Nordic solutions for unlocking a decarbonised, sustainable energy future

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Flexibility Resources
Finding ramping capabilities

Supply flexibility
Demand responds
Flexibility Resources

Finding ramping capabilities

- Resource
  - Dispatchable
  - Variable
  - Trade

- System
  - Heat
  - Electricity
  - Gas/fuel

- Service
  - Buildings
  - Industry
  - Transport

Supply flexibility

Sector coupling/Electrification

Demand responds
Sector coupling
Electrification as source of flexibility

Large flexibility potentials in electrification of the energy sectors

Hindered by regulatory barriers

Remove barriers

From technical to realisable potentials

Framework conditions

Market design
Direct regulation
Fiscal policies
Support schemes
Grid regulation

Distribution of EU energy consumption
(Source: EU Heating and Cooling strategy)

Hindered by regulatory barriers
District heating-electricity interface

Electrification as source of flexibility

Heat price

Electricity price

Electric boilers
Heat pumps
Heat only boilers

CHP

1. Variable RE
2. Electricity demand
3. Power to heat

Heat demand
Heat storage
Choice of heat supply - at different electricity prices

- Electric boilers
- Heat only boilers
- CHP

Patchwork regulation between electricity and heat
- Taxes on electricity consumption
- Heat is taxed at the fuel input
- Biomass exempted for taxes

More heat only boilers. Decoupling of electricity and heat markets
Unlocking a decarbonised, sustainable energy future

Make the sector coupling/electrification as flexible as possible
• Remove barriers
• Improve the business case for flexible power-to-heat/gas technologies
• Increase market integration and the value of VRE

Coherent changes in market designs, regulatory framework condition, and coupling of markets

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Goals and RE-thinking of the Energy System

Current electricity system
- Centralised fossil-intensive supply
- Electricity market only

The trichotomy of energy policy
- Market design
- Sector coupling
- Flexibility
- Competition
- Reliability
- Sustainability

Decarbonised energy systems
- Decentralised + Variable renewable energy + Phase-out of fossil peakers
- System integration

Decentralised fossil-intensive supply + Variable renewable energy + Phase-out of fossil peakers

System integration
Wind Power has consequences for the energy system!

Load duration curve for electricity consumption

Load duration curve for wind power production

Load duration curve for electricity consumption minus wind power production

Steeper residual load duration curve
• Less base load hours
• Lower price levels

Market design: Capacity mechanism or Scarcity pricing