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TRANSMISSION GRID - TO EMPOWER BUSINESS GROWTH AND WELFARE OF THE SOCIETY

October 18, 2016

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TIME	VOLTAGE	PHASE
17:45:22	17:45:22	17:45:22
16:45:22	17:45:22	17:45:22

TYPE	VALUE	UNIT
0.00	-2.31650	Hz
1242		MW
-45	-24	MWh
12	9	MWh
32	33	MWh
-3	18	MWh

PARAMETER	VALUE	UNIT
49.95		Hz

17



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PRESENT: LESSONS LEARNED AND NEW ACHIEVEMENTS FOR BUSINESS GROWTH

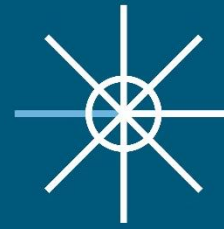


LitPol Link



The first Lithuanian-Polish power link

- 163 km transmission line Alytus-Elkas
- 500 MW HVDC converter station in Alytus
- Total project cost - € 580 million: € 150 million in Lithuania and € 430 million in Poland
- EU funds - € 213 million in Poland and € 35 million in Lithuania
- Operations since 9 December 2015
- Implemented in cooperation with PSE, the Polish TSO



NordBalt



The first Lithuanian-Swedish power link

- 450 km of submarine cable
- 700 MW capacity
- HVDC converter stations in Klaipėda and Nybro
- Total project cost - € 552 million
- EU funds € 131 million
- Operational since 18 February 2016
- Implemented in cooperation with Svenska kraftnät, the Swedish TSO



The challenges: time, people, money

- Average time of infrastructure projects implementation in Europe - 10 years
- Two technologically complex projects of regional importance in parallel
- Specialists involved in two projects simultaneously
- Major financial investment required in short time

From challenges - to lessons learned



Environmental

A complex and completely new process of environmental assessment
The sensitive neighborhood to people, natural reserves, rare species
Crossing the Curonian Lagoon and Curonian Spit - Natura 2000



Legal

Establishing a legal practice (crossing forests, mortgaged land plots, etc.)
Establishing the right-of-way with land owners



Financial

Applying and securing projects funds from CEF - a new financial source of EU
Major financial investment required in short time



Technological

State-of-art technology - first time in the Lithuanian power system
Connecting asynchronous powers systems



International

Crossing the NordStream
Maneuvers of the Russian fleet in the Baltic Sea throughout 2014-2015



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Technology



Environment





NordBalt

Horizontal drilling under the Curonian Spit

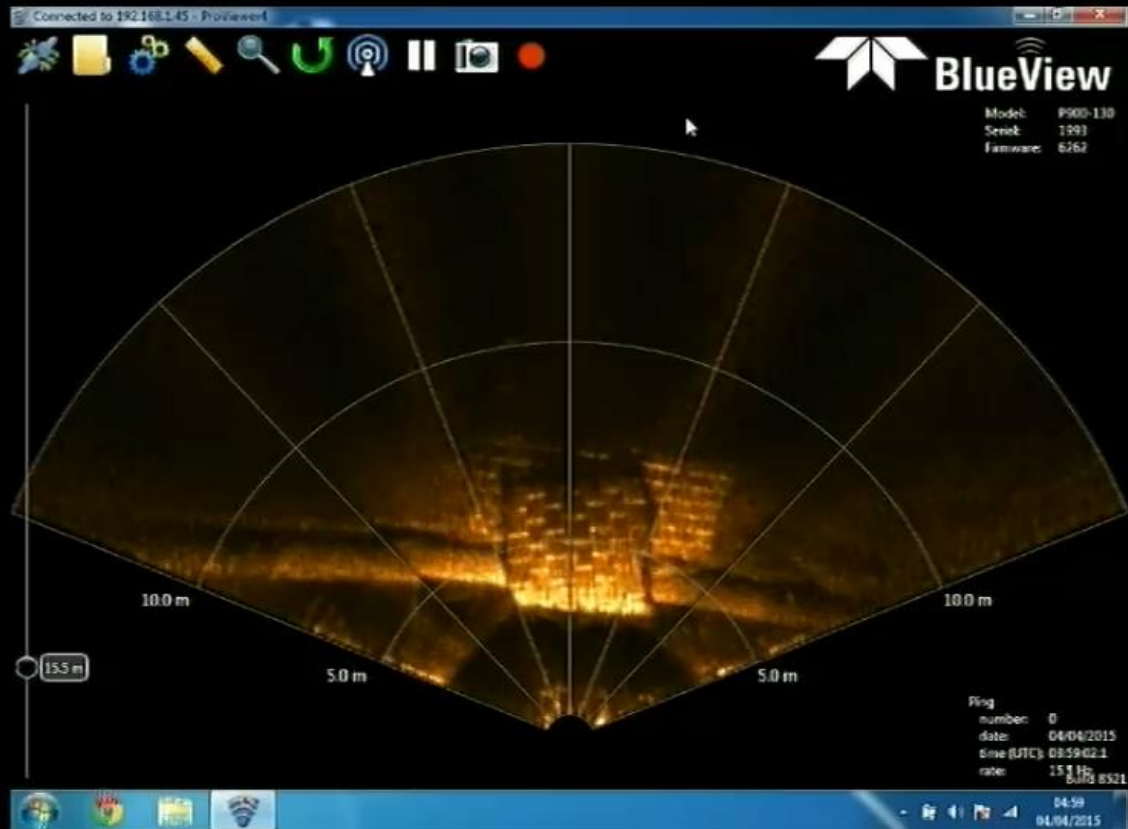
1 640 m under the the
Curonian Lagoon and 800 m
under sand dunes



Crossing with the Nord Stream gas pipeline



Concrete mattresses under and on the cable at a depth of 60 m

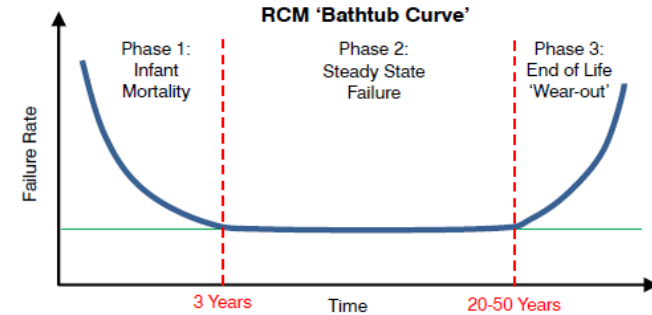
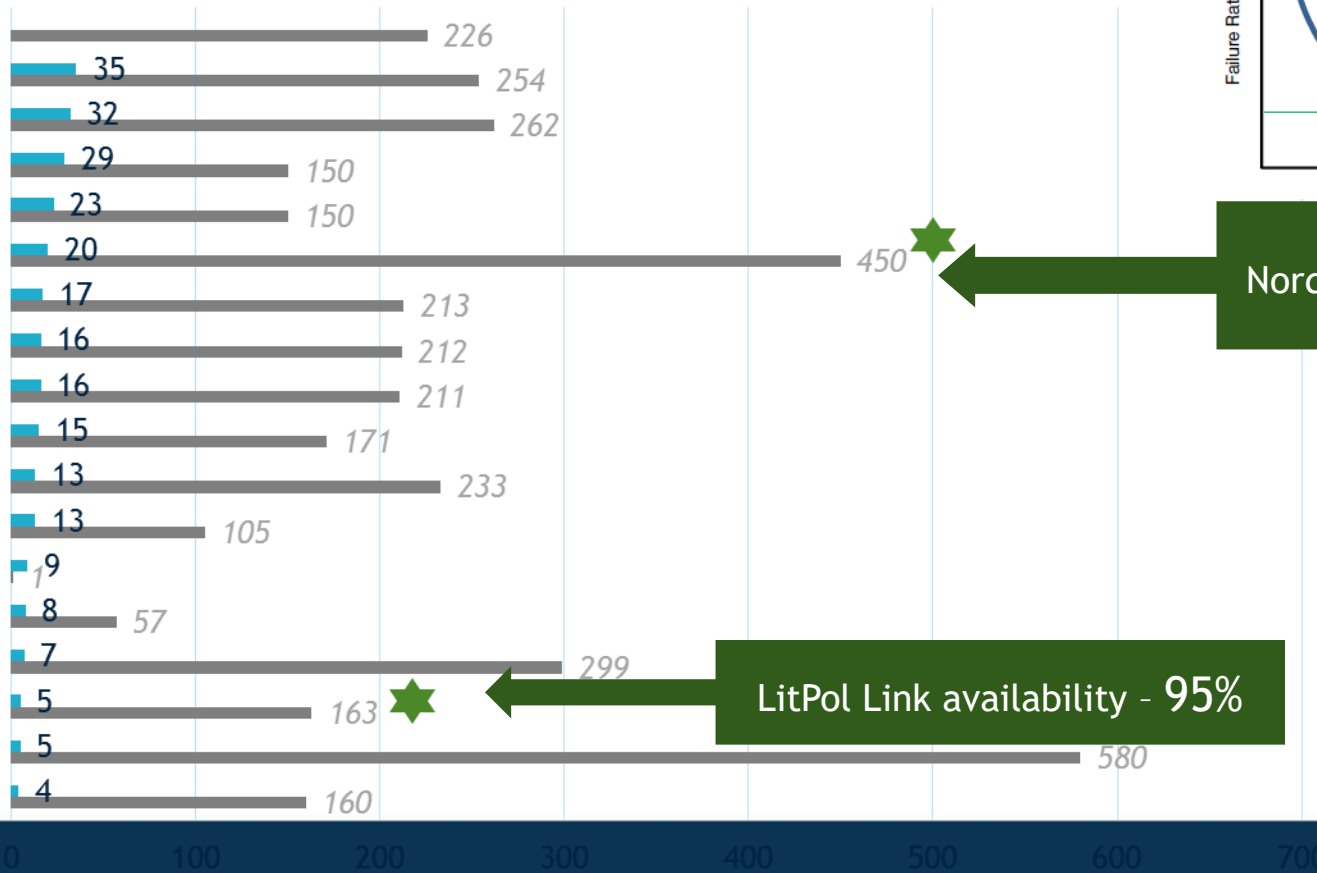


Filling of the sea cable with rubble

58,860 tons of rubble
delivered by 4 ships



HVDC interconnectors statistics

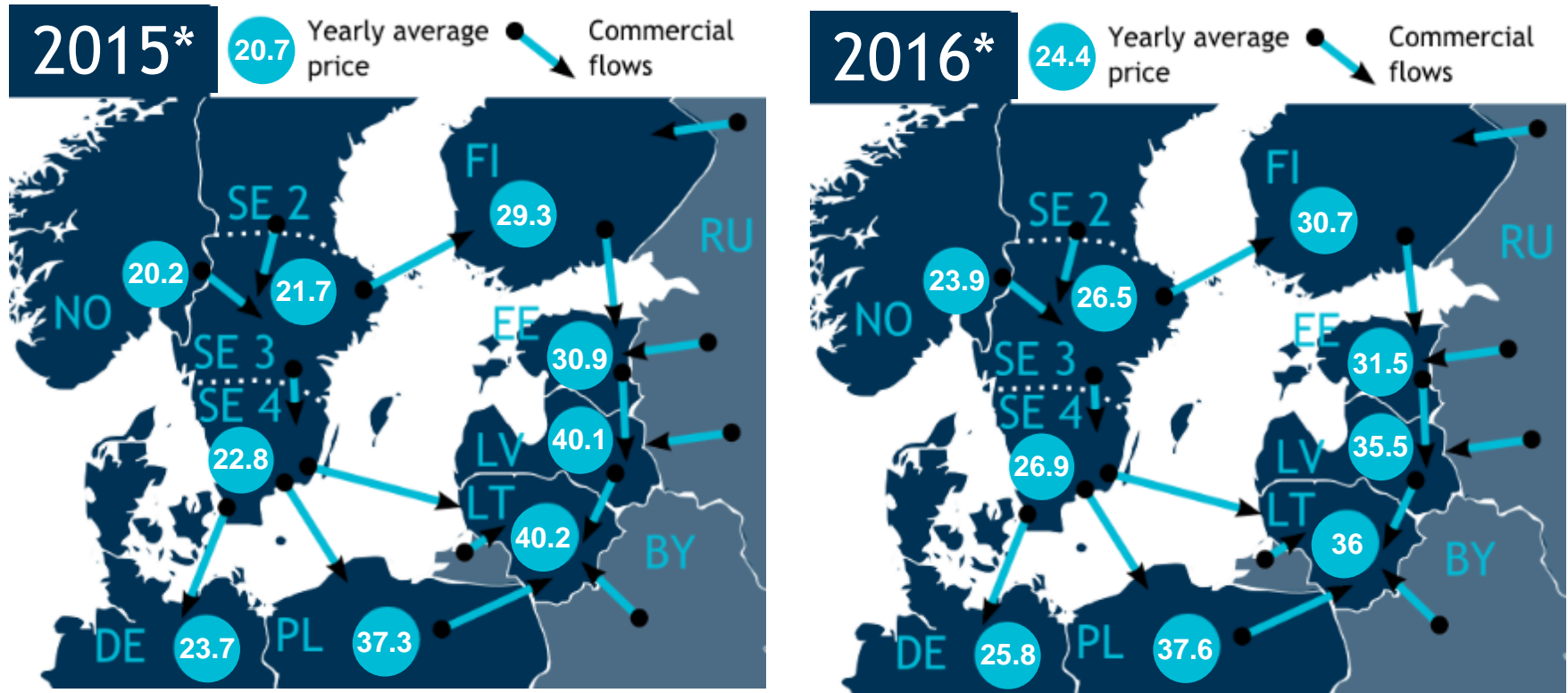


NordBalt availability - 80%

LitPol Link availability - 95%

- Unavailability, % per year
- Interconnector length, km

Impact of new interconnections



- On average 10% price drop in Nord Pool Lithuanian bidding area during January - September
- Import from Sweden to Lithuania
- Power flows from Lithuania to Poland dominate

Investments into grid projects make visible impact

A map of Europe is shown in a light blue color. A dark blue circle highlights the Baltic region, specifically Lithuania, Latvia, and Estonia. Lines radiate from this circle to various parts of the map, including Northern Europe, Russia, Belarus, and the CEE (Central and Eastern Europe) region. The text 'Northern Europe' is located above the circle, 'Russia' to the right, 'Belarus' below the right, and 'CEE' below the circle.

Until 2016

- Highest electricity prices in Lithuania and Latvia
- No interconnections with Western Europe

From 2016

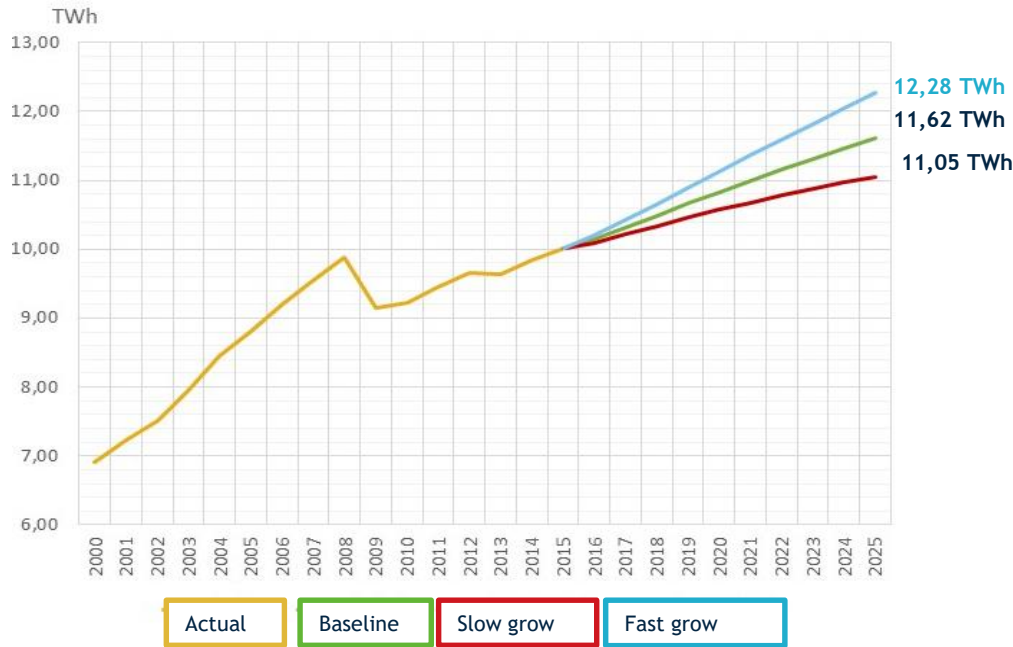
- Power links with Sweden and Poland
- Sweden is the biggest import partner
- 23% drop in electricity market price
- Lower electricity tariff for consumers



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FUTURE: NEW GRID DEVELOPMENT PROJECTS

Demand for electricity keeps growing



In 2015, demand for electricity increased in Lithuania by 1.4 %

Main factors affecting consumption



Heat pumps



Electric cars



Energy efficiency



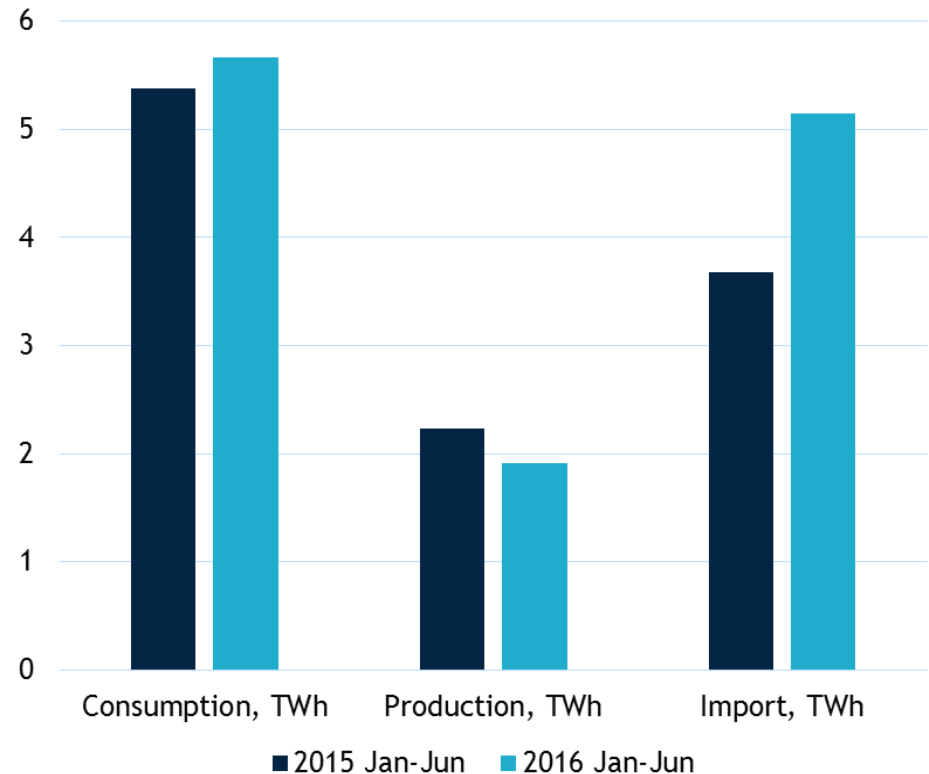
GDP growth

Forecasted GDP growth, %

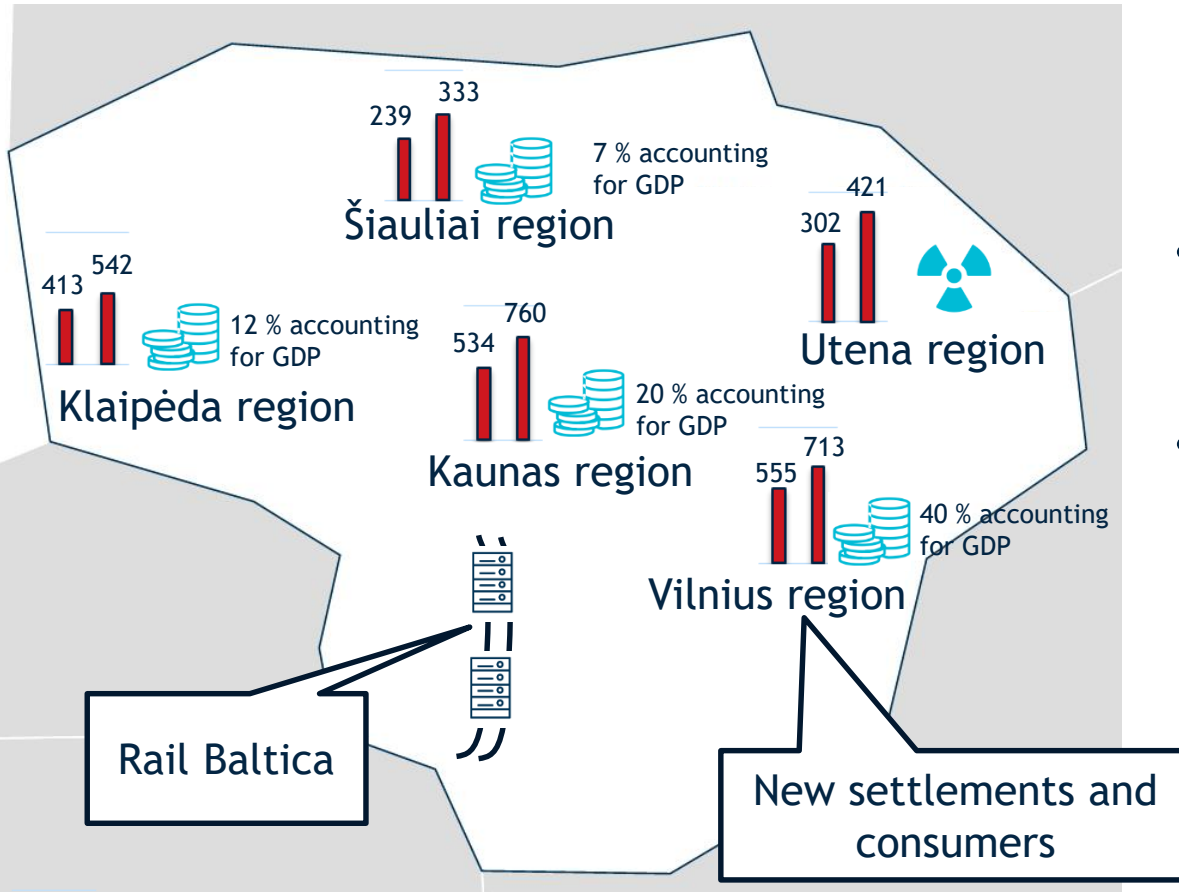


Record electricity consumption in first half of 2016

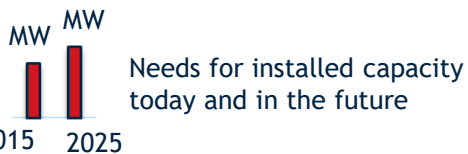
- Consumption increased by 5.3%
- Driving forces - 4.7% growth in industry and service sector
- 73.6% of consumed electricity imported
- 14% decrease in production
- 27% growth in wind energy



Grid development for system reliability and new consumers



- Development of the transmission grid is based on consumer's needs
- Needs for electricity grow in the largest regions



2015 2025

New grid projects 2016-2025

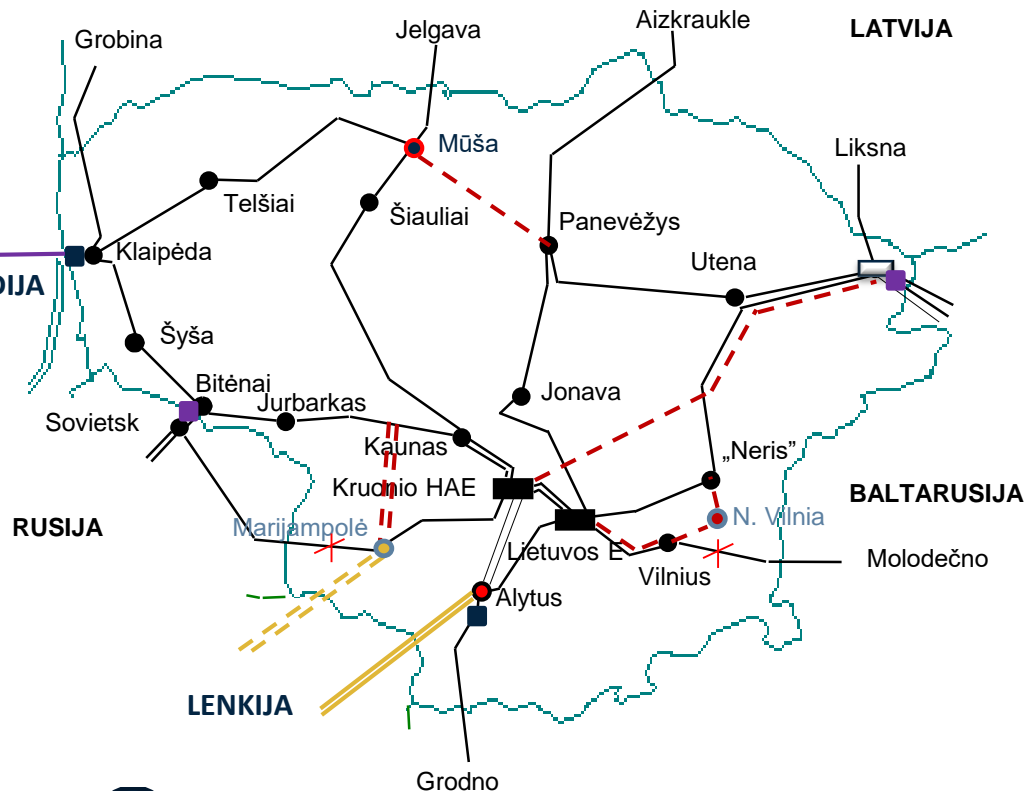


Ongoing constructions:

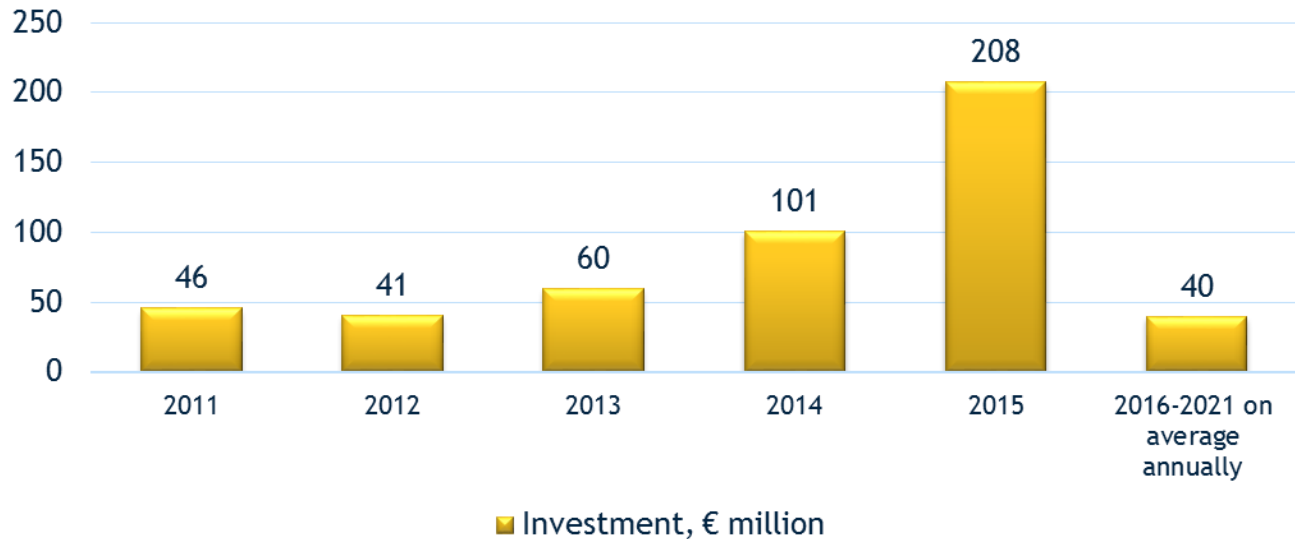
- 1 110 kV overhead line Kretinga-Benaičiai substation (2017)
- 2 330 kV overhead line Alytus-Kruonis (2018)
- 3 330 kV overhead line Lithuanian Power Plant-Vilnius (2018)
- 4 110 kV overhead line Pagėgiai-Bitėnai (2019)

Planned constructions:

- 5 110 kV overhead line Neris-Baltupis (2022)
- 6 110 kV overhead line Šilas-Varėna (2022)
- 7 330 kV overhead line Panevėžys-Mūša (with installation of Mūša 330 kV switchyard) (2023)
- 8 110 kV overhead line Kaunas-Eiguliai (2024)
- 9 Second power link with Poland (2024)
- 10 330 kV overhead line Visaginas-Kruonis including 330 kV substation Visaginas NPP (2024)
- 11 330 kV line Vilnia - Neris (with installation of Vilnia transformer substation 330 kV switchyard) (2025)



Investments go to system security and reliability



- High level of investment during 2014-2015 due to interconnection projects implementation
- The investments of 2016-2021 period primarily go to grid enforcements and system reliability and security
- By 2025 total investment in the grid is about € 671 million



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THE NEXT 10 YEARS WILL BE CHALLENGING FOR THE POWER SYSTEMS

Relying on import is a challenge to system security and reliability



14 European countries imported more than 10% of consumed electricity in 2015



In Baltic, old generation decommissioned faster than new installed



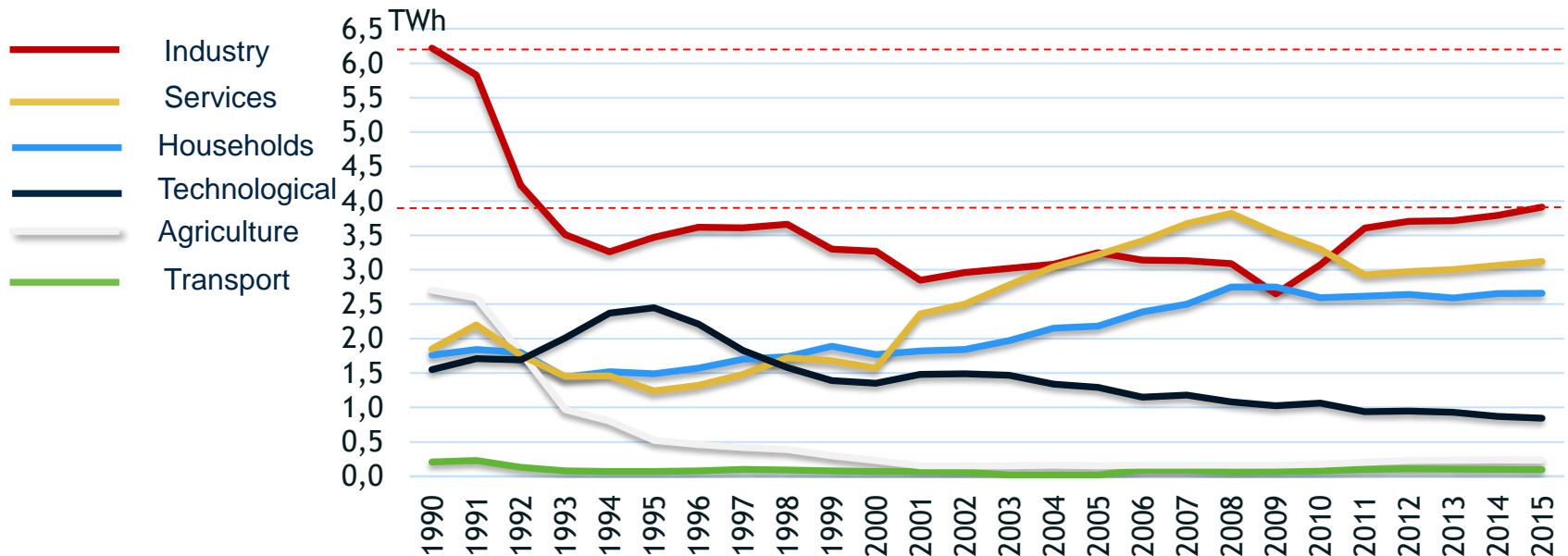
In 10 years, import capacities will be not adequate for system



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USING THE TRANSMISSION GRID FOR WIDE OPPORTUNITIES

Lithuanian grid usage data shows the opportunities that could be explored



- Two thirds of grid potential is currently used by the industry
- Transport sector has biggest opportunities to grow

Additional 100 MW consumer - €46.1 million in savings for everyone

Consumption +8%



Price cap -
€5.5million



POS -€12.3million



visuomeninio
tiekimo
paslaugos kaina

skirstymo
žemos įtampos
tinklais kaina

skirstymo
vidutinės
įtampos tinklais
kaina

Sisteminis
paslaugų kaina

perdavimo
aukštos įtampos
tinklais kaina

elektros
energijos
įsigijimo kaina

PVM

The snowball effect on related parts of the tariff could save €46.1 million in one year

Additional 100 MW in consumption would result in 9% drop in transmission tariff and other infrastructure costs





Empowering the growth of
Lithuania