Framework conditions for flexibility options in the district heating–electricity interface

Comparative study of the district heating sectors in the Nordic and Baltic countries

4DH Conference, Aalborg, September 2016

Daniel Møller Sneum, Energy Economics and Regulation, DTU Management Engineering, DK
Eli Sandberg, NMBU Ecology and Natural Resource Management, NO
Emilie Rosenlund Soysal, EER, DTU Management Engineering, DK
Ole Jess Olsen, EER, DTU Management Engineering, DK
Klaus Skytte, EER, DTU Management Engineering, DK
Outline

1. Project background and subject
2. Study approach
3. Key findings
1. WHAT: Investigates future options for increased energy system flexibility

2. WHICH: Heat, gas, transport and electricity

3. WHERE: Nordics and Baltics

4. HOW: Look at framework conditions for flexibility by identifying regulatory barriers and drivers

5. WHY: An increased amount of variable supply increases the need for flexibility in the system
DH in the Nordic/Baltic countries supplies 135 TWh - electricity supply is 370 TWh

Approach: What is flexibility?

Production/demand is considered flexible if it has the ability to adjust within a short timeframe.
Approach: Technologies covered in the survey

- Heat storage
- Combined Heat and Power plants (CHP)
- Electric boilers
- Large heat pumps
- Heat-only boilers in DH
- Large solar heat panels
- Flexible DH network operation
- Consumers of DH as flexibility providers
- Feed-in to the DH grid from industry

CHP most important source of flexibility today

P2H possess large potential for flexibility
Is CHP providing flexibility?

In DK, FI and SE, CHPs respond to spot market price signals - thus balancing the energy system.
Why not in the Baltic countries?

Main objective with CHP:
Substitute previous power production. Shale oil in Estonia and nuclear in Lithuania and Latvia.
The future for flexible CHP is uncertain

More feasible to invest in biomass-fired heat-only boilers

CHP-units threatened by market development
Power-to-heat technologies

• Important in Norway – but here DH is marginal – and in Sweden

• In the other countries P2H is either marginal or non-existing

• Electricity prices including taxes + tariffs are the main barriers
Key findings: General

1. No policy for flexibility in any of the countries

2. Dichotomy: local biomass vs. flexibility-enabling production of heat in all countries

3. Electricity prices may be in a valley of death for both CHP and P2H
Electricity prices makes operation/investment in CHP and P2H unattractive

Heat production cost

Electricity price

Optimal technology choice

- Electric boilers
- Heat pumps
- Heat only boilers
- CHP
Key findings: CHP

1. All countries support CHP, but in different ways

2. Preservation of existing CHP a challenge

3. Limited exposure to market prices in Baltics. FiT + mandatory procurement prevent flexibility
Key findings: P2H + other DH-elements

1. All countries have levies on electricity used for P2H → Higher P2H marginal heat production cost

2. Heat storage generally not supported, nor hindered. A result of economic incentives

3. Support for biomass in all countries, except Estonia
Sum up: Framework conditions for flexibility in DH-elec interface

CHP and P2H: best potential to offer flexibility from district heating in Nordics + Baltics

But framework conditions, such as
- incentives for biomass heating
- electricity costs and levies for P2H
- support schemes for CHP

limit district heating’s full potential for flexibility
Did we get everything?
If not, let me know!

www.Flex4RES.org
Extra: Danish example

Day ahead spot price 2015 DK1 (West DK)
Gas boiler
Biomass boiler (wood chips)
Heat pump (COP 2.6)
Gas engine

Heat production cost [EUR/MWh heat]

Day ahead spot price 2015 DK1 (West DK) [EUR/MWh electricity]

Number of hours

Gas engine
Extra: Approach to the study

**Construct survey**
- National surveys on regulation of DH

**Responses to survey**
- Review and consultation with key stakeholders in the Nordic and Baltic countries

**Analyze survey**
- Surveys are compared to identify differences among the countries

**Confirm analyses**
- Results confirmed by national partners and stakeholders