

Agora
Energiewende



The German perspective of increased North European electricity market integration

STEPHANIE ROPENUS, PH.D. | STOCKHOLM, 3RD OF MARCH 2015

SEMINAR BY SVENSK ENERGI
AND NEPP (NORTH EUROPEAN POWER PERSPECTIVES)



Who we are

- > Independent and non-partisan think tank, 19 experts
- > Project duration: 2012-2017 | Funded by the Mercator Foundation and the European Climate Foundation
- > *Mission:* How do we turn the *Energiewende* in Germany into a success story?
- > *Methods:* Analysing, understanding, discussing, assessing, putting forward proposals



Outline

1. The German “Energiewende“ in a European Context
2. Rationale for Nordic and German Electricity Market Integration
3. Possible Effects of Nordic and German Electricity Market Integration
4. (Some of the) Challenges and Perspectives
5. Outlook

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What lies at the heart of Germany's energy transition?

Phase-Out of Nuclear

Stepwise shut down of all plants until 2022.

8 plants shut down in 2011, 9 plants to follow in 2015, 2017, 2019, 2021 and 2022.

Increase Efficiency

Reduction of electricity consumption vs. 2008 of -10% by 2020; -25% by 2050



Energiewende

Low-carbon economy

Reductions in GHG vs. 1990:

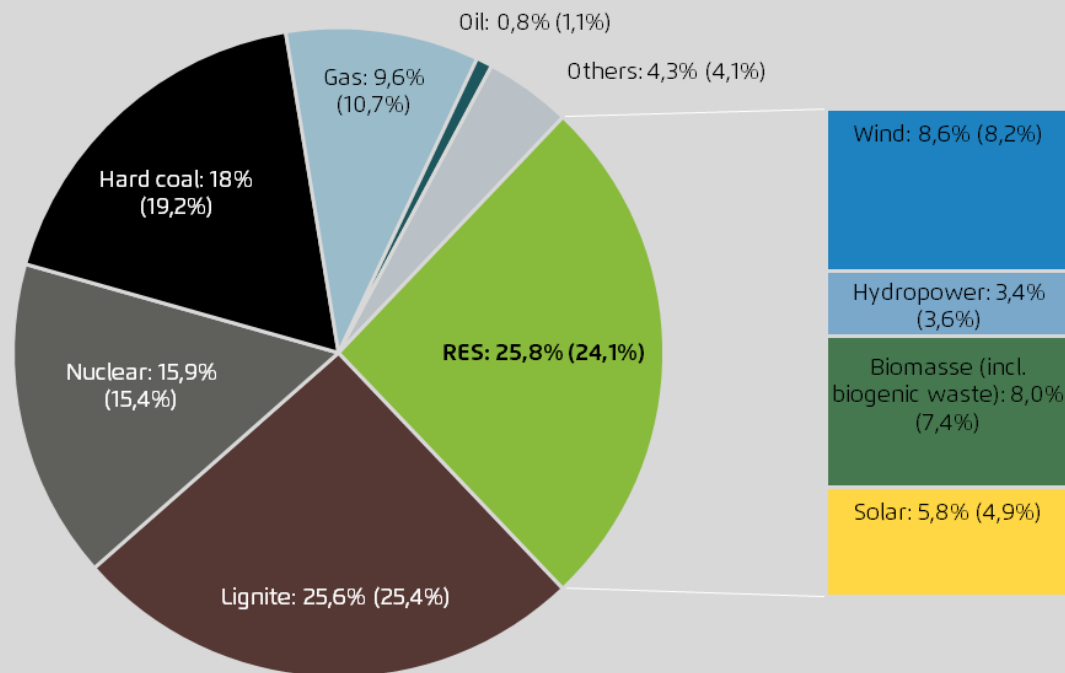
- 40% by 2020; - 80% to -95% by 2050.

Entering the Era of Renewables

Share in power consumption of 40-45% by 2025; 55-60% by 2035; \geq 80% by 2050

The German power mix 2014: Still dominated by conventional energy sources, but rising shares of renewables.

Germany's Power Generation Mix 2014 (2013 values in brackets)

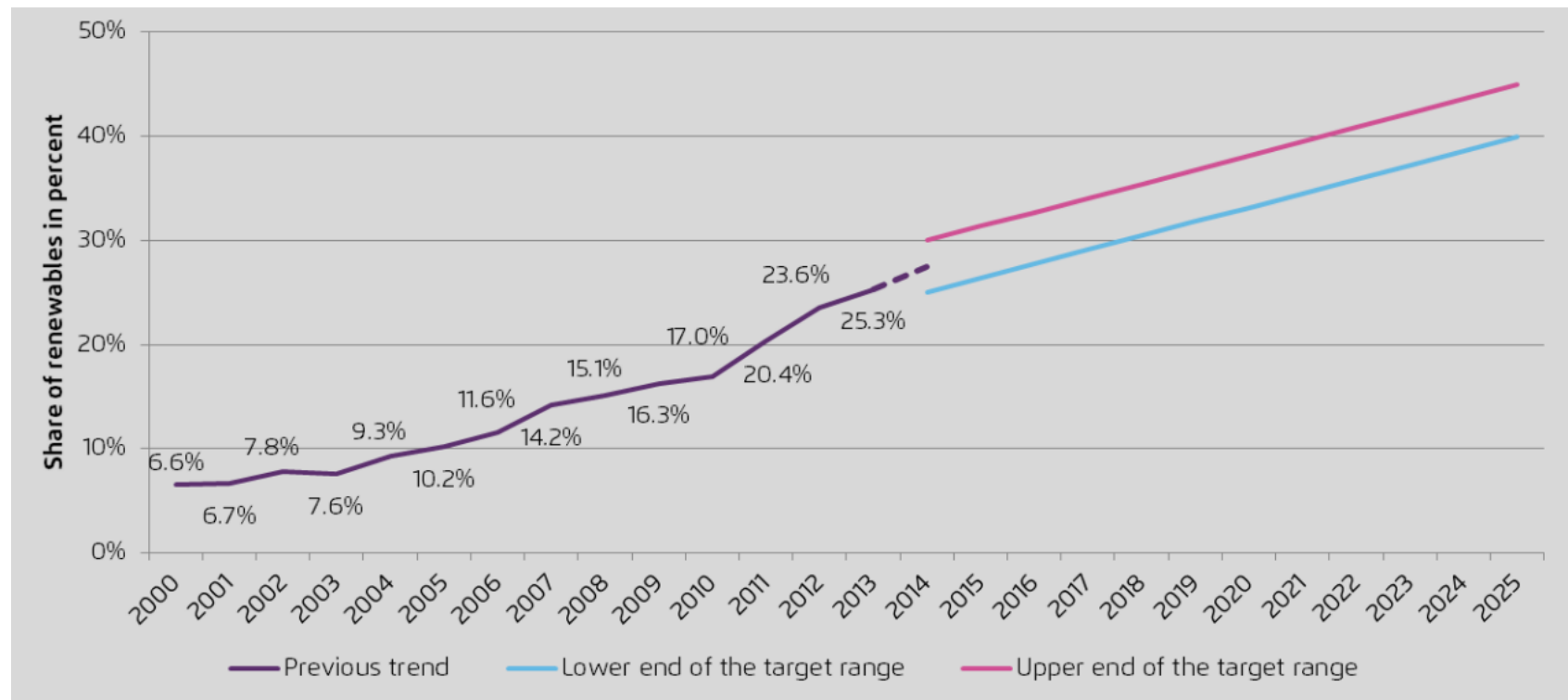


Source: AG Energiebilanzen 2014

Germany: Renewables increased constantly over the last ten years

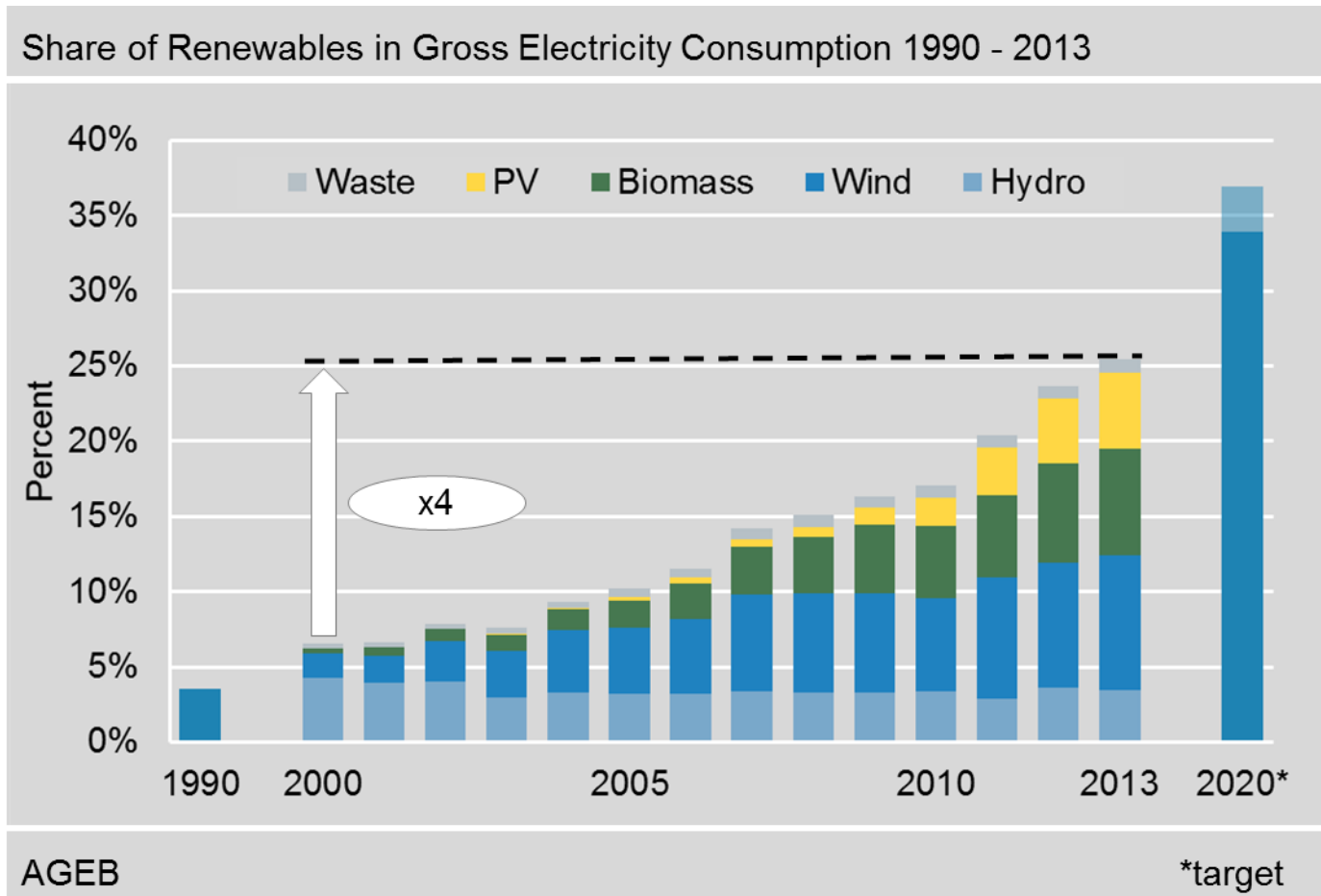
– and are to reach 40-45% in electricity by 2025 according to the **Renewable Energy Act (EEG)**...

Share of renewables in gross electricity consumption

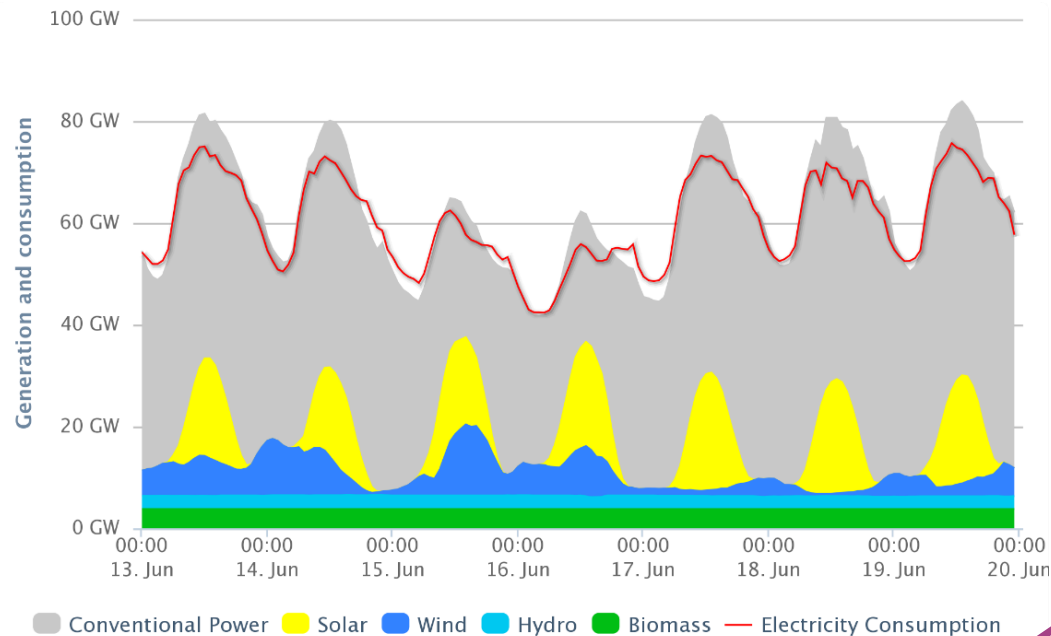


Source: AG Energiebilanzen 2014

Key Insight: it's all about **wind** and **solar**.



Wind and PV will fundamentally change the power system. There will be higher flexibility needs.



Last Update: 20.02.2014 15:15

Source: EEX 2014, ENTSO-E 2014

Key flexibility options

Fossil power plants incl. Combined Heat and Power (CHP).

Demand Side Management

Grid expansion

Curtailment of wind and PV

Storage

Including interconnectors

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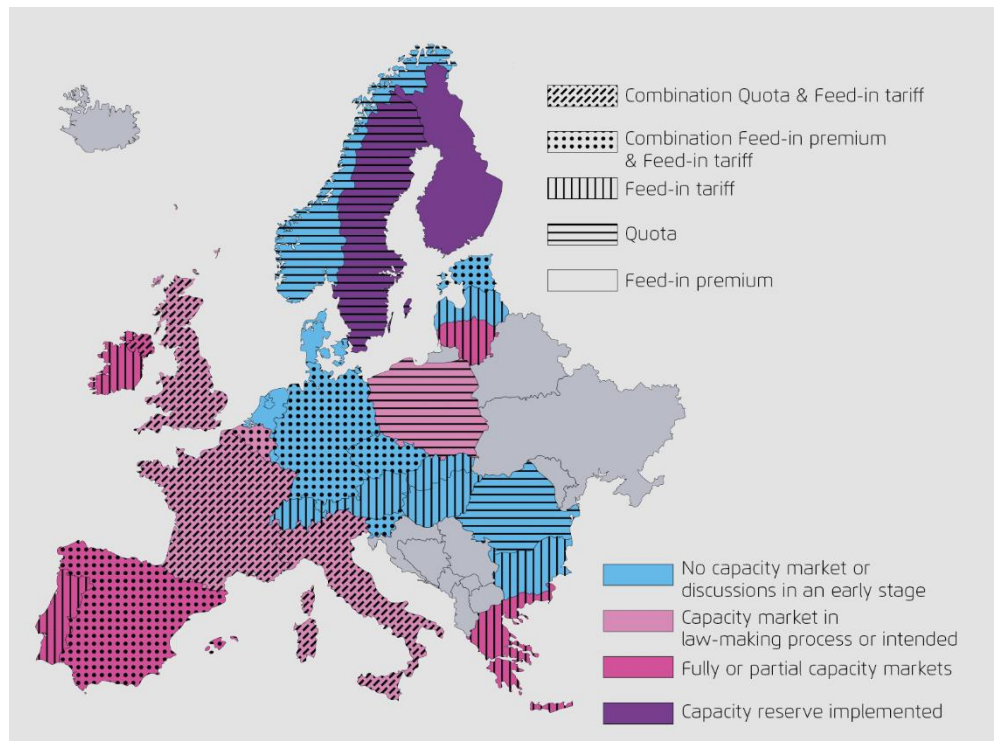
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Why is cooperation among European neighbours so beneficial?

European cooperation provides win-win situations



Sharing of resources:
balancing of variable renewable energy sources over larger geographical areas, use of **indirect storage** (hydro).

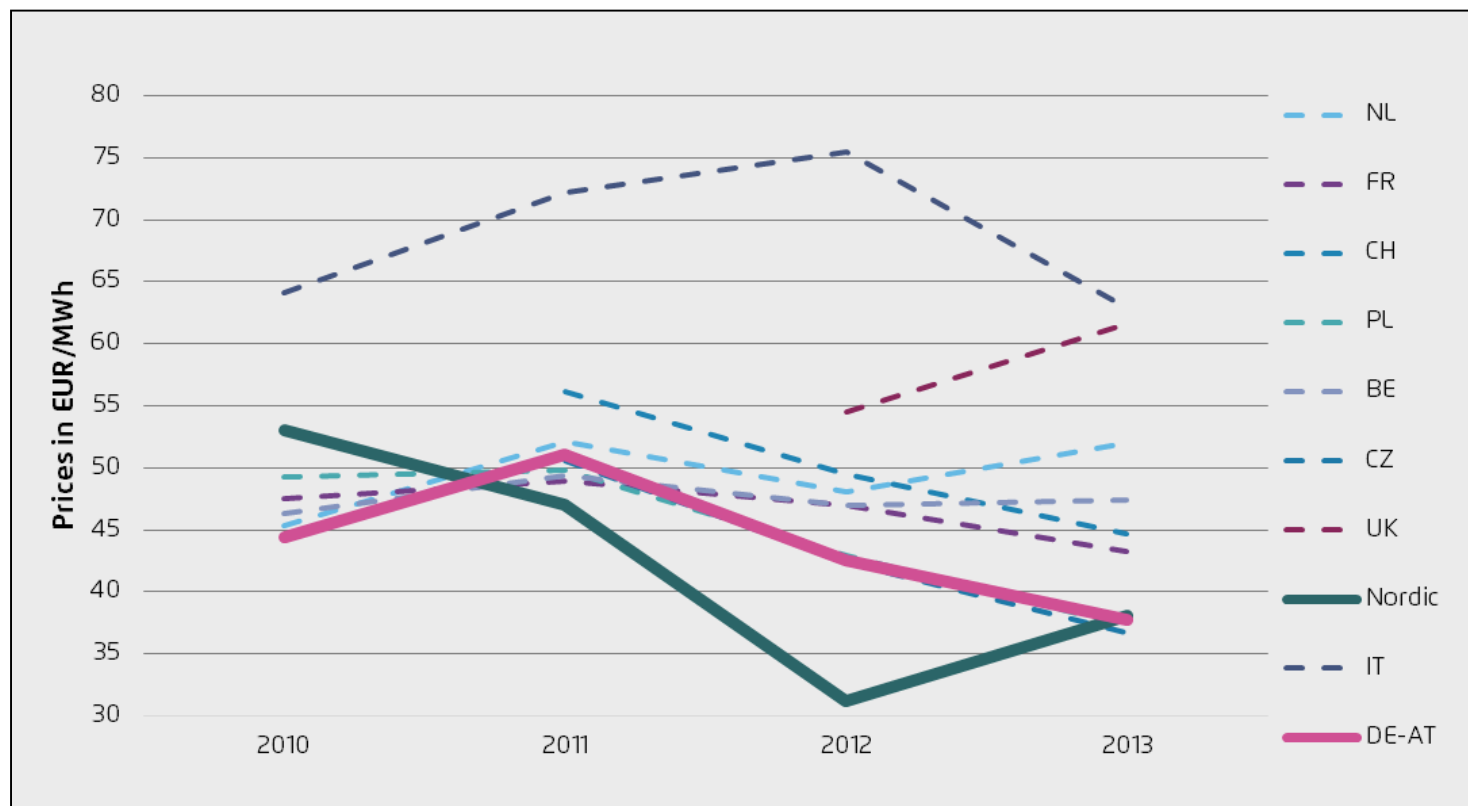
Security of supply: reduced need of reliable capacities to meet peak demand.

Efficiency: better utilisation of **renewable energy sources across Europe**. Renewable endowment in the Nordic countries can possibly lead to green generation surplus.

Source: Own illustration based on Eurelectric (2012), Öko-Institut (2012), Fraunhofer ISI et al. (2012)

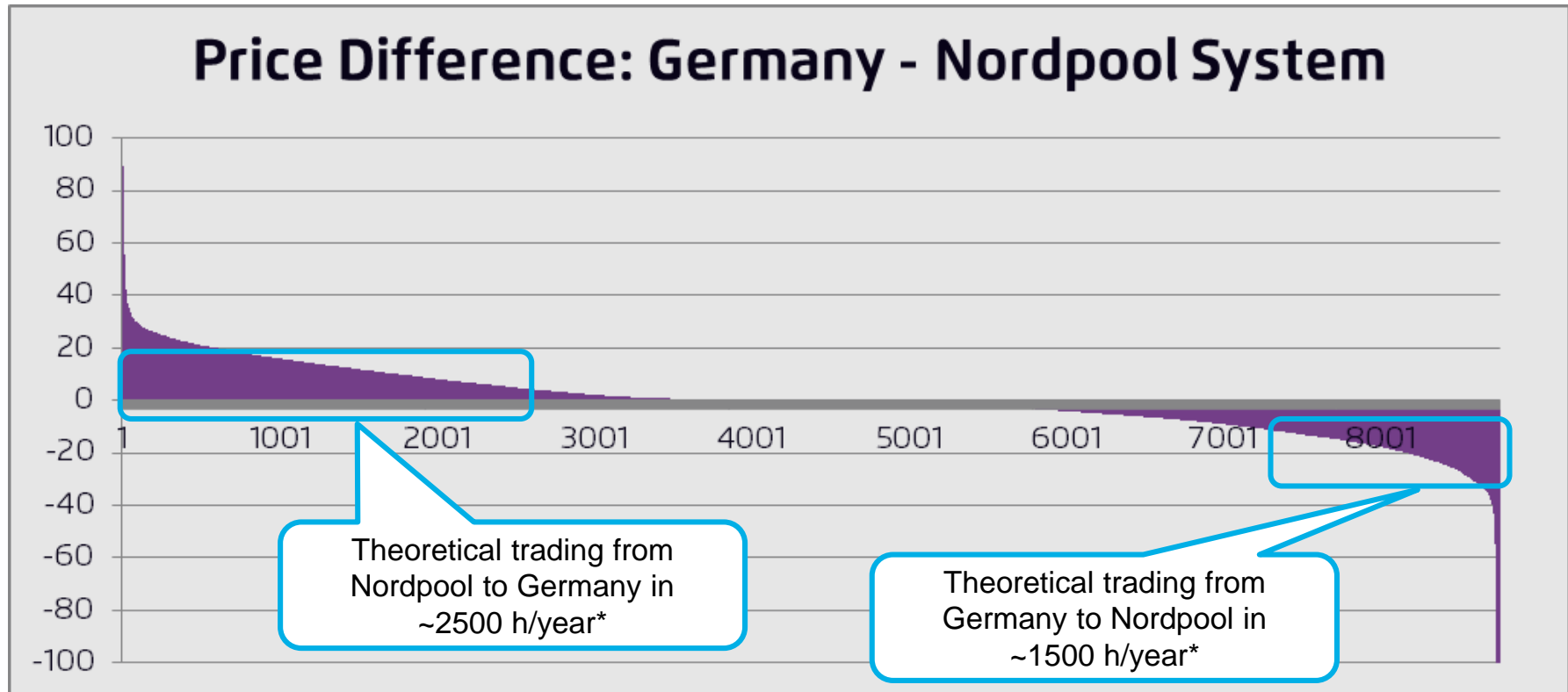
Benefits of trade: on average, Germany and Nordics have both very low wholesale power prices...

Wholesale power prices in Europe 2010-2013



Source: Power exchanges

...but there is a case for trade because the prices are not the same all of the time...



Price difference duration curve

*assuming trading would take place at ~10 EUR/MWh price difference; Nov. 2012 – Oct. 2013

Source: Power exchanges, own analysis

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Objective of Project

“Economic and climate effects of increased integration of the Nordic and German electricity systems“

- Project in cooperation with Global Utmaning 
- Assessment and discussion of the economic and climate effects of further integrating the Nordic and German electricity systems:
 - Power system
 - ✓ Complementary generation mixes
 - ✓ Increasing shares of renewables
 - Greenhouse gas emissions mitigation
 - Macroeconomic benefits and redistributive effects
 - ✓ Larger market for electricity
 - ✓ Different parts of the value chain (stakeholders)

Project “Economic and climate effects of increased integration of the Nordic and German electricity systems“

Work Package 1: quantitative analysis

Carried out by Ea Energy Analysis & DTU.

- Modelling of future energy system (time horizon: 2030).
- Analysis of electricity prices, electricity generation and trade, overall costs and benefits.
- Analysis of national welfare and interconnector congestion rents.

Work Package 2: qualitative analysis

Carried out by German Institute for Economic Research DIW.

- Macroeconomic impacts and distributional effects among different stakeholder groups (consumers, producers, energy intensive industry) as well as interconnector investments.

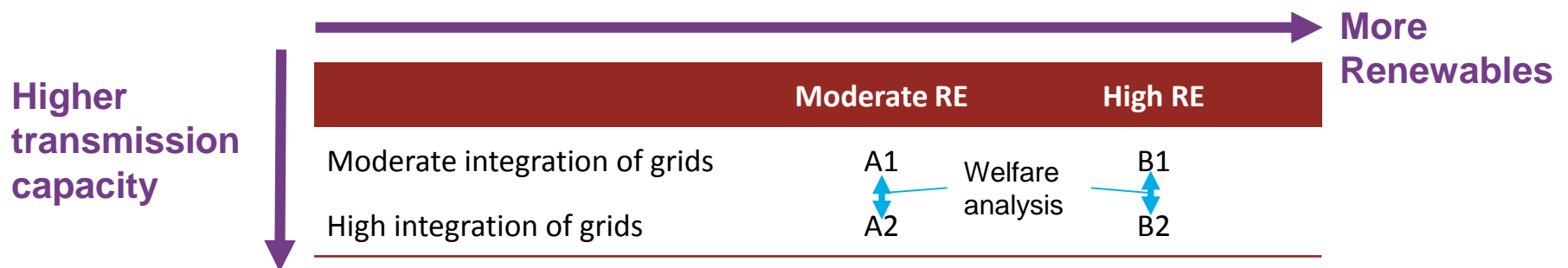
Scenario design

Variation

- Renewables deployment
- Grid expansion Nordics and Germany – (TYNDP 2020 and 2030)
- Investment in new generation capacity (Model optimised)
- Decommissioning of existing capacity (Model optimised)

Common assumptions

- RE deployment + other investments in neighbouring countries
- Grid development in neighbouring countries: TYNDP until 2025
- Fuel and CO₂-prices
- Electricity and heat demand



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Challenges – Distributional Effects

- **In total, increased integration yields net benefits.**
- However, there are 2 types of distributional effects:
 - Distributional effects among countries
 - Distributional effects among stakeholders within one country
- Distributional effects among stakeholders:
 - Power producers and power consumers (low/high price countries).
 - Influence of final price composition including network costs, taxes and levies.
 - Sensitivity of electricity used for heating (e.g., Norway, Sweden).

Challenges – Grid Expansion

- Network expansion *within* one country (“hinterland integration“) important for enabling cross-border exchanges of electricity
 - Bottlenecks in the grid hamper transmission of electricity to load centres
 - German Network Development Plan: increase in network capacity especially between the North and South of Germany
 - Northern Germany interconnected with Scandinavian countries via Denmark as a hub
 - In the future: first direct connection to Norway via NordLink

Consultation was until 1st of March 2015.

Perspectives - Green Paper: An Electricity Market for Germany's Energy Transition (some aspects...)

- Strengthening market price signals for producers and consumers
- **Expanding and optimising the power grids**
- Maintaining **one single price zone** (but grid expansion as a key prerequisite)
- Intensifying European cooperation
- Fundamental policy decision: *electricity market 2.0* or *capacity market*
- **Capacity reserve** as a safeguard

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Outlook

- **Increased integration** of Nordic and German electricity systems is **beneficial**. It allows balancing across larger areas and facilitates the achievement of the Internal Energy Market as well as greenhouse gas reductions.
- **Hourly variations** provide a case for trade (main direction North => South).
- However, **distributional effects** differ:
 - Across countries.
 - For stakeholders within one country.
- **Mitigation of negative spillover effects** crucial for creating acceptance of increased integration.

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Tack för uppmärksamheten!

Questions or Comments? Please feel free to contact me:
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