AURORA ENERGY RESEARCH

Electricity Independence in the Baltics—How to Tap Into the Potential of Offshore Wind

Public Report

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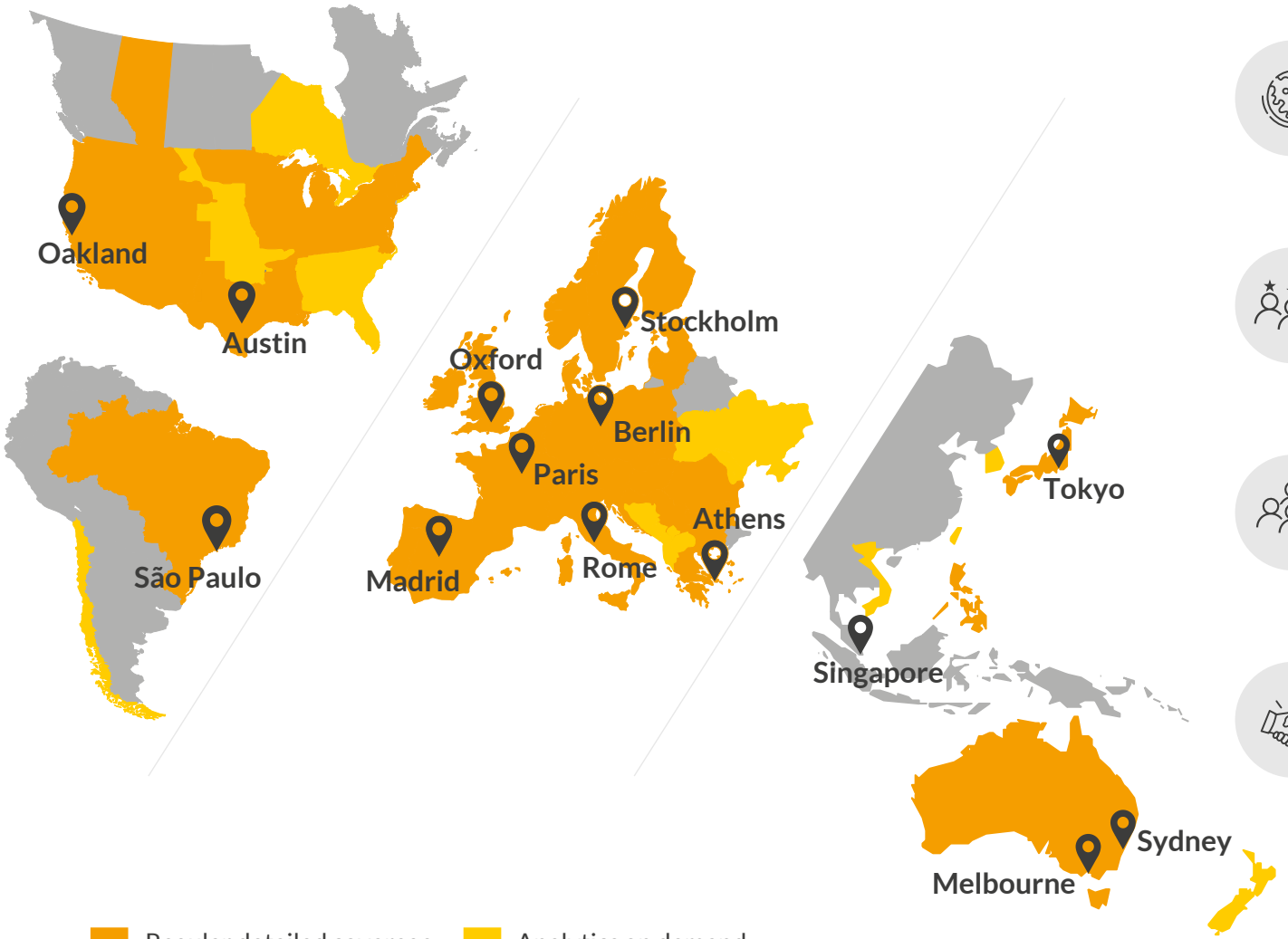

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850+
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150+
transactions supported in 2023

Source: Aurora Energy Research

Baltic Power and Renewables Market Service:

Dive into key market analysis and forecasts for the Baltics power and renewables markets

Power and Renewables
Market Service

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Analyst Support

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Table of contents

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Looking to understand more about the changing dynamics of the Baltic energy market?
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Laura Raud Pettersson, Commercial Associate

Renewables buildout drives down Baltic prices, which is countered by an uptake in demand and carbon prices in the late 2020s

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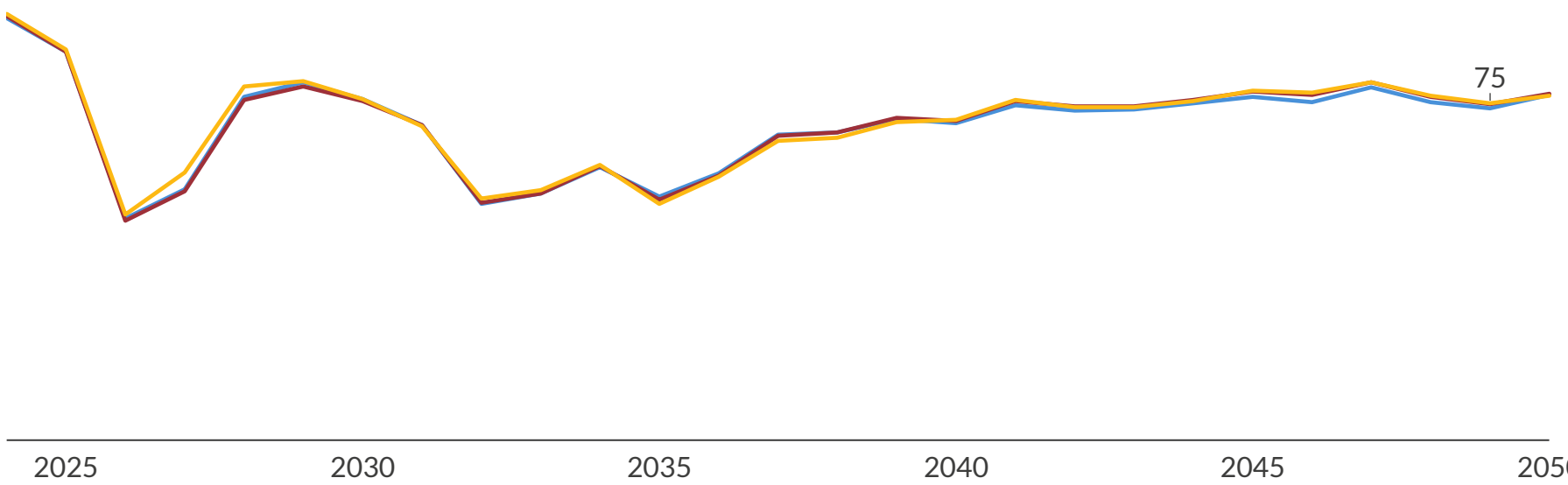
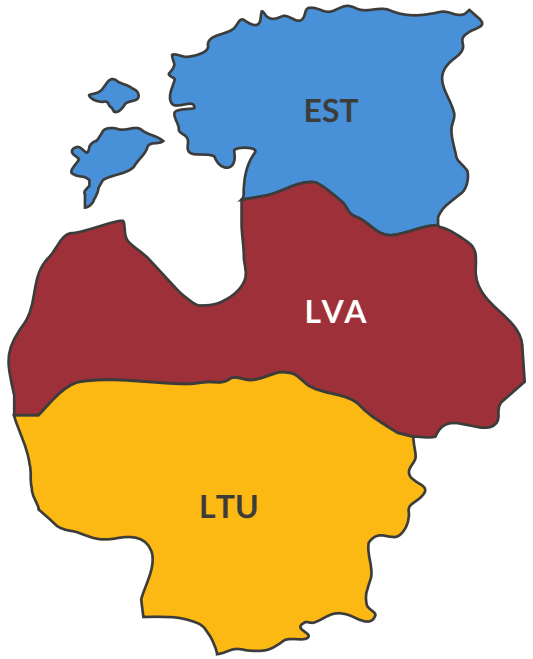
Baseload wholesale power price by country
€/MWh (2023 real)





Phases of forecast

- Baltic power prices drop sharply by 2026 due to rapid onshore wind and solar PV capacity buildout.
- Prices increase after 2027 as rising demand outpaces capacity buildout.

- In the early 2030s, the entry of offshore wind in the Baltics Sea decreases prices.
- Thereafter, prices increase to ~75€ due to increasing demand, growing trade with Poland, and higher gas and carbon prices. However, capture price cannibalisation slows down renewables buildout.
- The commissioning of Estlink III briefly breaks the upward trend in 2035, but with growing demand, power prices resume their ascent into the 2040s.

Source: Aurora Energy Research

Despite rising electricity demand in heating, transport and electrolysis, net imports decrease due to rapidly growing renewable generation

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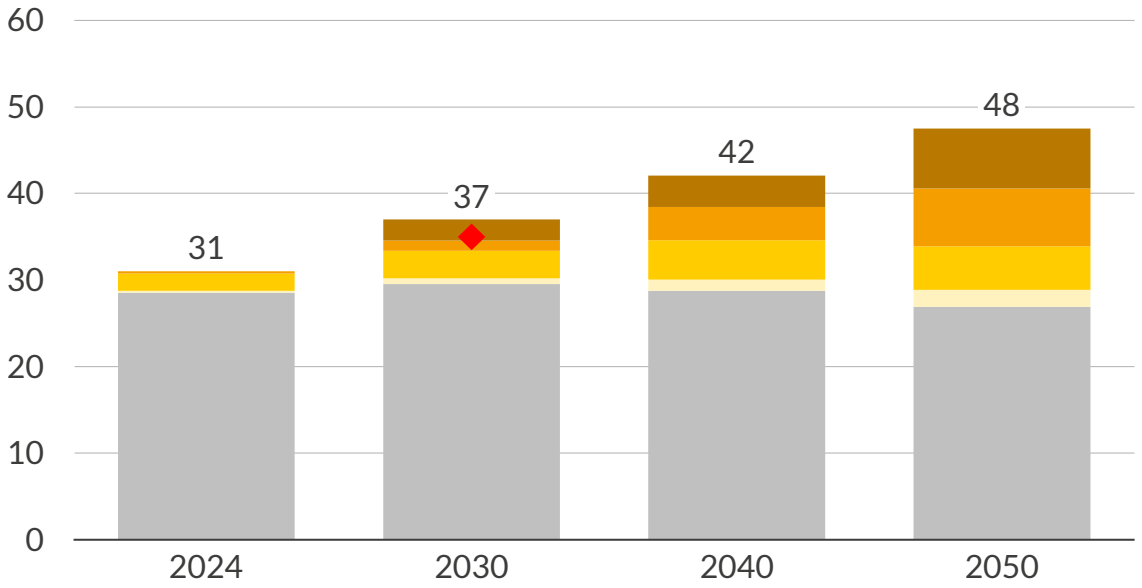
Electricity demand in the Baltics

TWh

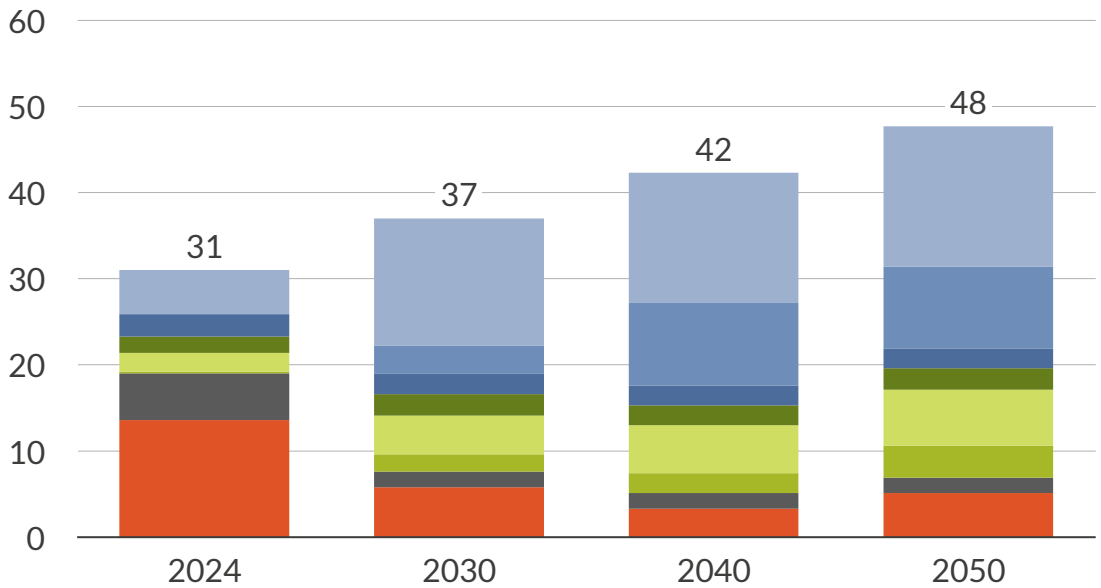


- From the 2030s onward, growth in power demand is driven by electrolysers, BEVs and heat pumps, while conventional base demand falls due to improved energy efficiency and declining population.
- In the last decades of the forecast horizon, the growth comes mainly from the accelerating buildout of electrolysers and BEV uptake.

Electrolysis | Heat pumps | Base demand
BEVs[1] | Industry electrification | TSO estimate[2]

Electricity generation and net imports in the Baltics

TWh



- Generation from wind, solar, hydropower, waste and biomass nearly quadruples from 2024 to 2050, rising to above 95% of total production by the end of the 2030s.
- The Baltics remain a net importer of annually 3 to 6 TWh in the long-run, mainly from Poland, Finland & South-Sweden

Onshore wind | Hydro | Fixed solar PV | Fossil thermal[3]
Offshore wind | Biomass/biogas | Tracking solar PV | Interconnectors

1) Battery electric vehicles. 2) The sum of central scenario estimates for 2030 demand by the TSOs, methodologies and definitions may vary. 3) Includes oil shale, oil and gas-fired power plants.

Sources: Aurora Energy Research, Elering, Litgrid, AST

Increased interconnector capacities with the neighbouring markets enable further integration with the EU power market

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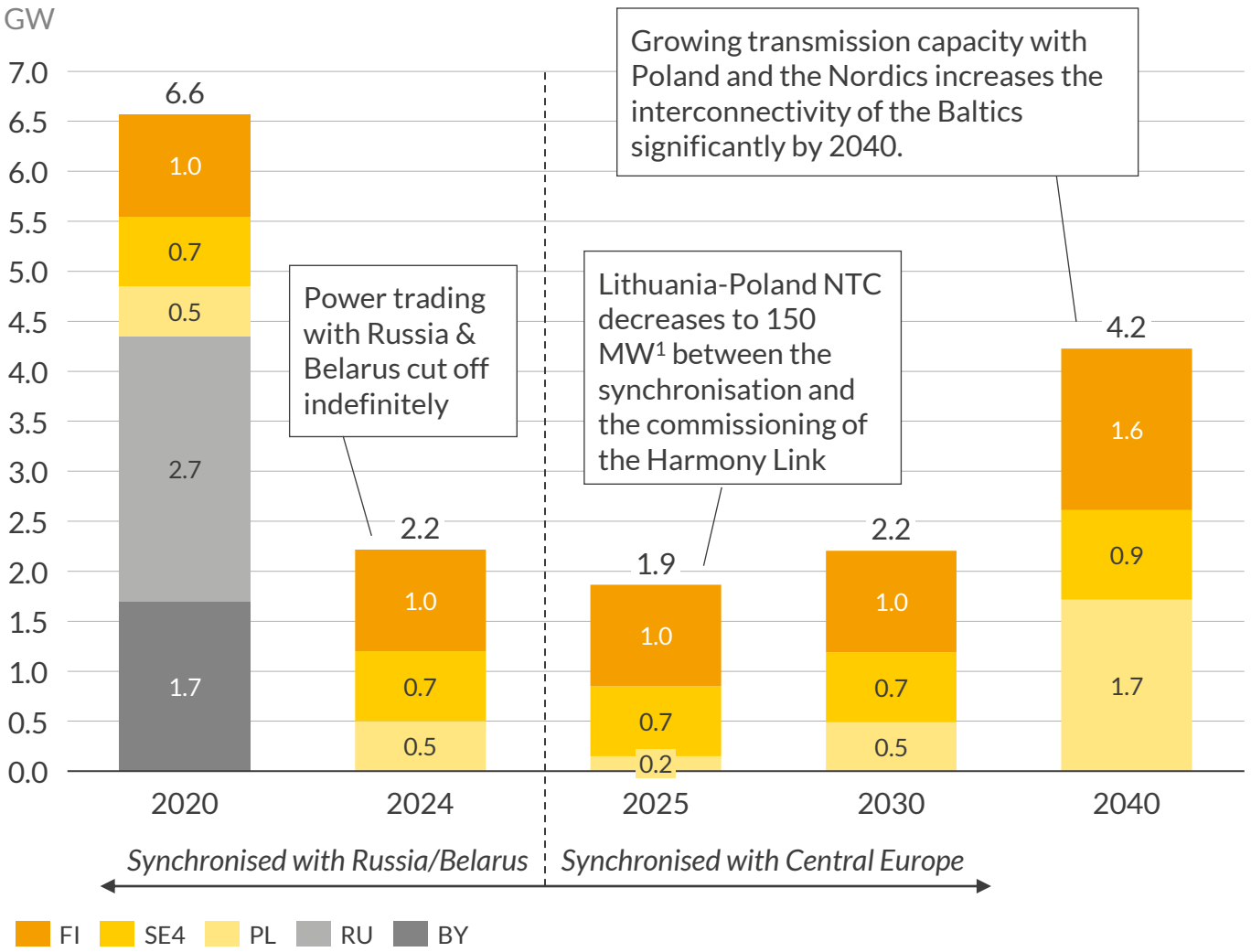
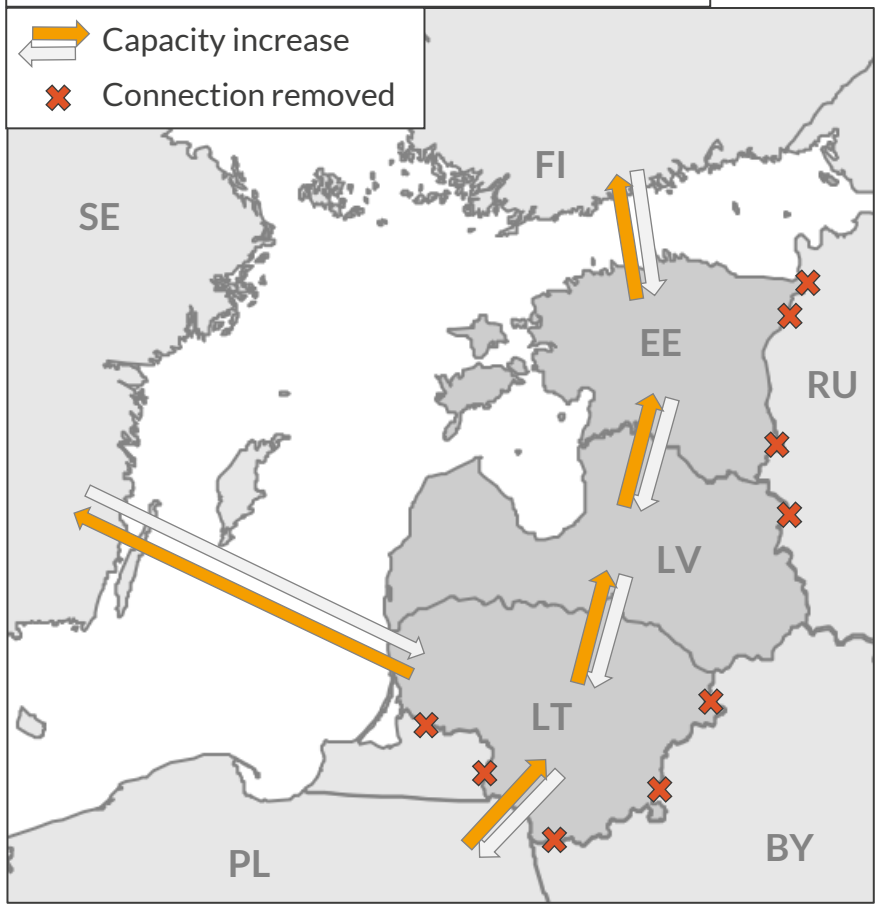
Total export capacity

GW



Changes to interconnection capacity by 2040



1) Along with the synchronization with the Central European Synchronous Area, the 500 MW LitPol link is mostly reserved to provide system services and becomes partially unavailable for trading.

Sources: Aurora Energy Research; European Commission; ENTSO-E; AST; Elering; Litgrid

Non-subsidised offshore wind buildout will not be economically viable before the 2040s despite the declining LCOE

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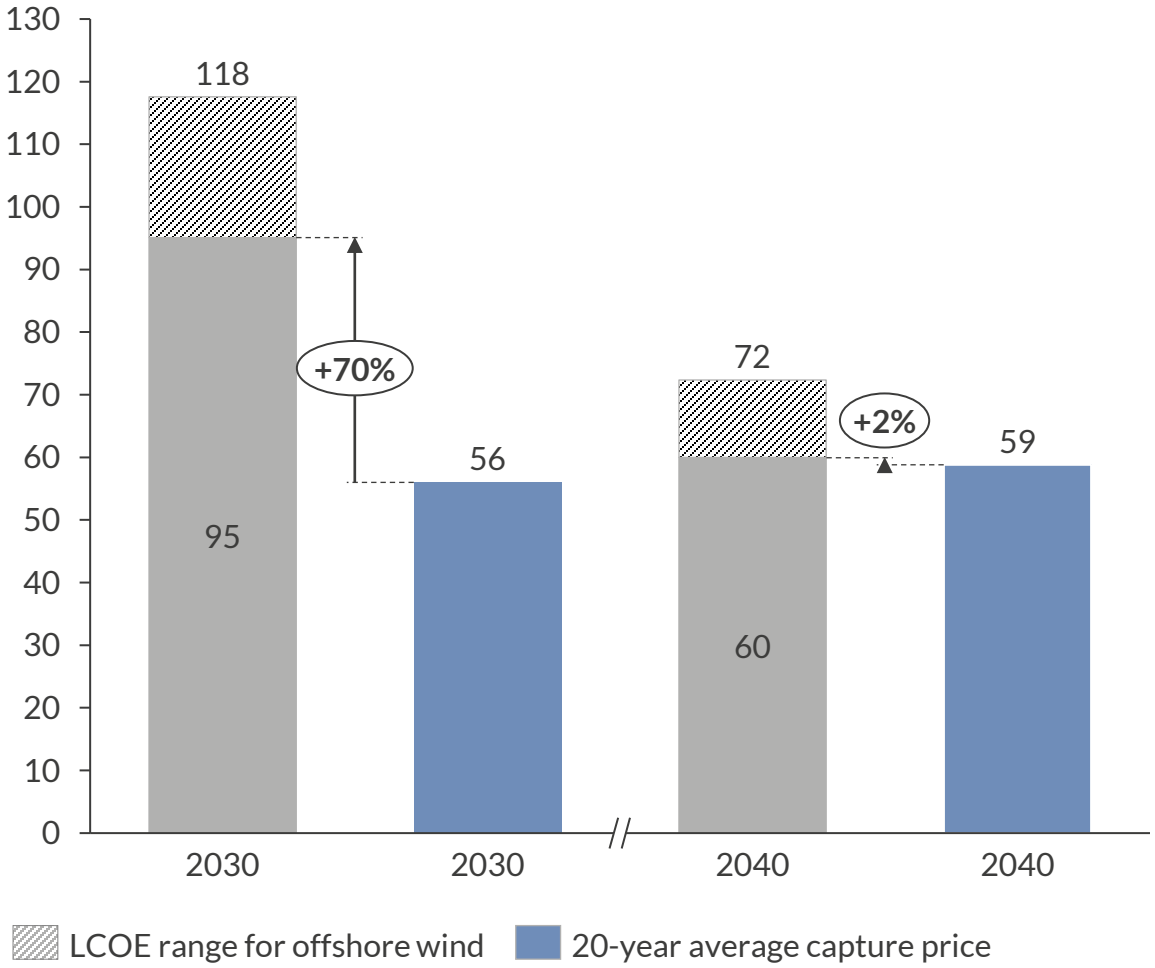
Offshore wind LCOE[1] trajectories and capture prices in Lithuania
€/MWh (real 2023)



Assumptions		
LCOE		**Capture price**
CAPEX range	+/-15 % to our Central case	Capture prices from Aurora's Central scenario, assuming 2.2 GW of total offshore wind capacity in the Baltics.
Lifetime	30 years	
WACC[2] (PPA)	10 %	
Load factor	51.7 %	

Challenges for non-subsidised offshore wind deployment

- LCOE of non-subsidised offshore wind power in Lithuania for 2030 is substantially higher than the expected capture prices in Aurora Central, making even PPA-backed projects unlikely to materialise.
- Even a lower CAPEX assumption is not sufficient to drive the LCOE low enough for PPA-based offshore wind to be economically viable in the early 2030s, when all Baltic states would like to see their first offshore wind farms commissioned.
- The development of CAPEX and power prices are correlated with the general economic growth, so in a world with higher power prices, offshore wind CAPEX would also most likely be higher.

1) LCOEs for a representative newbuild asset pre-curtailment, for different commercial operation dates. Wind assets assume a 2-year construction period. 2) WACCs are in real terms and pre-tax.

Source: Aurora Energy Research

Lithuania and Estonia struggle to attract bidders for offshore wind in both CfD and seabed lease auctions

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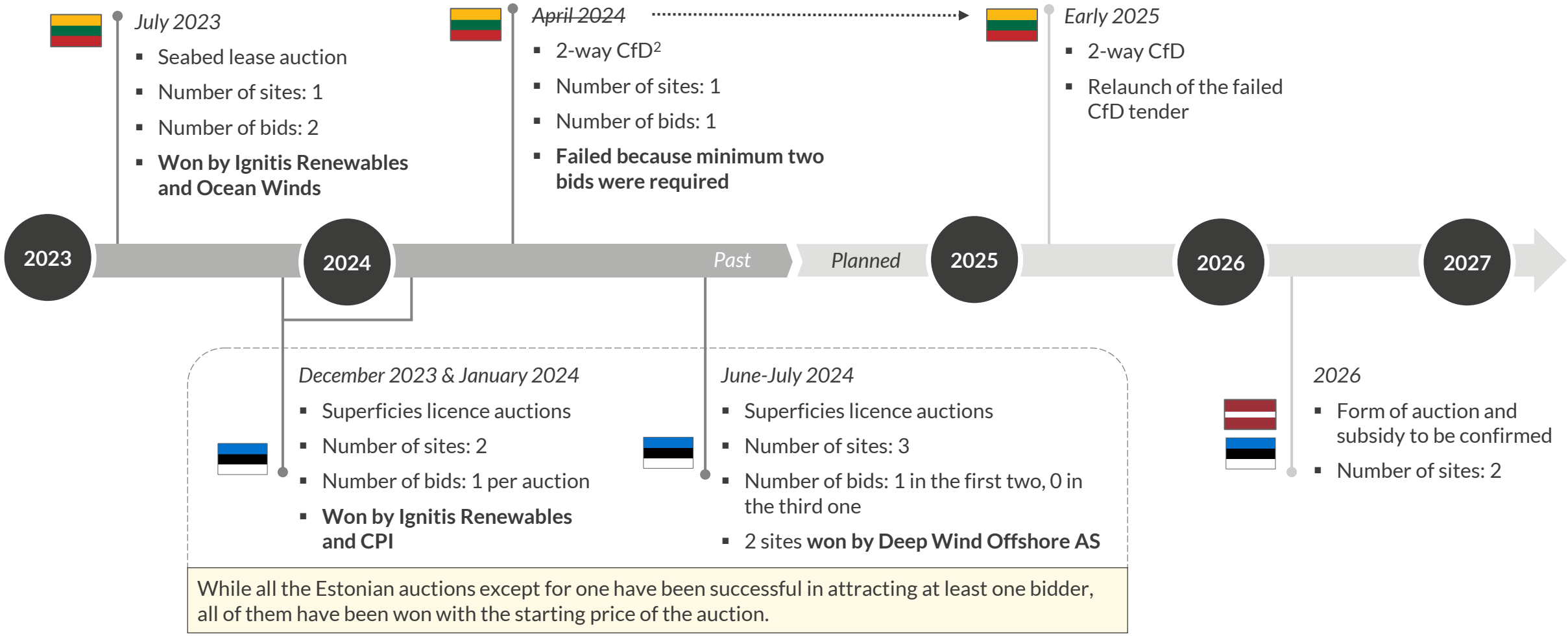
Timeline of past and planned offshore wind auctions in the Baltics[1]

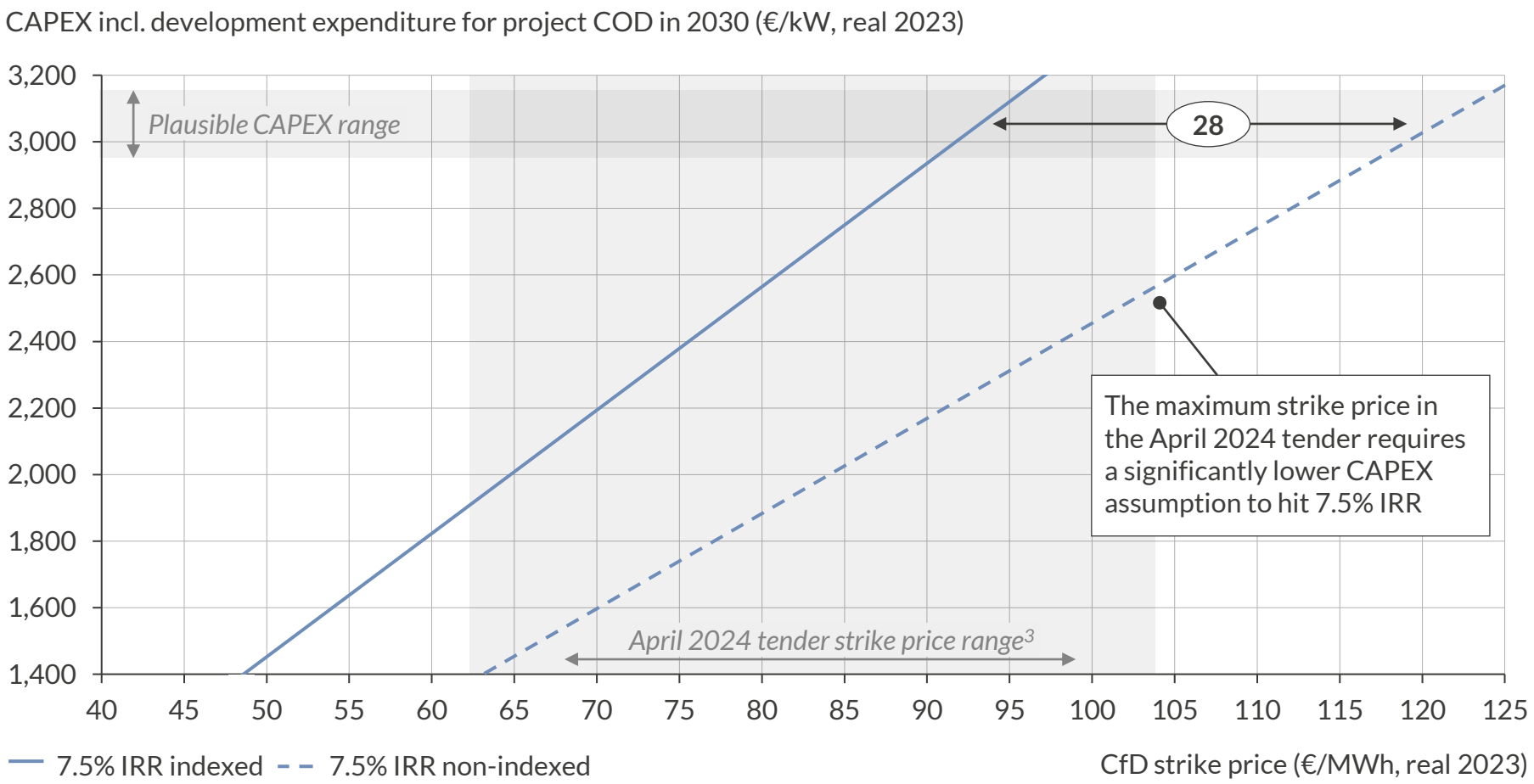


1) Based on the results announcement date. 2) Contract for difference.

Sources: VERT, TTJA, Elwind, Lithuanian Ministry of Energy, Ignitis.

Unlevered IRRs of >7.5% (real, pre-tax) can be achieved with a significantly lower strike price if indexed to inflation[1]

Possible combinations of project CAPEX and CfD strike prices to achieve 7.5% IRR level[2]
€ (real 2023)



- Achieving a **7.5% IRR** (real, pre-tax) without indexation of the strike price would require below-average CAPEX and a CfD strike price above the maximum bid of the 2024 auction.
- Indexation would make the same IRR achievable with nearly 30 €/MWh lower strike price.
- Under **standard assumptions** for CAPEX and the maximum strike price of the April 2024 tender, the IRR would remain around 6%.
- Indexation has been used or is being planned in various European markets, including **Poland**, **France**, **Ireland** and **the UK**.

1) We assume IMF World Economic Outlook inflation rates up to 2028, from then we assume a constant 2% inflation. 2) Unlevered real pre-tax IRR. We assume a 20-year CfD and a 30-year lifetime for the asset, with post-CfD revenues based on capture prices in Aurora Central. 3) Assuming 3.25% inflation relative to 2023.
Sources: Aurora Energy Research, Reuters, Wind Europe

Conclusions

1 Rapid buildout of renewables causes power prices in the Baltics to drop in the short term, which is countered by increasing demand and carbon prices in the late 2020s. Thereafter, prices increase to ~75€ due to further increasing demand, growing trade with Poland, and higher gas and carbon prices.

2 Without additional government support for renewables, the Baltics will not reach their target of having net zero imports by 2030.

3 While the impact of desynchronisation on day-ahead price clearing is limited, it influences the market by reducing geopolitical risks, integrating the Baltics with European power markets, promoting BESS development, and limiting the Lithuania-Poland interconnection.

4 Non-subsidised offshore wind build-out will not be economically viable until the 2040s. Compared with other European markets, the Baltics have lower power prices than Central European markets and higher cost of capital than the Nordics.

5 The most feasible solution to make the tenders more attractive is to reduce the WACC by mitigating project risks. This can be achieved by ensuring a stable policy environment, supporting additional industrial offtake, and indexing CfD strike price to inflation.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