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Integrating New Technologies While Maintaining Resource Adequacy

Session 4 – Electricification of heat

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Electricity will play a central role in the low carbon economy. It can almost totally eliminate CO2 emissions by 2050, and offers the prospect of partially replacing fossil fuels in transport and heating.

Although electricity will increasingly be used in these 2 sectors, electricity consumption overall would only have to continue to increase at historic growth rates, thanks to continuous improvements in efficiency.
Energy Agreement 2012 – low carbon economy 2050 DK

- 2020: 50% wind power in electricity consumption
- 2020: 40% reduction of GHG emissions vs. 1990
- 2030: Coal out of power plants
- 2035: 100% renewable energy in electricity and heating sector
- 2050: 100% renewable energy
What will the future bring?: a low carbon economy

Historical and projected GHG emission without policy change up to 2020

Historical and projected GHG emission with new targets
Windmill capacity and production 2000-2014

Production - GWh

Capacity - MW

Source: Danish Energy Association on data from the Danish Energy Agency
We will reach 50% wind in 2020

Wind production - share of electricity - 2020

- Electricity from wind 2014: 35.1%
- Horns Reef 3: 4.9%
- Onshore: 4.1%
- Nearcoast: 4.6%
- Kriegers Flak (after 2020): 7.3%

Source: Dansih Energy Association
Power system with high share wind

- the “abnormal” is the “new normal”

Four questions to ask:

Who will consume more?

Who will produce?

Who will be fast?

Who will consume less?

Conclusion:

Need market framework that can and will handle the unusual situations:

- New or adjusted market design
- More integration
Moderate expectations for flexible demand

Expected development for flexible electricity use and wind production

Source: Energinet.dk and Danish Energy Association
High potentials for flexible demand

Who will use the increasing wind production?
Heat pumps alone have a technical potential of 12 TWh in households and industry.

Source: Energinet.dk and Danish Energy Association
Benefits of electrification of heat

- Replacing fossil fuels
- On primary energy use
- On final end-use
- Sensitivity on price changes and security (HP)
- Decarbonisation – remove emissions – non ETS - ETS
Main barriers

The additional, policy related costs we add to our power bills, making electricity much more expensive to customers than fossil alternatives.

Financial barriers, which slow the progress of new technologies replacing old ones.

The way we compare different energy carriers and (currently) maintain a policy favouring fossil solutions for our energy using appliances, our heating and our transport (Primary Energy Factors).
Opposition between economics and company economics - taxation

Heating Price incl. fixed costs

- Gas boiler
- Gas boiler
- Flue gas cooling
- Wood chip boiler
- Electric heat pump

[Bar chart with the following data points: Gas boiler (Company economics: 400, Economics: 300), Gas boiler (Company economics: 350, Economics: 250), Flue gas cooling (Company economics: 375, Economics: 325), Wood chip boiler (Company economics: 500, Economics: 450), Electric heat pump (Company economics: 375, Economics: 325)]
Conclusions

- Electricification of heating supports low carbon economy
- There is a large potential for electrification of heat in DK and EU
- Progress in electrification is slow
- Heating technologies must compete on equal conditions
- Regulation must support electrification which is a precondition for low carbon economy