Barriers for flexibility between district heating and electricity

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Publication date: 2017

Document Version
Peer reviewed version

Citation (APA):

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Barriers for flexibility between district heating and electricity

Klaus Skytte
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Wind of change
From centralised and fossil-intensive systems to decarbonised and integrated energy systems

Current electricity system

The trichotomy of energy policy

Decarbonised energy systems

Centralised fossil-intensive supply
Electricity market only

Market design

Sector coupling

Flexibility

Competition

Reliability

Sustainability

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

From technical to realisable potentials

Framework conditions
- Market design
- Direct regulation
- Fiscal policies
- Support schemes
- Grid regulation

Hindered by regulatory barriers

Remove barriers
Challenges in a larger perspective

Energy system integration

Energy Efficiency

CCS

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

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

Electricity price
Heat price

Electric boilers
Heat only boilers
CHP

Taxes on electricity use & grid tariffs

More heat only boilers.
Decoupling of electricity and heat markets
Choice of heat supply
With dynamic tariffs

- Electric boilers
- Heat only boilers
- CHP

Optimal technology choice

Dynamic tariff

Heat price vs. Electricity price graph
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?

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Share of energy consumption for heating in the Baltic countries

Source: Euroheat & Power, 2015