The Nordic market after the energy crisis - A long term outlook

Nordic Energy Day 2024

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The geopolitical tensions surfacing makes the energy transition more difficult and costly

Covid 19

War in Europe

China's dominance

Energy crisis – decoupling

- Increased focus on security of supply
- Interaction between energy carriers
- Autonomous value chains
- Decentralised production

Great power rivalry – risk minimization

- Trade policy
- "Take" the value chains home
- Data security and cybersecurity
- International alliances

The geopolitical earthquake has put Europe in a difficult situation

3

Increasing protectionism:
- The United States in lasting conflict with China
- Wants a leading position in energy and digitalization
- Green jobs are the contract with the American middle class (IRA, Chips Act, increased tariffs against China)

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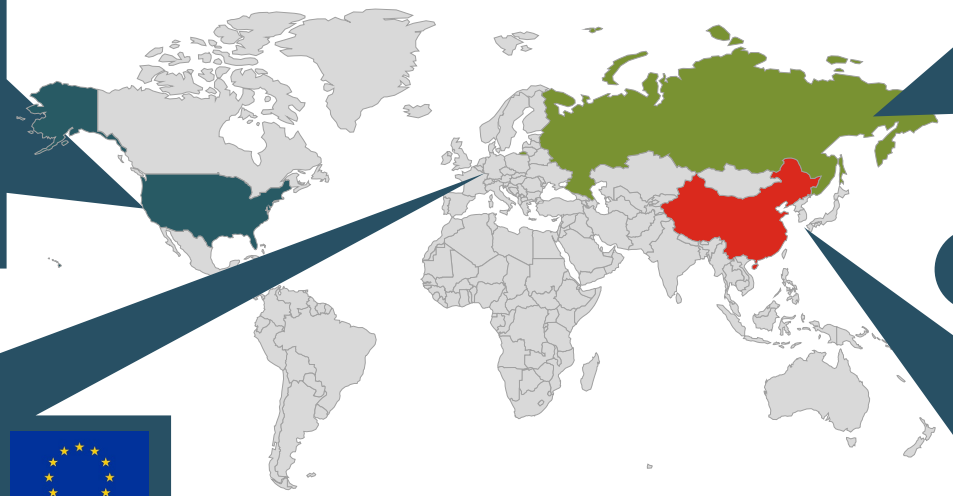
End of deliveries of cheap gas from Russia:
- Development towards a lengthy war
- Closer alliance with China against the West
- Natural resources and the High North remain important bargaining chips



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Europe in a squeeze:
- High gas prices have shown how vulnerable the economy is
- Dependence on China on renewable technologies
- Uncertainty about whether Europe is coordinated, in competition, or in conflict with the United States

2

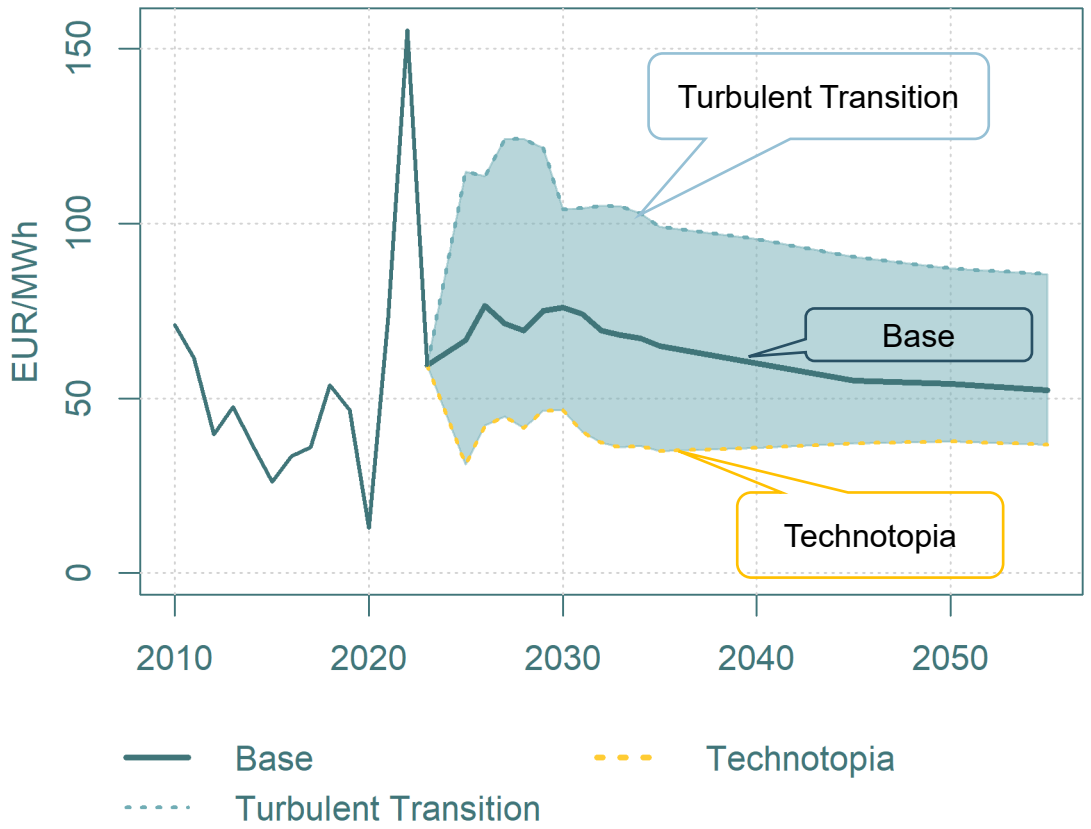
Leading in all renewable value chains and nuclear power:
- Increasingly aggressive foreign policy in neighboring areas*
- Aggressive economic warfare
- Made in China 2025: Become a Leader in Green Energy and Digitalization (Artificial Intelligence, Semiconductors)

Sources: Foreign Affairs nov/dec 2022, Kåre Dahl Martinsen (2022); Økonomisk krigføring, THEMA: Energinasjonen etter energikrisen
**Taiwan, Islands in the South-China sea, border conflicts with India*

Europe’s challenge going forward…

A more costly transition will lead to power prices remaining at a level higher than historical averages

Nordic system price



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Decoupling from Russia:

- Gas prices are still key as the cost of gas-fired generation continues to be the main short to medium term driver
  - ➡ Uncertain gas market development
- Accelerating RES investments
  - ➡ Volatility increases with more RES in the system

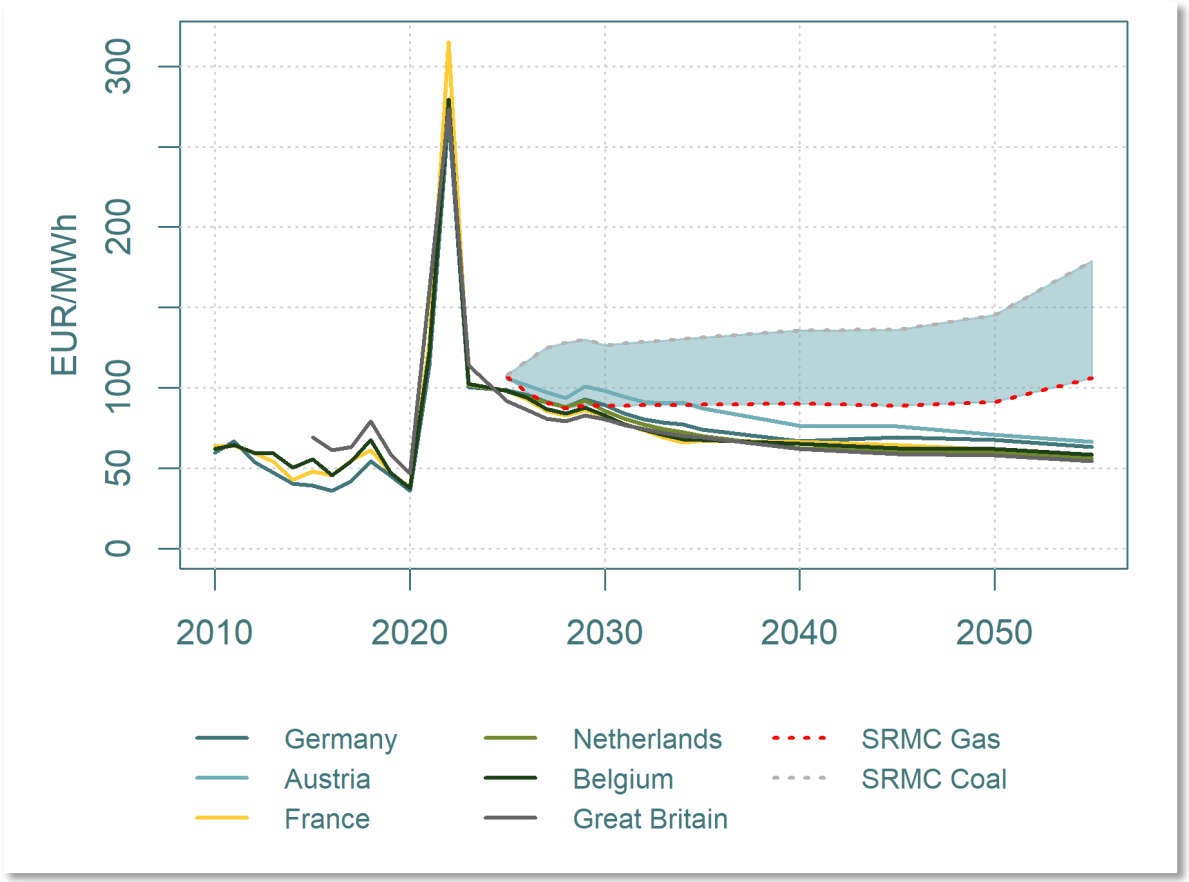
2

Derisking from China:

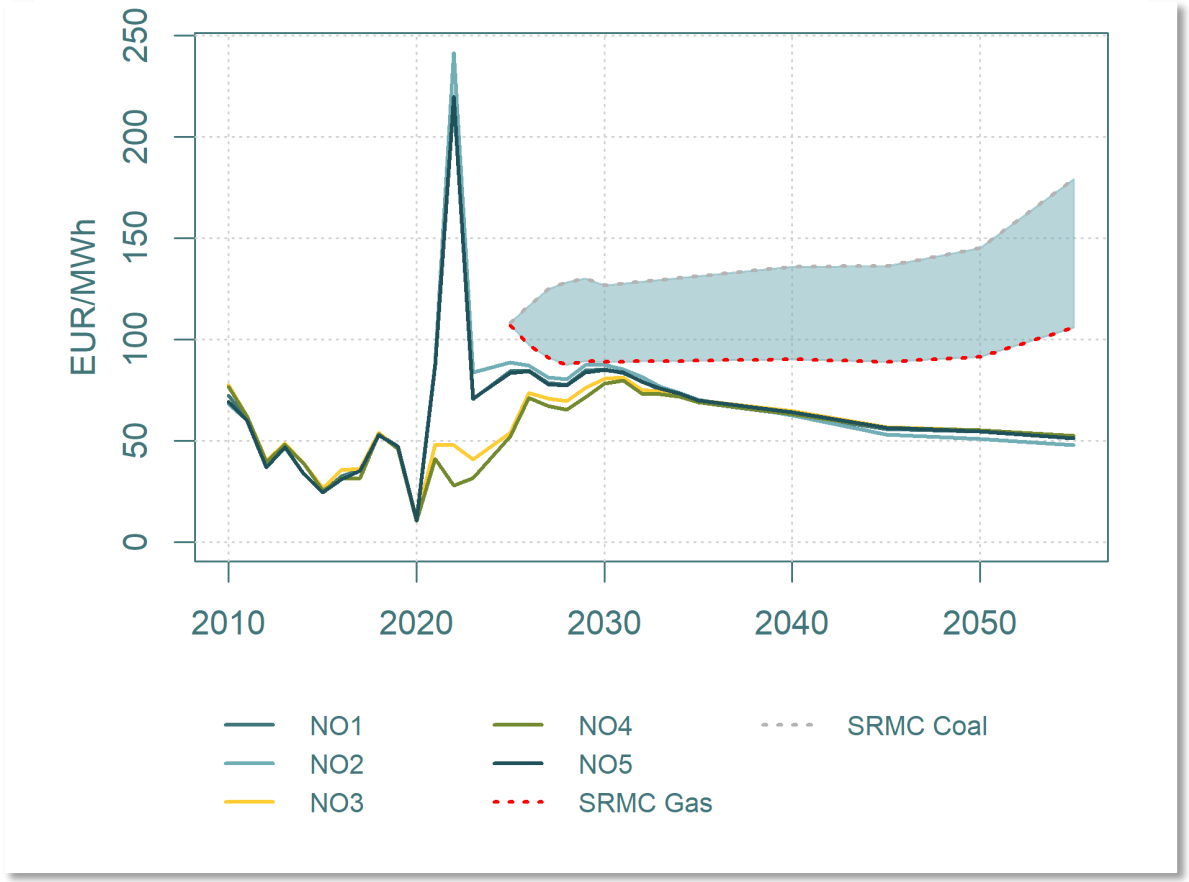
- A strong increase in demand is across the Nordics to meet climate targets
- Significant buildout of RES
  - ➡ Higher cost for RES investments increases power prices

Power prices continue to follow the cost of gas-fired generation over the next decade

Continental Power Prices vs. SRMC coal and gas

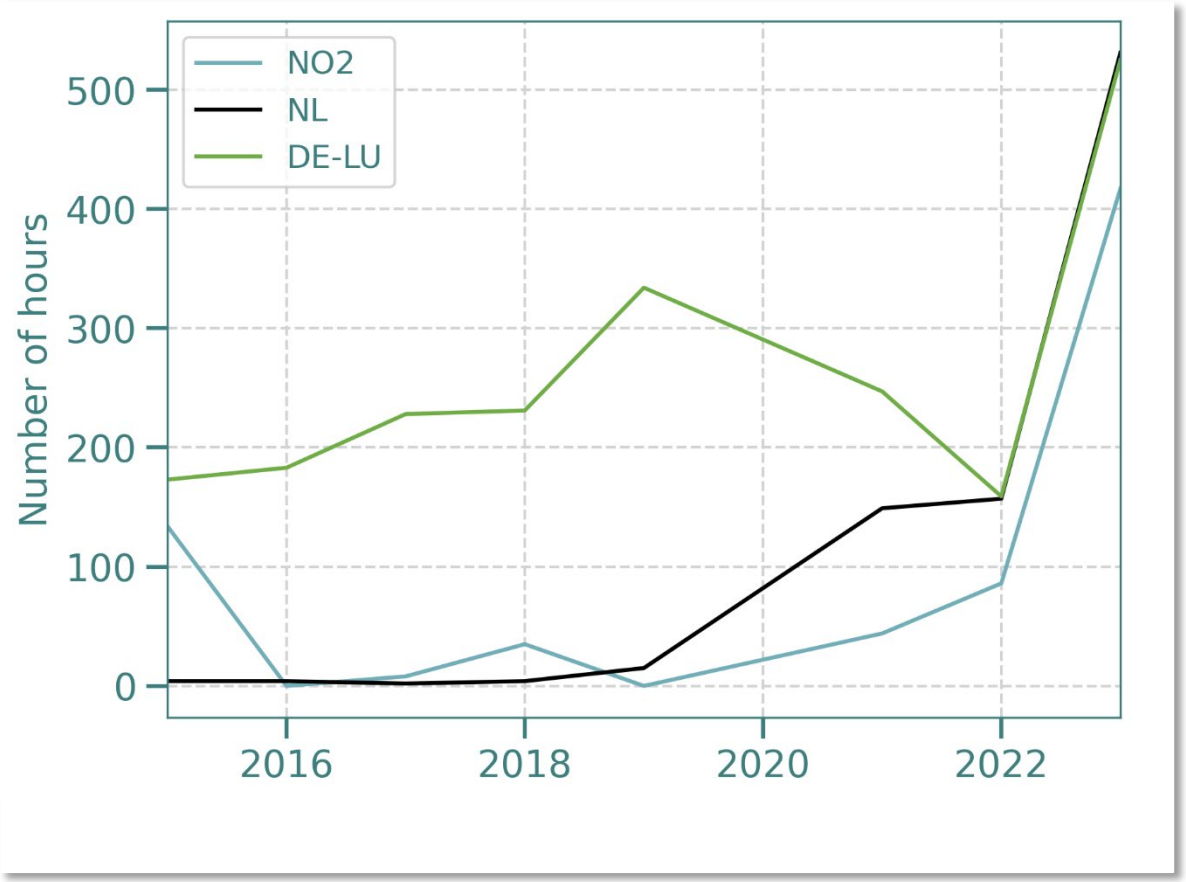


Norwegian Power Prices vs. SRMC coal and gas

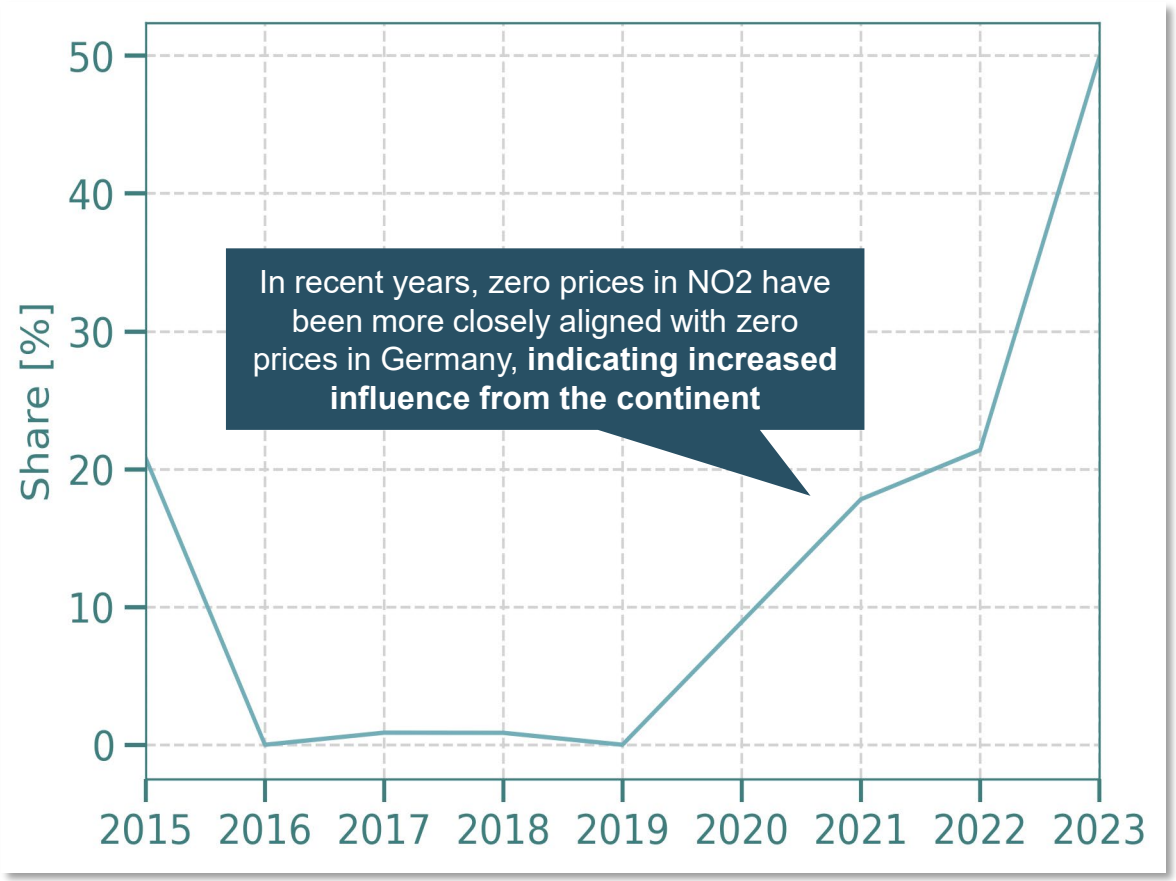


RES buildout has increased the number of zero prices in the southern part of the Nordics, mirroring a similar trend on the continent

Annual frequency of zero prices*



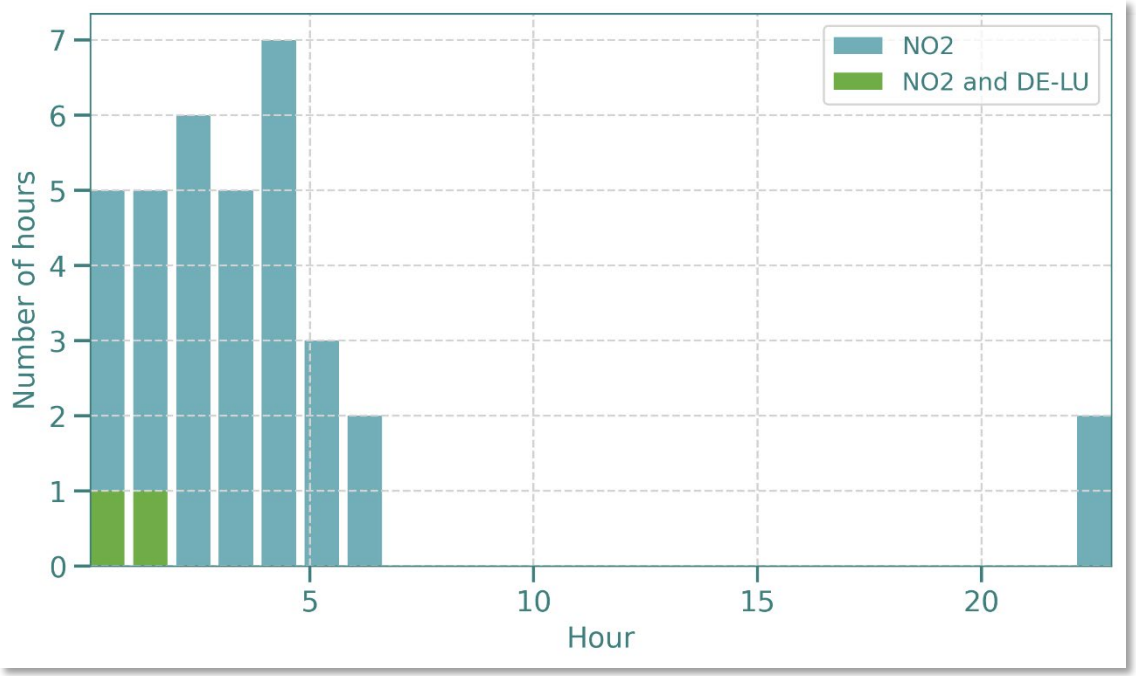
How often is the price zero in NO2 when the price is zero in Germany?



**Prices below 5 EUR/MWh. 2020 has been left out due to abnormally low price levels in the Nordics.*

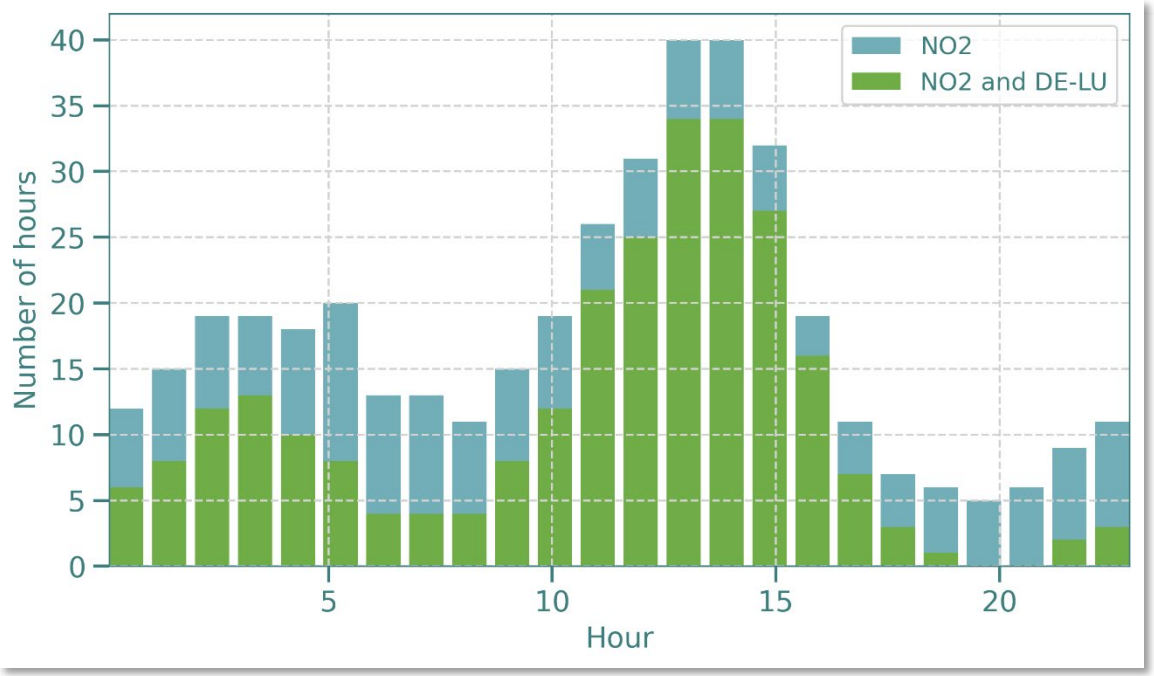
Stronger influence from the Continent results in more zero price hours during mid-day

Hourly distribution of zero prices in 2018



- In 2018, most zero prices in NO2 occurred during night-time hours
- Only in two of these hours, DE-LU also had zero prices

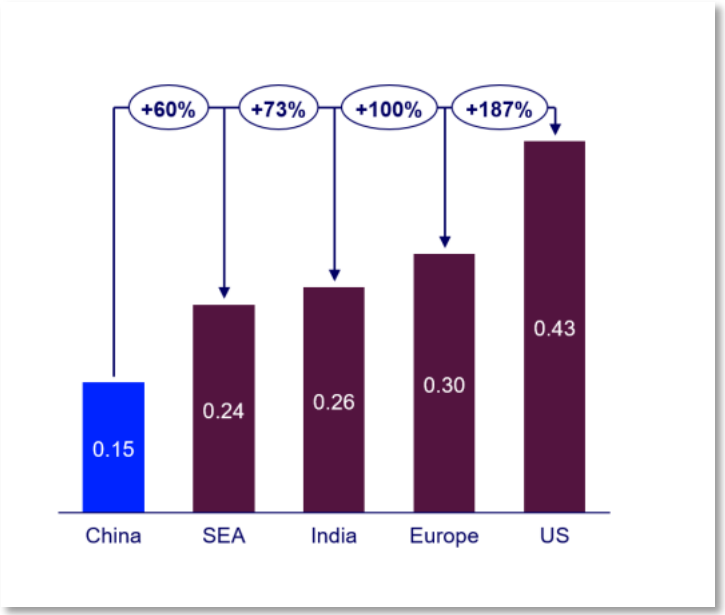
Hourly distribution of zero prices in 2023



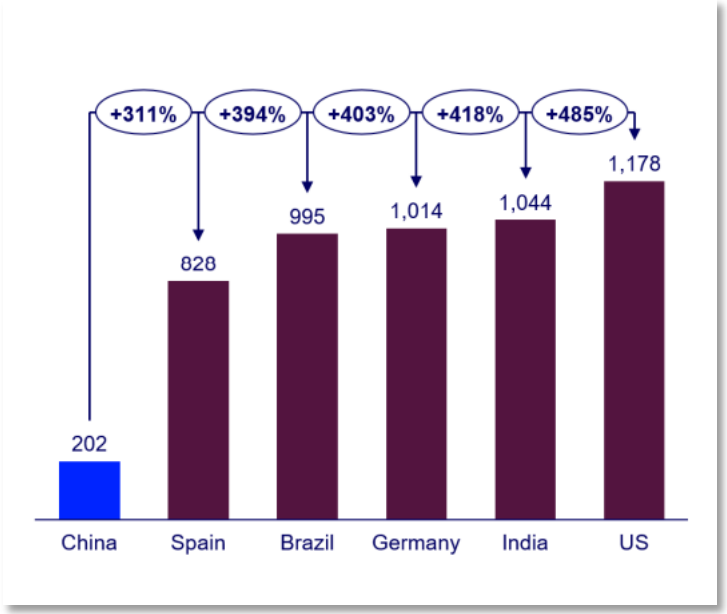
- In 2023, most zero prices occurred during mid-day hours, when solar output on the continent tend to be high
- In the majority of these hours, DE-LU also had zero prices

It will be far more expensive to achieve the zero-emission targets if our own value chains are to be built up

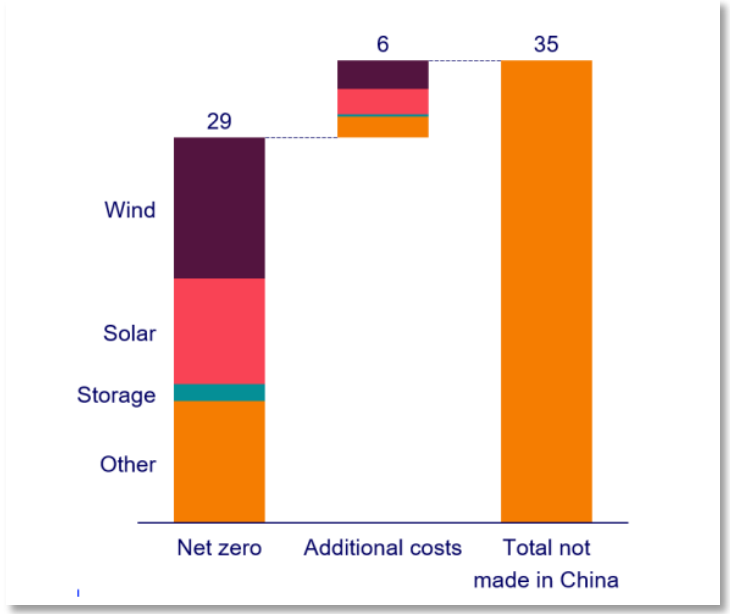
Solar PV module prices 2023 (US$/w)



Wind turbine prices 2023 (US$/MW)



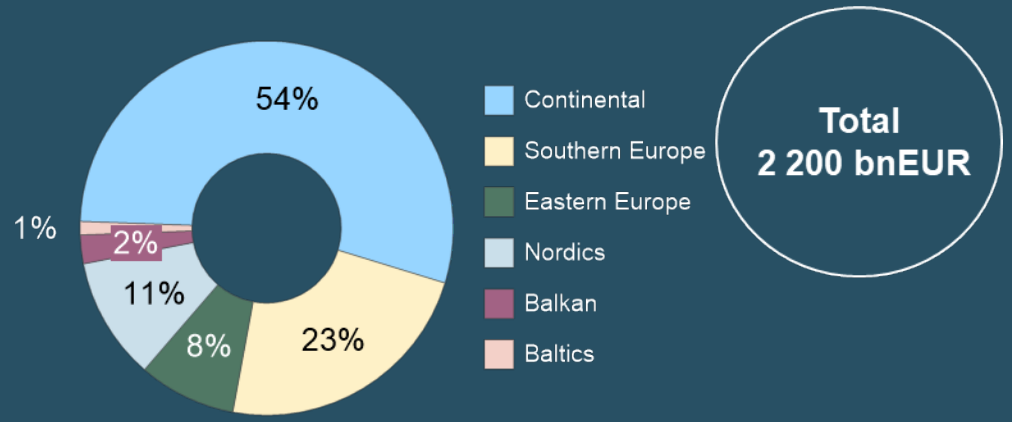
20 per cent more expensive energy transition globally without China (USD trillion)



- But without China, it will probably be impossible to achieve the 2030 and 2050 goals – the direction now is still more regional markets, trade barriers of various kinds that partially reverse globalization
- Global players will locate in the different regions to compete there, which means that the energy transition will probably be more expensive and take longer

Kilde: Wood Mackenzie, https://qz.com/enery-transition-without-china-costs-20-percent-more-1851251438?utm_source=cbnewsletter&utm_medium=email&utm_term=2024-02-23&utm_campaign=China+Briefing+22+February+Interview+with+Chinese+govt+climate+advisor+missing+emissions+targets+the+cost+of+excluding+China

2 200 bn EUR of Investments in solar PV, wind, hydrogen and battery technologies are necessary to finance the energy transition in Europe…

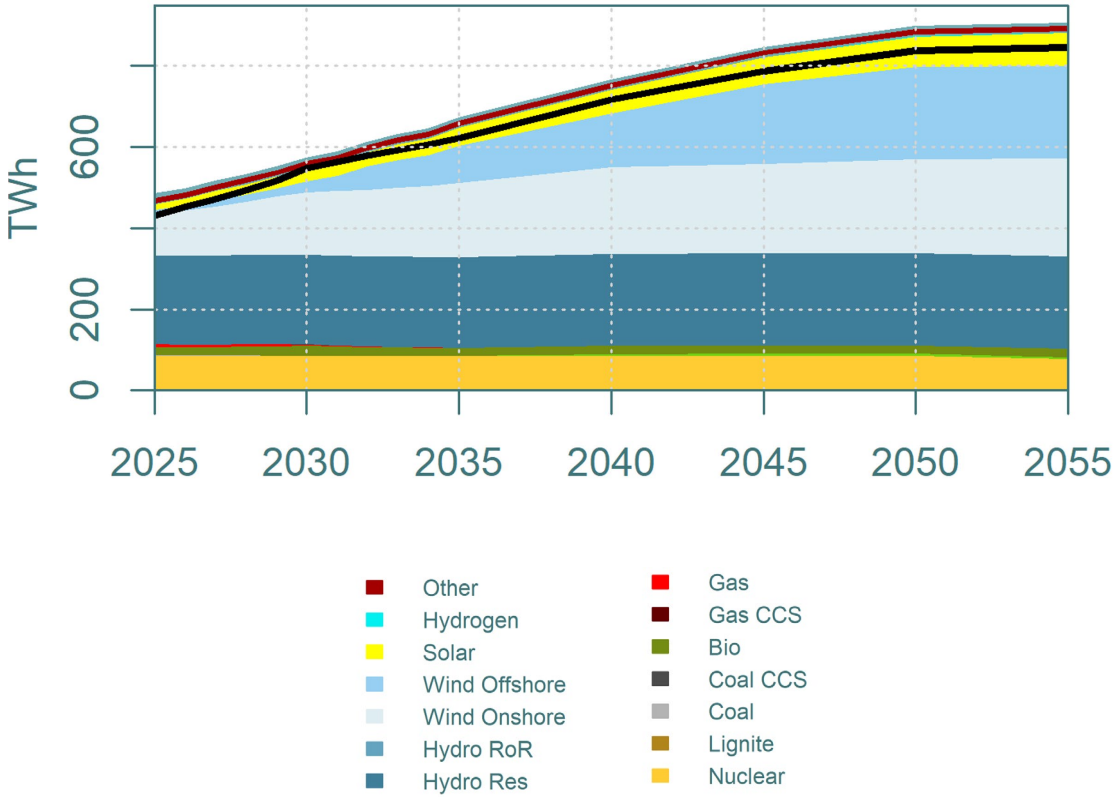


- Market sizes for different regions reflect the local investment conditions.
- The investments amount to 2 200 bn EUR from 2025-2050, an average of just under 85 bnEUR every year.
- The total accumulated GDP in the EU was 17 000 bnEUR in 2023[1]. Hence the investments account to roughly 5 ‰ of the GDP every year on average.

[1] *Eurostat, 2023-EUR. EU-27 do not include UK, Norway and many Balkan countries*

… of this 11% or 240 bn EUR is required in the Nordics

Supply mix and demand in the Nordics

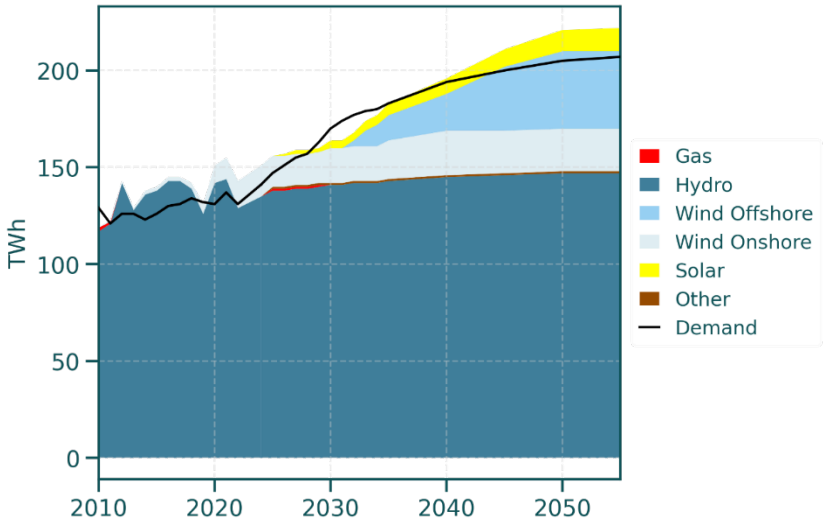


The generation surplus will vanish in Norway, while the supply/demand balance remains positive in Sweden

Little new supply coming online this decade in Norway

Strong public resistance to onshore wind

Offshore wind industry is facing both delays and high costs, introducing uncertainty to the timeline

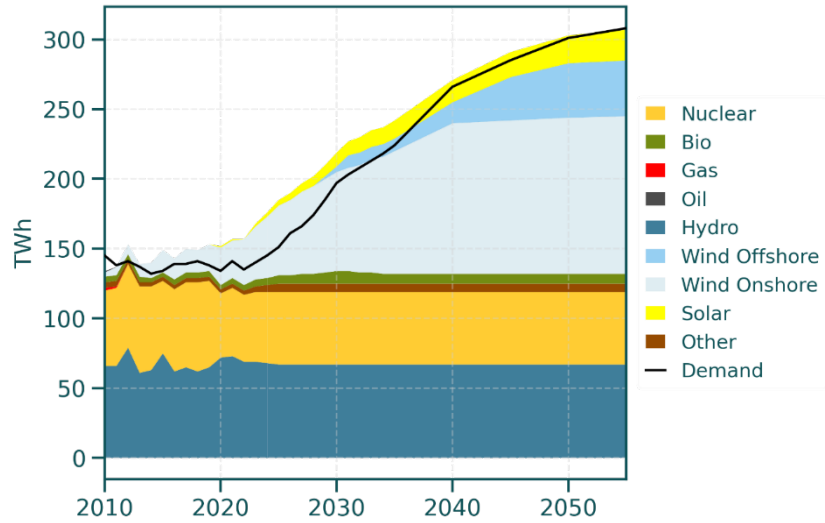


- Strong public resistance to onshore wind power
- Solar power is expected to grow, but the total generation will be modest
- Large-scale deployment of offshore wind after 2030. However, the industry is facing both delays and high costs, introducing uncertainty to the timeline
- In general, investors face high regulatory uncertainty

Target changed from 100% RES to 100% fossil-free in Sweden

Current government has high ambitions for nuclear

Increasing local resistance against onshore wind



- Current government has high ambitions for nuclear
- Strong pipeline of onshore wind projects
- Increasing local resistance from municipalities against onshore wind power development in Sweden
- We expect a substantial growth in electricity demand in Sweden, both due to ambitious climate targets and the establishment of new industries

Summing up

New geopolitical reality

- Covid
- War in Europe
- China's dominance

Decoupling from Russia

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   - Uncertain gas market development
2. Accelerating RES investments
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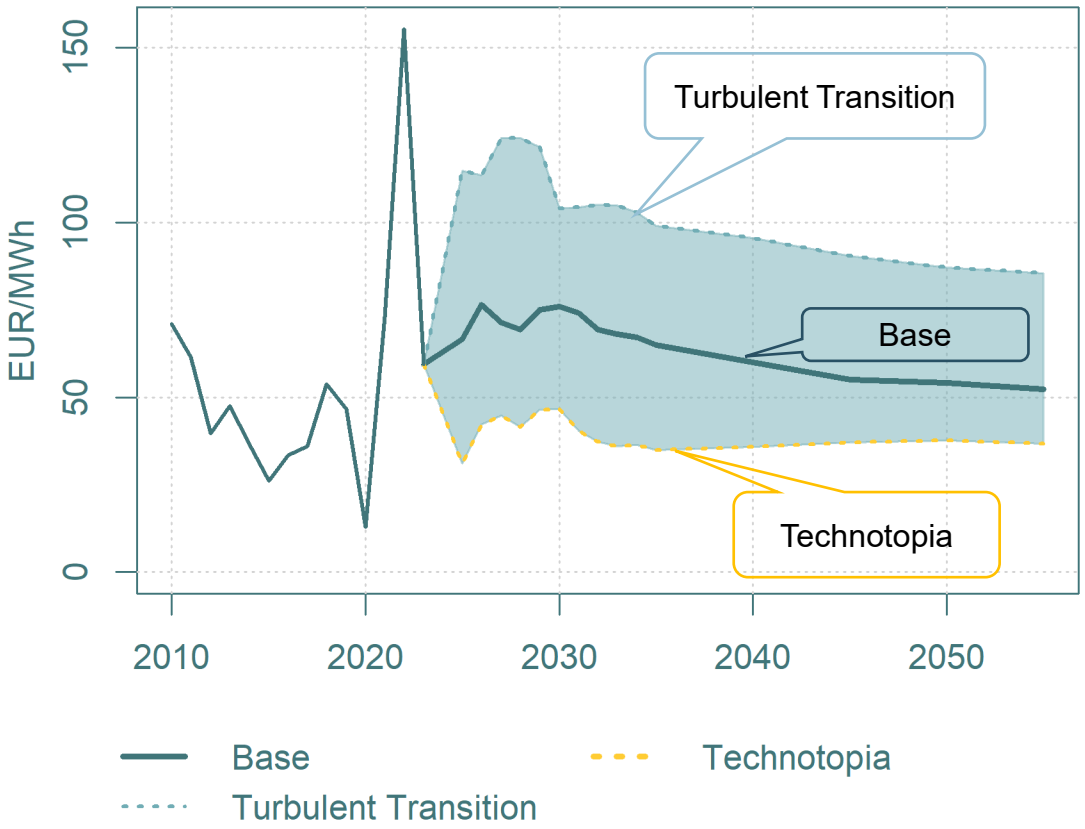

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Navigate the energy transition with confidence