

The VTT logo consists of the letters 'VTT' in a bold, white, sans-serif font, centered within a solid black square. The background of the slide is a complex geometric pattern of triangles in blue, orange, grey, and white, creating a tessellated effect.

VTT

Prospects of electricity and heat-only SMRs in the Baltic Region

Tomi J Lindroos – Tomi.J.Lindroos@vtt.fi
Nelli Putkonen, Anni Niemi, Fares Alblouwy (VTT)
Heikki Suikkanen (LUT)

08/11/2022 VTT – beyond the obvious

Baltic targets for 2030

Decarbonization

- Reducing total GHGs while maintaining LULUCF sinks
- National non-ETS target, noting that EU Commission suggested higher non-ETS target
- Increasing the share of renewable electricity, heat, and transport energy

Energy efficiency

- Reduced primary and final energy use with special emphasis on energy renovations

Energy security

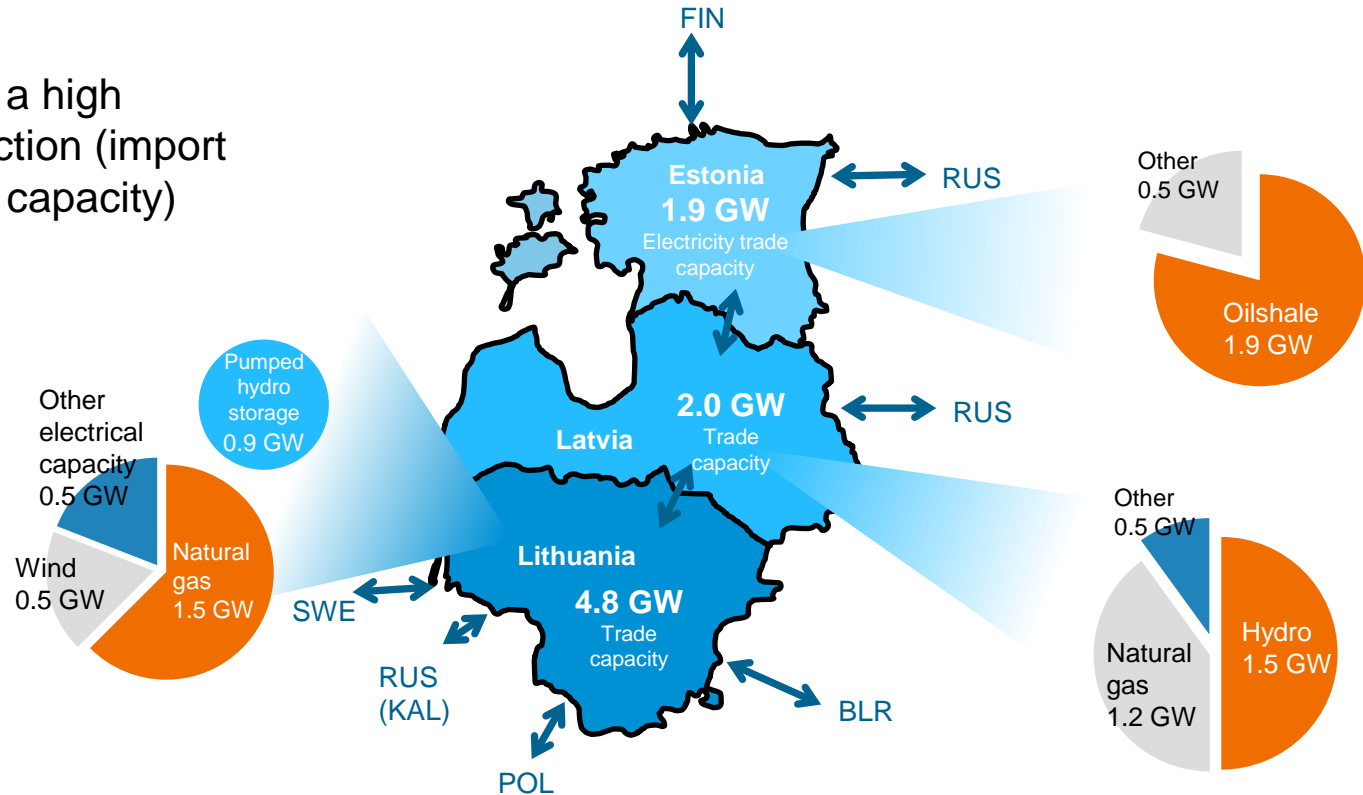
- Reduced imports by increasing domestic generation and production
- Increased interconnectivity and flexibility
- Long-term and short-term adequacy. Short-term particularly important with electricity.

Markets, research, innovation, competitiveness

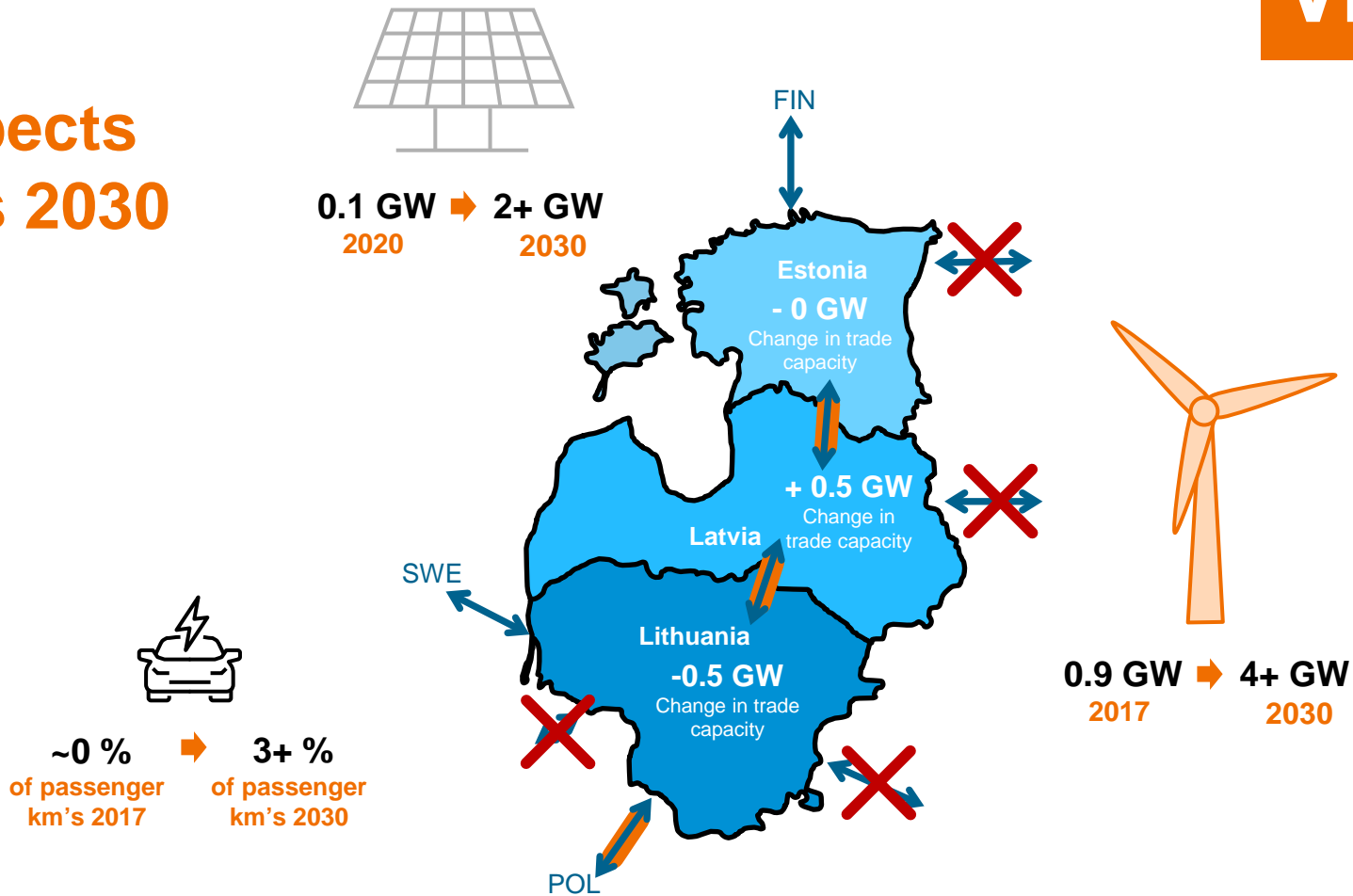
- Large range of measures and targets

Baltic power system today

- Baltic countries have a high degree of interconnection (import capacity / generation capacity)
 - Estonia has been a net exporter of electricity on annual level, Lithuania a net importer
 - All Baltic countries have very high share of combined heat and power (CHP) generation.

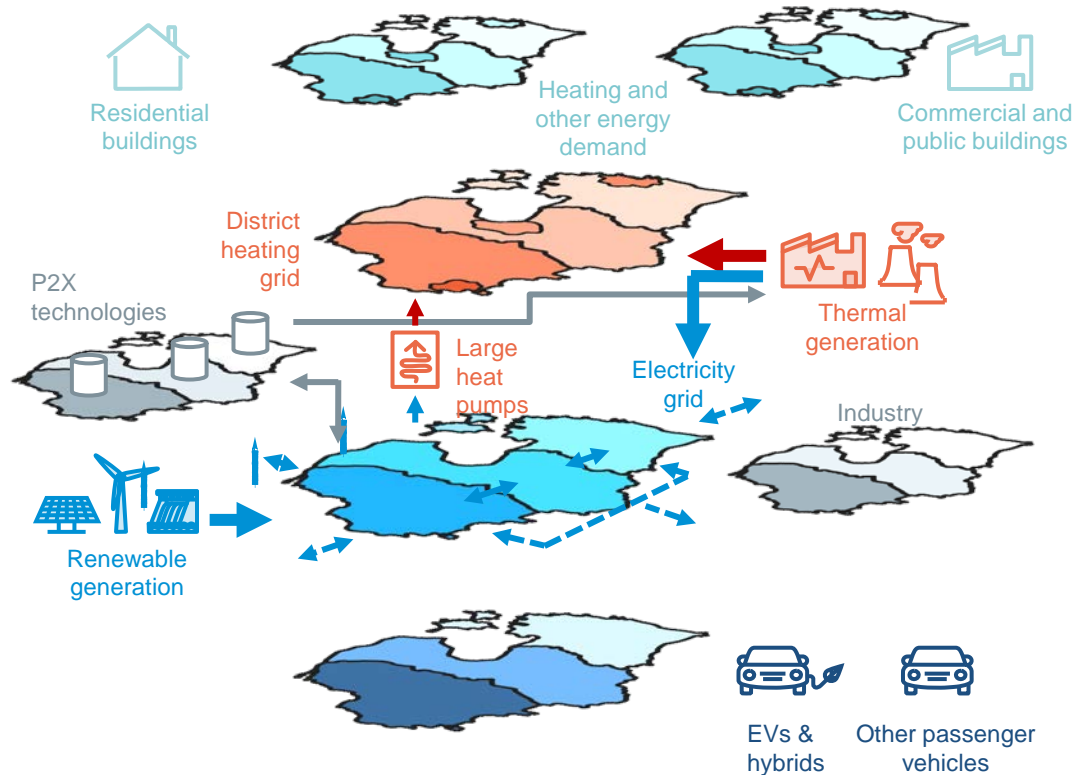


Key aspects towards 2030



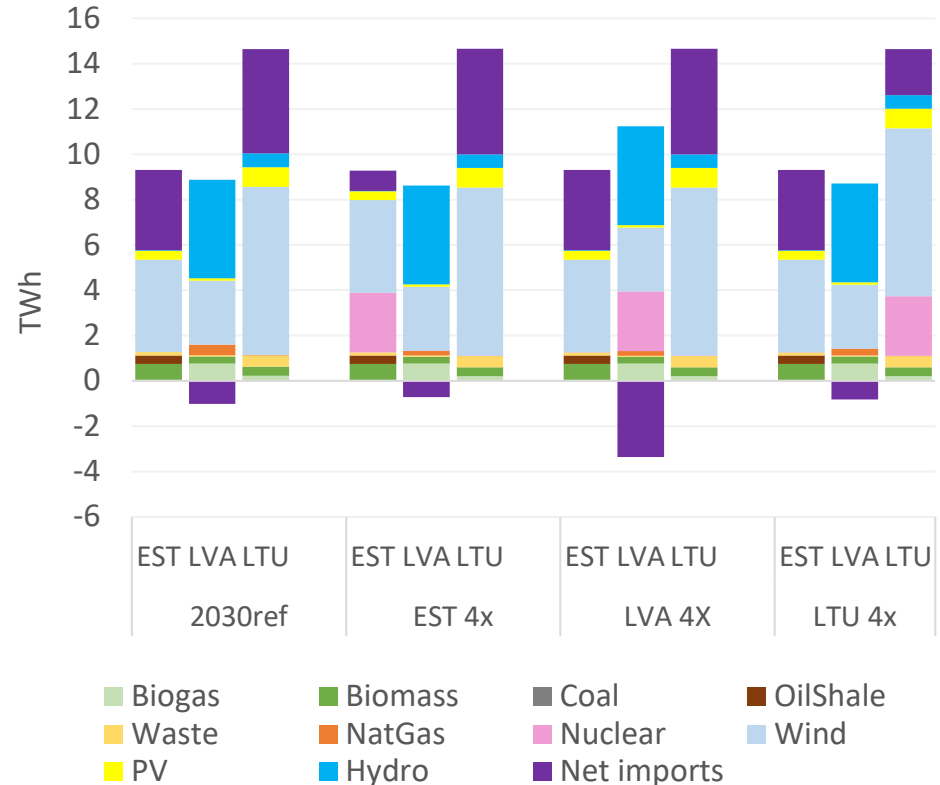
Baltic Backbone model

- Modelling energy systems with improved sectoral integration at hourly level
- Range of technologies and policies compared with target indicators
- Deep dives to most promising options
- Open source model, download from <https://gitlab.vtt.fi/backbone/projects/fasten-model>



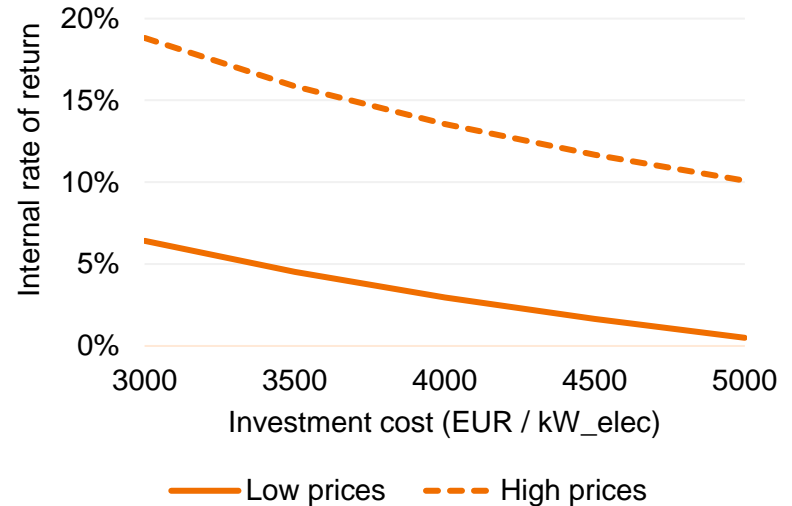
Adding NuScale x4 to Baltic countries

- Assuming 4x NuScale modules
 - 4x 73 MWe_{net}
- Wind and solar replace most of the fossil fuels already in the reference scenario, additional nuclear
 - increases domestic generation
 - Slightly decreases CO₂ emissions
 - Slightly reduces renewable energy share, but not amount



Profitability strongly depends on assumed fuel prices

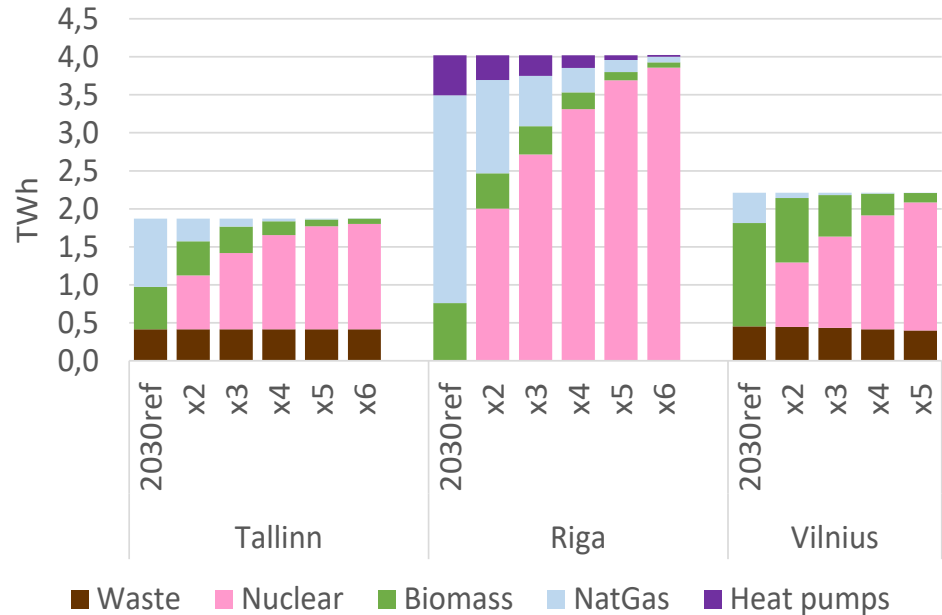
- Almost equal profitability in each country due to electricity trade and typically the same marginal prices between Baltic countries
- Assuming historical (2015-2020) low prices result to low profitability around 5% with default costs
- Assuming current high prices (2021-2022) results to a very good profitability (15+% IRR) with default costs



* NuScale estimates that total investment costs would be around 3400 USD/kWe_gross (~3500 EUR/kWe_net with 31.10.2022 exchange rate)

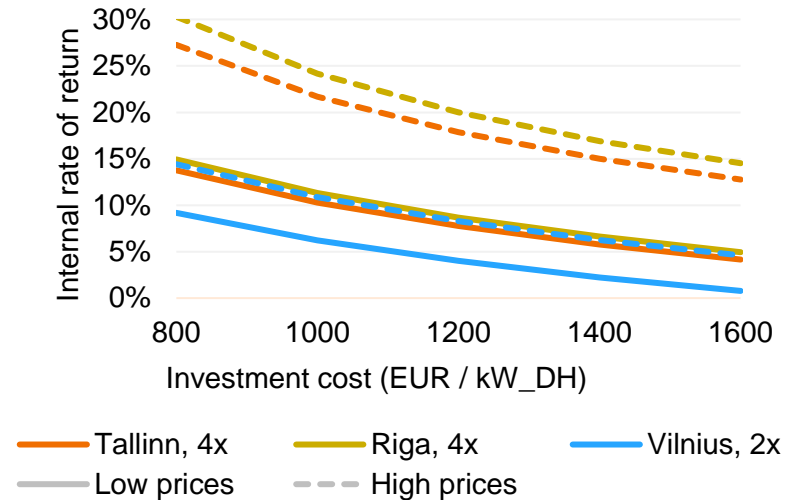
Adding LDR-50 SMRs to Baltic countries

- Siting units to Baltic capitals
- Number of units by scaling output power (MW_DH) from 2x to 6x of the summer demand of each city
- First units replace natural gas in Tallinn and Riga. Replacing biomass from 3x-4x onwards.
- Already first units replacing biomass in Vilnius



Profitability strongly depends on assumed fuel prices and location

- Current high prices favour also a district heat reactor, but the profitability highly depends on the existing DH system and its units
- Good profitability (10+ % IRR) with 1000 EUR / kW_DH investment cost in Tallinn and Riga also with low prices



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