

Baltic Energy Technology Scenarios 2018

Towards renewable and low-carbon electricity and district heating



Nordic Energy
Research

Integration of Baltic power systems with Nordic and continental Europe



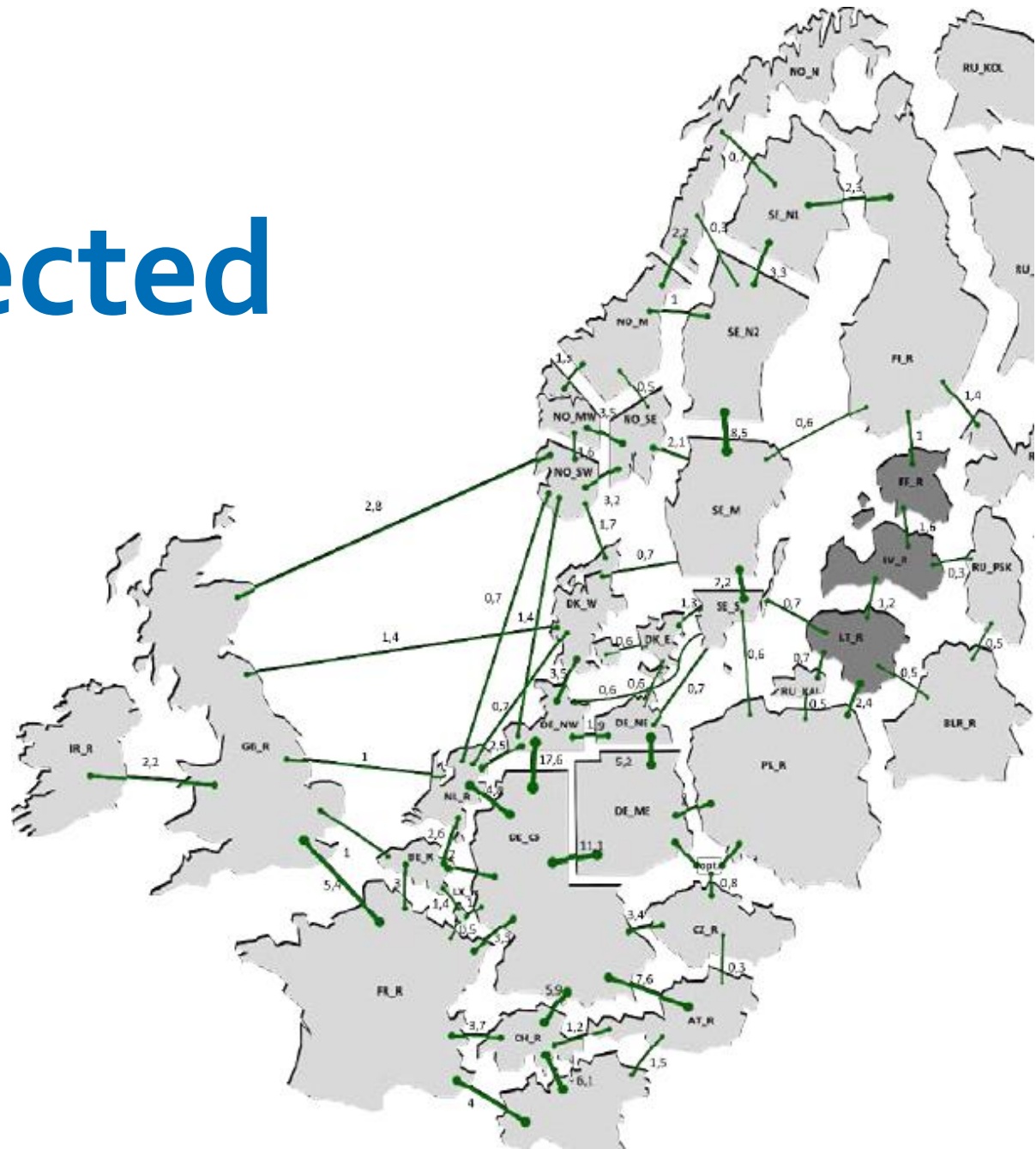
- The three Baltic countries used to be so-called “energy islands”
- This situation has changed with the establishment of Estlink 1 and 2, LitPol and the Nordbalt interconnector linking Sweden and Lithuania.



An interconnected Europe

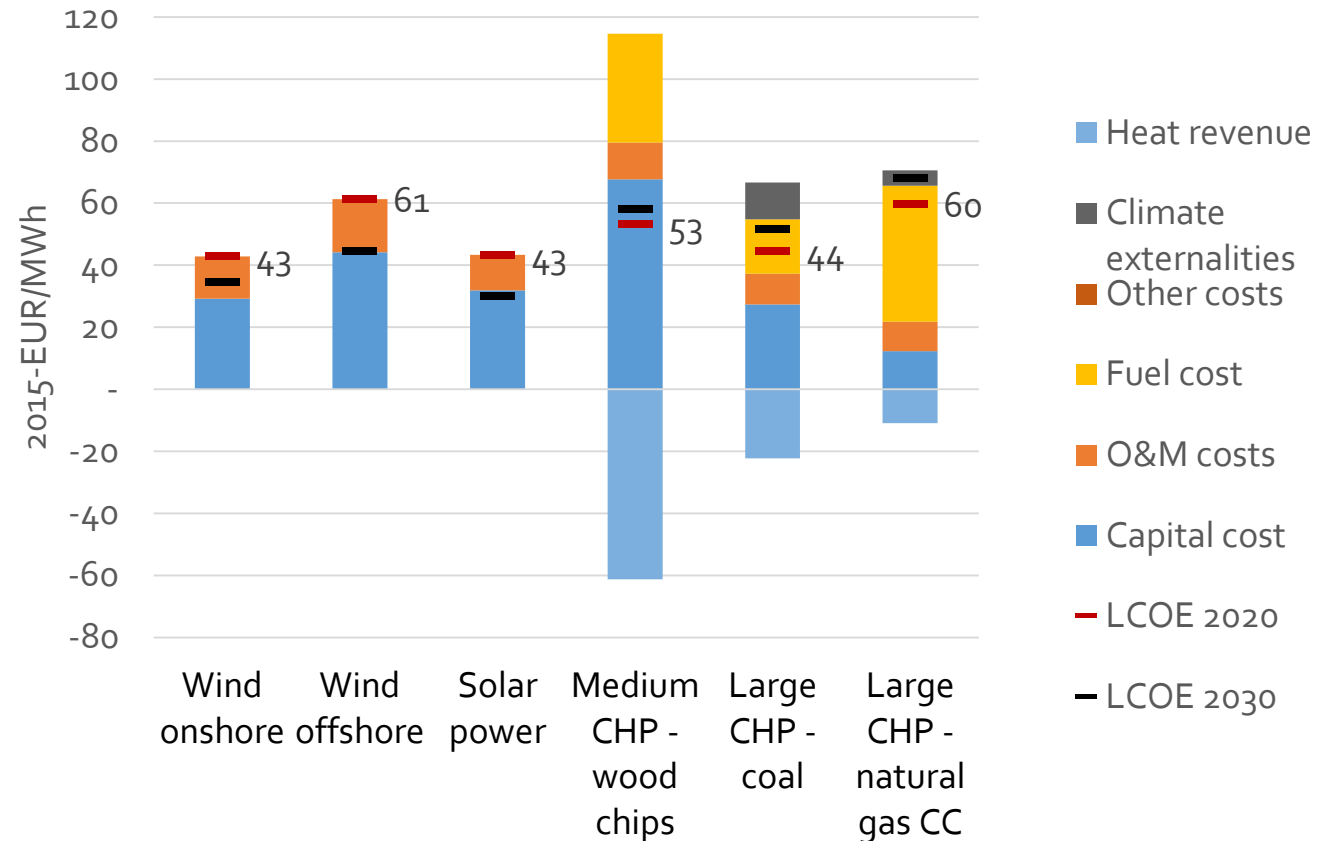
The **Balmorel model** is applied to investigate least cost dispatch and capacity expansions of electricity and heat systems.

It all depends on the assumptions...



Sharp declines in the cost of wind and solar power.

- In recent years, results from auctions of renewable energy around the world have indicated sharp declines in the cost of wind and solar power.
- Measured on LCOE, onshore wind and solar PV are the cheapest options by 2020
- Learning curve theory: Prices will continue to drop!



Full load hours for wind-based electricity in Latvia: 2140 for onshore, 3640 for offshore. Solar power: 959. Technical lifetime of individual technologies: 4% WACC. Value of heat set to 12 EUR/MWh. Climate externalities (CO₂) based on cost of CO₂ of 20 EUR/ton. Wood pellets: 8.5 EUR/GJ. Wood chips: 7.4 EUR/GJ. Coal: 3.0 EUR/GJ. Natural gas: 8.9 EUR/GJ.

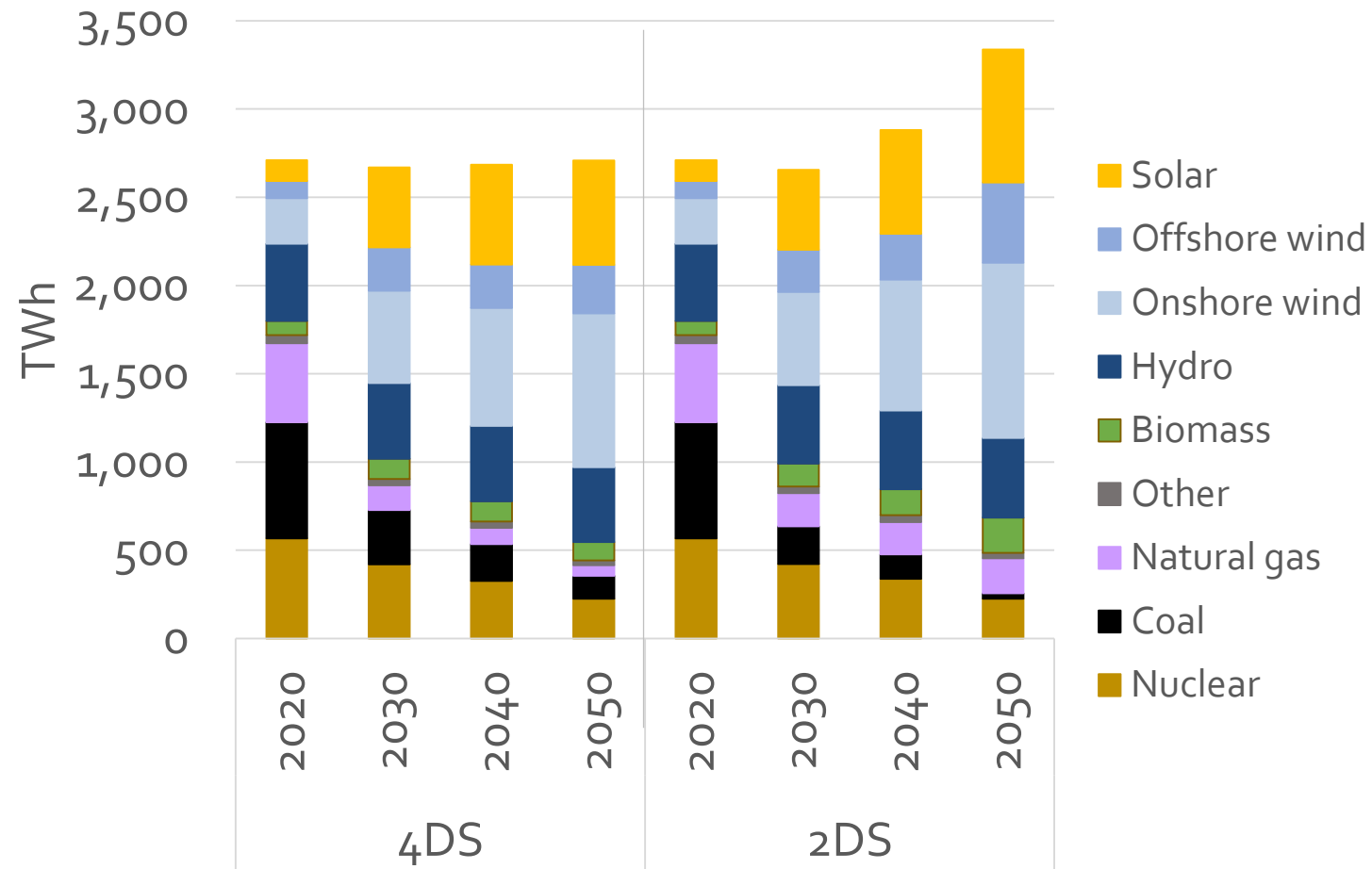


Renewable energy will dominate the future power markets

Annual electricity generation by fuel in the entire modelled area.

2030: 66% RE

2050: 85% RE
66% wind + solar

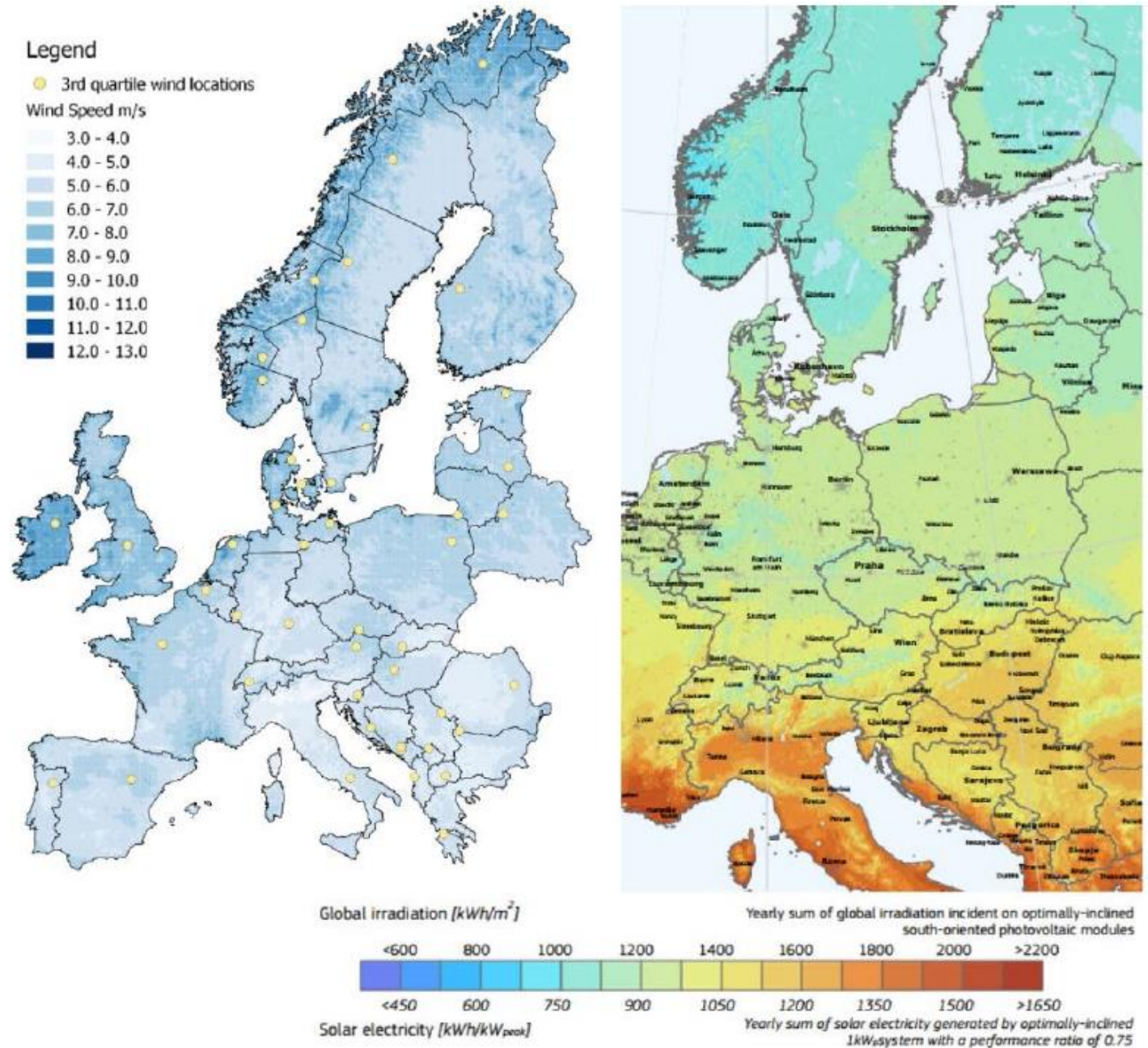


15 €/t => 40 €/ton
National plans, RE subsidies

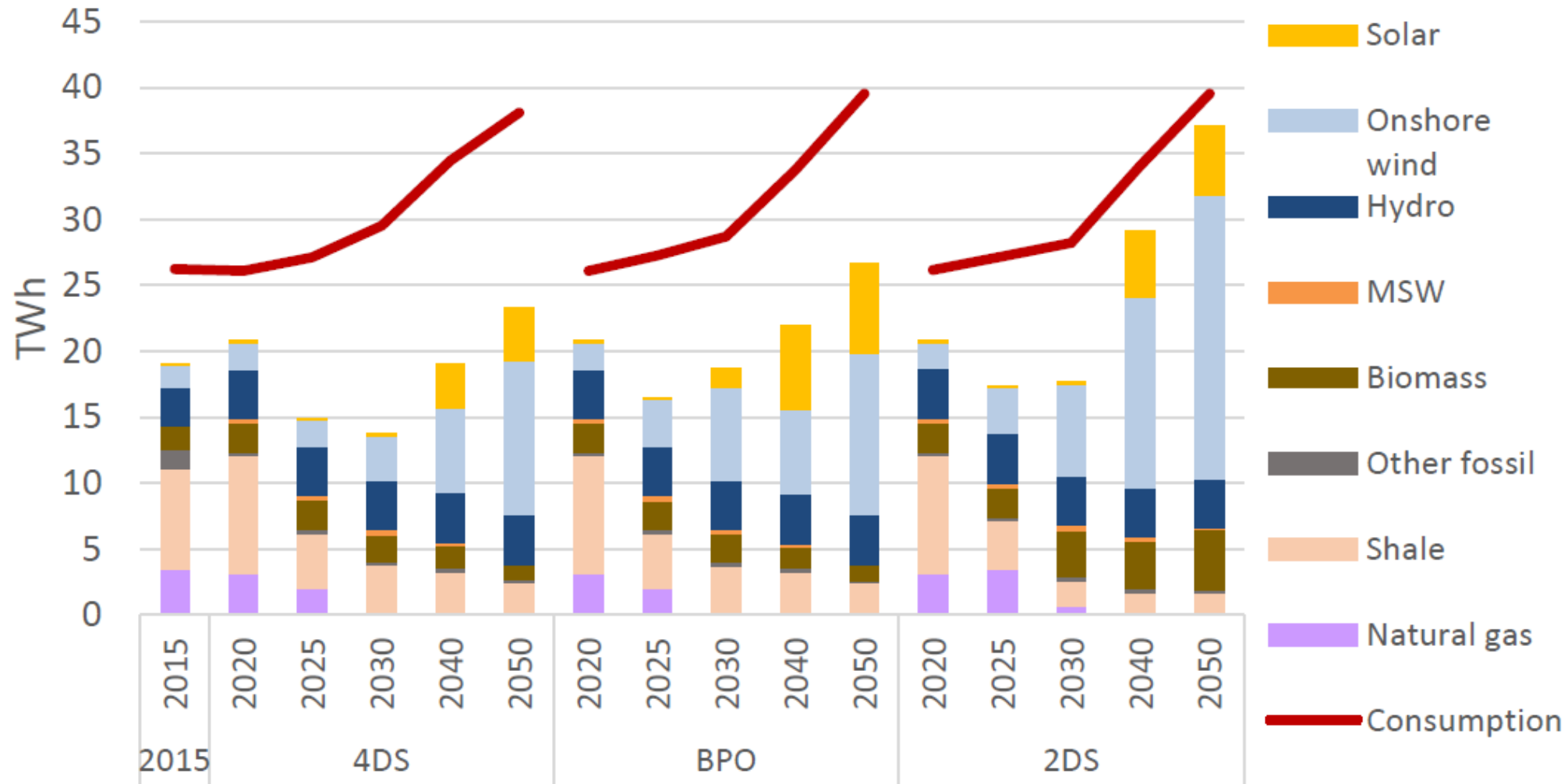
30 €/t => 100 €/ton



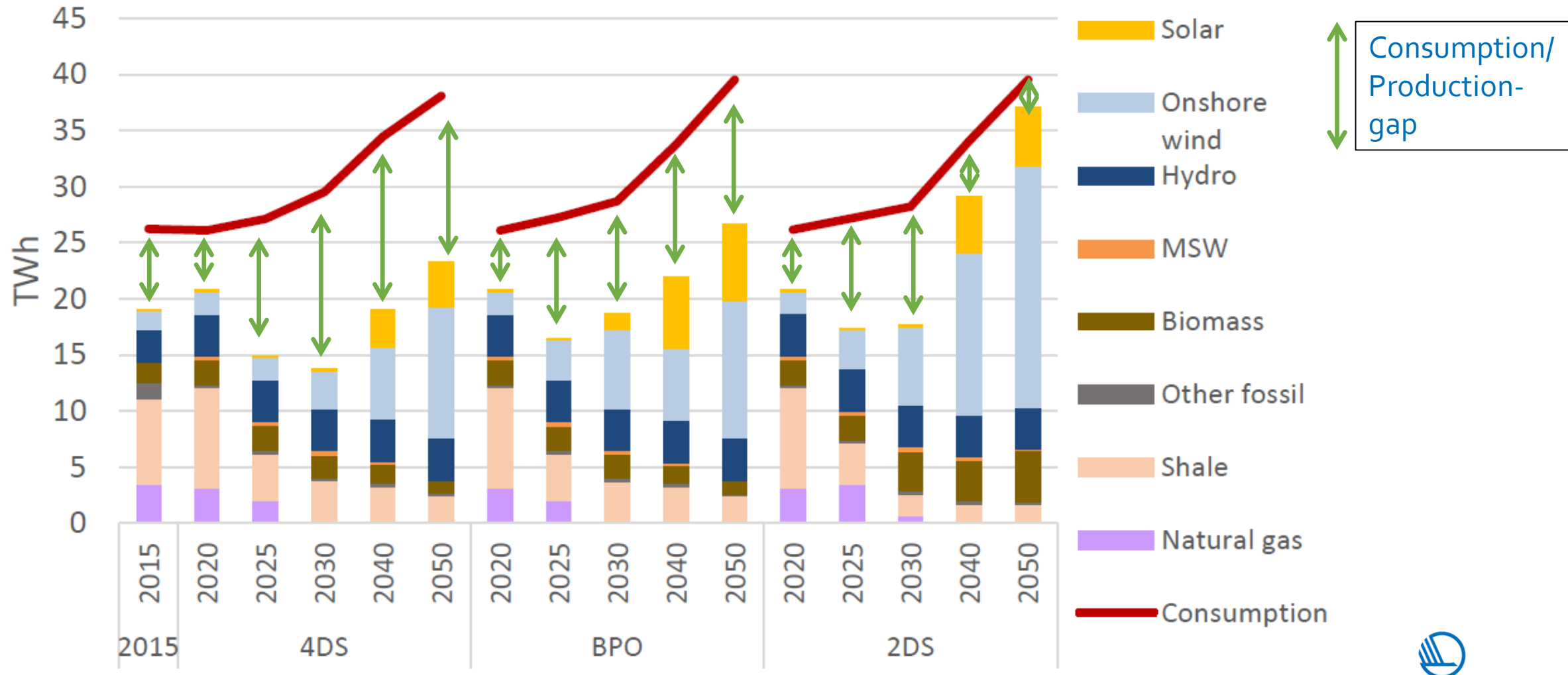
Wind and solar resources in the Baltic countries are mediocre compared to the rest of Europe



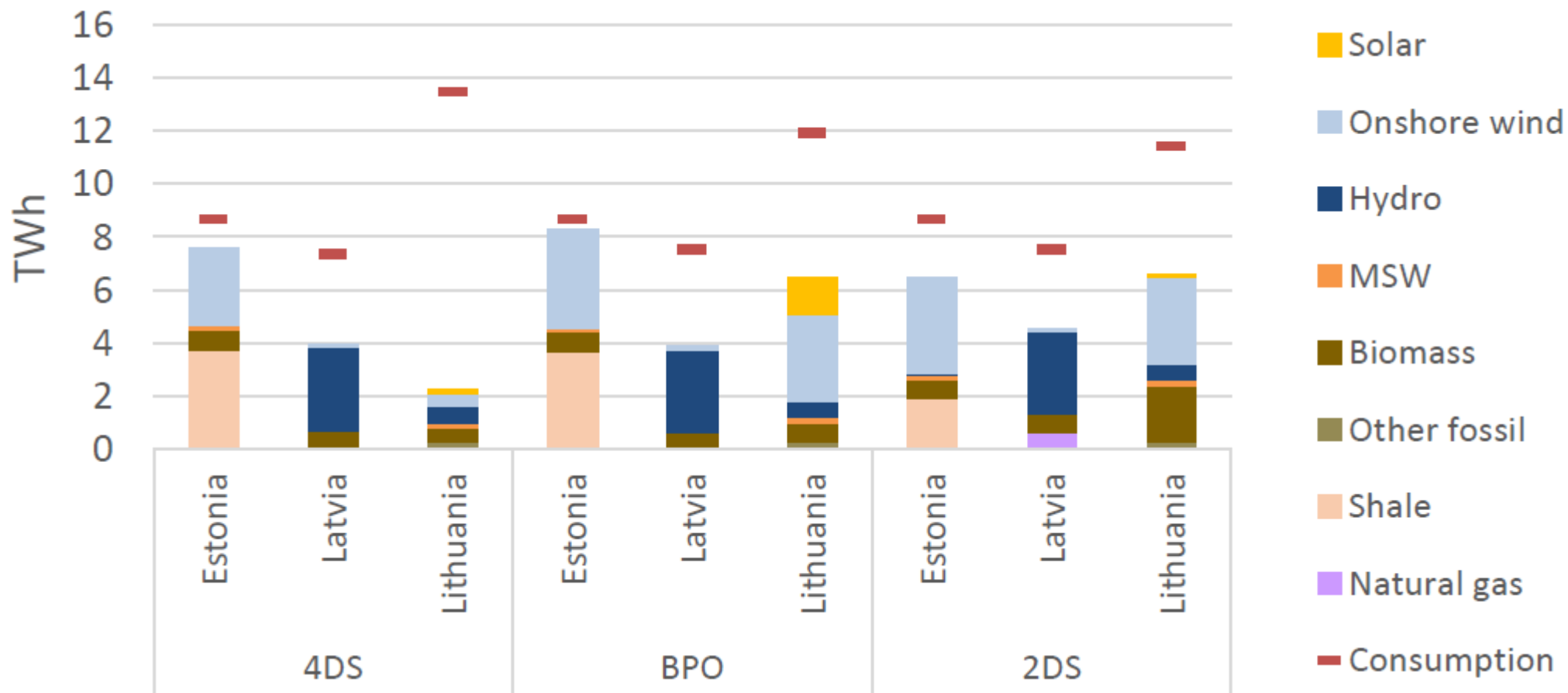
The Baltic countries are likely to remain net importers of electricity



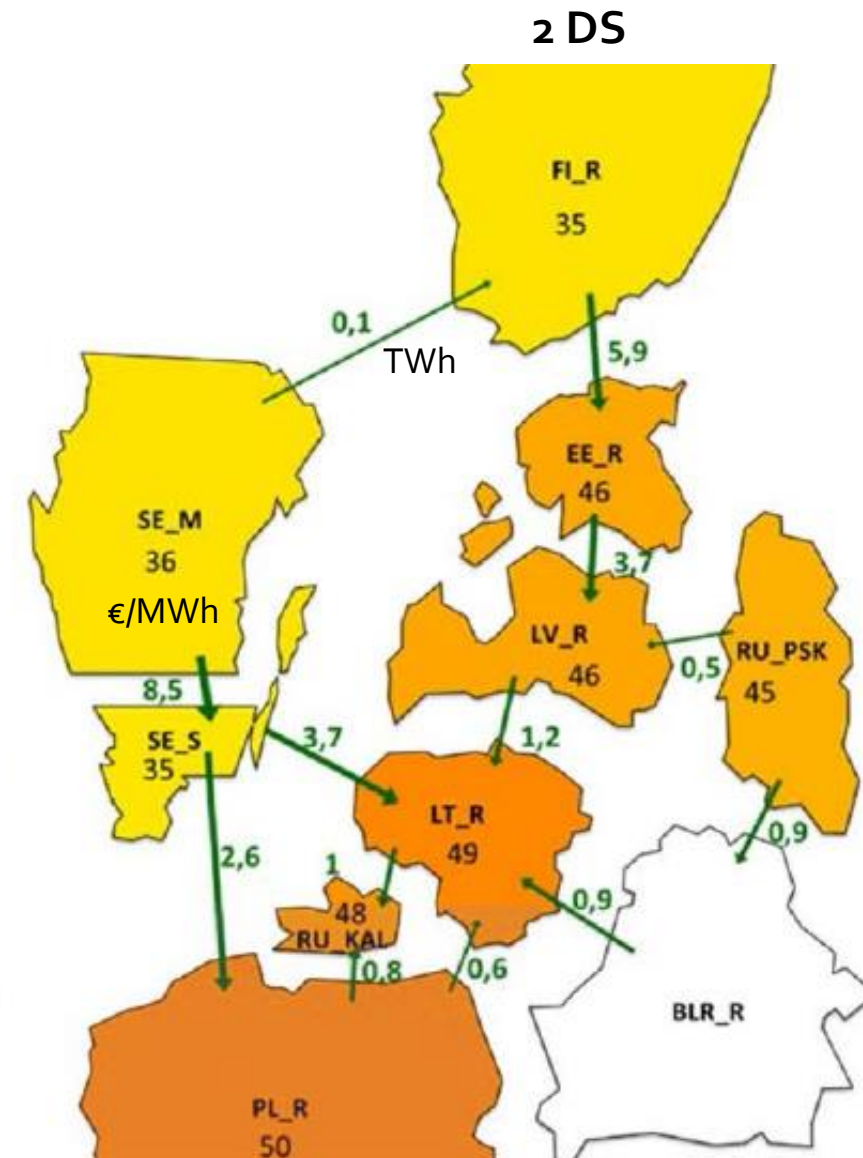
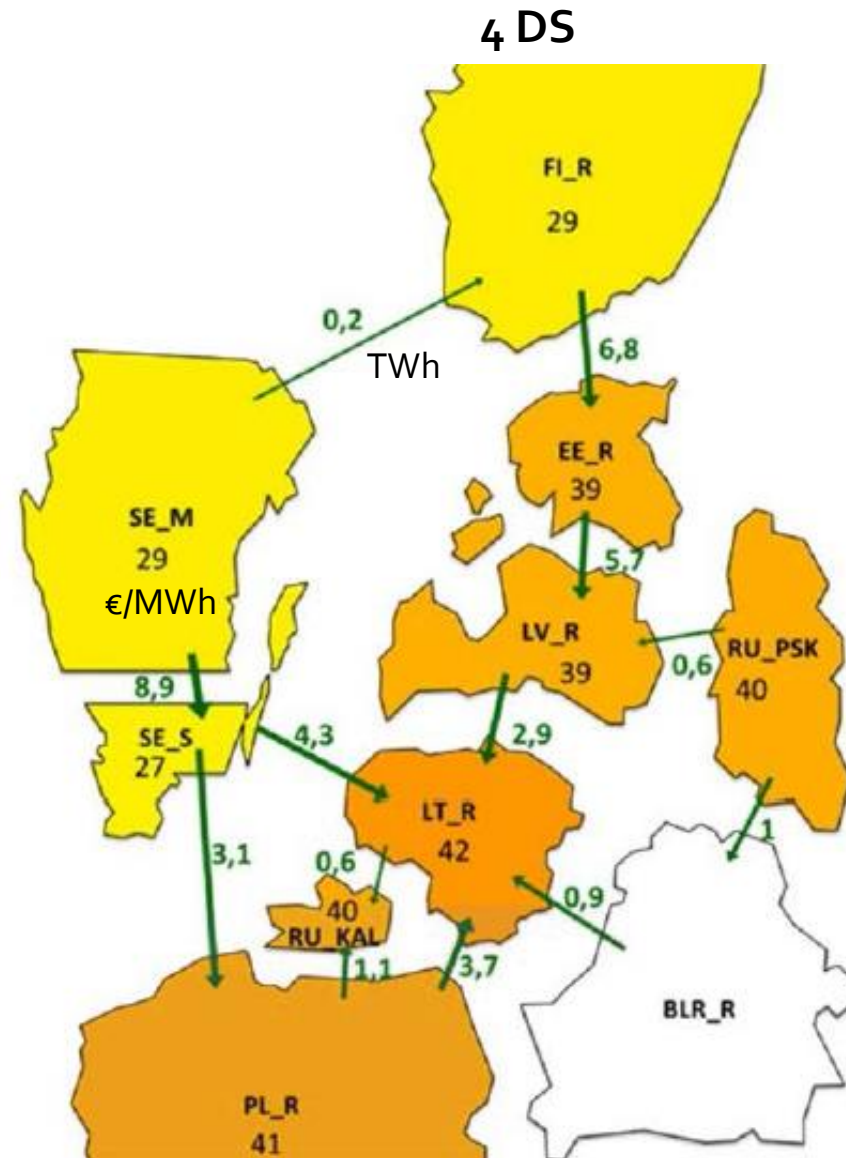
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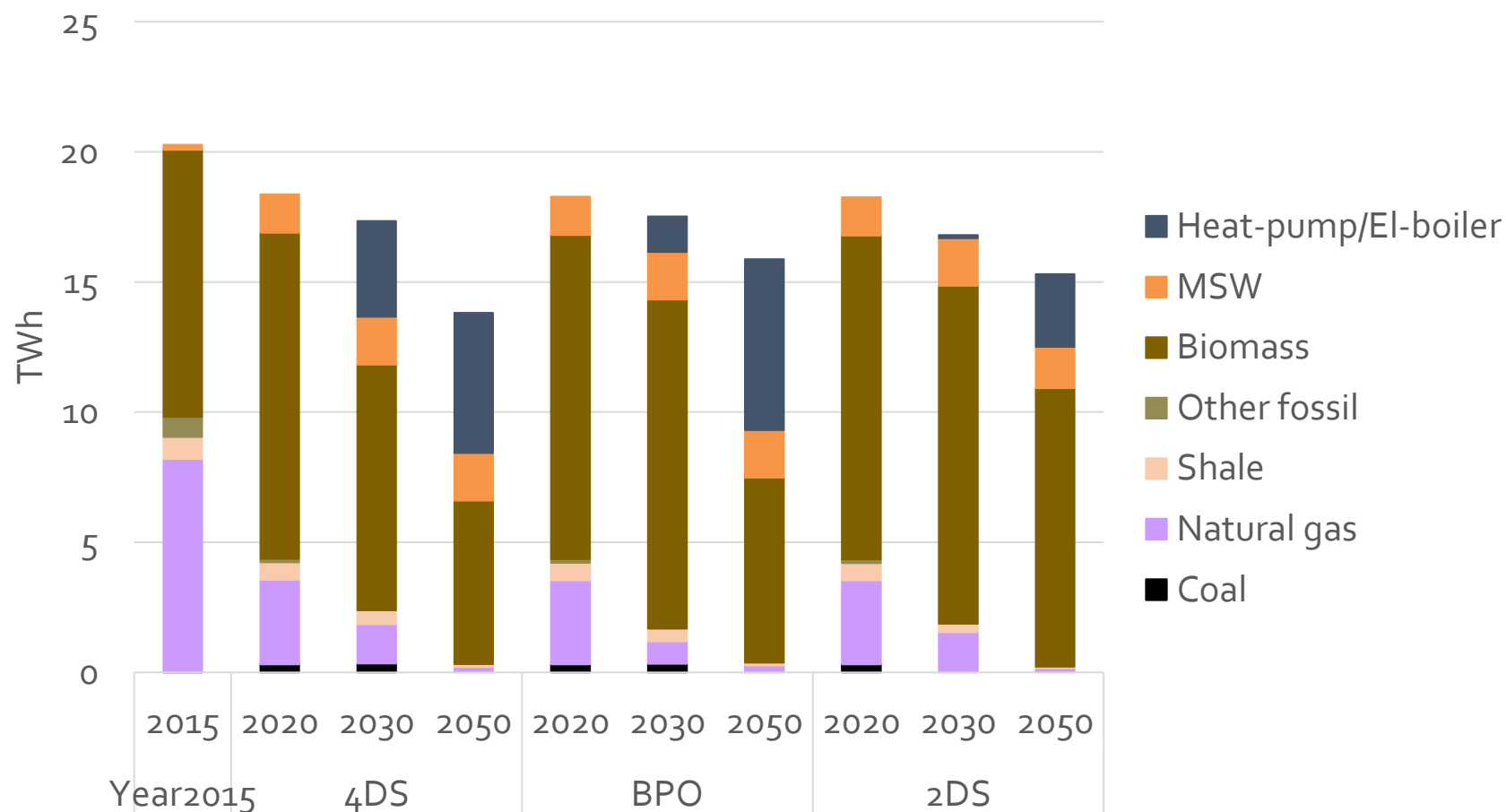
Annual electricity generation in 2030



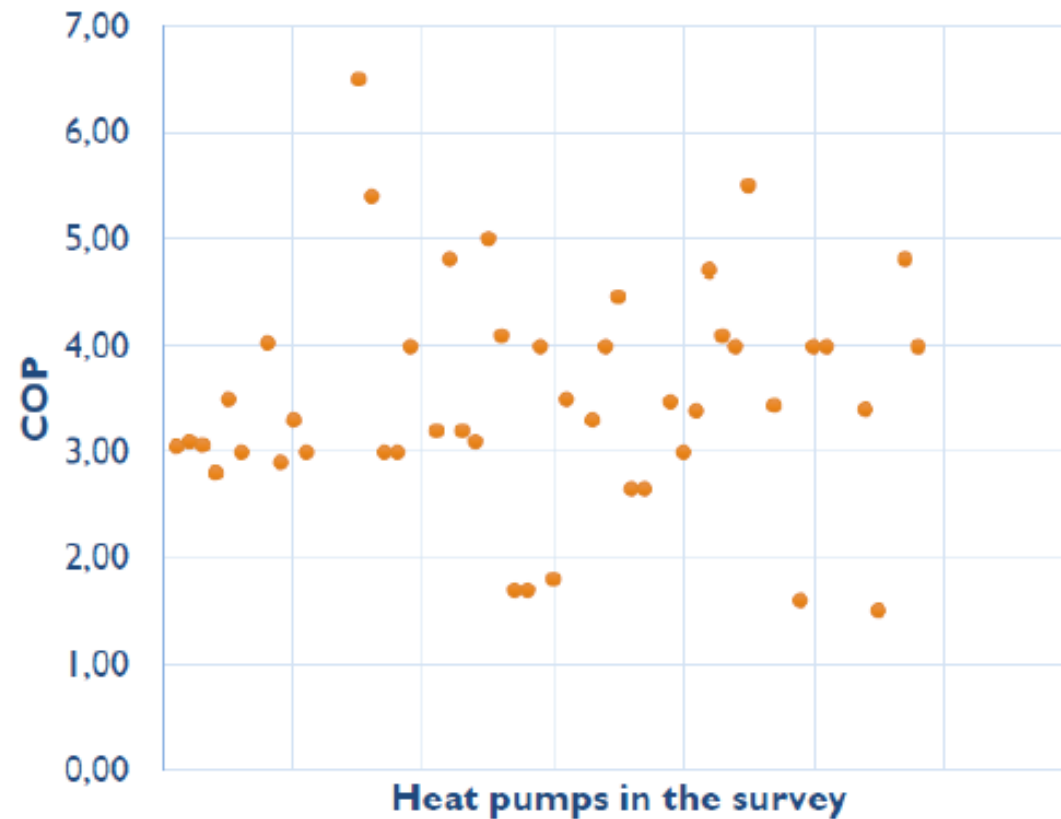
Wholesale electricity prices in the Baltic countries remain higher than in the Nordic countries in both the 4DS and 2DS



District heating: Natural gas is replaced by biomass boilers and heat pumps



Electric heat pumps are a competitive option in district heating schemes in need of new generation capacity



Average COP	4DS/BOP/2DS
2020–2024	2.00
2025–2029	2.17
2030–2049	2.33
2050	3.00

Assumptions on COP for heat pumps are conservative compared to international expectations and experiences.



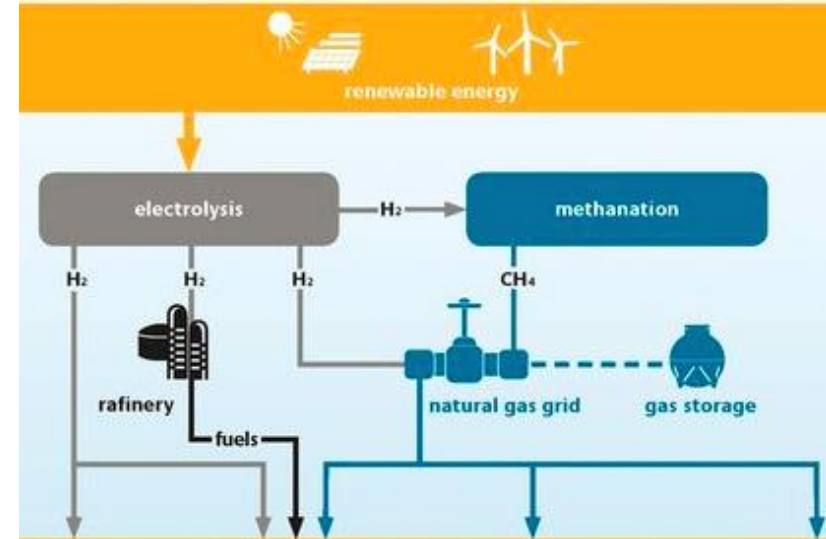
Batteries

- Ancillary services and peak power



Power to gas

- Perhaps beyond 2030



Cost reflective network tariffs

- Key to sector integration



Power to heat

- Starting up now



Key findings

- In the absence of sustainable policies to facilitate cost-effective local generation, the Baltic countries are likely to become **large net importers of electricity** from the Nordic countries and Russia.
- Modest subsidies (or price guarantees) would **incentivize renewable** electricity generation in the Baltics countries. Without political support, the deployment of new domestic generation capacity might be limited before 2030.
- **Power to heat** will become more and more competitive as the share of variable renewables in the electricity system increases. Important to prepare for this transformation.

