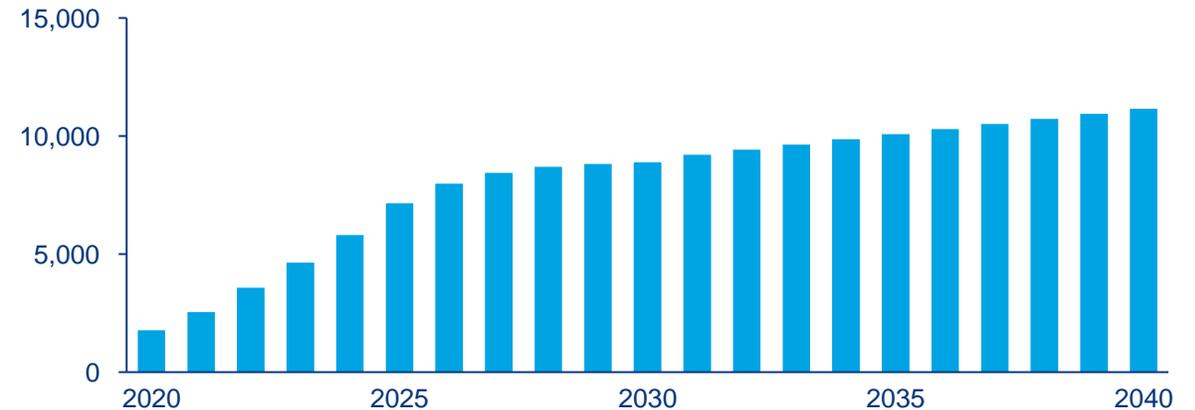
Onshore Wind cumulative Capacity (MW)



Solar PV

- The market has been dominated by small-scale installations thus far, though that will start to shift through the early 2020s as larger auctioned projects are delivered.
- Auctions for both <1 MW (mostly won by solar PV) and >1 MW (mostly won by onshore wind) installations are available in Poland. Solar will begin to take a larger share of the >1 MW auction pot due to restrictions on the siting of onshore wind turbines limiting the project pipeline.
- The government is expecting to allocate 700 MW of solar in the upcoming 1.5 GW auction for >1 MW projects (though that volume will depend on bidding dynamics), and 800 MW of <1 MW PV projects.
- Expecting a ramp up in utility deployment. PGE planning large volumes (up to 1.1 GW) at decommissioned mining sites.
- DG solar is also expected to grow with Mój Prąd (My Electricity) rebate scheme for residential solar systems and reduction in VAT rates for micro-solar systems. Net metering is also expanded to allow businesses and energy communities to participate instead of the original restrictions that included only residential, public sector and housing community users.
- Growth is expected to gradually flatten post-2025 due to land constraints and limitations.
- Onshore wind has been outcompeting solar PV on cost in the recent large-scale auction rounds.

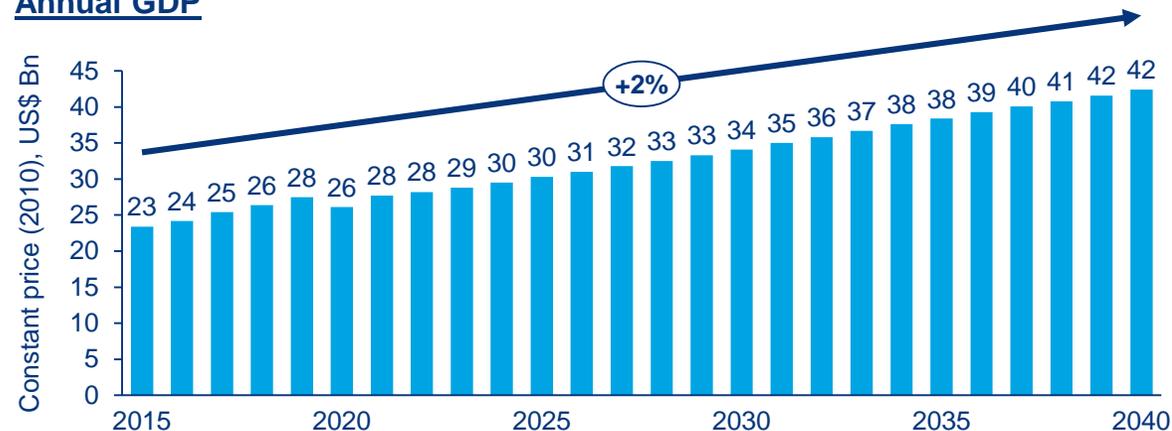
Solar PV cumulative Capacity (MW)



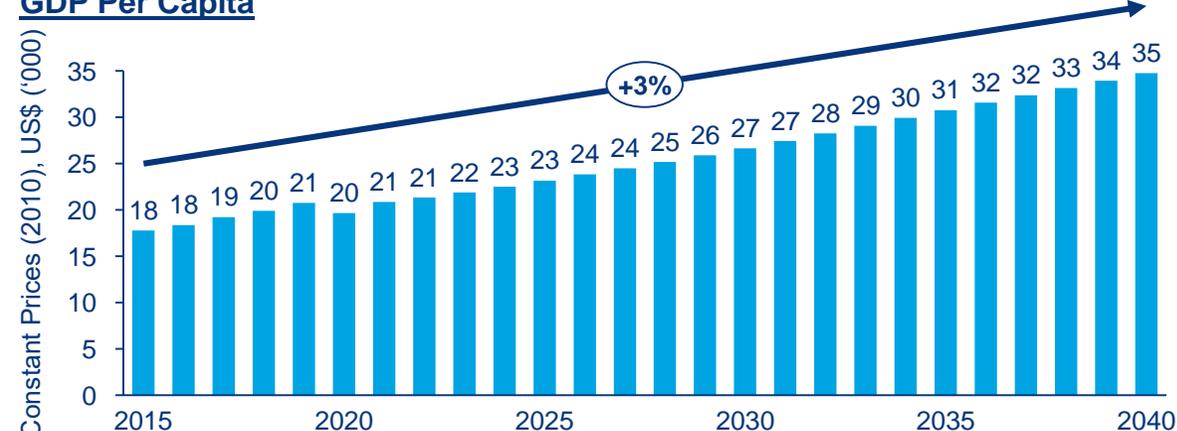
Estonia

Macroeconomics Summary - Estonia

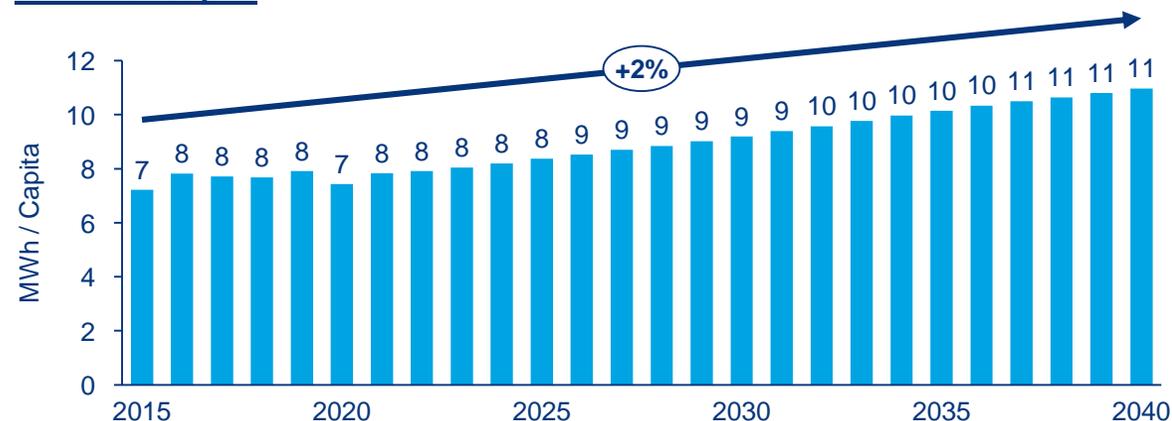
Annual GDP



GDP Per Capita



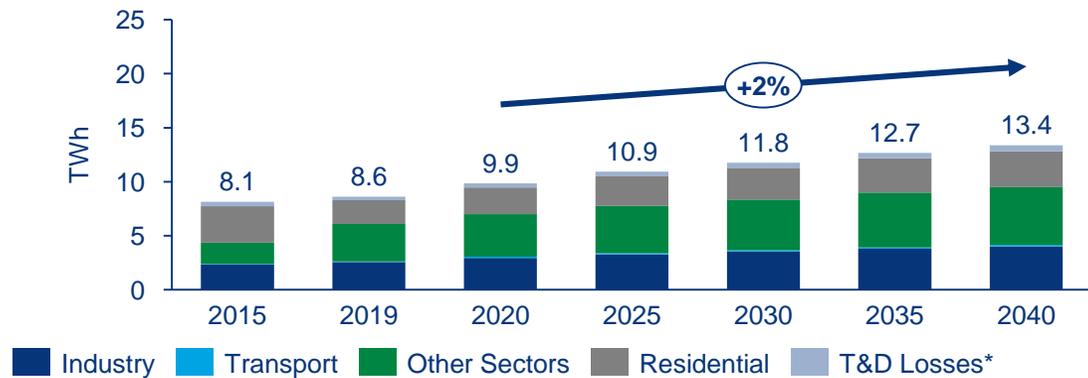
MWh Per Capita



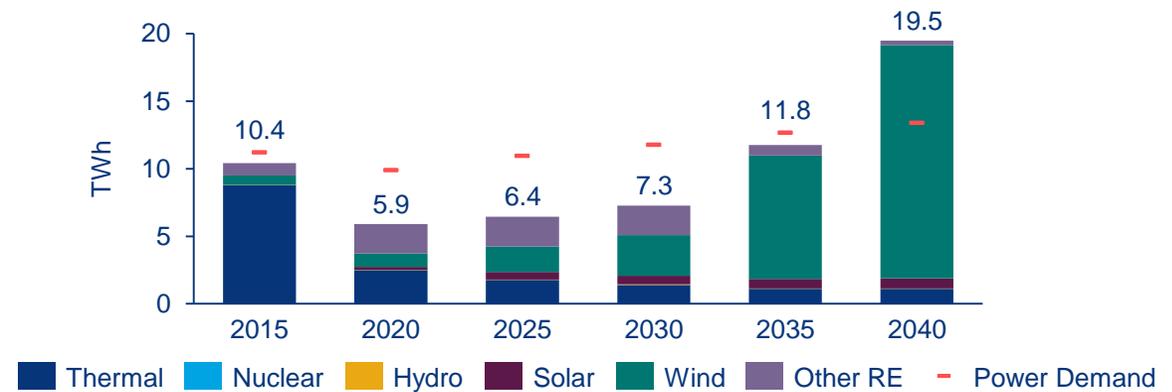
- Estonia is the smallest of the 3 Baltic states. In recent years, growth has been driven by information and communication, wholesale and retail trade, professional, scientific and technical activities. Improving labour and productivity rates has fueled consistent growth.
- Significant impact is expected from Covid-19 given Estonia's dependence on trade, and the greater impact on other EU countries and the downturn from global trade even before Covid-19.

Power demand is expected to grow over time, and eventually reducing dependency on energy imports from neighboring countries

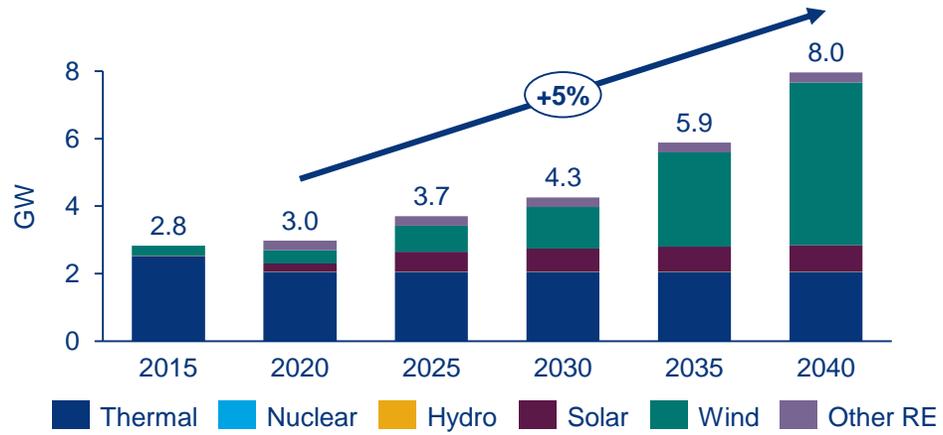
Power Demand Outlook



Power Generation Mix

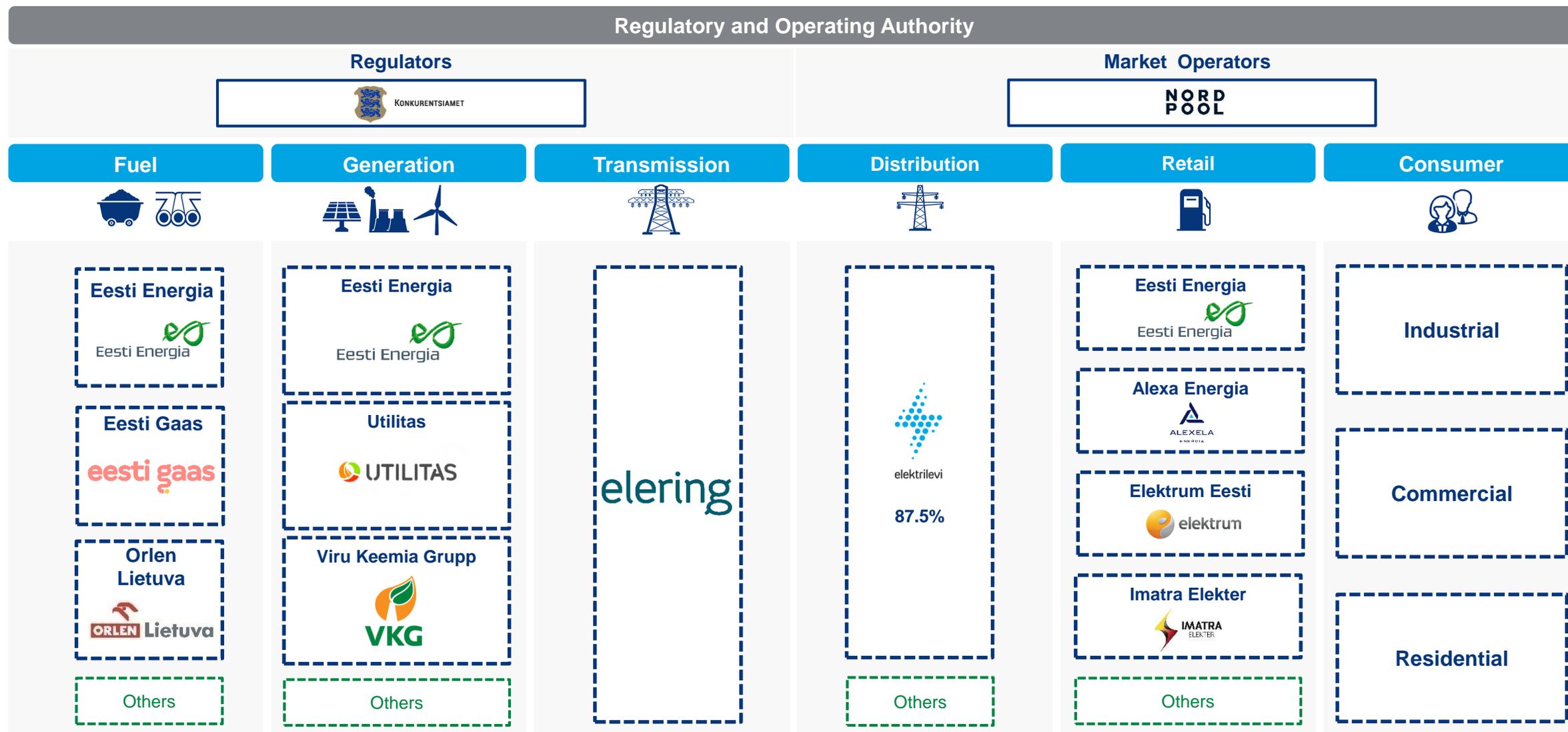


Installed Capacity Outlook



- Power demand in Estonia is expected to grow at CAGR of 2% until 2040. The largest increase is expected to come from the transport sector as Electric Vehicles gain traction.
- Oil shale has been Estonia's main source of electricity generation historically. However, this is set to gradually change with the implementation of carbon emission allowance and EU green targets. In 2019, Eesti Energia closed down four old and less efficient units with capacity of ~600MW.
- With the successful implementation of auctions from 2020, larger auctions are expected to follow which would drive Estonia's mid – long term outlook for renewable energy development.

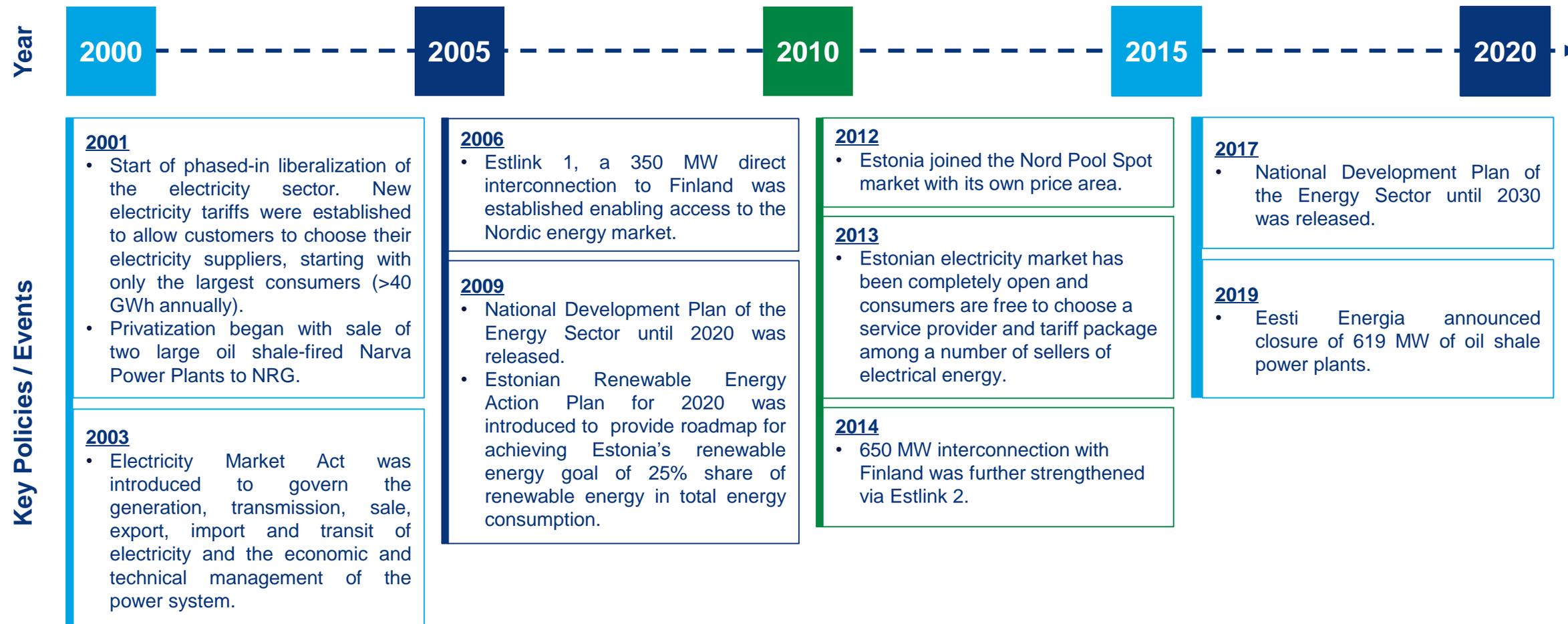
Estonia Power Market Structure



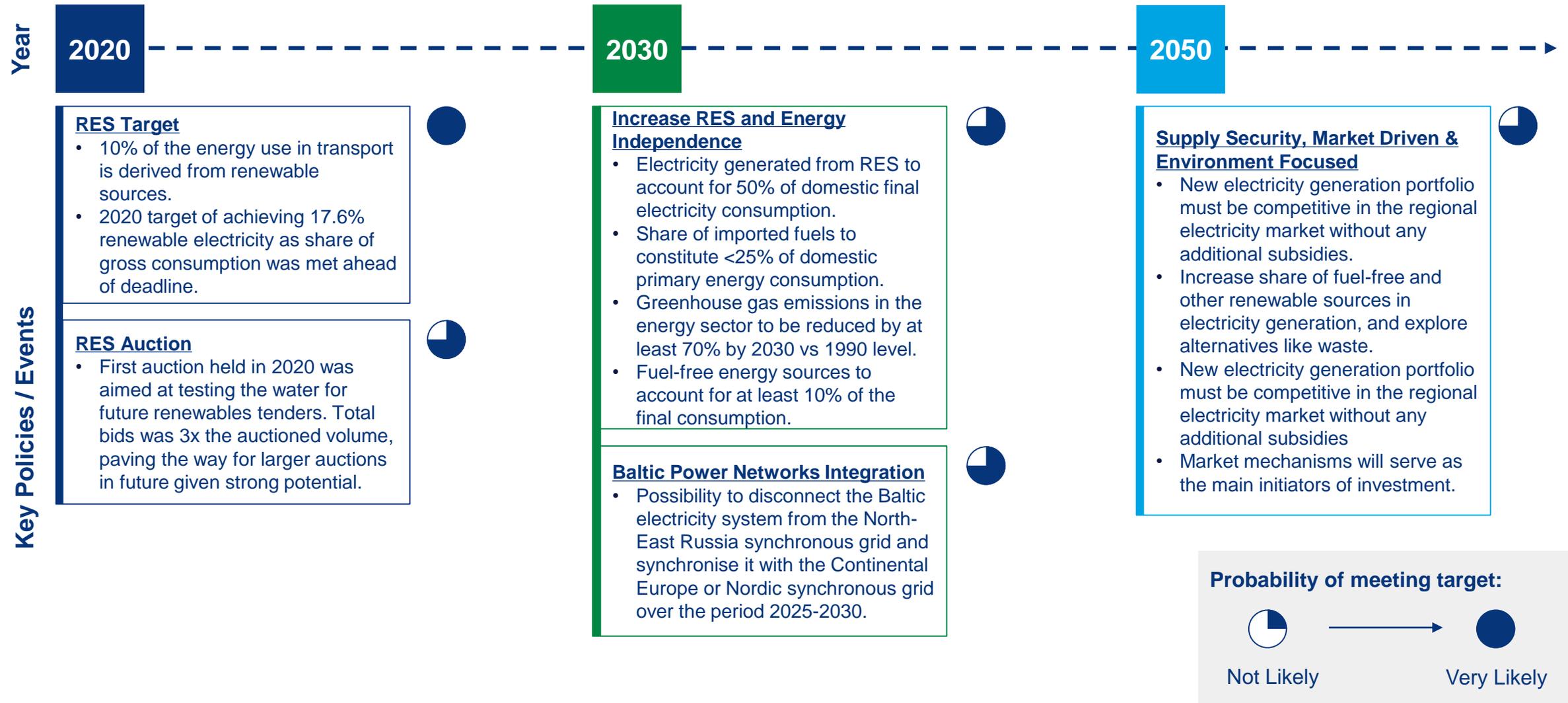
Power Market Key Stakeholder Overview

Stakeholder	Roles and Responsibilities
 <p>REPUBLIC OF ESTONIA MINISTRY OF ECONOMIC AFFAIRS AND COMMUNICATIONS</p>	<p>The main strategic objectives of the Ministry involve governance that encourages entrepreneurship and innovation, an efficient and safe transport system, constantly developing information society and environmentally friendly energy supply at a justified price. It publishes the National Development Plan of the Energy Sector.</p>
 <p>KONKURENTSIAMET</p> <p>Estonian Competitive Authority (ECA)</p>	<p>ECA is responsible for developing a competitive, flexible, secure and environmentally sound internal and regional market. It approves, adopts and inspects the prices of power supply services, inspects and coordinates connection fees, connection fee calculation methods and connection contracts, supervises the electricity industry and subject undertakings to activity and development obligations.</p>
 <p>Elering</p>	<p>Elering AS is the national transmission system operator for electricity and gas in Estonia. As part of the EU's 3rd Energy Package, Government of Estonia bought out Elering from Eesti Energia in order to meet ownership unbundling requirements. Elering is also a member of the European Network of Transmission System Operators for Electricity.</p>

The power market has undergone multiple reforms over the years...



... and the next stage will focus on advancement in RES and free-market mechanism





Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Electricity Market Act

- The act governs the generation, transmission, sale, export, import and transit of electricity and the economic and technical management of the power system. It also prescribes the principles of the operation of the electricity market, based on the need to ensure an effective supply of electricity which is provided at a reasonable price and which meets environmental requirements and the needs of consumers, and the utilization of energy sources in a balanced manner, in an environmentally clean way and with a long-term perspective.

2030 National Energy and Climate Plan (NECP 2030)

- NECP 2030 is a communication drawn up to meet the requirement laid down by EU regulations on governance of the Energy Union and climate action. Notable targets include:
 - Achievement of an 80% reduction in GHG emissions by 2050 (including 70% by 2030) vs 1990 levels, and 13% reduction of GHG emissions by 2030 compared to 2005 levels in the sectors falling under the scope of the Shared Effort Regulation (transport, small-scale power, agriculture, waste management, forestry, industry).
 - Increase share of renewable energy in total final consumption must be at least 42% by 2030 while capping energy consumption at 32-33 TWh. Primary energy consumption to be reduced by 14% vs recent peak, and ensure energy security by reducing dependence on imported energy.
- Wood Mackenzie's expectations
 - The Electricity Market Act has laid out strong foundations and guidelines for development in Estonia. Estonia has been compliant with EU regulations and has clear implementation measures laid out to ensure targets are achieved. The success of Estonia's 1st RES auction has been promising in paving the path for RES growth as demand for bids was high and prices were low. As such, we expect Estonia to meet targets laid out.

Key policies and targets for adoption of renewable energy and market liberalization

Key Features

National Development Plan of the Energy Sector until 2030 (NDEPS 2030)

Summary

- NDEPS 2030 targets availability, affordability and environmental friendliness of the energy supply to the consumers, keeping in line with the terms and conditions established in the long-term energy and climate policy of the European Union. Notable points include:
 - By 2030, electricity generated from RES accounts for 50% of domestic final electricity consumption (which is expected to stabilize at 32 TWh) and new generation equipment for renewable electricity is built under the conditions of an open electricity market without additional domestic subsidies. The share of imported fuels to constitute <25% of domestic primary energy consumption in 2030.
 - Estonia's electricity system will be synchronised with the synchronous grid coordinated in EU.
 - Greenhouse gas emissions in the energy sector are reduced by at least 70% by 2030 (compared to the 1990 level) and a reduction of emissions by more than 80% could be realistically achieved by 2050.
 - Fuel-free energy sources to account for at least 10% of the final consumption by 2030. This is expected to come from hydro, solar and wind. The use of solar energy in small applications is expected to increase 100 MW by 2050, covering about 1% of the country's power demand. Wind energy can cover 1/3 of power demand in 2050.
 - In 2050, Estonia will mainly use domestic resources to meet its energy needs, including heat generation and transport and electricity production. The investments in the energy sector will result in redoubling the efficiency of using local primary fossil fuels compared to the current level.
 - Long-term perspective on the use of biofuels envisages generation of electricity and heat in line with forest growth.
-
- Wood Mackenzie's expectations
 - Estonia has a strong track record of meeting energy targets, hitting their 2020 renewable energy goals 8 years ahead of schedule with substantial growth in wind and biofuels. The country has strong potential in renewable energy with advantage of locally produced renewable fuels such as biomethane, wind, and small scale hydro and solar, which are already being developed and expected to continue expansion. As such, Estonia is expected to continue meeting targets and driving development around the Baltic region.

Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Premium Tariff (not issued after 2018)

- European Commission's guideline justified for state aid for environmental protection and energy. Premium tariff was rolled out where a RES producer receives a premium on top of NordPoolSpot wholesale market hourly spot price, payable by TSO, for electricity is exported into the grid. This does not apply for RES electricity produced for self-consumption.
- It is eligible for all types of RES with installed capacity <125 MW, with an annual cap of 600 GWh for wind. Rate is €0.0537 / kWh for all RES types other than €0.032 / kWh for biomass plants < 10MW. Eligibility is limited to a maximum of 12 years from commercial operations when electricity produced first enters the grid. Cost of premium tariff is reflected as "additional renewable energy fee" borne by end-user.

Auction

- Introduced in 2019, auction will replace premium tariff system. This is only applicable to new RES installations, and previously awarded RES producers under the premium tariff scheme will still hold until their 12 years of eligibility runs out. More information on the **next page**.

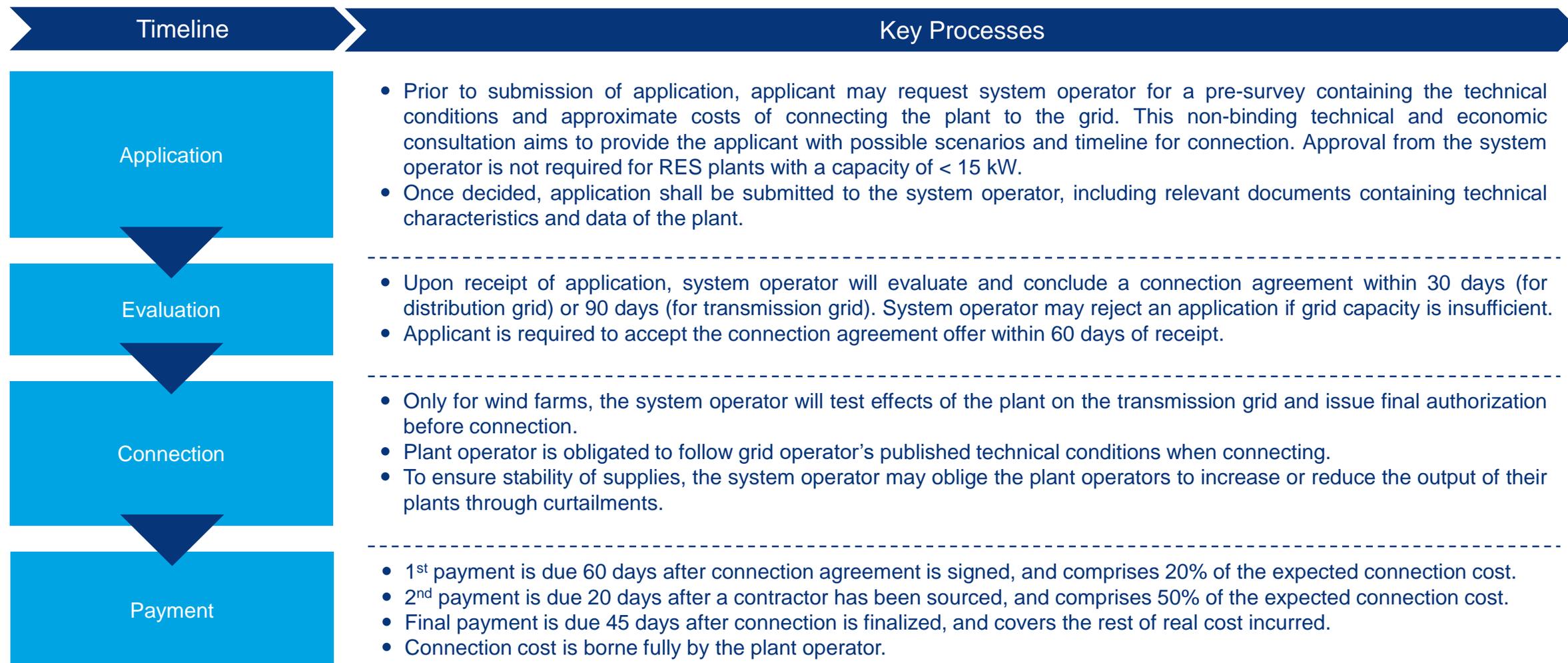
Auction Structure*

Element	RES Auction
Determined value through auction	The outcome of the tendering procedure determines a strike price comprising market price plus the premium.
Available Types	Technology neutral.
Pricing Rule	The bidder who offers the lowest price will be awarded the tender. Winners will get an average monthly price per MWh plus a feed-in premium for 12 years that will be set according to the auction. In the first auction, highest premium is set at €53.7 per MWh, and cap for premium + average market price combined is €93 per MWh.
Participation Size	2 different categories – capacity between 50 kW - 1MW (annual target of 5 GWh up to 2021) and capacity above 1 MW.
Key Selection Criteria	Tenders are selected based on time and ability to meet delivery deadline.
Realization Time	To begin generation by 2021 for the 1 st auction.
Duration of Support	In Estonia, support is granted for 12 years.
Upcoming Tenders	The next bid will be announced in early 2021, where the state wants to at least 450 GWh of renewable electricity per year, from early 2023.



*The 1st auction aimed to test market's capacity and feasibility of systems. Larger auctions with possible tweaks will be organized subsequently depending its outcome.

Overview of connecting to the grid



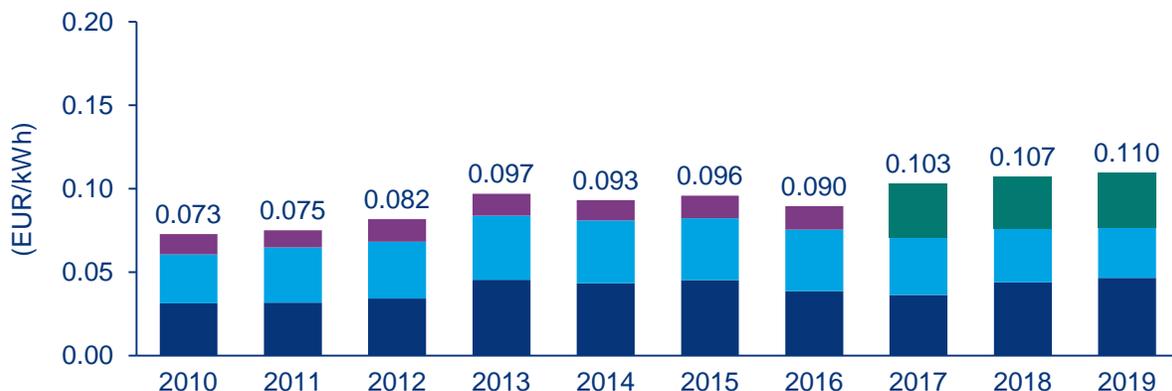
Electricity prices in Estonia

Electricity prices for residential consumers*

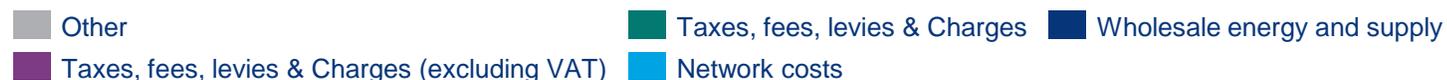


- prices for residential consumers are higher than price for non-residential consumers.
- The retail market in Estonia is fully liberalized where customer are free to choose which electricity retailer to buy electricity from.
- The final price is made up of network service, price of electricity (excluding network service), excise tax on electricity, charge for support of renewable energy, and VAT of 20%. Out of these, network service makes up the largest proportion of total price.

Electricity prices for non-residential consumers**



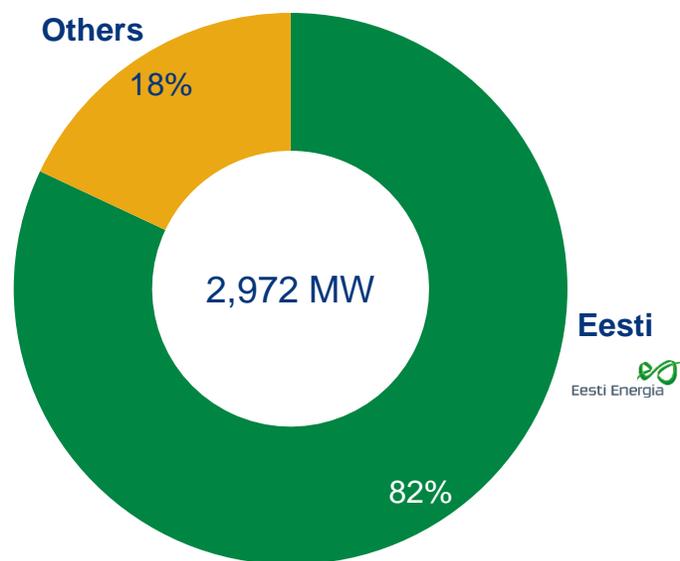
Note: Taxes, fees, levies and charges include VAT, Environmental taxes, Capacity taxes and Renewables taxes



Note: *prices are indicative of medium standard residential consumption between 2500-5000 kWh. **prices are indicative of medium standard non-residential consumption between 500-2000 MWh

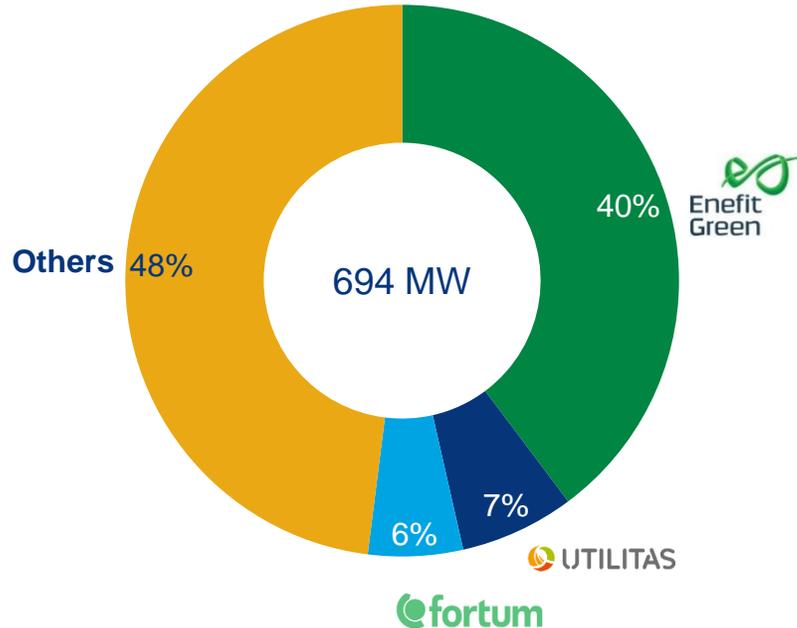
Source: Wood Mackenzie, Eurostat

Eesti Energia has the largest share of the generation market



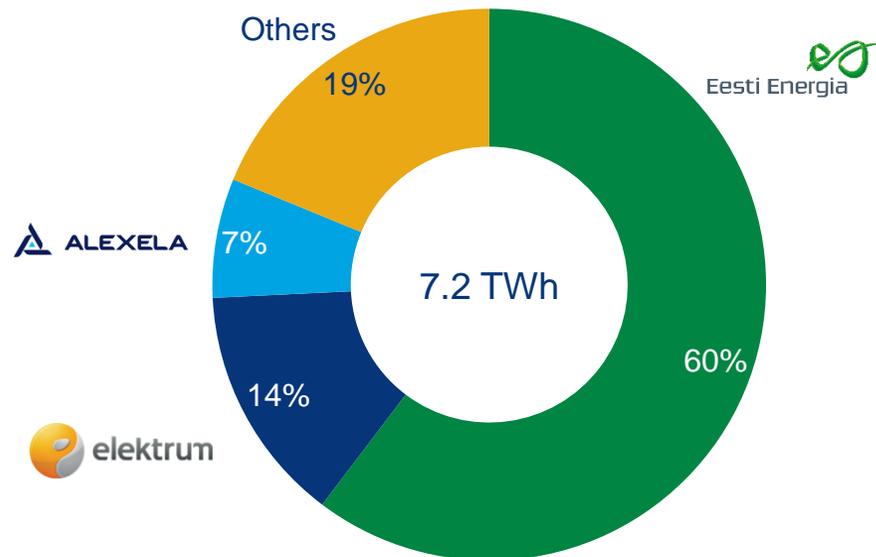
Notable plants	Overview
<p>Eesti Power Plant / Eesti Energia</p>  <p>Eesti Energia</p>	<p>The 866 MW Eesti Power Plant is powered by oil-shale and is the largest power plant in Estonia. However, it has raised many environment concerns in recent times and in 2019, 489MW of installed generation was shut down out of the original capacity of 1,355 MW.</p>
<p>Auvere Power Plant / Eesti Energia</p>  <p>Eesti Energia</p>	<p>The 300 MW Auvere Power Plant is Estonia's biggest industrial investment and said to be the last oil shale power plant of Estonia. The plant is able to use oil shale as fuel to the extent of 100%, biomass to the extent of 50%, peat to the extent of 20% and oil shale gas to the extent of 10%.</p>
<p>Kiisa Emergency Reserve Power Plant / Elering</p> 	<p>Kiisa Power Plant is a 250 MW emergency reserve power plant based on the engine power plant technology. It is activated by Elering when there is network failure or capacity shortfall, and it does not participate in the everyday electricity market.</p>

Top 3 Renewable Energy generation companies



RES	Overview
<p>Enefit Green</p> 	<p>Enefit Green is one of the largest renewable energy producers in Estonia, and is 100% owned by Eesti Energia group. Enefit Green generates electricity and heat from wind, water, biomass, solar energy and municipal waste, with combined installed capacity of 132.7MW. Additionally, Enefit Green’s portfolio also includes 140.8 MW of wind farms from Nelja Energia.</p>
<p>Utilitas</p> 	<p>Utilitas is an Estonian energy group, the principal activities of which include generating thermal energy and electricity and providing district heating services. Installations consists of 102.4 MW of Biomass Plants.</p>
<p>Fortum</p> 	<p>Fortum develops sustainable energy solutions for cities of Tartu and Pärnu, meeting the needs of local communities. The main business operations based on local and renewable energy are production, distribution and sales of electricity, district heating and cooling. Total installed capacity is 49 MW of electricity production.</p>

Top 3 Electricity Retailers



Retailer	Overview
<p>Eesti Energia</p> 	<p>Eesti Energia is the largest electricity retailer in Estonia, offering a range of different products for both households and industrial users. In 2019 Eesti Energia’s market share in Estonia was 60.3%, amounting to total retail sales of 4.33 TWh.</p>
<p>Elektrum Eesti</p> 	<p>Elektrum Eesti is a contemporary customer-orientated energy company which aims become a service provider who can best link the needs of electricity consumers with the most suitable energy solutions. It is a subsidiary of Latvenergo Group. In 2019, Elektrum sold 1 TWh of electricity in Estonia retail market.</p>
<p>Alexela Group</p> 	<p>Alexela Energia is a seller of electricity and gas, and in 2018 acquired 220 Energia who in the same business. Through the acquisition, the group hopes customers can benefit from the offers of Alexela while improving the company’s long-term capability to offer competitive alternative in the market. Combined market share is estimated to be ~7%.</p>

Summary table of top 10 renewable energy asset owners

Owner	Business model	Largest project to date	Market share*	Description
 Enefit	Owner/operator	Narva (39.1 MW Wind)	40.1%	Enefit is a subsidiary of Estonian, Eesti Energia – a large group of electricity generation and trading companies in the Baltic States.
 UTILITAS	Owner/operator	Tallinn Power Station (25 MW Biomass)	7.3%	The principal activity of OÜ Utilitas Tallinna Elektri jaam is the generation and sales of thermal energy and electricity. The company is operating two biofuel-based combined heat and power stations in Tallinn.
 fortum	Owner/operator	Pärnu (25 MW Biomass)	6.0%	Fortum's Estonian operations are focused on district heating and electricity production. They operate two CHP plants – one fully owned and another 60% Fortum owned.
 ignitis renewables	Owner/operator	Mäli (12 MW Wind)	2.8%	Ignitis Group by revenue is the largest group of energy companies in the Baltic States
Skinest Energia	Owner/operator	Esivere I (12 MW Wind)	1.9%	Skinest Energia AS is a renewable energy producer and developer, focused on wind power currently operating a 12 MW wind projects. According to the company, it has “several environmentally friendly projects in development”.

Note: * Of total biomass, biogas, wind, large hydro, and solar capacity

Source: Wood Mackenzie, Company Websites

Summary table of top 10 renewable energy asset owners

Owner	Business model	Largest project to date	Market share	Description
	Owner	Nasva (3.6 MW Wind)	0.9%	Baltic Workboats is a operator of two wind farms in Estonia. The company has proposed a 4 MW nearshore project.
Telewind	Owner/operator	Läätsa (3 MW Wind)	0.5%	AS Telewind operates a 3 MW wind park in Estonia.
	Developer/owner	Salme (3 MW Wind)	0.5%	Established in 2007, Eleon Ltd. is an Estonia-based turbine OEM and The first patented Eleon 3M116 direct drive wind turbine prototype was erected in 2013 in Saaremaa, Estonia. Eleon is currently constructing a 102 MW project in Estonia.
Green Electric	Owner/operator	Aburi (1.8 MW Wind)	0.3%	OU Green Electric operates a 1.8 MW wind park in Estonia.
	Developer/owner/operator	Nasva (1.6 MW Wind)	0.3%	Eolus is a Swedish developer and owner of wind primarily in Sweden. Eolus established business operations in the Estonian market in 2007, the first market outside Sweden. At the end of 2014, the amount of installed capacity in the country was 303 MW.

Note: * Of total biomass, biogas, wind, large hydro, and solar capacity

Source: Wood Mackenzie, Company Websites

Summary of Technologies

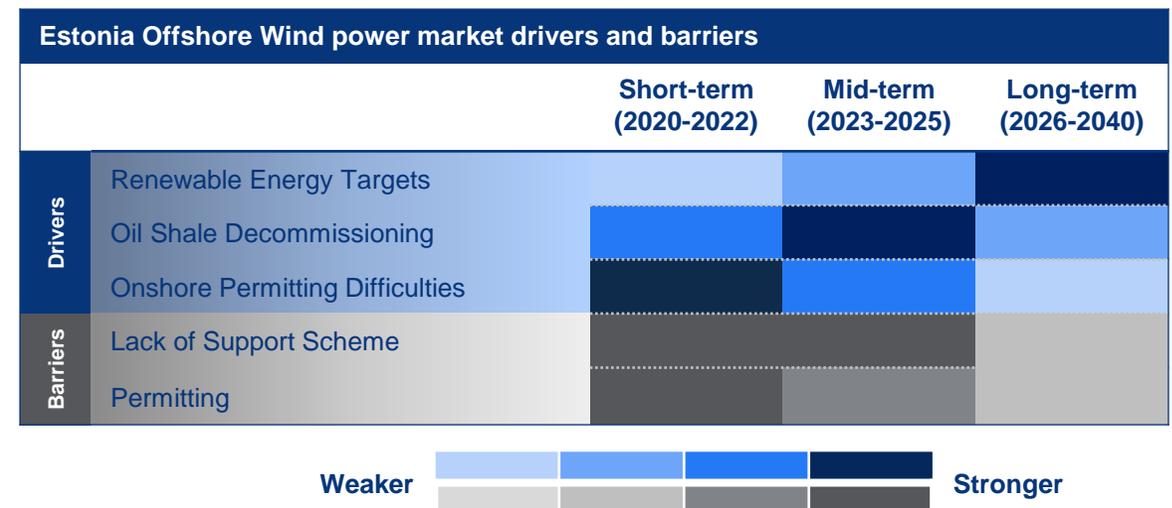
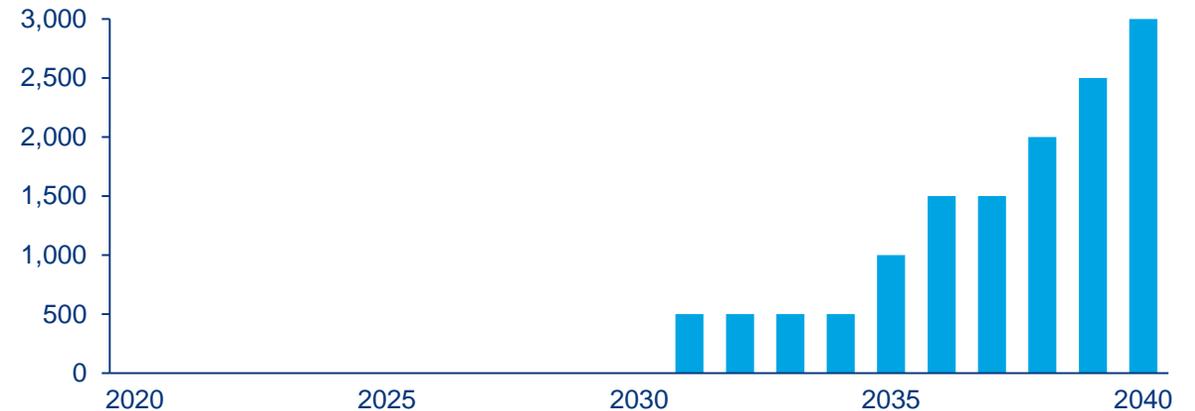
	Offshore Wind		Onshore Wind		Solar	
	Current	Beyond 2030	Current	Beyond 2030	Current	Beyond 2030
Policy Support						
Cost Competitiveness						
Construction Time						
Ease of Starting-up						
Overall Competitiveness						



Offshore Wind

- Factors such as renewable energy targets, oil shale plant decommissioning and onshore planning constraints could facilitate offshore wind development despite permitting difficulties and lack of a route to market.
- Estonia aims at sourcing 50% of its final electricity consumption from renewables by 2030 and at achieving lower dependence on energy imports and a fully independent operation of the Baltic power networks by 2025. The share of oil shale will decrease in Estonia’s power mix going forward. Onshore permitting hurdles provide an incentive to harvest offshore wind power.
- The lack of support leaves offshore wind effectively without a policy-based route to market. Multiple conflicts over use of the sea (shipping, defense) result in permitting hurdles, slowing down the EIA process for the 700-1,100MW Hiiumaa project.
- It’s unlikely that there will be any ad hoc support schemes for offshore wind in Estonia. Thus, commercial operation of a new project will need to be based on merchant conditions, be backed by a PPA or seek support under a EU cooperation mechanism.
- Enefit Green – the owner of Hiiumaa, the project at the most advanced development stage – will continue to apply for the relevant permits. The developer is also bringing forward another project located in the South (Pärnu Bay). The project is less advanced than Hiiumaa but could be fast-tracked if the latter was to be suspended or delayed further.

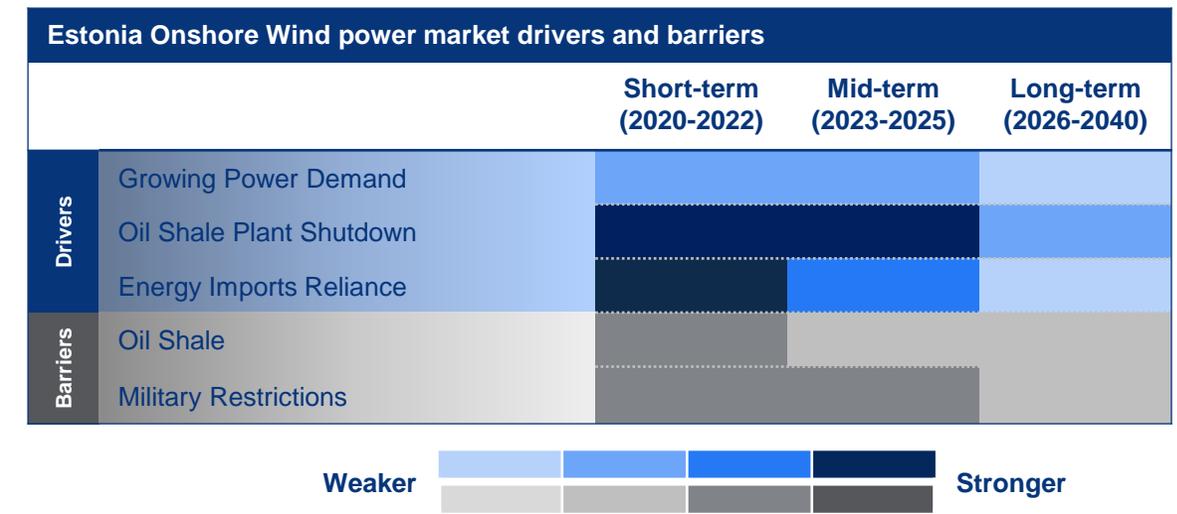
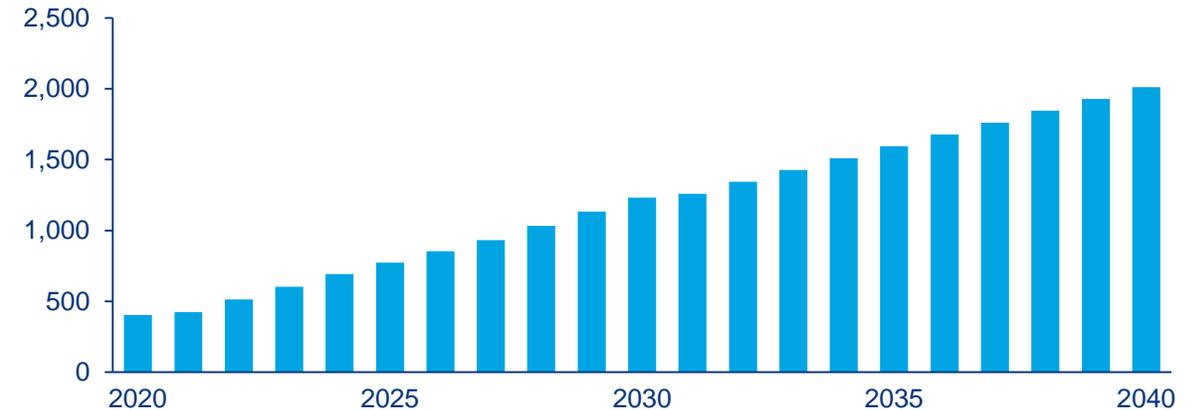
Offshore Wind PV cumulative Capacity (MW)



Onshore Wind

- Developers in Estonia have not added any new onshore wind capacity since 2016 as the 600 GWh/year subsidy scheme for renewables was already used up, leaving no incentives to build new wind energy projects
- Estonia was one of the first EU countries to reach its 2020 RES target. The country aims at sourcing 30% of its electricity (42% of its energy) from renewables by 2030 and to reduce GHG emissions by 80% by 2050 compared to the 1990 levels
- The government awarded the 140MW Tootsi wind power project to Eesti Energia, which will drive near-term growth
- New tenders will be scheduled every two/three years and will mid-term growth
- Estonia aims to achieve independence from the Russian energy system and join the synchronous system of Continental Europe via Poland by 2025, as well as to reduce its use of oil shale, which accounts for 90% of Estonia's CO2 emissions and ~80% of its electricity production
- Eesti Energia is shutting down three old oil shale plants totalling 619MW, potentially making space for renewables. In the longer term, higher CO2 prices may increase the generation costs of oil shale, leading to additional shutdowns or conversions to biomass and CHP
- Projects planned by private investors have had issues due to court appeals citing national security concerns related to military radars, which may need to be removed for smooth development of the sector
- Onshore and offshore wind power will bridge the decommissioning of oil shale plants in the long term

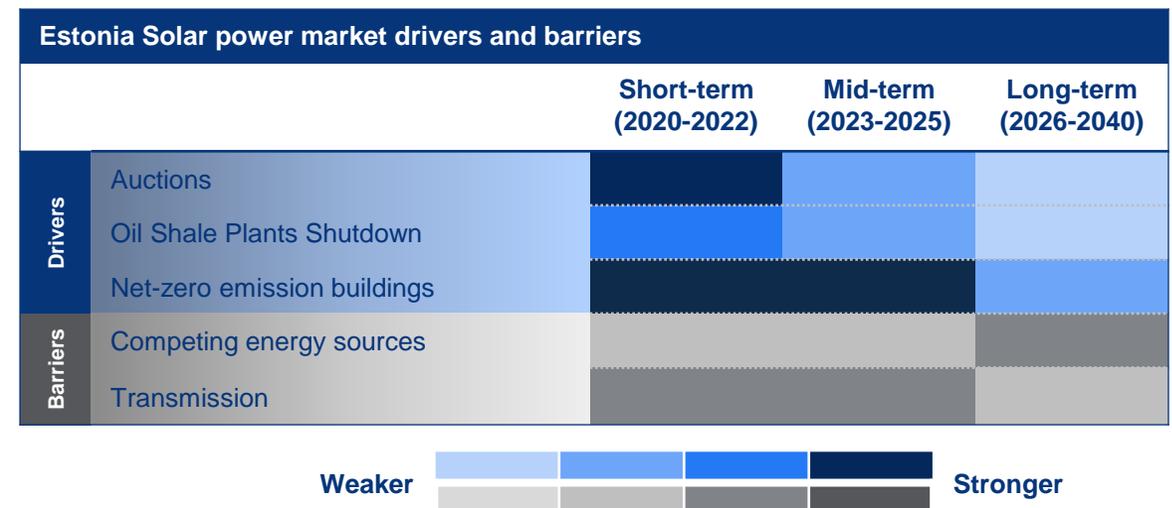
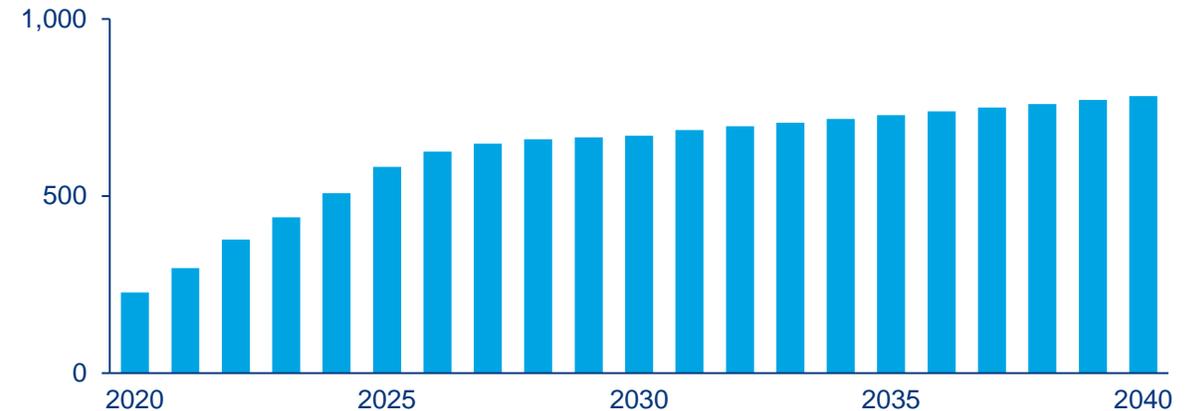
Onshore Wind PV Cumulative Capacity (MW)



Solar PV

- Estonia has a target of 100 MW of PV by 2050 which has already been exceeded.
- 12-year FIT premium available for <50kW systems. Initially planned to expire in 2020 but this might be extended.
- Auctions are open for 50 kW - 1 MW systems, where FIT premiums are awarded. The auction is technology neutral with 5 GWh per year on offer initially, but potentially larger volumes to follow. Given the short realization time and smaller capacity size, solar PV is expected to benefit from the auction and this should boost solar installations. Utility Eesti Energy plans to deploy 50 MW of solar by 2022.
- With the announcement from Eesti Energy about shutdown of multiple units in their largest oil shale plants, there is opportunity for RES to backfill the decrease in capacity from these shutdowns.
- With requirements for near-zero energy buildings after 2020, demand for DG solar is expected to rise.

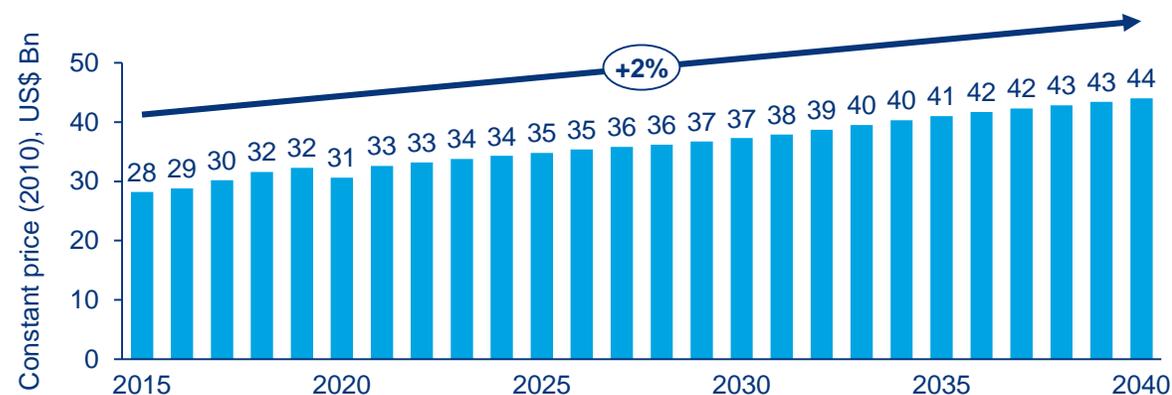
Solar PV Cumulative Capacity (MW)



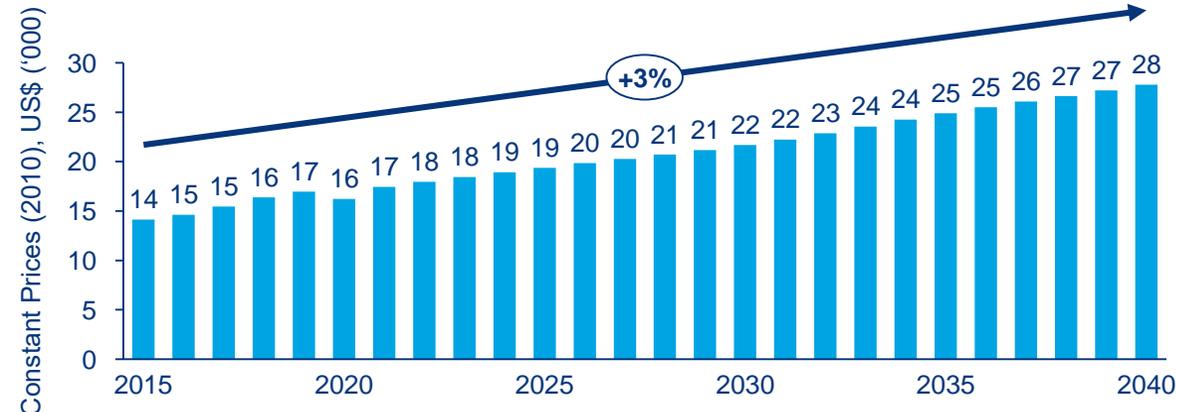
Latvia

Macroeconomics Summary - Latvia

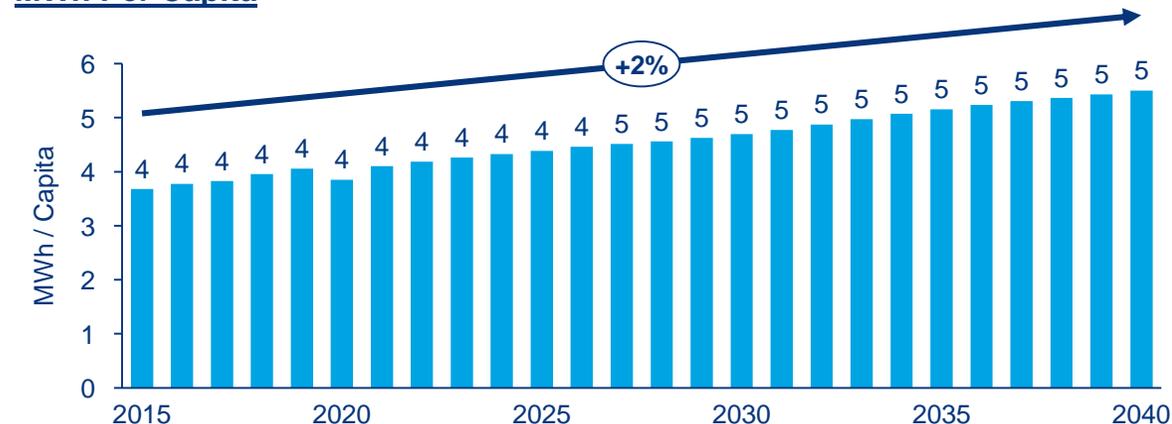
Annual GDP



GDP Per Capita



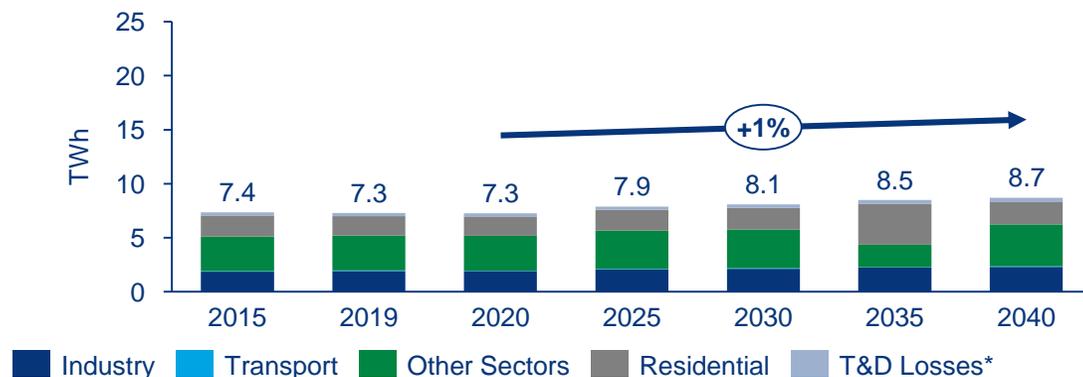
MWh Per Capita



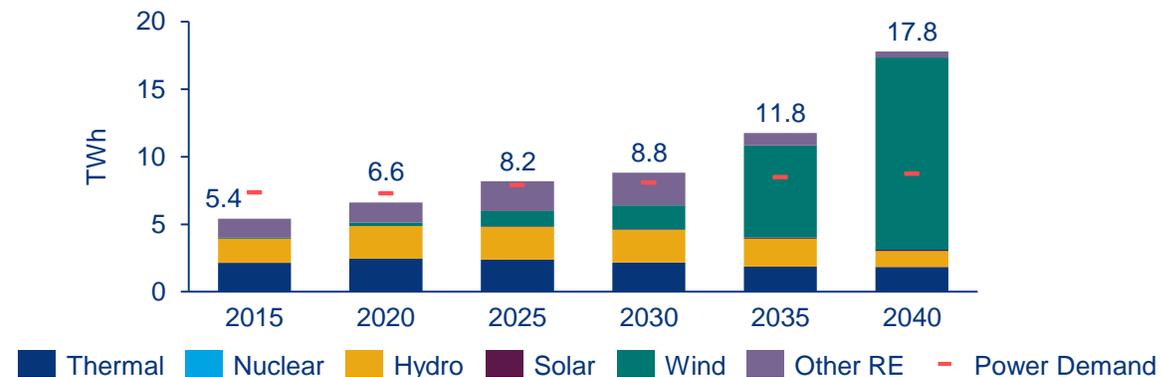
- Latvia's economy is supported by services and manufacturing sectors, with strong presence in timber and wood-processing, agriculture and food products, and manufacturing of machinery and electronic devices.
- GDP has been rising steadily but growth slowed down in the past 2 years. Impact from Covid-19 is expected to be significant in 2020, but growth is expected to bounce back from 2021 onwards. Growth is expected to come more from domestic demand with more severe slowdown expected in other parts of Europe.

Power demand is expected to grow over time, and eventually reducing dependency on energy imports from neighboring countries

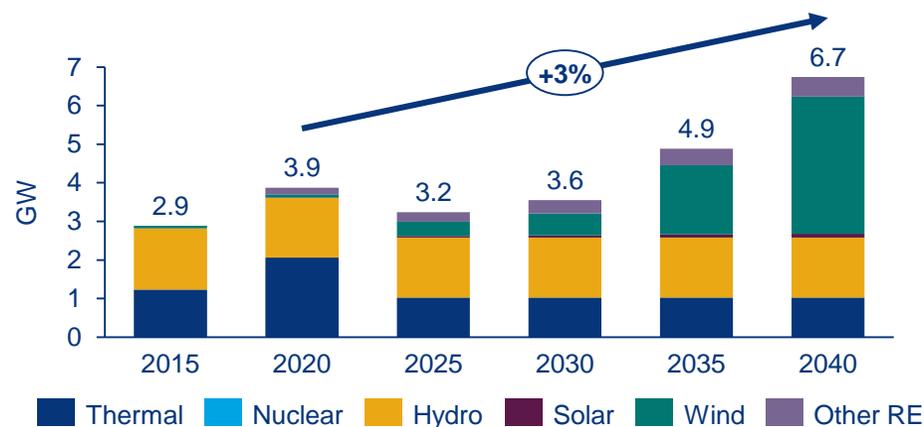
Power Demand Outlook



Power Generation Mix

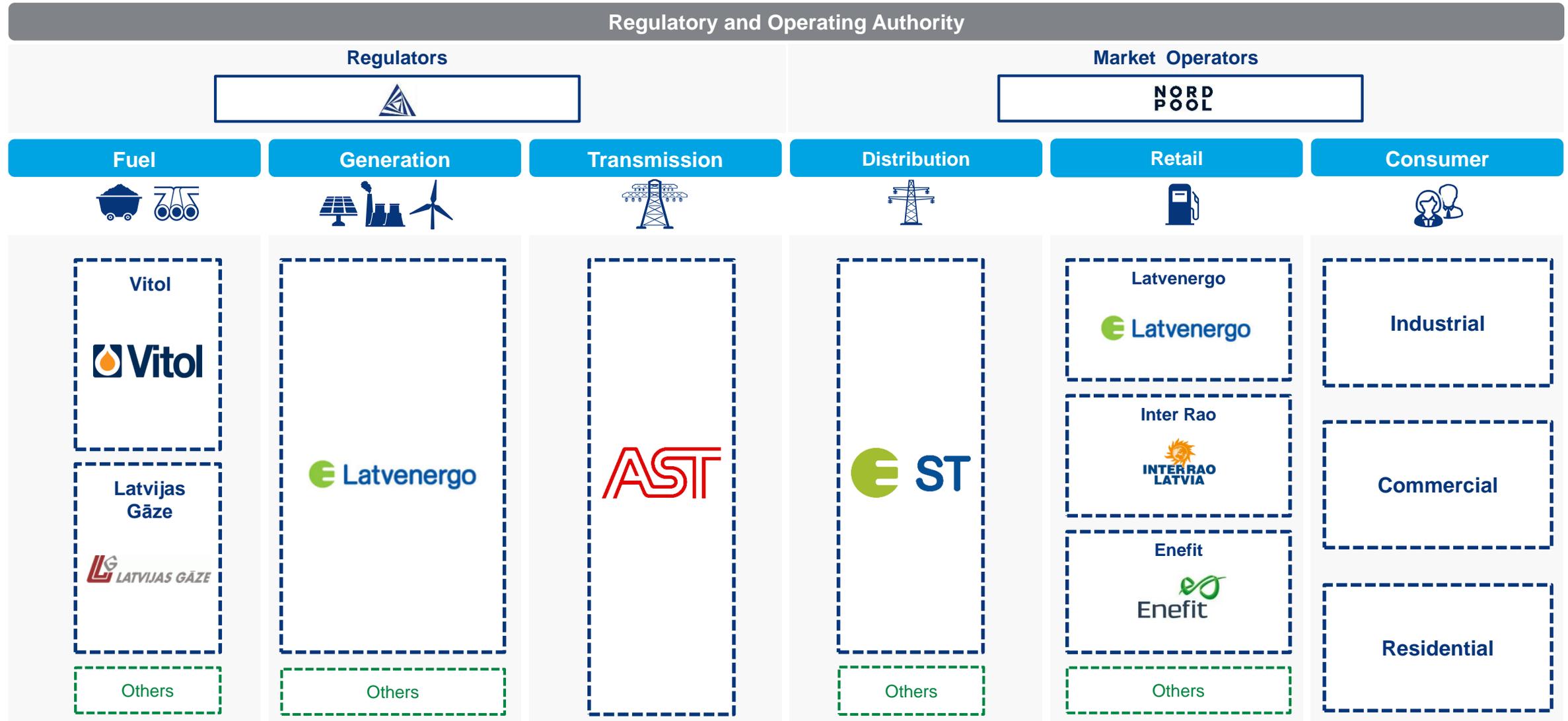


Installed Capacity Outlook



- Power demand in Latvia is expected to grow at CAGR of 1% into 2040. Policies targeting energy efficiency like near-zero building targets are expected to slow power demand growth.
- Large hydro plants from Daugava have been the major energy source in Latvia. With the lack of policies promoting new RES, new installed capacity for RES is expected to be limited in the near term.
- Offshore wind is expected to drive power generation in the longer term given larger capacity and stability of supply.

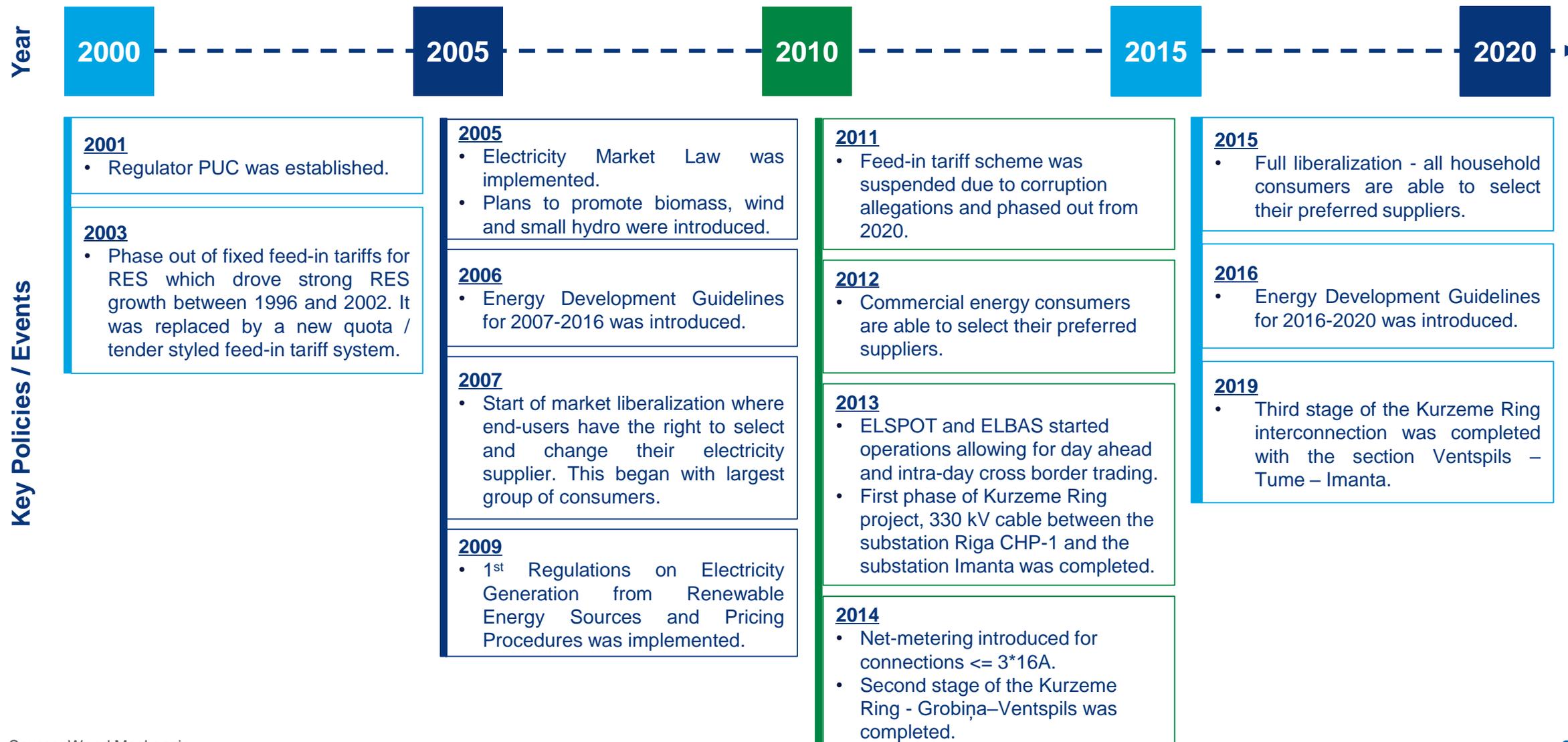
Latvia Power Market Structure



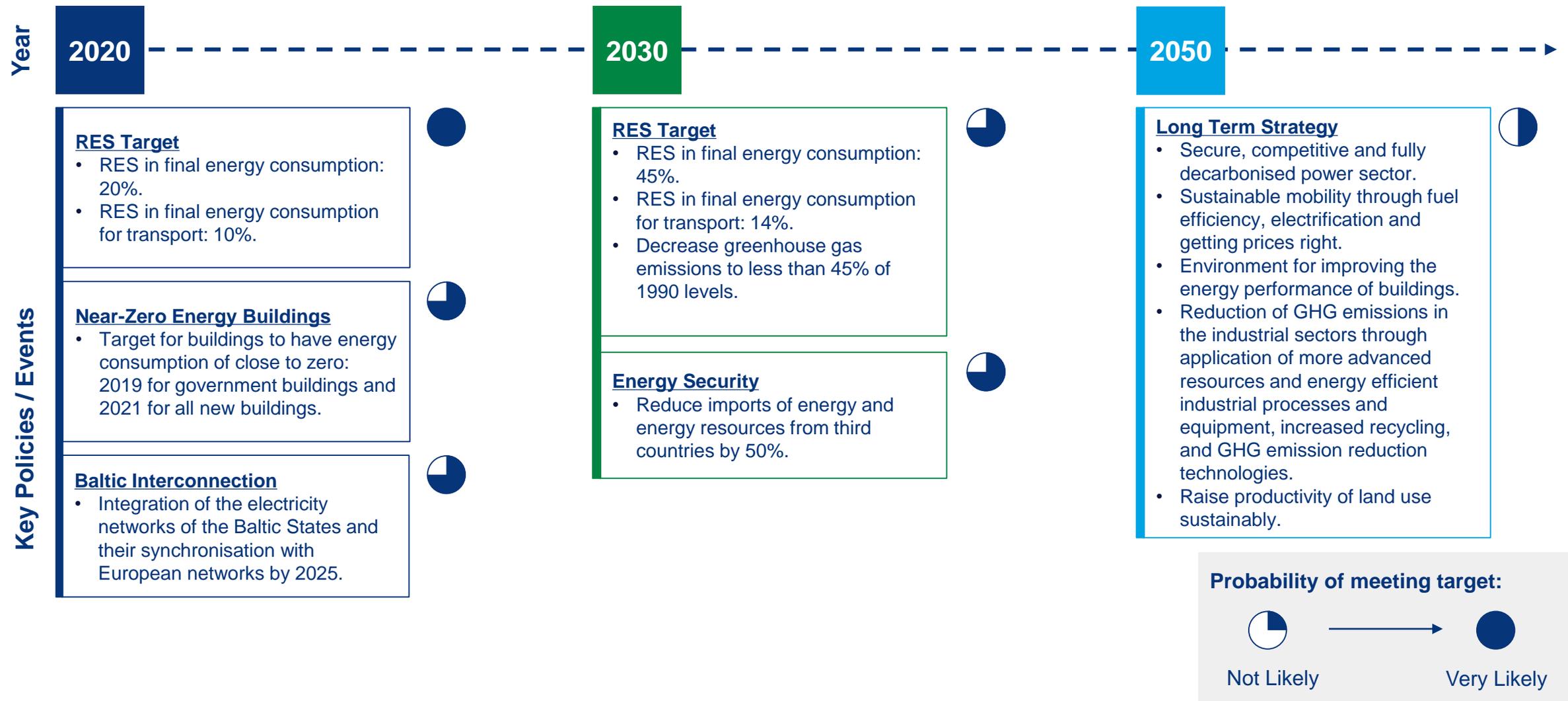
Power Market Key Stakeholder Overview

Stakeholder	Roles and Responsibilities
 <p>Ministry of Economics</p>	<p>Ministry of Economics is the leading state administrative institution responsible for economic policy in Latvia, helps develop and implement energy policies in the country.</p>
 <p>Public Utilities Commission (PUC)</p>	<p>PUC is institutionally and functionally independent, full-fledged, autonomous body governed by Latvian public law which carries out regulation of public services in energy, electronic communications, post, municipal waste management and water management sectors in accordance with the law “On Regulators of Public Utilities” and special legal acts of the regulated sectors.</p>
 <p>Augstsprieguma Tīkls AS (AST)</p>	<p>AST is the electricity transmission system operator of Latvia. Legally unbundled since 2005, it became an independent company in January 2012. It operates power systems with voltages of 110 kV and above leased from Latvenergo, and ensures the security of electricity supply of Latvia to provide a continuous electricity transmission service.</p>

Power market has undergone multiple reforms over the years...



... and the next stage will focus on advancement in RES and free-market mechanism



Key policies and targets for adoption of renewable energy and market liberalization

Key Features

Summary

Net Metering

- Net-metering applies to clients who are producers of electricity, which are at the same time connected to the electricity grid through a connection smaller than or equal to 3*16A.
- All types of RES generation are eligible but it is more common for solar.
- There is no direct financial compensation for the injected electricity, but the financial equivalent of the injected kW is deducted from the overall electricity bill. If an installation feeds more electricity into the grid than it has taken from the grid during a billing period, this amount is transferred to the next billing period

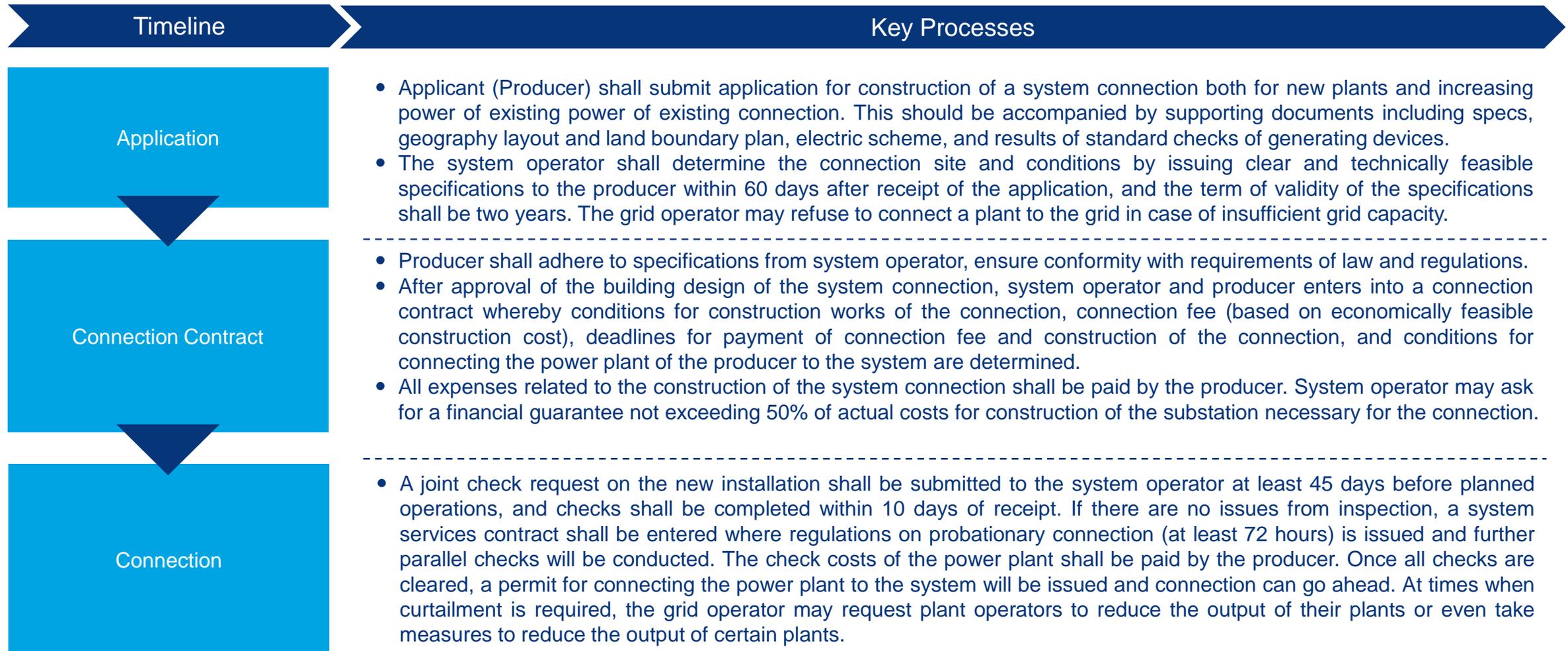
National Energy and Climate Plan (NECP 2021 - 2030)

- NECP 2021 - 2030 is a communication drawn up to meet the requirement laid down by EU regulations on governance of the Energy Union and climate action. Notable targets include:
 - Total greenhouse gas emissions in 2030 should be less than 45% vs 1990.
 - At least 45% of gross final consumption of energy to come from RES in 2030.
 - Reduce imports of energy and energy resources from third countries by 50% by 2030 vs 2011 level.
 - Target for buildings to have energy consumption of close to zero: 2019 for government buildings and 2021 for all new buildings.
 - Integration of the electricity networks of the Baltic States and their synchronisation with European networks by 2025.

• Wood Mackenzie's expectations

- Lack of support for new RES installations, but with high penetration of hydro and biomass, Latvia is still ahead of current renewables targets. 2030 RES target was originally 50% of gross final consumption, but it was adjusted down in latest draft. Even so, to achieve the high levels would be challenging without strong RES policy support.
- Renewables support scheme is under major reform and planning. We expect Latvia to follow the auction scheme which Lithuania and Estonia have successfully implemented, and the auctions should be technology neutral. However, there is a lack of updates on new policies currently and actual implementation will take some time once approved.

Overview of connecting to the grid

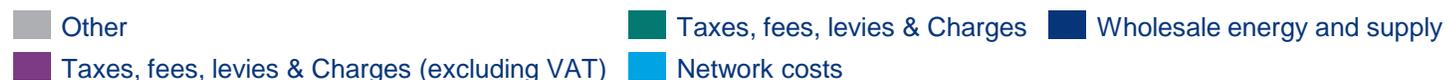


Electricity price in Latvia

Electricity prices for residential consumers*



Electricity prices for non-residential consumers**



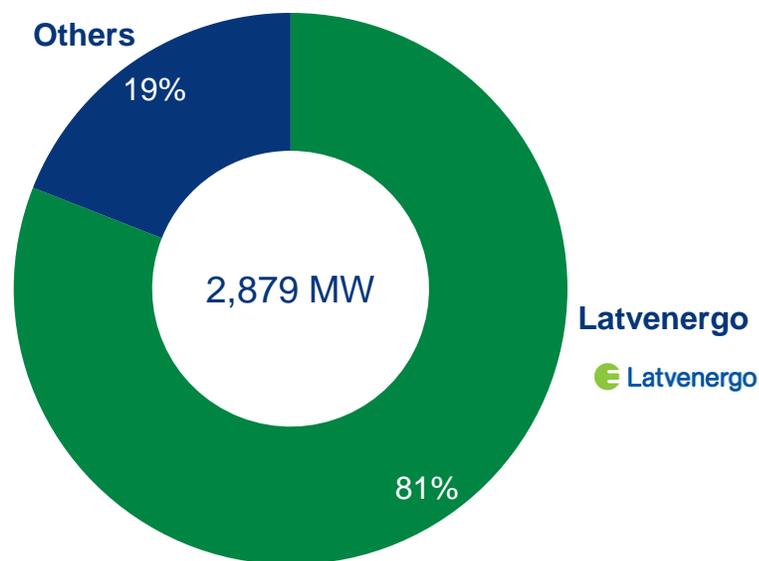
- Prices for residential consumers are constantly higher than prices for non-residential consumers.
- Electricity price is made up of electricity cost (generation & trading), network operator service (transmission & distribution) cost, mandatory procurement cost, and VAT of 21%. Main components of the prices are network operator service and electricity cost.
- Liberalisation of the retail market began with large industrial consumers in 2007, and was completed in 2015 with households able to choose their preferred electricity supplier as well. With the shift away from regulated prices, there was an increase in residential tariff post liberalization.
- With the interconnectivity with rest of Europe, prices are more responsive to European price movements and prices on the Nordpool Electricity Market.

Note: Taxes, fees, levies and charges include VAT, Environmental taxes, Capacity taxes and Renewables taxes

Note: *prices are indicative of medium standard residential consumption between 2500-5000 kWh. **prices are indicative of medium standard non-residential consumption between 500-2000 MWh

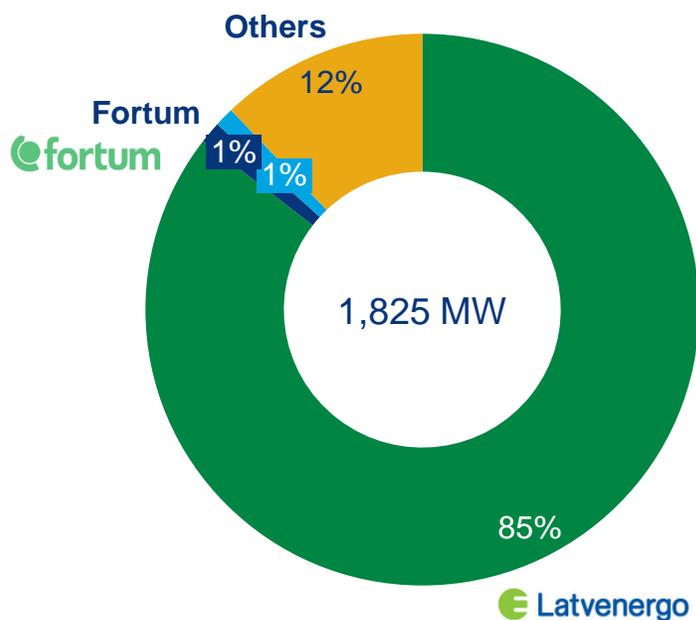
Latvenergo, dominates the Latvian generation market

In 2019, Latvenergo has an installed capacity of 2,591 MW, around 90% of the total capacity in Latvia (Based on Latvenergo annual report).



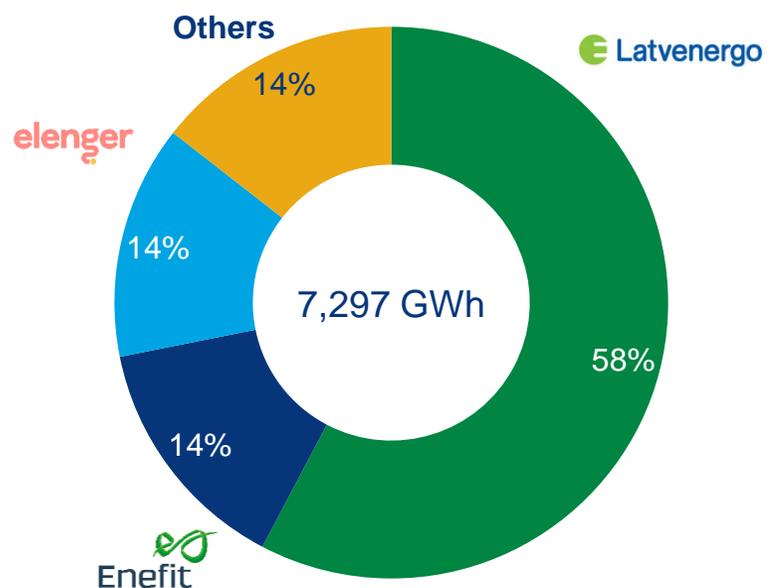
Name / Owner	Overview
Plavinas HPP / Latvenergo 	The 908 MW Plavinas HPP is the largest hydropower plant by installed capacity in the Baltic states and one of the largest in the European Union. It ensures stability of the power system in the event of unplanned outages or accidents at base plants, and also synchronous compensator for voltage regulation in high voltage networks.
Riga CHPP-2 / Latvenergo 	The plant is the most efficient and advanced combined-cycle power plant in the Baltics. It comprises two combined-cycle gas turbine units and five water boilers. The capacity of the plant is 832 MW (in cogeneration mode) or 881 MW (in condensation mode).
Riga HPP / Latvenergo 	The 402 MW Riga HPP is the newest of the Daugava hydropower plants. It also serves as a synchronous compensator for voltage regulation in high voltage electricity networks.

Top 3 Renewable Energy generation companies



RES	Overview
Latvenergo 	Latvenergo’s renewable portfolio includes hydro (1,558 MW from Daugava Hydropower Plants and 0.8MW from Aiviekste HPP), wind (1MW from Ainazi WPP).
Fortum 	Fortum owns the first large-scale biomass CHP unit, 23 MW Jelgava Plant which was commissioned in 2013 in Latvia. It uses local woodchips as a source of energy. The plant also generates heat for district heating. Electricity produced is sold in free market and to some large industrial customers.
Energy Ventures OÜ	Energy Ventures OÜ is the owner of the largest wind farm in Latvia, 20.7 MW onshore Pope Wind Farm located at Kurzeme.

Top 3 Electricity Retailers



Retailer	Overview
<p>Latvenergo</p> 	<p>Latvenergo is one of the largest electricity traders in the Baltic states, trading electricity and natural gas as well as an extensive range of related products and services under the Elektrum brand. In 2019, it sold 4,211 GWh (58% of market share) to its customers which includes more than 20,000 business customers and 700,000 households.</p>
<p>Enefit</p> 	<p>SIA Enefit is one of the largest electricity and gas traders in Latvia. In addition to the widest range of energy purchasing products on the market, Enefit also offers technical solutions and support tools for companies to improve energy efficiency, as well as solar panel solutions for households. In 2019, it supplied 1,031.92 GWh of power to customers in Latvia.</p>
<p>Elenger</p> 	<p>Elenger, subsidiary of Eesti Gaas, is one of the largest and most experienced private energy groups in the Baltic region, with roots in 1865. In 2019, Elenger reported 1 TWh of energy sales in Latvia.</p>

Summary table of top 10 renewable energy asset owners

Owner	Business model	Largest project to date	Market share*	Description
 Latvenergo	Owner/operator	Plavinas (868 MW Hydro)	84.8%	Latvenergo is a state-owned electric utility company in Latvia. The group has energy production portfolio, which mainly consists of hydropower plants and thermal power plants.
 fortum	Owner/operator	Jelgava Power Station (23 MW Biomass)	1.3%	Fortum’s Latvian operations are focused on district heating and electricity production. They operate the Jelgava CHP plant. According to the company, they are currently working on another “circular economy and fuel diversification” project in the area.
Energy Ventures	Owner/operator	Kurzeme/Pope (20.7 MW Wind)	1.1%	Energy Ventures OU operates a 19.8 MW wind park in Latvia.
Veju Parks	Owner/operator	Grobina (19.8 MW Wind)	1.1%	Veju Parks operates a 19.8 MW wind park in Latvia.
Clear Energy Holdings	Owner	Liepaja (6.9 MW Wind)	0.4%	Clear Energy Holdings SA operates a 6.9 MW wind park in Latvia.

Note: * Of total biomass, biogas, wind, large hydro, and solar capacity

Source: Wood Mackenzie, Company Websites

Summary table of top 10 renewable energy asset owners

Owner	Business model	Largest project to date	Market share	Description
 DP CleanTech	Owner/operator	Getlini Power Station (6.3 MW Biomass)	0.3%	DP CleanTech is a global biomass energy company, specialized in biomass and clean energy power plants.
 HoSt BIO-ENERGY INSTALLATIONS	Owner/operator	Lizums Power Station (3.3 MW Biomass)	0.2%	Dutch company HoSt's activities focus 100% on the technological development of waste-to-energy systems for the processing of biomass and waste flows and the supply of systems for the sustainable generation of energy from biomass and waste.
Enercom Plus	Owner/operator	Enercom Plus (2.7 MW Wind)	0.1%	Enercom Plus operates a 2.7 MW wind park in Latvia.
 Enefit	Owner/operator	Valka Power Station (2.4 MW Biomass)	0.1%	Enefit is a subsidiary of Estonian, Eesti Energia – a large group of electricity generation and trading companies in the Baltic States.
Sia Lenkas Energo	Owner/operator	Liepaja (2 MW Wind)	0.1%	Sia Lenkas Energo operates a 2 MW wind park in Latvia.

Note: * Of total biomass, biogas, wind, large hydro, and solar capacity

Source: Wood Mackenzie, Company Websites

Summary of Technologies

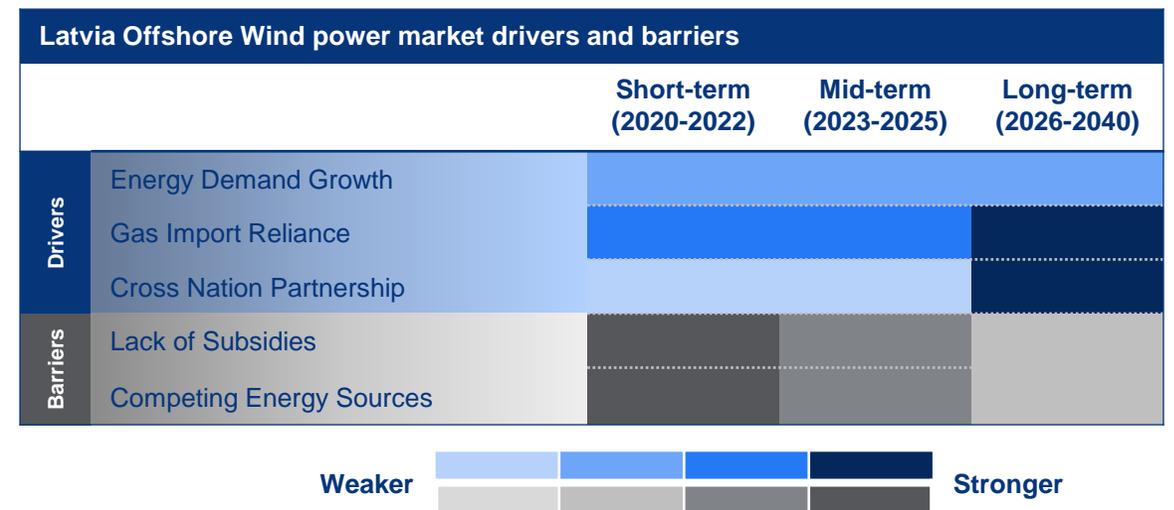
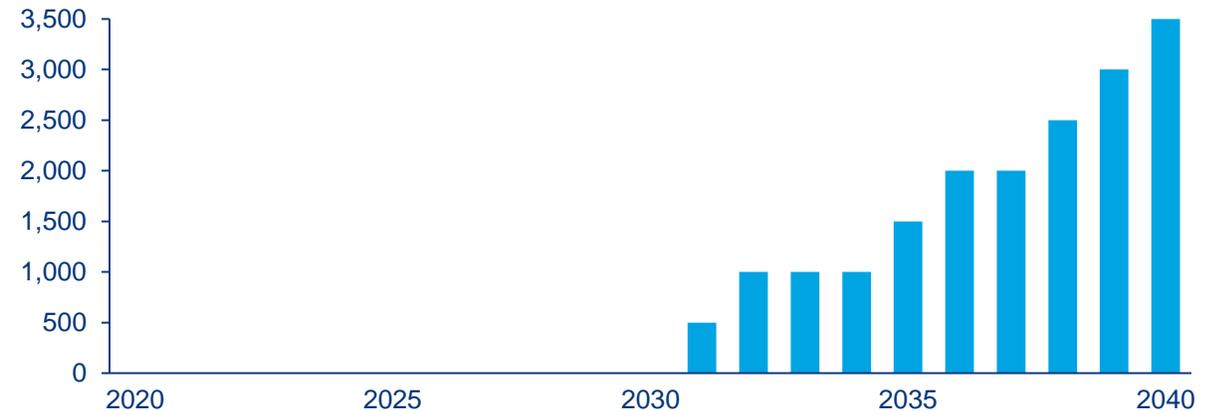
	Offshore Wind		Onshore Wind		Solar	
	Current	Beyond 2030	Current	Beyond 2030	Current	Beyond 2030
Policy Support						
Cost Competitiveness						
Construction Time						
Ease of Starting-up						
Overall Competitiveness						



Offshore Wind

- Latvia and Estonia are currently considering a joint 1 GW Offshore Wind Project. The cooperation is expected to make offshore wind more affordable.
- However, this is expected to take some time before it materializes as both parties will need time to short list potential sites, and RES requirements should come from other competing sources. As such, we expect the auction to materialize in the second half of the decade, coming online only in 2031.
- Latvia’s draft National Energy and Climate Plan envisages an increase in total onshore and offshore wind power capacity to at least 800 MW over the next 10 years, but with lack of subsidies or policies encouraging new RES installations, growth is expected to be minimal for the decade.
- However in the long term with cost competitiveness and successful partnership with neighbouring Baltic nations, perception towards offshore wind is expected to evolve and stronger growth is expected in the next decade.

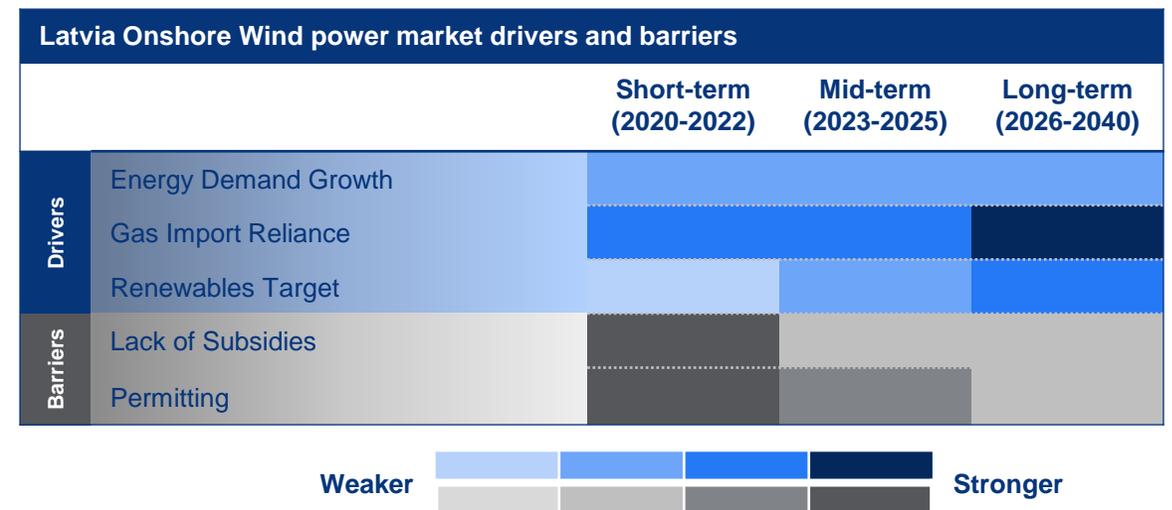
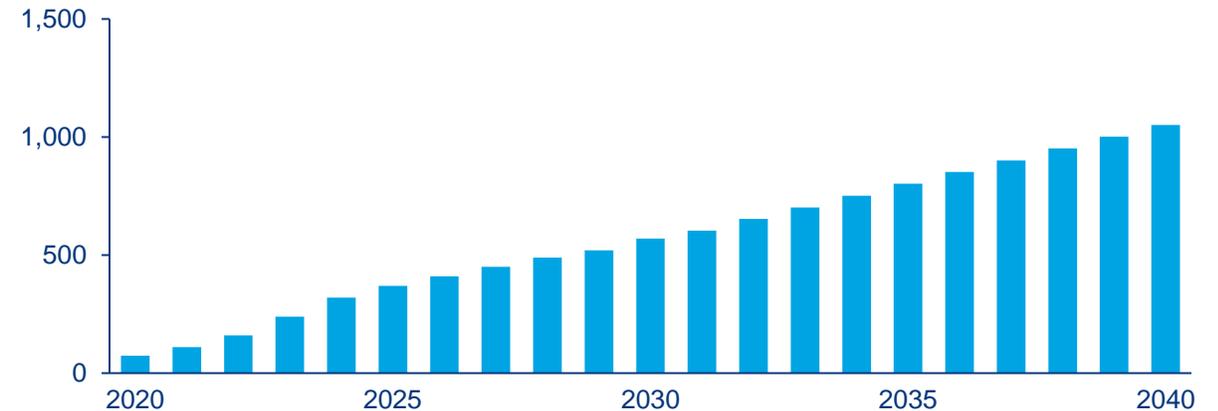
Offshore Wind PV Cumulative Capacity (MW)



Onshore Wind

- By 2019, the total net operating capacity for wind power in Latvia was only 65MW. With about 40% renewables in its energy mix as of 2019, Latvia is on track to reach its 40% renewable energy target for 2020 thanks to a high penetration of biomass and hydro.
- There is currently no form of incentive for wind power development in Latvia as FIT support has been suspended for new plants since 2011, which is why new projects will sell electricity at the wholesale power market.
- Interference with military radars in the East are the main planning barrier, but efforts to promote long-term lease agreements in forests provide an upside.
- The government is refraining from granting a route to market to projects that could claim eligibility under the FIT scheme in order to limit public expenditure.
- The Ministry of Economics submitted the National Energy and Climate Plan for 2021-2030 to the EU which doesn't set specific targets for onshore wind, but indicates measures to promote the technology along with offshore wind.
- In March 2019, Swedish developer Eolus failed to obtain an EIA for a 51-turbine (~250MW) project originally scheduled for COD in 2022 in Dobele and Tukum. The project had tip heights of up to 240m and met local opposition.
- Developers continue scouting for new sites to build projects that can sell electricity to the neighboring Lithuania and Estonia.
- Utilities are expected to become more involved in non-hydro renewables over the next decade, thus supporting long-term market growth.

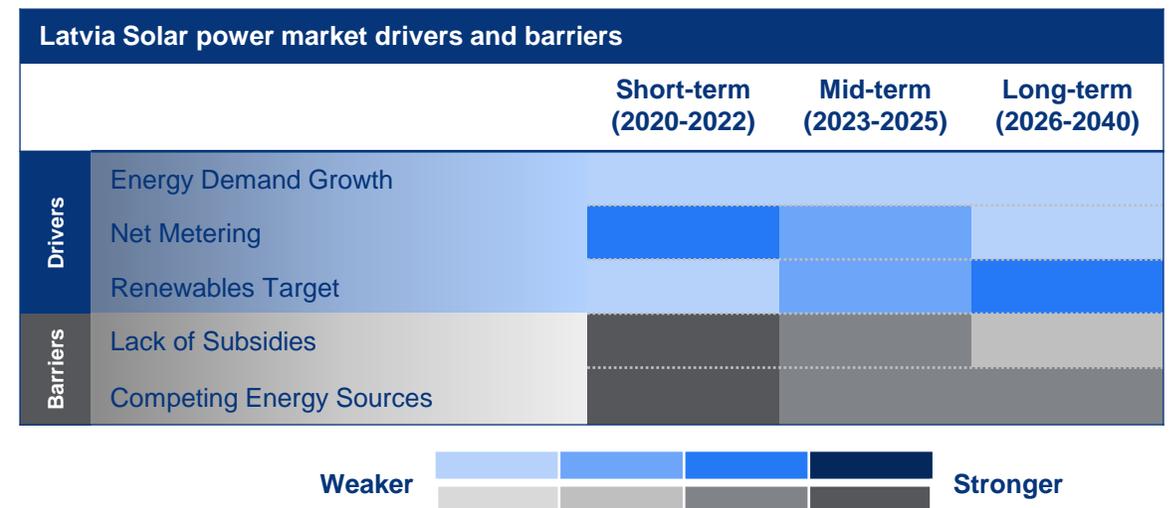
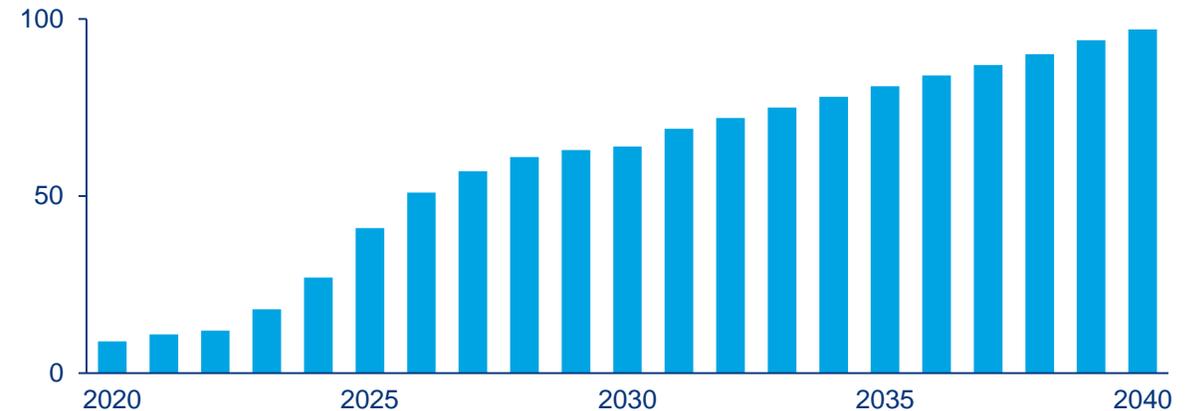
Onshore Wind PV Cumulative Capacity (MW)



Solar PV

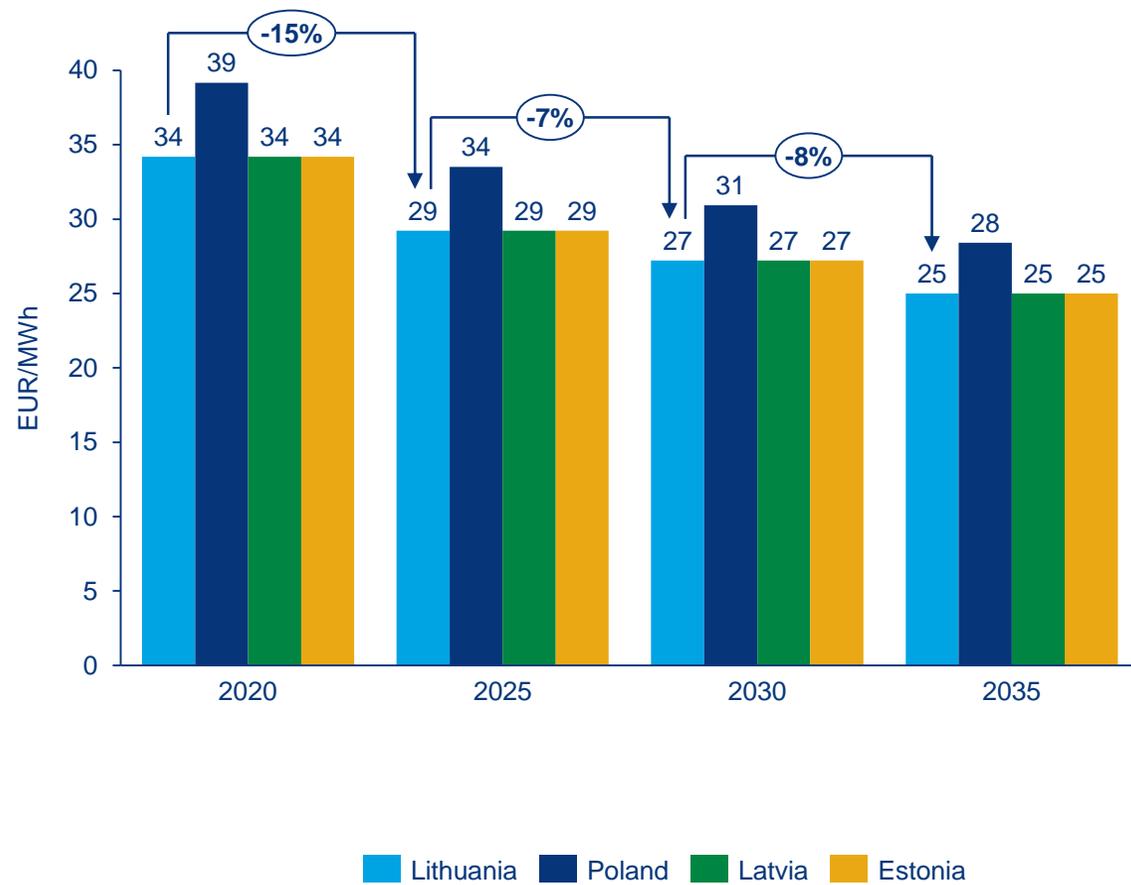
- Latvia has achieved past renewable targets due to high penetration of biomass and hydro. However, to achieve the 50% target set out for 2030, the country needs to increase penetration in other RES types as well.
- There is a lack of subsidies at the moment with the original Feed-in Tariff scheme suspended. This has resulted in stagnating RES growth, and is expected to continue in the short term future. Talks are underway to revamp the subsidies system in support of broader EU goals, but this is expected to be rolled out only in the mid-term.
- The only factor promoting RES is net metering for <10 kW installations launched in 2017. This is most applicable for DG solar PV installations given the small capacity.
- Market is likely to grow very slowly until more support measures are implemented

Solar PV Cumulative Capacity (MW)



Appendix

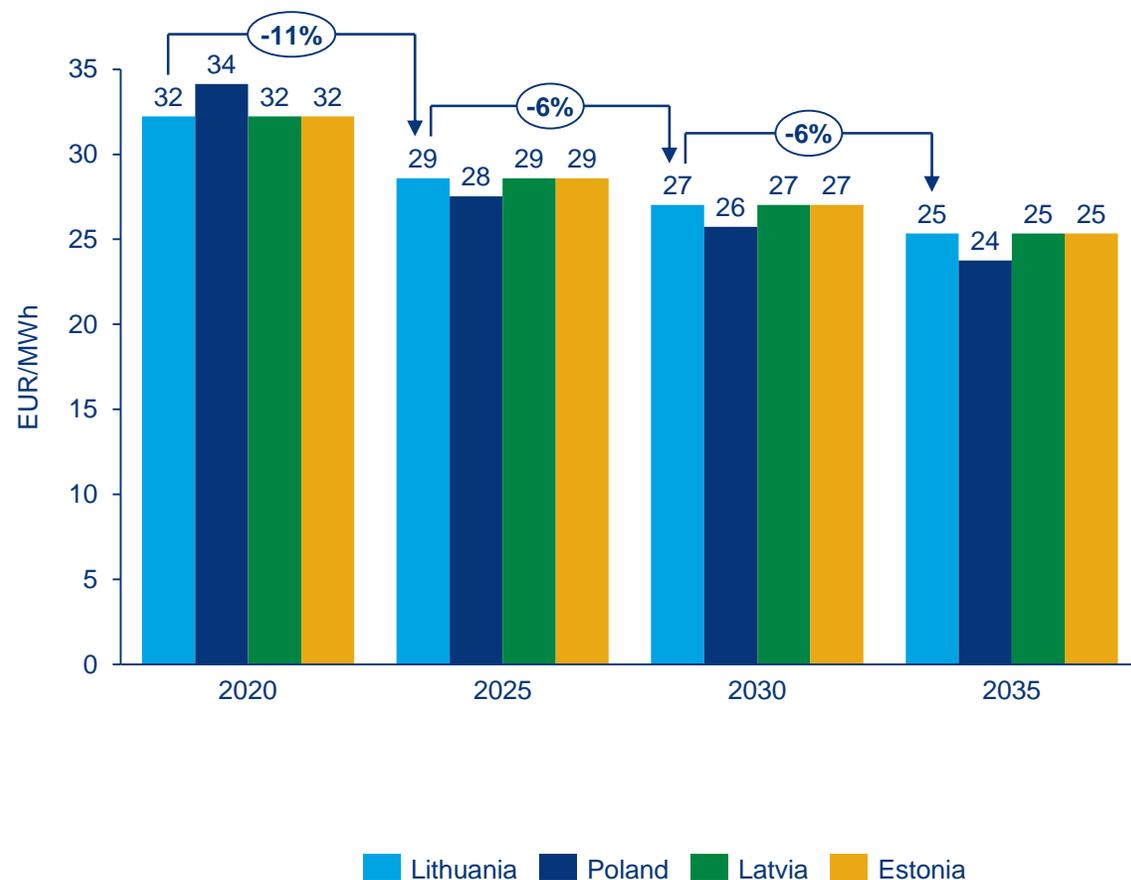
Wind LCOE expectations



LCOE inputs

Metric		2020	2025	2030	2035
Design life	Yrs	30	30	30	30
Capacity Factor	%	35-40	35-40	35-40	35-40
Degradation	%	0.3	0.3	0.3	0.3
Total CAPEX (hard costs + soft costs)	EUR/kW	1036	498	296	204
WACC	%	5	5	5	5
WTG	EUR/kW	629	244	110	50
EBOP	EUR/kW	121	58	28	13.1
CBOP	EUR/kW	94	44.8	21.	10.2
Dev Fees	EUR/kW	43.7	21	12.5	8.6
Fixed O&M	EUR/kW/yr	17.6	17.6	17.6	17.6

Solar PV LCOE expectations

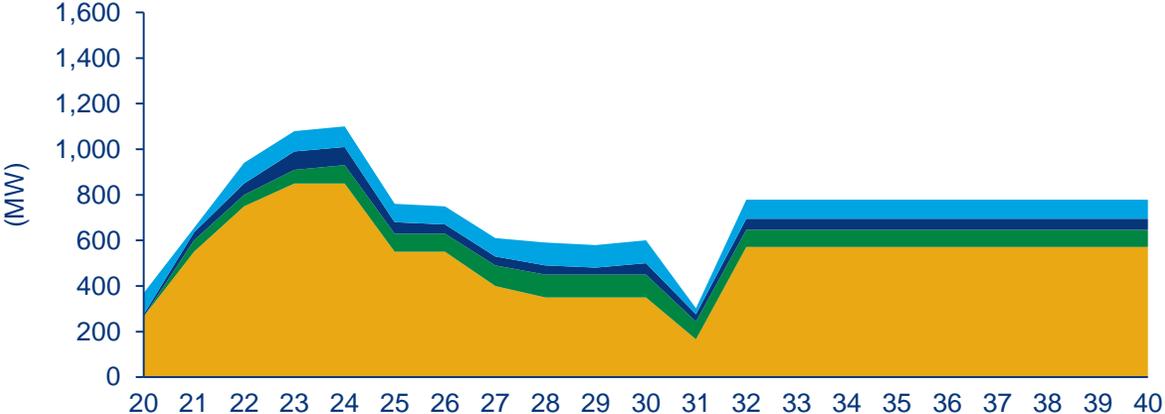


LCOE inputs

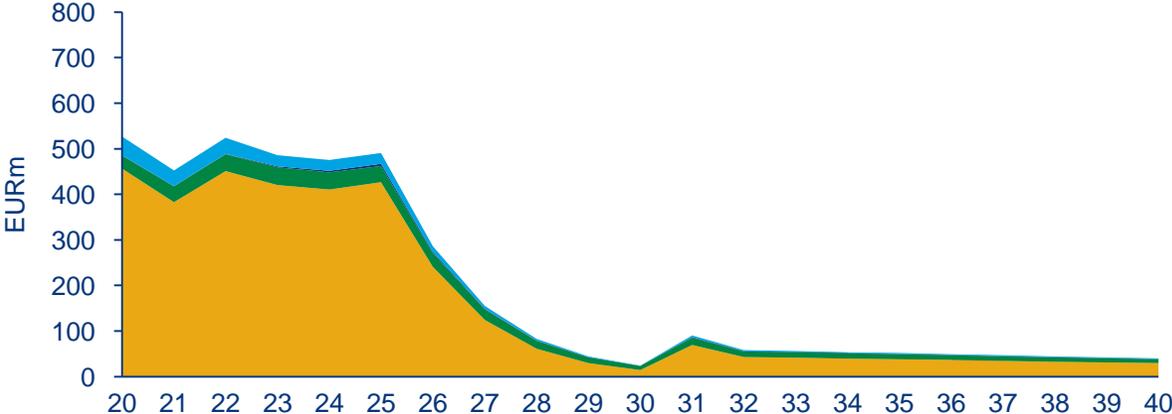
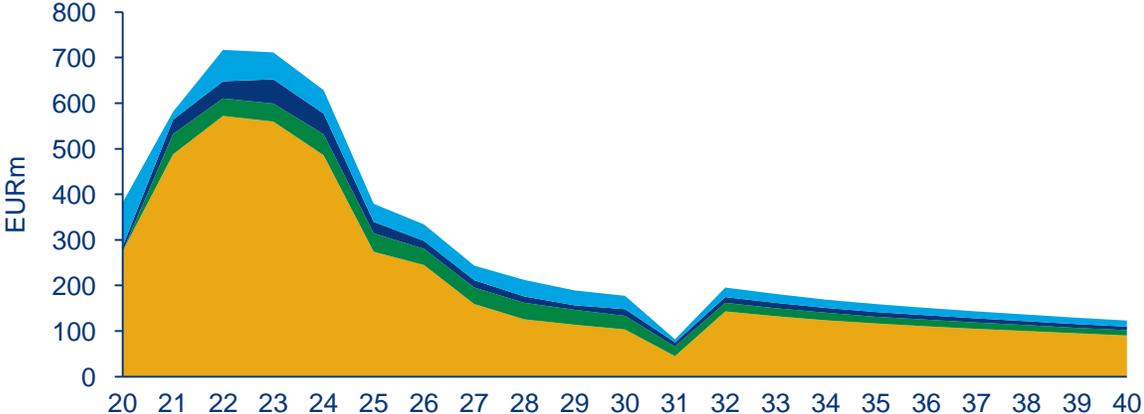
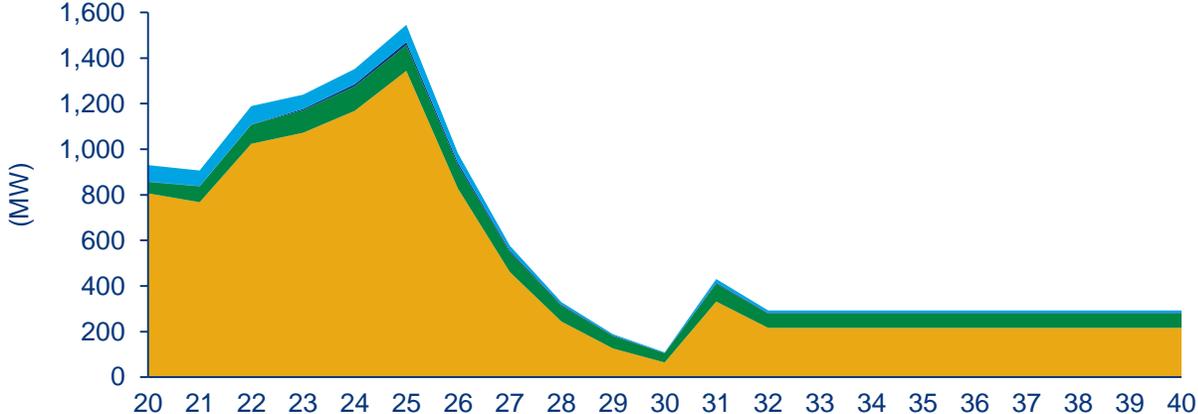
Metric		2020	2025	2030	2035
Design life	Yrs	30	30	30	30
Capacity Factor	%	24-25	24-25	24-25	24-25
Degradation	%	0.3	0.3	0.3	0.3
Total CAPEX (hard costs + soft costs)	EUR/kW	566	317.3	220.9	177.3
WACC	%	5	5	5	5
Panels	EUR/kW	233.2	90.3	41.8	19.9
EBOP/CBOP	EUR/kW	132	63	30	14.3
Dev Fees	EUR/kW	23.9	13.4	9.3	7.5
Fixed O&M	EUR/kW/yr	8.8	8.8	8.8	8.8

Steep decline in costs across technologies will see a fall in overall RE spend despite growth in forecast capacity

Onshore wind forecast in MW and overall spend



Solar pv forecast in MW and overall spend



 Estonia  Latvia  Lithuania  Poland

National policy and regulation is increasingly shaped at the EU level

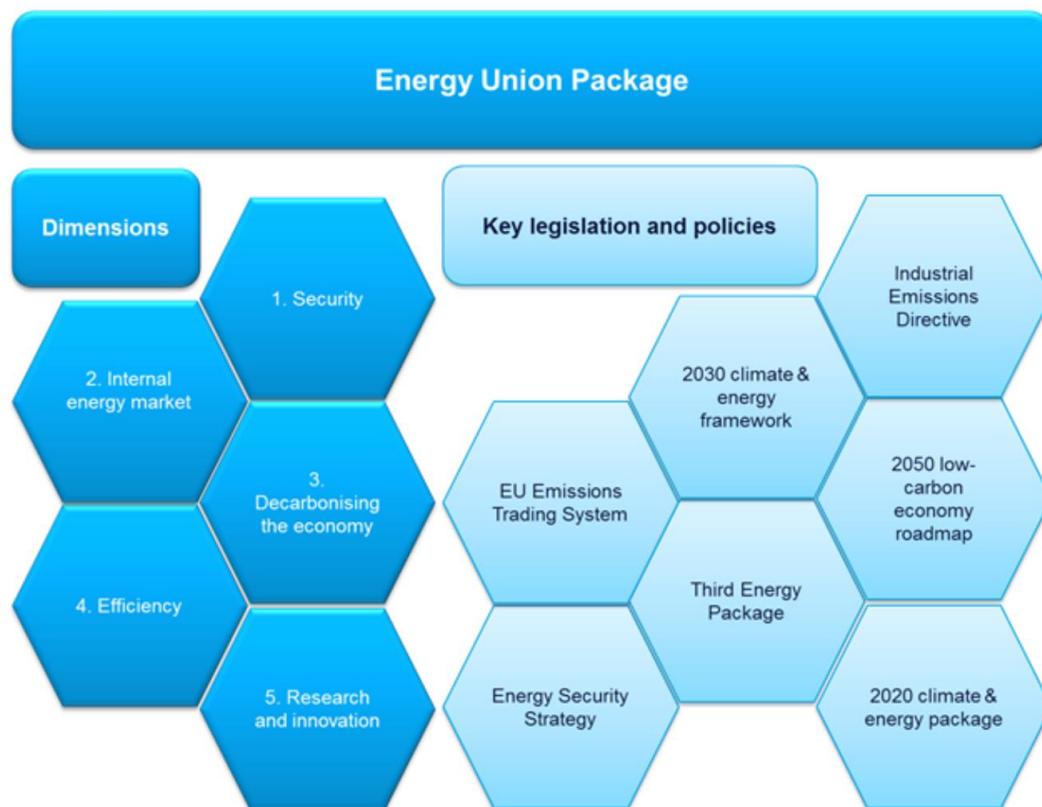
Gas infrastructure strategies in the Baltics are informed primarily by the EU's Energy Union Package from 2015 which promotes energy security through transnational integration

In February 2015 the EC presented its Energy Union package. The framework is based on ensuring energy security, sustainability and competitiveness. It aims to provide an integrated legal framework across the region that consolidates energy regulation at a European level rather than national.

Dimension 1 covers energy security, solidarity and trust and aims to improve Europe's ability to overcome supply disruptions, reduce dependency on particular fuels, energy suppliers and supply routes, and ensure affordability of energy supplies.

Particular implications for gas:

- EU gas supply security rules
 - Ensures appropriate tools to prepare and manage the effects of a gas shortage
 - Natural gas companies required to notify the EC of contracts relevant to the security of gas supply as soon as they are signed or amended. The EC would intervene if market abuses are identified
 - Introduces a mandatory solidarity principle that ensures supply to all protected customers within a regional risk grouping
- LNG and gas storage strategy
 - Prioritises infrastructure development by building new terminals in appropriate locations or improving access to existing terminals
 - Emphasises the need to complete the internal gas market, eliminate the remaining regulatory, commercial and legal barriers, and provide access to regional gas hubs



Two trans-national structures define the Baltic gas market(s)

Estonia, Finland and Latvia on one hand and Estonia, Latvia and Lithuania on the other create integrated markets, but also imbalance

2020 saw the establishment of a single gas transmission tariff zone

- The zone (also known as a gas entry-exit zone) consists of Estonia, Finland, and Latvia
- The three states will have common entry points for pipeline access and no transmission fees within the zone
- Lithuania declined to participate in the zone in 2017, and therefore, Lithuanian gas suppliers will have to pay a fee at the Kiemėnai entry point
- Revenue from entry points is accordingly to be coordinated between the transmission system operators of the participating states

Since 2012 there has been a virtual trading platform – called Get Baltic – that allows traders from the three Baltic states to trade gas (Lithuania, Latvia, Estonia)

The GIPL gas pipeline is currently under construction and expected online in 2021

- GIPL (Gas Interconnection Poland-Lithuania) aims to connect the gas transmission systems in Poland and Lithuania and, consequently, enable the integration of the isolated gas markets in the Baltic States and Finland with Poland and other EU gas markets
- The project has been recognised by the European Commission as a Project of Common Interest (PCI) and the European Investment Bank (EIB) has signed a €65 million loan agreement with Lithuanian gas transmission system operator AB Amber Grid to finance the construction of the Lithuanian section of the planned gas interconnection between Poland and Lithuania.

Intra-national gas infrastructure overview



- Floating Storage Regasification Unit (FSRU)
- LNG Terminal
- Underground Gas Storage (UGS)
- Existing interconnection
- ⋯ Future interconnection

Poland and Lithuania are the Baltics’ LNG demand centers at six bcm per year

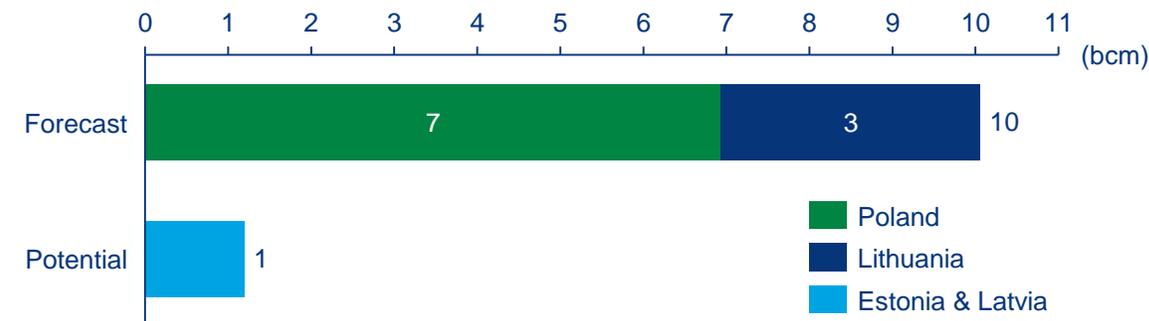
More integration between the countries’ gas markets could unlock the potential from Estonia and Latvia resulting in approximately one additional bcm per year between 2020-2030

We expect the Baltic market to become more closely integrated over time. E.g. A shared balancing zone across the region is planned by 2024. Consequently, it may become more appropriate to treat Finland, Latvia and Estonia as a single gas market. If this were the case, the capacity at the Klaipeda LNG terminal in Lithuania would not be sufficient to meet the maximum LNG demand scenarios for both Latvia and Estonia.

A new LNG terminal has been on the drawing board since 2009

- “Baltic LNG” is a 13-mmtpa liquefaction terminal planned by Gazprom in the Leningrad Oblast.
- The proposed plant would include two trains of 6.5 mmtpa and is planned to be built on the coast of the Gulf of Finland near the port of Ust-Luga.
- If realized, we forecast that the plant will ramp up throughout 2026 with LNG capacity at 61% of its nominal capacity in its first year and ramp-up to 98% in its second year.
- The project is still speculative as it has been abandoned and has changed commercial structure several times since 2009

Forecast and potential LNG demand by country (2020-2030 average)



The Klaipėda LNG terminal is exempt from regasification costs

- The Lithuanian state exempted the FSRU from regasification costs until at least 2024, although regasification should happen continuously on the floating platform
- The support is authorized by the European Commission
- The state aid given by Lithuania to Klaipėda LNG terminal may be considered to constitute a serious impediment to full market integration in the region

Natural gas retail in the Baltics is relatively consolidated compared to an EU average

Estonia is among the most consolidated gas markets in Europe despite aspirations for more fragmentation and thus competition in the market in line with EU goals

Natural gas IMPRO* market fragmentation (2018)

	# of IMPRO entities	# of main IMPRO entities (>5% market share)	Cumulative main IMPRO market share
Estonia	1	1	100%
Latvia	1	2	91%
Lithuania	6	3	97%
Poland	36	1	88%

Natural gas retail market fragmentation (2018)

	# of retailers	# of main retailers (>5% market share)	Cumulative main retailer market share
Estonia	37	1	89%
Latvia	11	2	87%
Lithuania	5	2	88%
Poland	106	2	87%

Note: * IMPRO = Importers and producers

Source: Wood Mackenzie, Eurostat

Since July 2004, small business consumers in the EU have been free to switch their gas or electricity supplier, and in July 2007 this option was extended to all consumers. Independent national regulatory authorities have been established across the Member States to ensure that suppliers and network companies operate correctly.

- Market consolidation has been observed in several EU countries over the past years,
- Poland and Estonia remain the least fragmented IMPRO markets (along with Finland, who also sees one entity with a market share of 100%)
- Estonia and Finland are also the most consolidated EU retail markets with a single entity in charge of ~90%
- Despite targets by the Estonian government of 32% market share by the largest entity, Eesti Gaas has increased its share over the years
- Expect Lithuania, all countries saw the total number of retailers grow over the past decade, while the number of main retailers was flat or declining

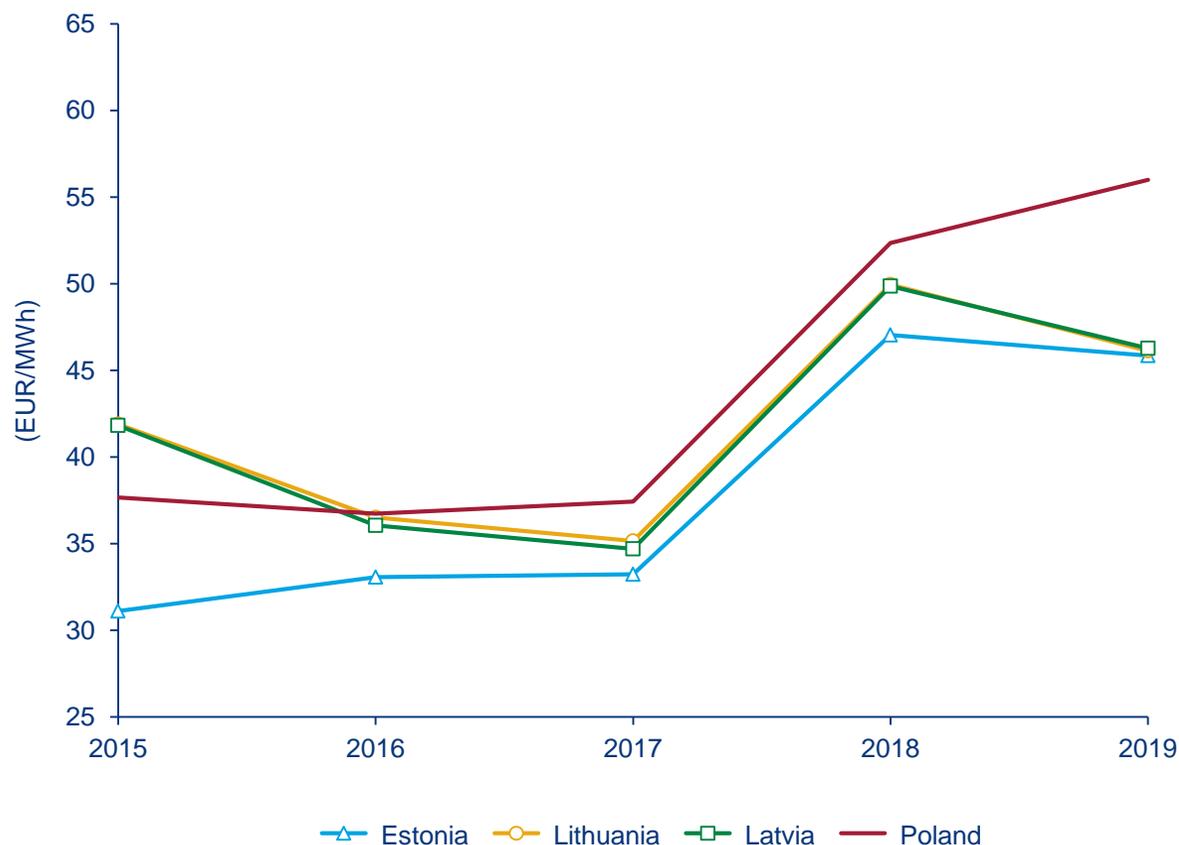


Are there any fundamental changes to key macro metrics expected in context of the Baltic power markets?

- The recent covid crisis has left lasting effects on the global economy and the Baltic markets are no different. Despite countries like Lithuania seeing strong YoY GDP growth, short term hiccups have left markets reeling with a lot of uncertainty
- The Baltic markets, however, are expected to receive generous amounts of support from the EU's recovery fund between the 2020-2024 period. These criteria could be subject to change. The allocation of such funds will depend on the severity of the pandemic caused recession, GDP and average unemployment between 2015-2019
 - Lithuania is expected to receive 13% of its annual nominal GDP in 2019 (€6.3bn)
 - Estonia is expected to receive 11% of its nominal GDP (€3.3bn)
 - Latvia is expected to receive 14.7% of its nominal GDP (€4.5bn)
 - Poland will receive € 160bn in total
- There is a targeted effort to channel these funds towards green initiatives and improve on a country's green and digital transition. There will be a concerted effort to shift away from heavy industries and move towards more energy efficient services and transformation of industry
- An increasing shift towards work from home like arrangements will see a decline in demand for power from the C&I sectors and a possible spoke in residential demand
- Renewables has been most resilient to the Covid impact and will continue to make a stronger case going forward. The pace of the transition to cleaner power will be defined by the pace at which countries are able to bounce back economically and the targeted use of funds being made available

Historical price and future movement expectations – Focus, Lithuania

Historical price development



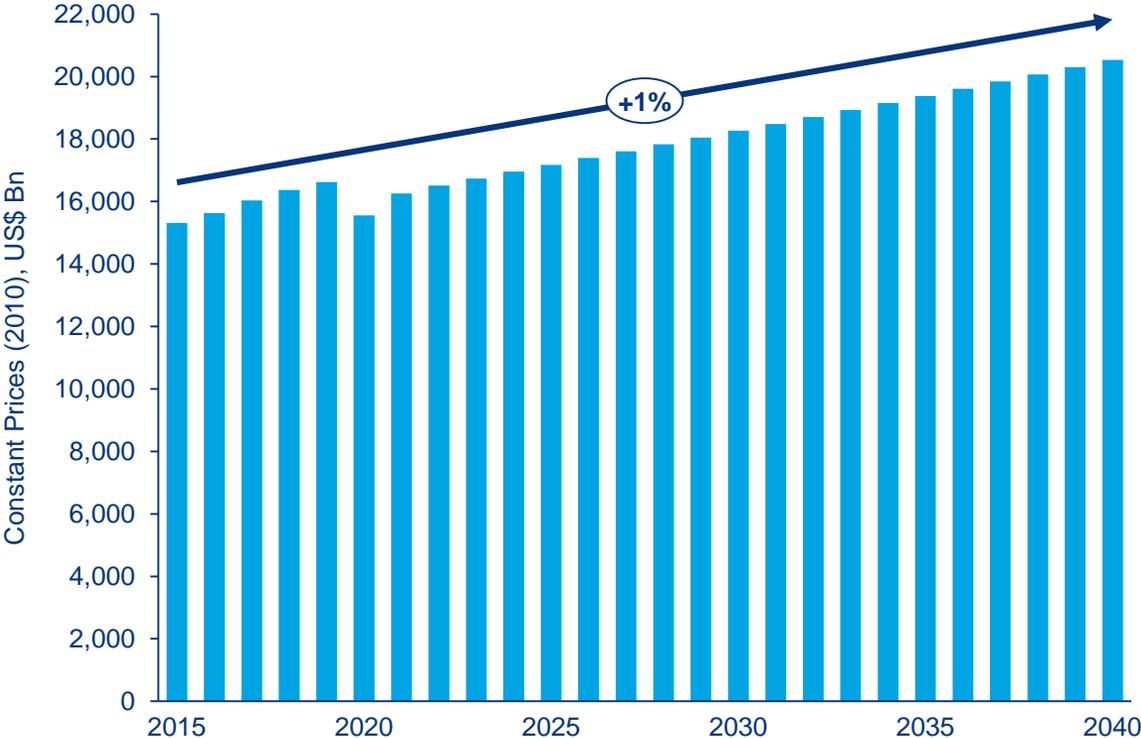
Future price movement expectations and major drivers

Lithuania – Prices expected to move up in the near term and then stabilize

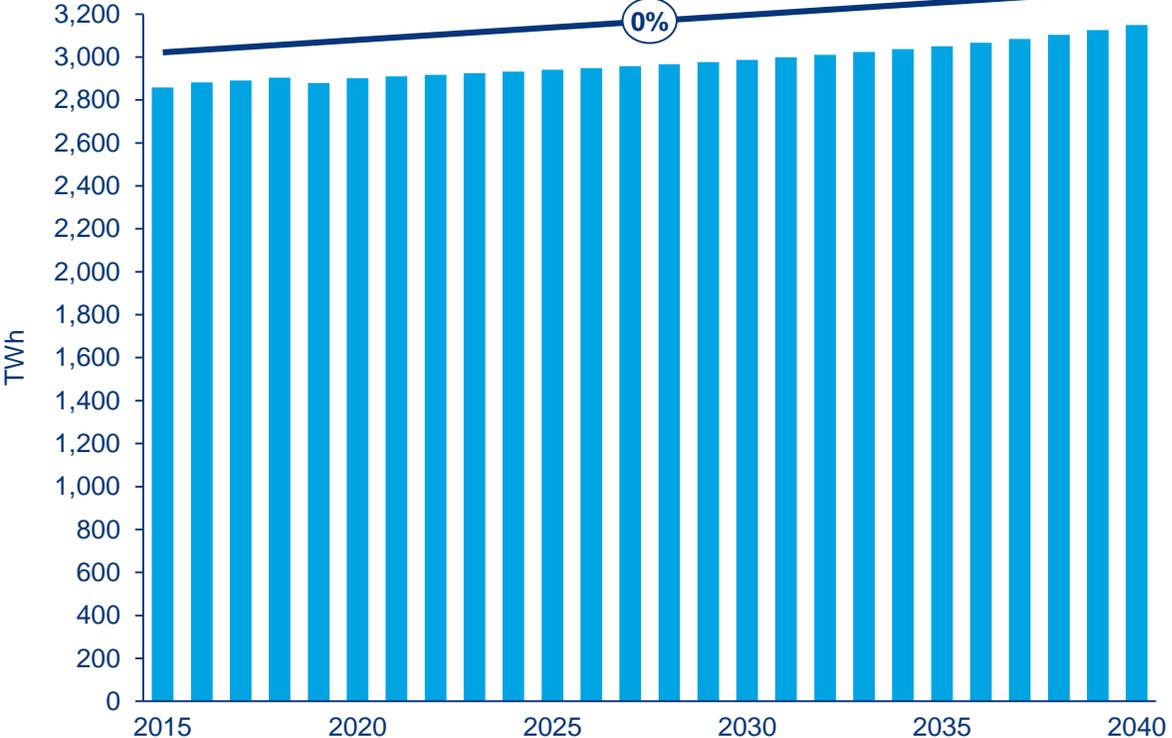
- Given the current scenario, prices are expected to increase in Lithuania as the country looks to synchronize with the rest of the European power network
- Once Belarusian and Russian imports stop (2020 & 2025) the market costs are expected to rise as more expensive marginal generators are utilized, hence seeing a spike in prices in the near term
- This along with the retiring of thermal plants will add further pressure on prices in Lithuania
- Over time continued wind and solar growth will rebalance the supply mix, displacing increasing amount of higher cost supply – average market prices will stabilize
- A higher penetration of hydro can play a significant role in flexibility as the country looks to build more renewables technology
- Carbon prices will tend to rise over time – there will be an influence there from other commodities but the general direction of travel is up. The carbon market background, set against the increasing ambition of emissions reduction targets (extending to net-zero emissions at mid-century), is one of sustained supply-side tightness
- The interconnection with Sweden will provide Lithuania opportunities to source cheaper power and apply downward pressure on prices
- Further more, the launch of the nuclear facility in Finland will see flows increase from Finland to Estonia, Estonia to Latvia and Latvia to Lithuania. Further additions will be seen once the 1.2GW nuclear facility in Finland comes online in 2028
- This will ease some of the pressures on Lithuania’s dependence on Russia and Belarus along with continued renewables development and interconnections with Europe

EU GDP and power demand up to 2040

Annual GDP – EU 27

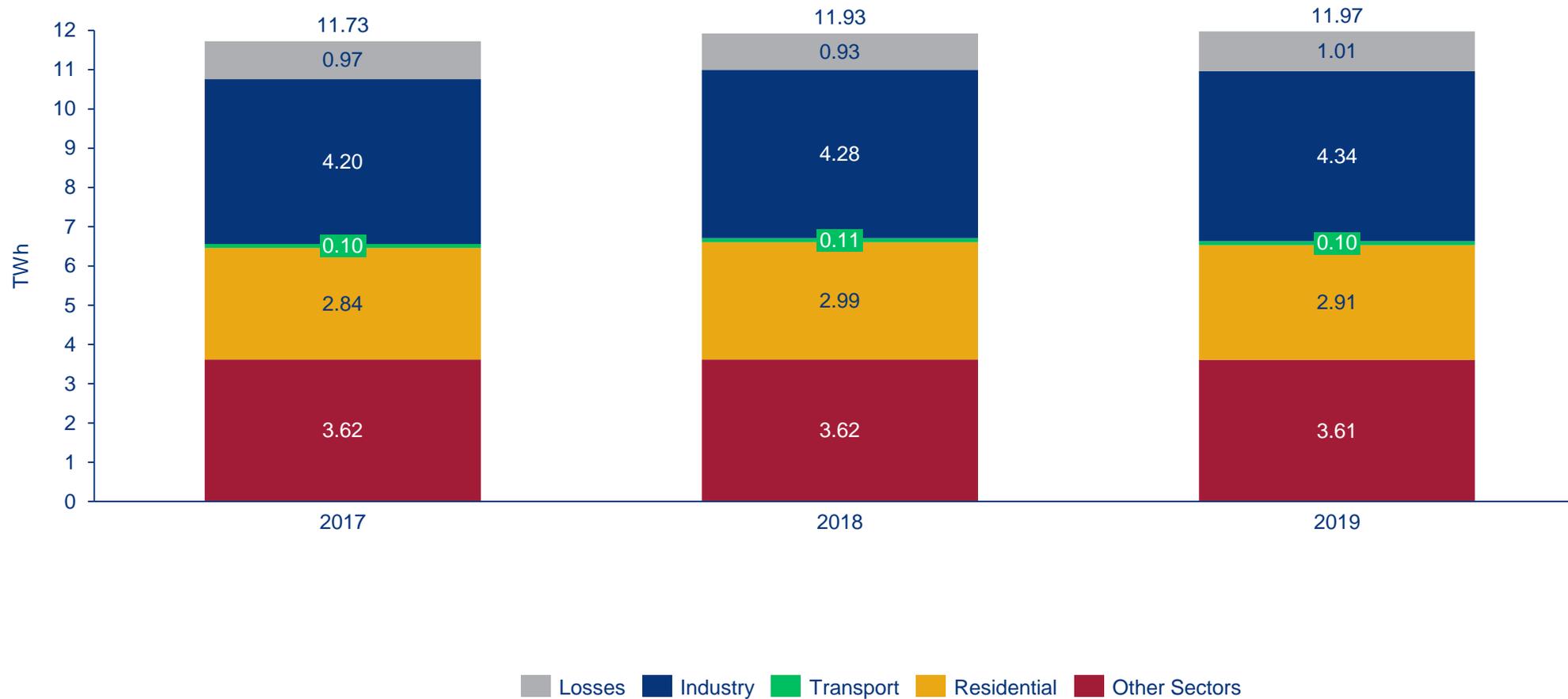


EU27 power demand



Source: Wood Mackenzie, Worldbank

Lithuania, power demand 2017-2019





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