European Power Markets

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Driver for the development: European energy policy goals

Energy future is:

more sustainable - towards carbon neutral EU...

...more secure...  ...more competitive
What does this mean in practice?

• Sustainability
  – Renewable generation (solar, wind) – first with subsidies, but becoming competitive
  – Needs back-up capacity – but how to get this to the market?
  – Role of nuclear after Fukushima less attractive
  – Demand: energy efficiency, heating and mobility using electricity

• Security of supply
  – Resource sharing

• Competitiveness
  – Market based solutions
  – Market integration

• New and continuously changing electricity flow patterns
• More cross-border flows
• Long-distance flows
• Volatile prices

• Needs a strong grid
• Challenges the current market model
The path to 2020 and 2050

- Example: Denmark

Centralised Generation  ➔  Distributed Generation
The path to 2020 and 2050

• Less CO2
• More renewables
• More cross-border trade
Power production by PV in Germany in May 2012: PV delivered approx. 10% of monthly electricity demand

Actual production

- **Solar**: max. 22.4 GW; 4.1 TWh
- **Wind**: max. 14.1 GW; 2.9 TWh
- **Conventional**: max. 51.2 GW; 26.6 TWh


Towards a fully developed internal electricity market

A well functioning electricity market is a key for:

- Improving efficiency and competitiveness of the power sector
  - efficient market price
  - cross-border trade
  - efficient dispatching via "the invisible hand"
- Delivering benefits for end-users and trust to market players
- Contributing to the security of supply
- Reaching the 20-20-20 goals of EU
Functioning electricity markets
= market rules + adequate transmission capacity

Software: market rules
- European market model
- Efficient use of transmission capacity
- Better competition

Hardware: transmission capacity
- Reduction of congestions – efficiency improvements
- Price convergence

ENTSO-E Ten Year Network Development Plan 2012: €100 billion

"2020+"

ENTSO-E = European Network of Transmission System Operators for Electricity
Common market rules: North West Europe – the biggest electricity market in the world!

- 2000 Nordic countries
- 2010 North-West Europe

Next steps:
- 2013 common NWE order book + GB
- 2013 Latvia
- 2014 political goal: integrated European market

Electricity market 2013:
- 13 countries and about 260 million citizens served
- Generation 490 GW
- Transmission lines 160,000 km
- Demand 1900 TWh/year
- Exchanges about 200 TWh/year
Further market integration in Europe

Step-wise market coupling

- **2010**: Central West + Nordic
- **mid-2013**: + UK + Baltics
- **end-2013**: + Central South + Iberia
- **2014**: + Central East
- **2015**: + South-East

By far the biggest power market in the world – 3000 TWh!
Cross-border transmission capacities in the Baltic Sea region

Transmission capacities (MW)

- Present capacity
- Under construction

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Transmission capacity between the Nordic region and Continental Europe

MW

Year


To Continental Europe

From Continental Europe

Source: ENTSO-E Ten Year Network Development Plan 2012

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Transmission capacity between the Nordic and the Baltic regions

MW

Year


Estlink 2: Finland-Estonia

NordBalt: Sweden-Lithuania

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Electricity prices in North-West Russia on the rise

- For the last 30 years - a steady flow of electricity from SU/Russia to FI
- From late 2011 – high capacity fees make RU export unprofitable in peak hours
- Expected rise of RU gas prices may bring the RU prices generally on a par with the Nordic prices
- Opportunity: two-way trade between Baltic Sea region and Russia
Conclusions

• Market integration will proceed: rules + transmission capacity – "the biggest electricity market in the world"

• Big questions regarding generation – challenges the market model

• Two level decision making: national and European

• Structural bottlenecks will remain in the grid – licensing main obstacle for the investments

• Baltic Sea region: towards South and East
Powering Finland.
Planned new connection within and out of the Nordic region

<table>
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<tr>
<th>Project</th>
<th>Connection points</th>
<th>Capacity [MW]</th>
<th>Planned commissioning</th>
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<tr>
<td>Estlink 2 (DC)</td>
<td>FI-EE</td>
<td>650</td>
<td>2014</td>
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<td>Skagerrak 4 (DC)</td>
<td>Nor-DK</td>
<td>700</td>
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<td>NordBalt (DC)</td>
<td>Swe-Lit</td>
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<td>Cobra (DC)</td>
<td>DK-Neth</td>
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<td>West DK-Germany (AC)</td>
<td>DK-Ger</td>
<td>1000/1550</td>
<td>2017</td>
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<td>NORD.LINK (DC)</td>
<td>Nor-Ger</td>
<td>1400</td>
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<td>NSN (DC)</td>
<td>Nor-UK</td>
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<td>South-West Link (DC)</td>
<td>Nor-Swe</td>
<td>1400</td>
<td>2018-22*</td>
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<td>Finland-Sweden (AC)</td>
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<td>700</td>
<td>2021*</td>
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<td>Kriegers Flak CGS (DC)</td>
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<td>NA</td>
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*up for revision