Barriers for flexibility between district heating and electricity

Skytte, Klaus

Publication date:
2017

Document Version
Peer reviewed version

Citation (APA):
Barriers for flexibility between district heating and electricity

Klaus Skytte
Energy Economics and Regulation, DTU Management Engineering, Denmark
**Wind of change**

From centralised and fossil-intensive systems to decarbonised and integrated energy systems

---

**Current electricity system**

- Centralised fossil-intensive supply
- Electricity market only

**The trichotomy of energy policy**

- Market design
- Sector coupling
- Flexibility

**Decarbonised energy systems**

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

---

**From centralised and fossil-intensive systems to decarbonised and integrated energy systems**
Sector coupling
Electrification as source of flexibility

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

- 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

- Large flexibility potentials in electrification of the energy sectors

- Hinder by regulatory barriers

- Remove barriers
Challenges in a larger perspective

Energy system integration

Infrastructure

Biomass Supply

Regulation & market design
Outline of the talk today

• District heating-electricity interface

• Barriers for flexibility

• Discussion
District heating is widely used in most Baltic/Nordic countries and thus represents a flexibility source of considerable magnitude which is only partly exploited today by the power market.

Source: Euroheat, 2015
Which technologies can provide flexibility?

Today flexibility is mainly provided by CHP combined with heat storages (water tanks)

• Water tanks are widely installed and used in Denmark, Finland and Sweden

Electric boilers and large heat pumps

• Several barriers, e.g. existing taxation
• Consequently: very limited use in the Baltic/Nordic countries
District heating-electricity interface

1. Power demand exceeds the VRE supply

2. VRE supply sufficient for demand
   No need for additional flexibility

3. VRE power supply exceeds the demand
Different market frameworks

The Baltic/Nordic power market is an integrated competitive market.

DH is supplied by local monopolies regulated by national rules and authorities.

- Not originally designed to provide integration with the power market.
- National rules sometimes work against DH providing flexibility services to the power market.
- Local security-of-supply objectives may be preferred e.g. going from foreign natural gas to national biomass.
Barriers to flexibility

Market development, e.g.
- Large central power plants run fewer and fewer hours due to low electricity prices
- No incentives to investment in flexible capacity

Regulatory set up, e.g.
- Grid tariffs and taxes on electricity use
- Local DH utilities prefer to substitute gas-fired CHP by biomass heat-only boilers due to tax exemptions for biomass

Baltics:
Limited use of
- Market prices for CHP
- Thermal storages/water tanks
Choice of heat supply at different electricity prices net costs

- Electric boilers
- Heat pumps
- Heat only boilers
- CHP

Optimal technology choice
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
Choice of heat supply

With dynamic tariffs

- Electric boilers
- Heat only boilers
- CHP

Heat price vs. Electricity price

Optimal technology choice

Dynamic tariff
Summing up

- Trend towards more *market integration* and need for more *flexibility*
- Large potentials in district heating

- Need for a holistic system approach in order to identify and assess *regulatory and technical pathways* towards coherent energy systems

REthink market designs and regulation
- Make RE market ready & Markets RE ready

- Coherent changes in market designs, regulatory framework condition, and coupling of markets
- Dynamic tariffs and taxes?
Thank you for your interest

Questions?

Klaus Skytte
Head of Energy Economics and Regulation
System Analysis Division
DTU Management Engineering
Technical University of Denmark

klSk@dtu.dk,
http://www.sys.man.dtu.dk/
Share of energy consumption for heating in the Baltic countries

Source: Euroheat & Power, 2015