LIETUVOS ENERGETIKOS INSTITUTAS

Modelling of Baltic region energy development scenarios

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Organization of work

Regional cooperation project
"Baltic Region Initiative for Long Lasting Innovative Nuclear Technologies (BRILLIANT)"
Euratom (HORIZON 2020) http://balticbrilliantproject.eu
coordinated by Lithuanian Energy institute (2015-2018).

Objective: Analysis of long-term energy development scenarios (including nuclear)

Experts of 4 countries were involved :

- **University of Tartu – Estonia**
- **Latvias Universitate – Latvia**
- **Lithuanian Energy Institute – Lithuania**
- **National Centre for Nuclear Research - Poland**

Background: Map

Estonia

Population 1.3 mln

Area 45.3 thous. km2

Latvia

Population 2.0 mln

Area 64.6 thous. km2

Lithuania

Population 2.8 mln

Area 65.3 thous. km2

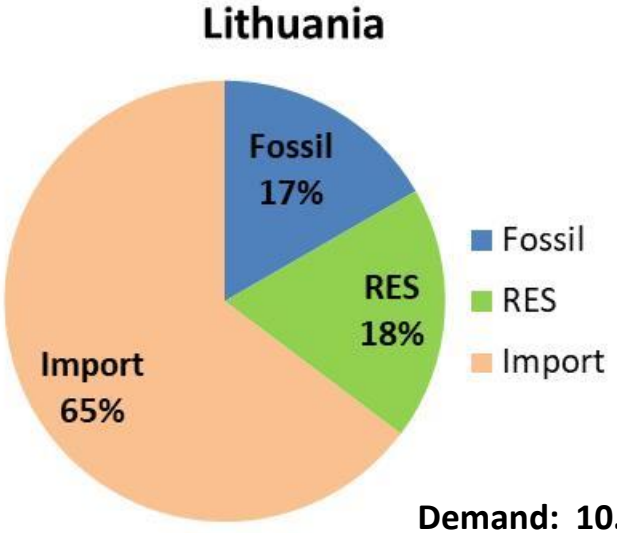
Poland

Population 37.9 mln

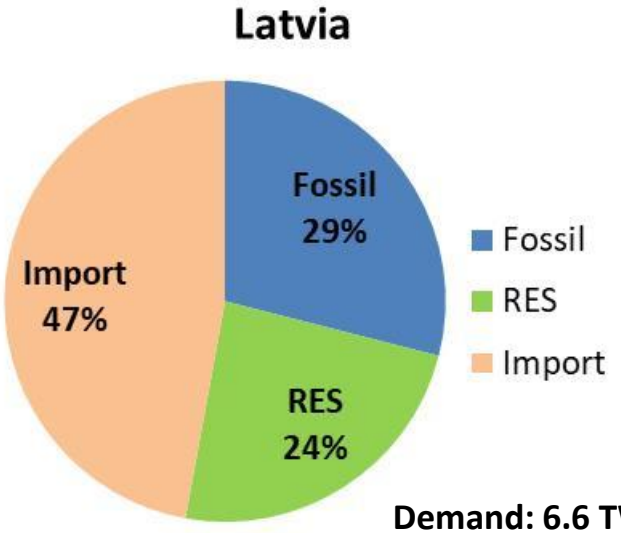
Area 312 thous. km2

Background: Main power interconnections

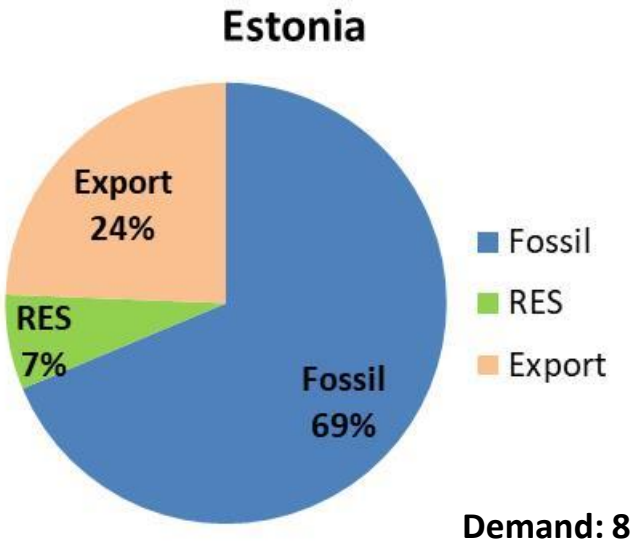
Background: power balance 2014



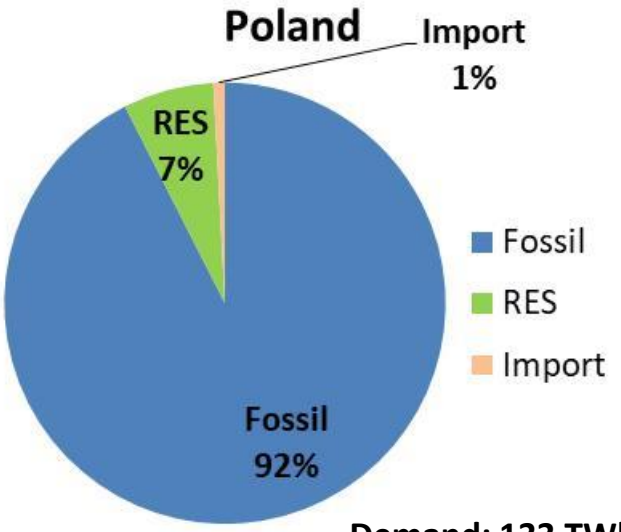
Demand: 10.1 TWh



Demand: 6.6 TWh



Demand: 8 TWh



Demand: 133 TWh

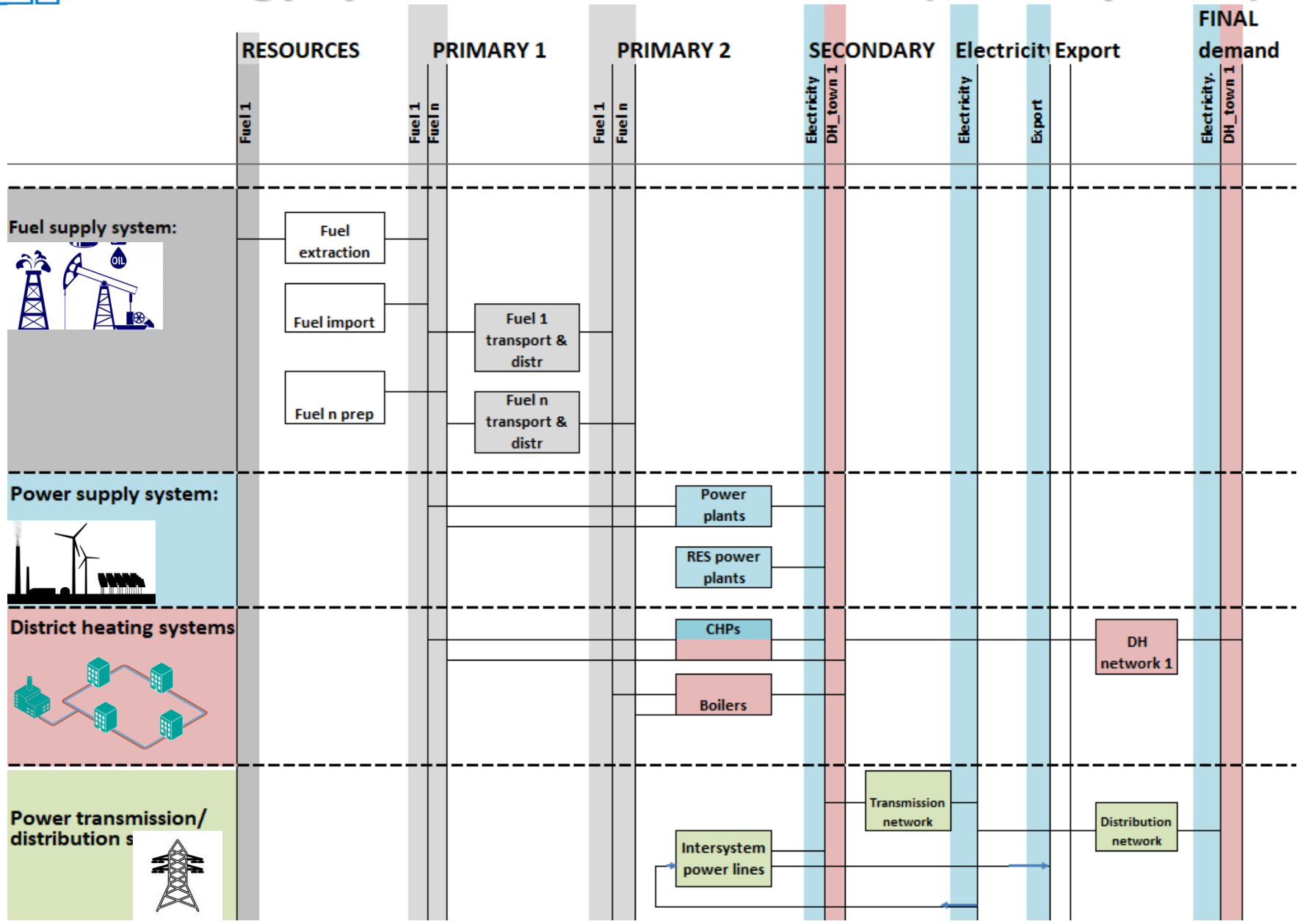
Methods

- Bottom-up techno-economic modelling tool

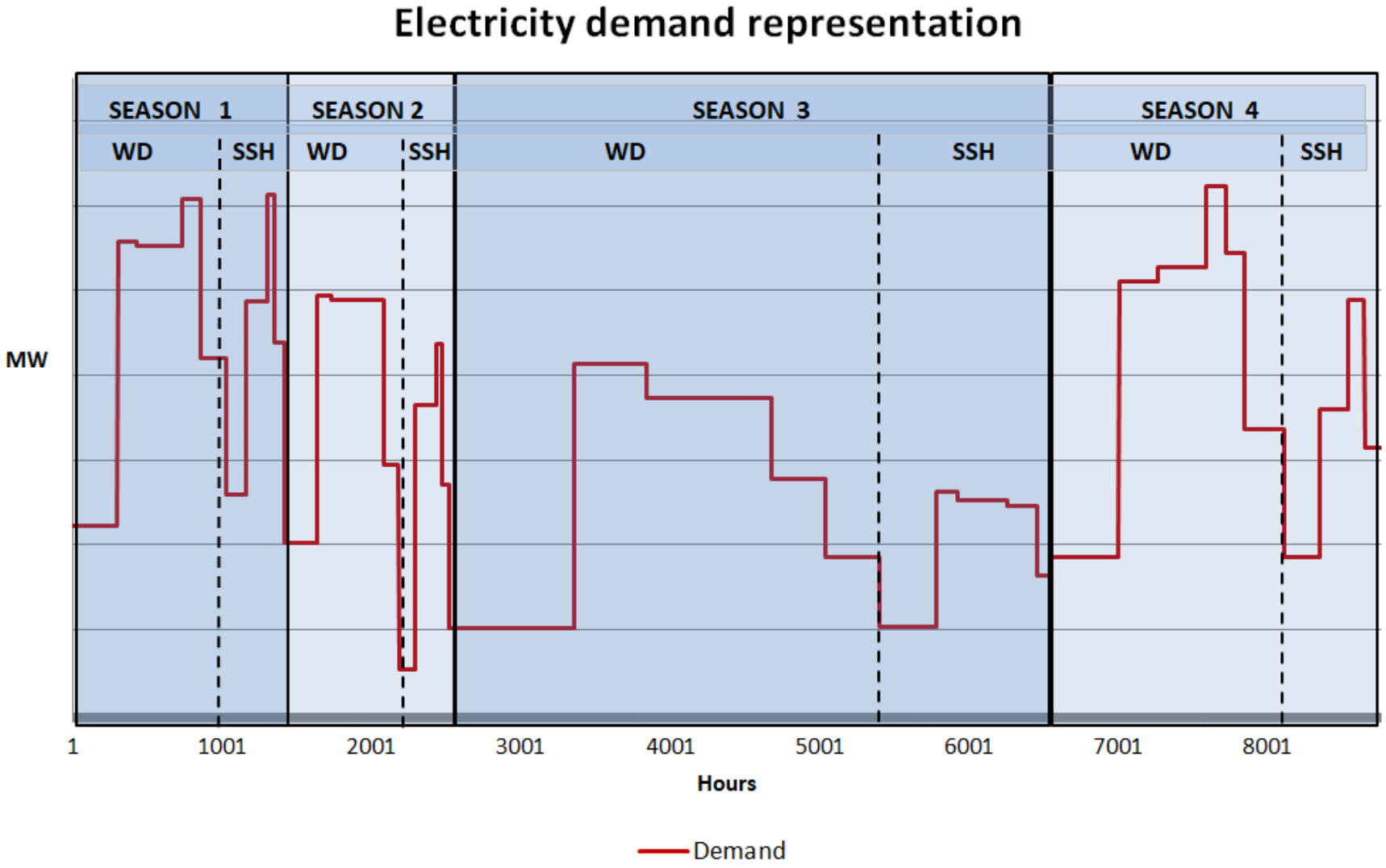
MESSAGE: ***M****odel for* ***E****nergy* ***S****upply* ***S****trategy* ***A****lternatives and their* ***G****eneral* ***E****nvironmental* ***I****mpact*

- Country energy models were hard-linked into the multiregional model (including Estonian, Latvian, Lithuanian and Polish energy systems).
- Planning horizon: 2050

Energy system scheme elements (Country level)



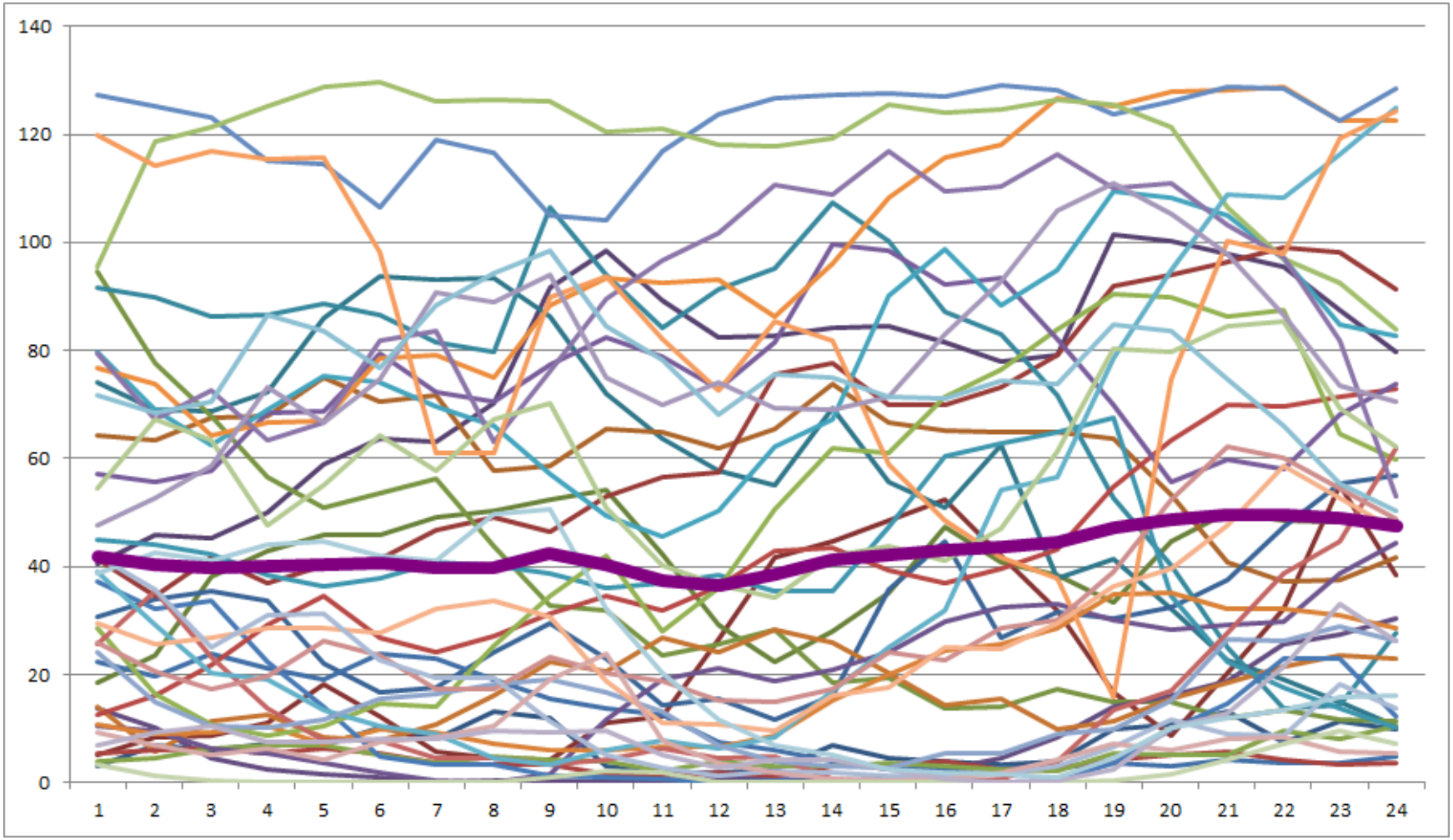
Temporal representation



Time slices: 38

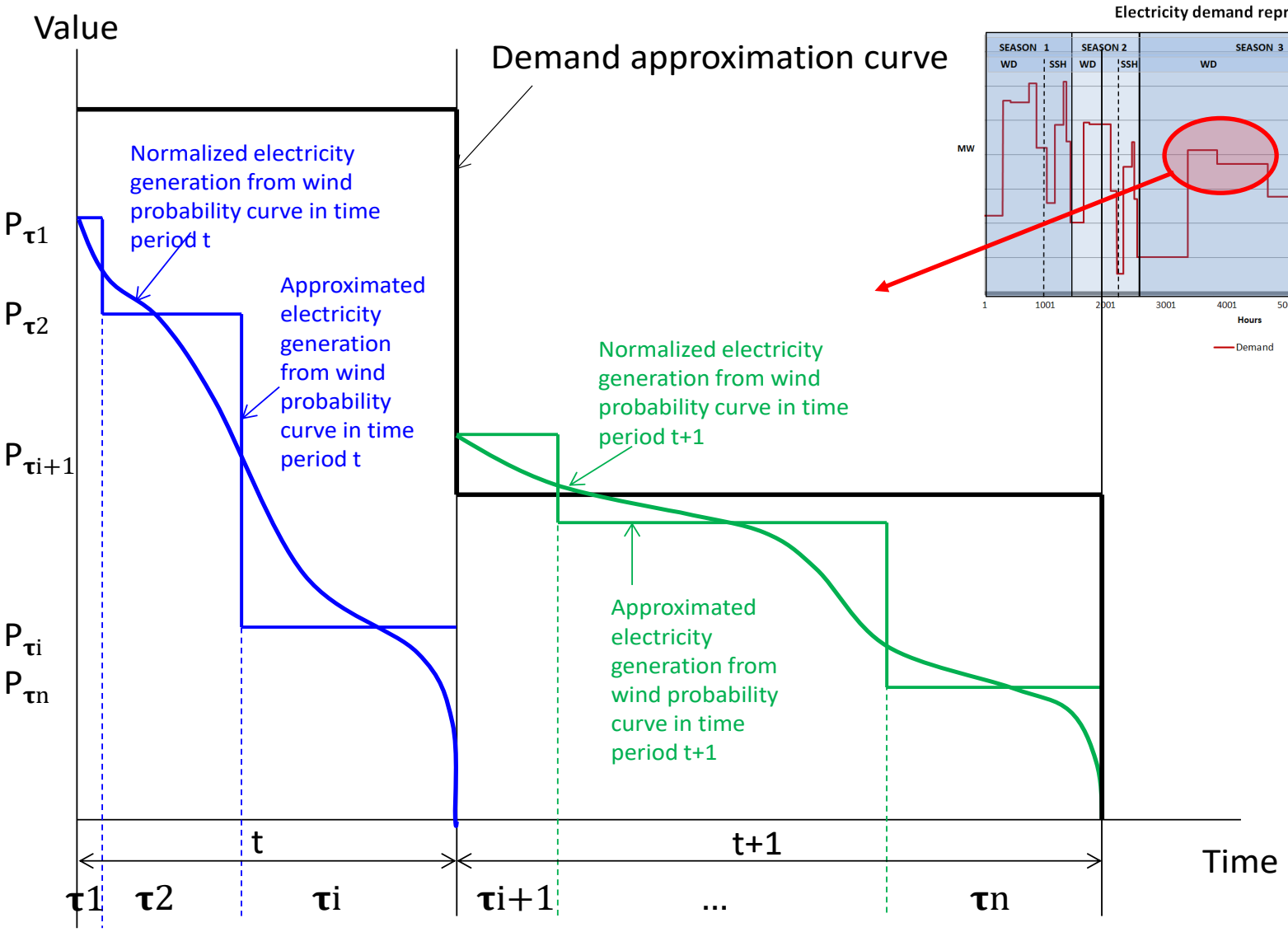
Time period: 2013 – 2050

Assessment of wind power resource



Hourly wind variation in Lithuania January/February

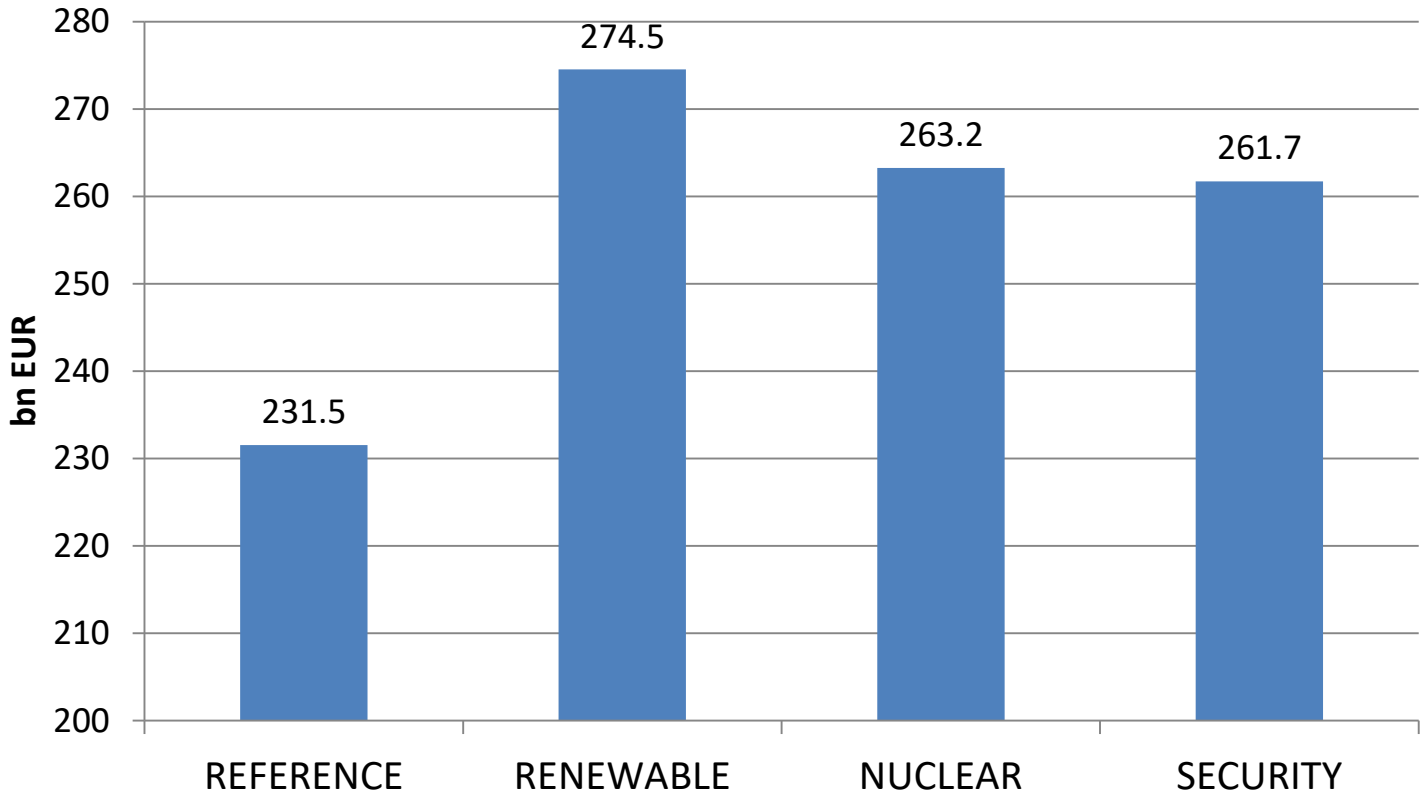
Representation of wind power generation



Scenarios

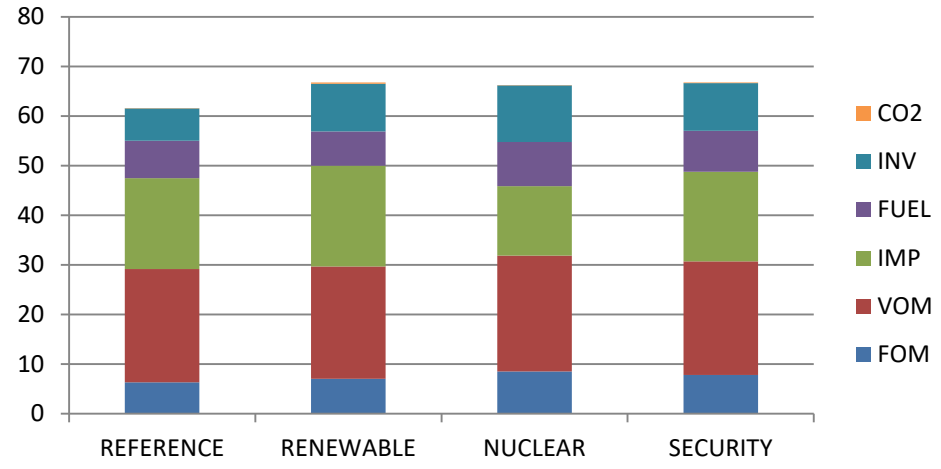
Parameters in the model	*REFERENCE*	*RENEWABLE*	*SECURITY*	*NUCLEAR*
CO2 price	**5-25** EUR/t	**5-100** EUR/t	**5-25** EUR/t	
Nuclear PP (LITHUANIA)	Optimization			**1.38 GW** (Forced construction)
Nuclear PP (POLAND)	Optimization			**6 GW** (Forced construction)
Required installed capacity	Not specified (Optimization)		100% of peak	Not specified (Optimization)
Other parameters and assumptions	No changes			

Total discounted cost of Regional energy systems operation and development in 2014-2050

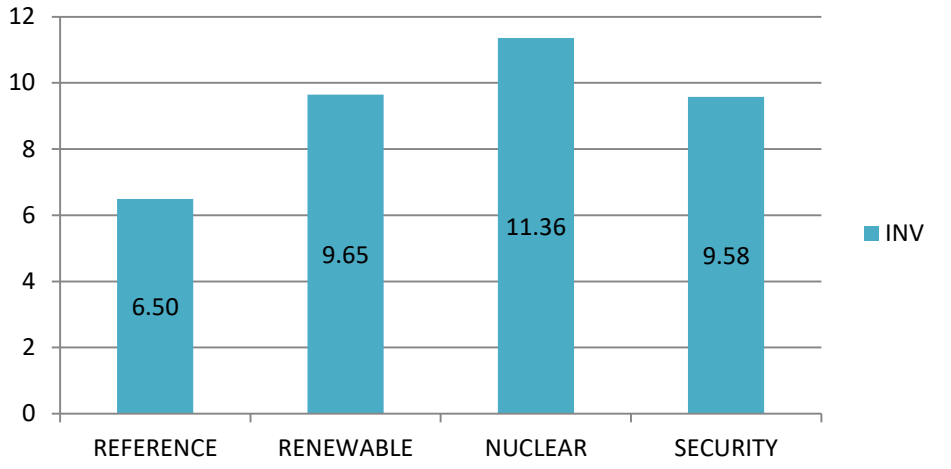


Total Costs and investments 2014-2050, bn EUR

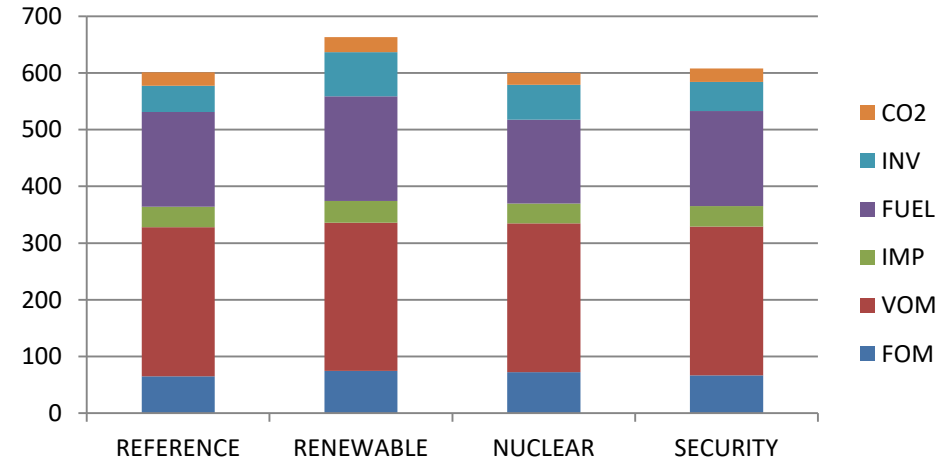
Costs. LITHUANIA



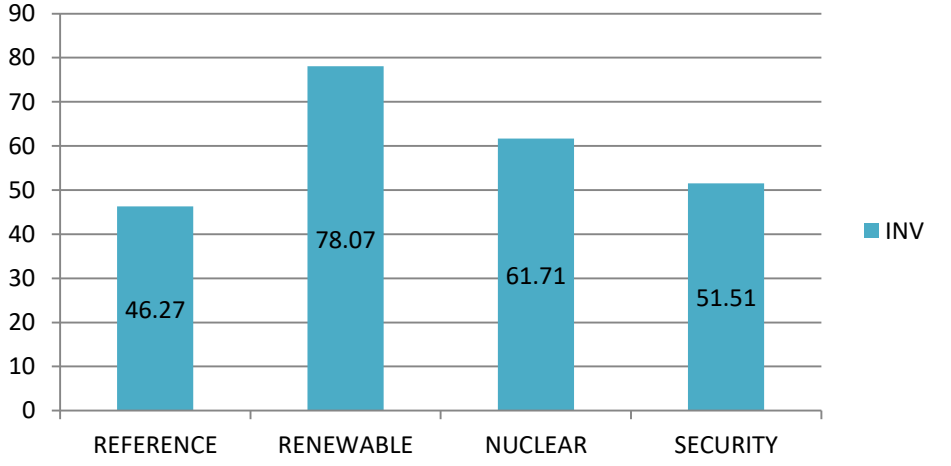
Investments. LITHUANIA



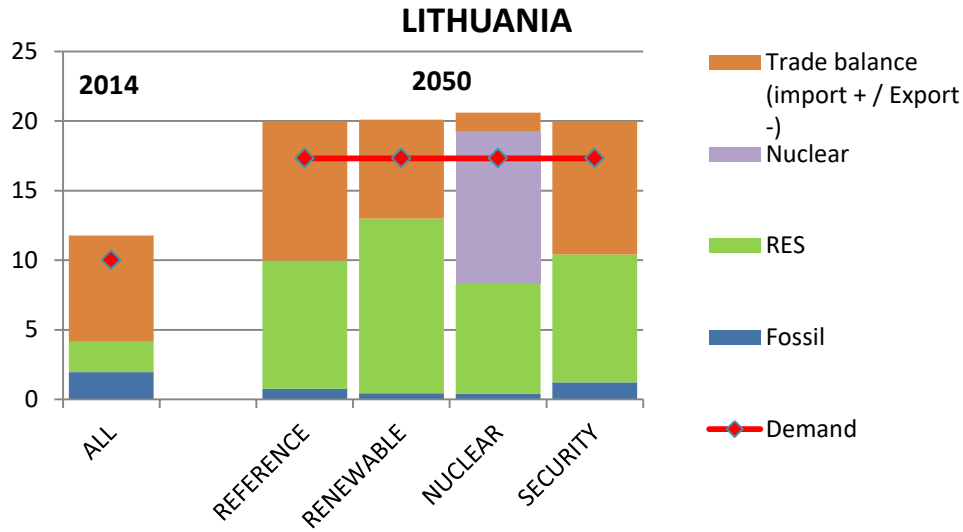
Costs. POLAND

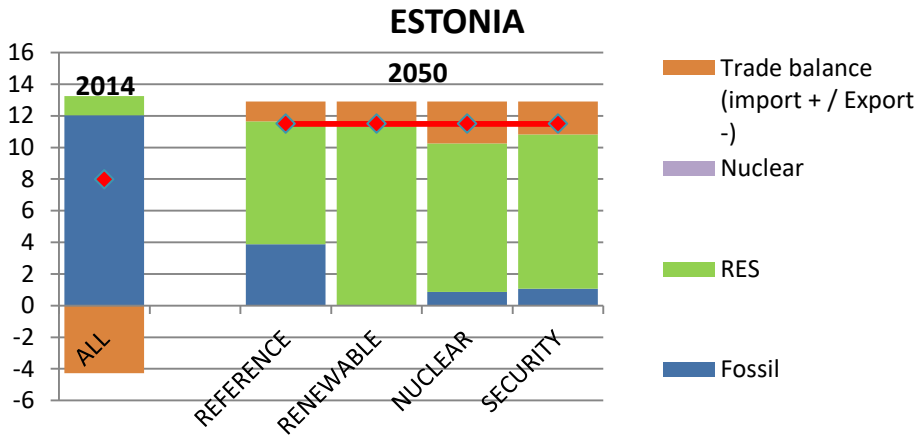


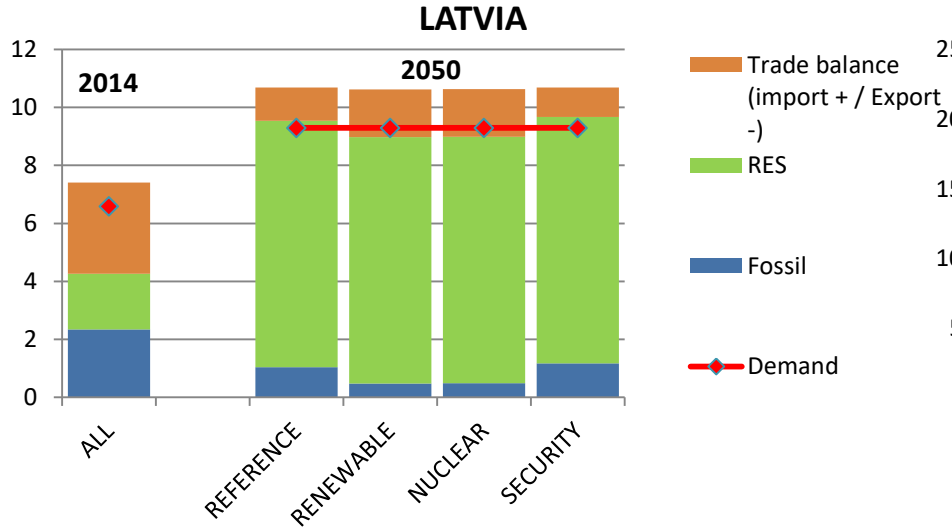
Investments. POLAND

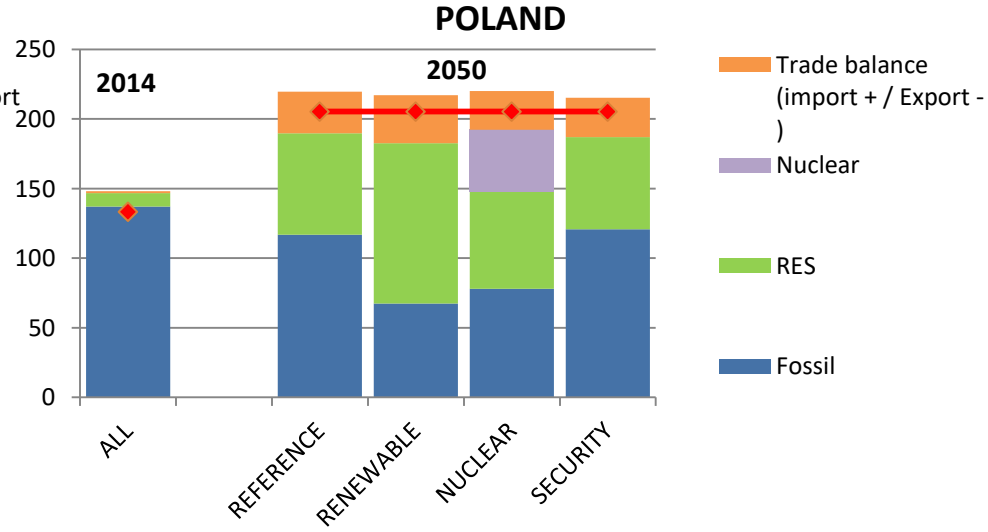


Electricity supply, TWh

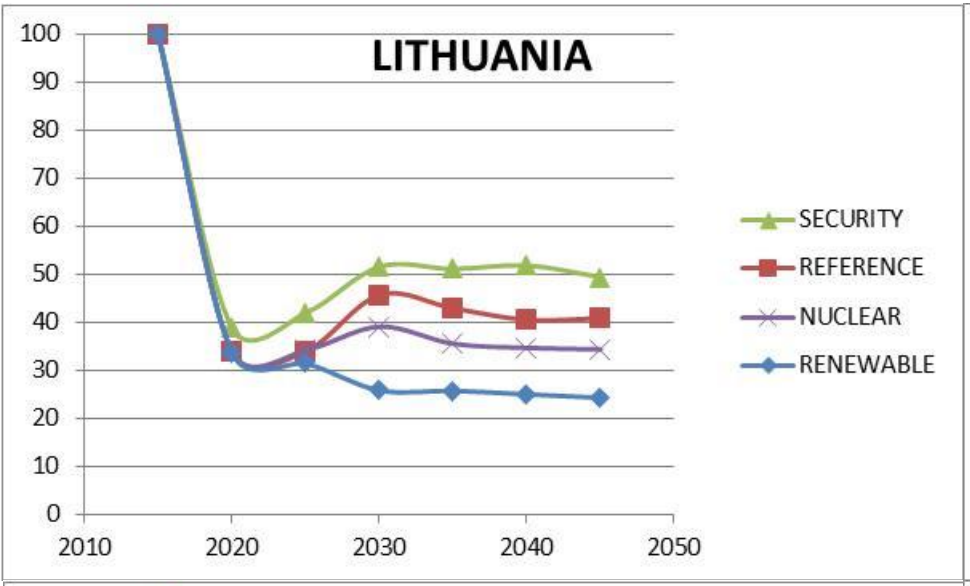


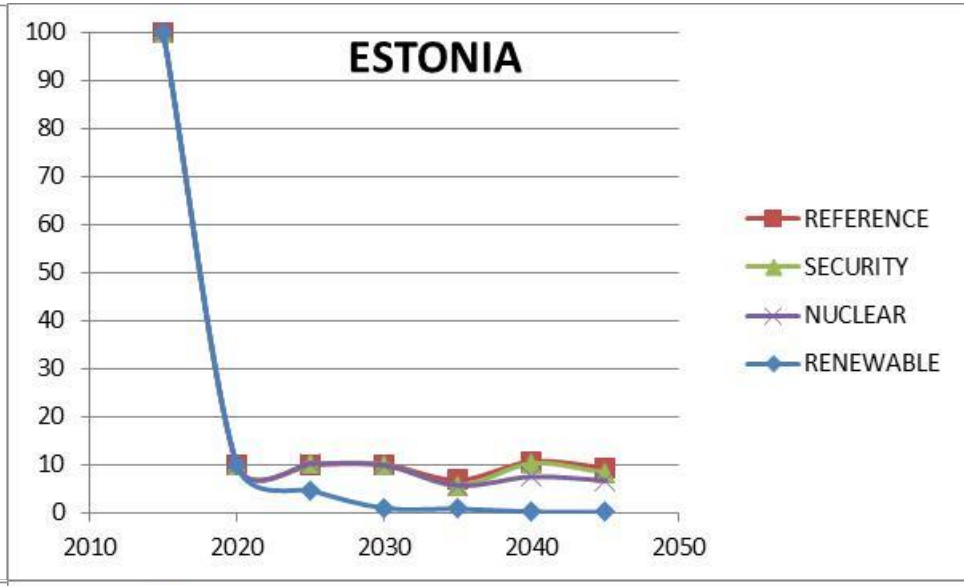


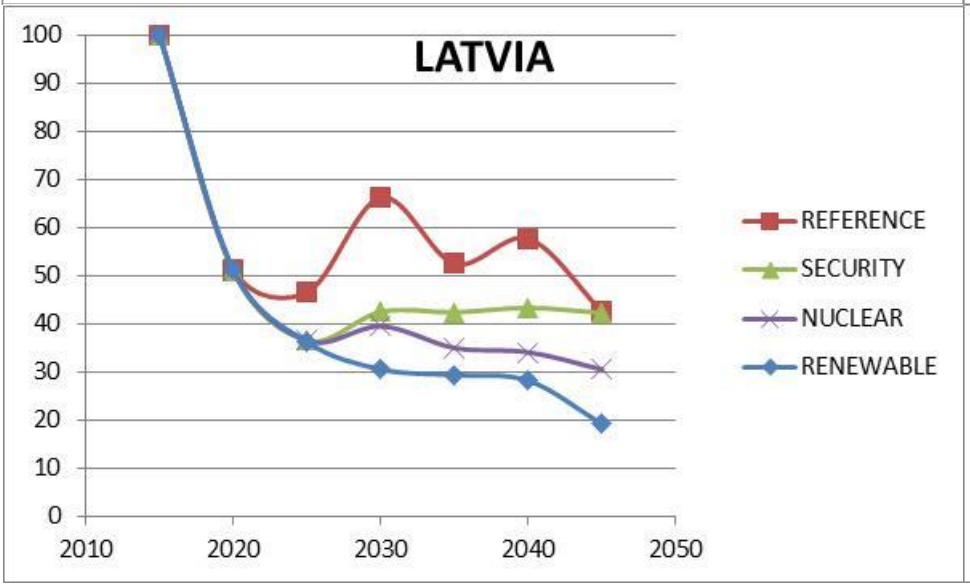


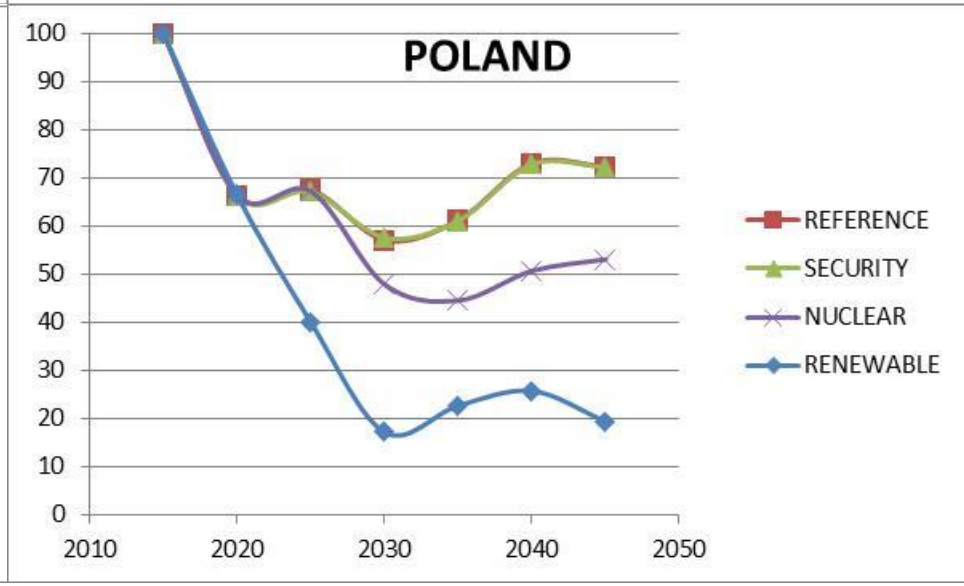


CO2 emissions (from energy generation), %









CONCLUSIONS

Trends for all scenarios:

- The electricity generation shifts towards renewable energy.
- The nuclear units in Lithuania and Poland are not constructed

  (it is **forced construction** in the case of NUCLEAR scenario)
- Electricity import to the region increases, export decreases
- CO2 emissions from electricity and heat generation decreases by 30-80% in the Region (depending on scenario).

THANK YOU

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