Flex4RES

Flexible Nordic Energy Systems

DTU

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

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

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norden

Nordic Energy Research

Outline

1. Project background and subject
2. Study approach
3. Key findings

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1. WHAT: Investigates future options for increased energy system flexibility

2. WHICH: Heat, gas, transport and electricity

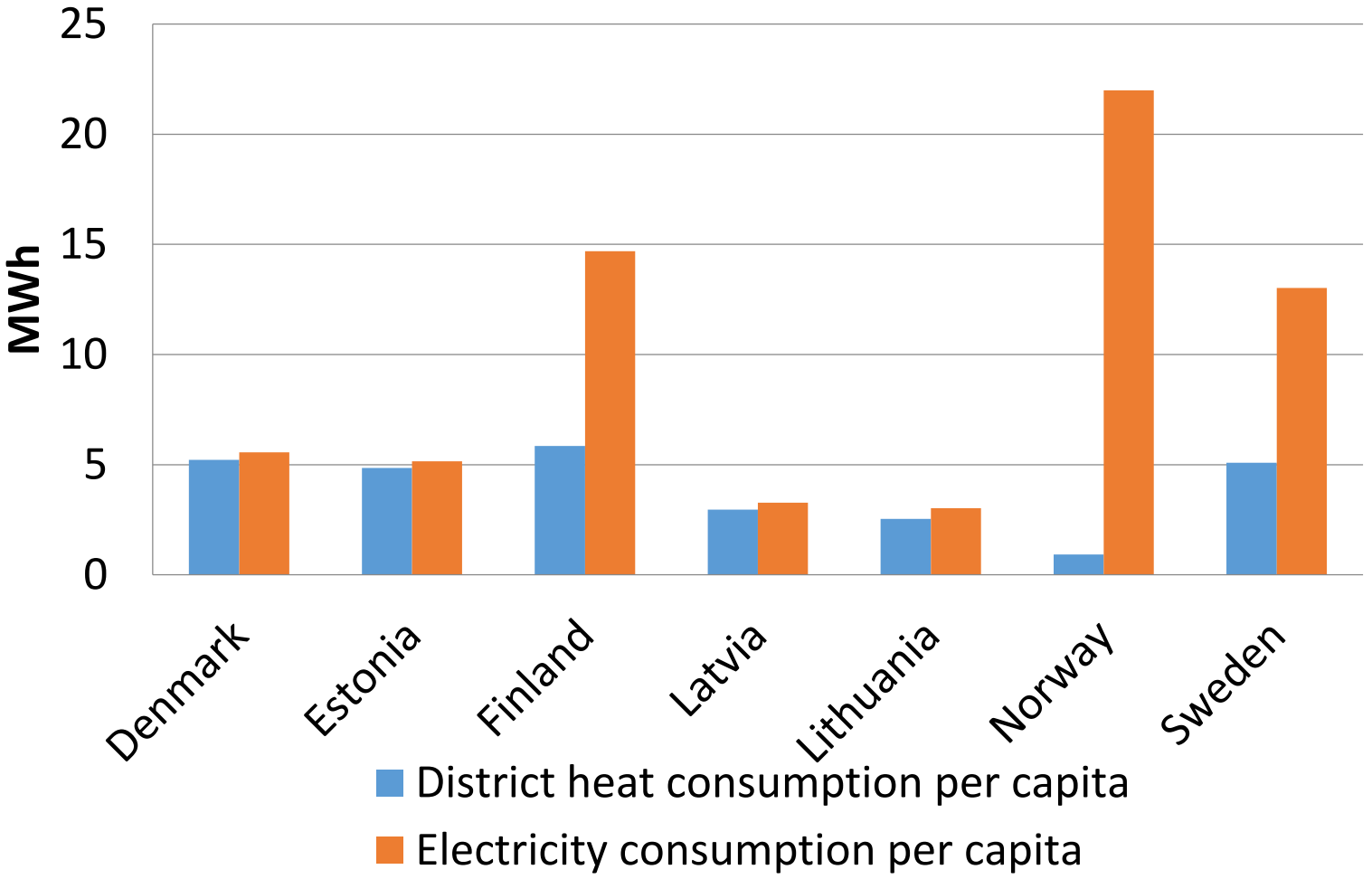
3. WHERE: Nordics and Baltics

Source: https://upload.wikimedia.org/wikipedia/commons/c/ce/NB8_countries.png

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



Source: Euroheat, 2015. "District Heating and Cooling Statistics 2015 - Country by country."

Approach: What is flexibility?

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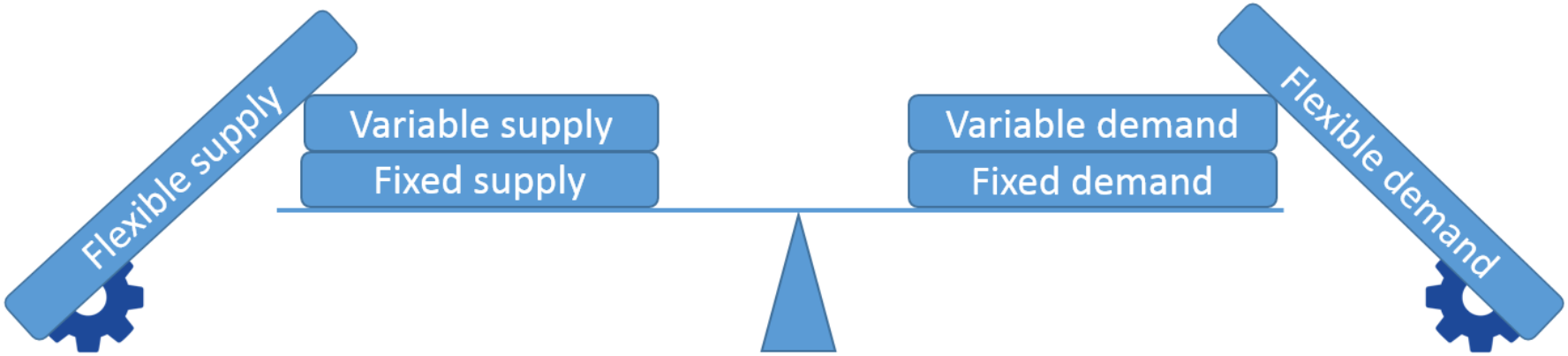
Production/demand is considered flexible if it has the ability to adjust within a short timeframe



Approach: Technologies covered in the survey

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- 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?

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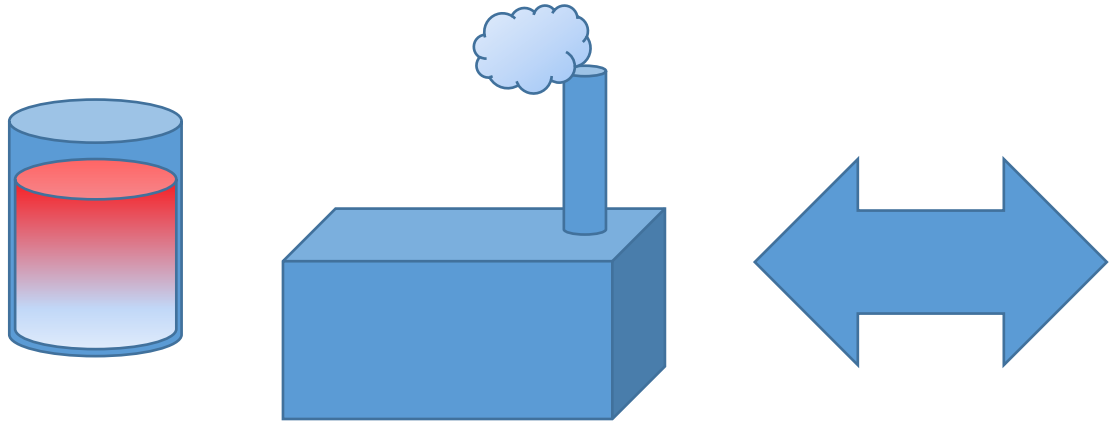
In DK, FI and SE, CHPs respond to spot market price signals - thus balancing the energy system



Why not in the Baltic countries?

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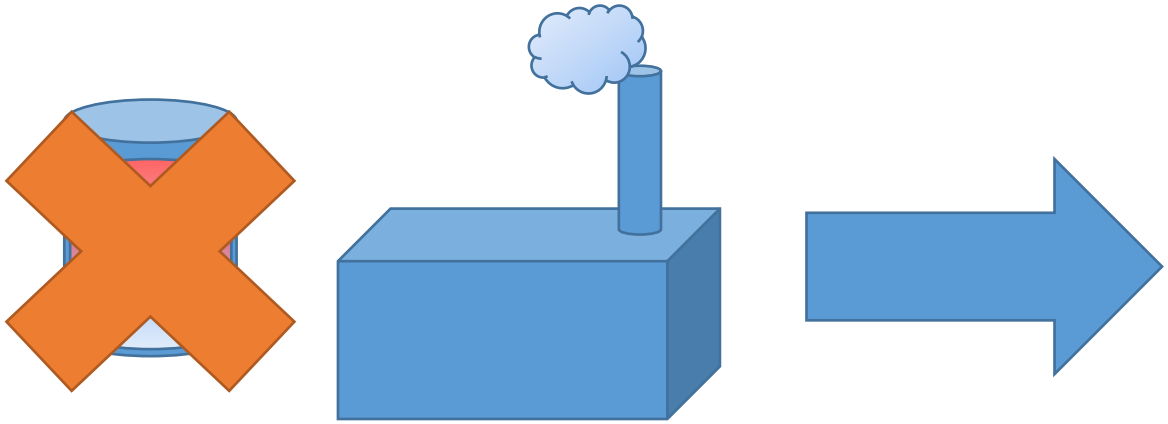
Main objective with CHP:

Substitute previous power production. Shale oil in Estonia and nuclear in Lithuania and Latvia



The future for flexible CHP is uncertain

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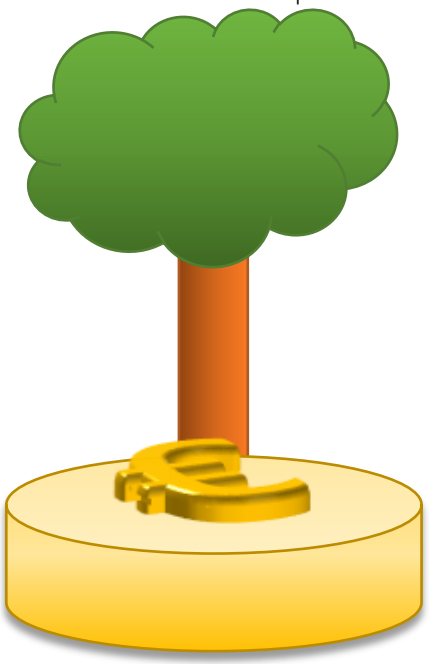
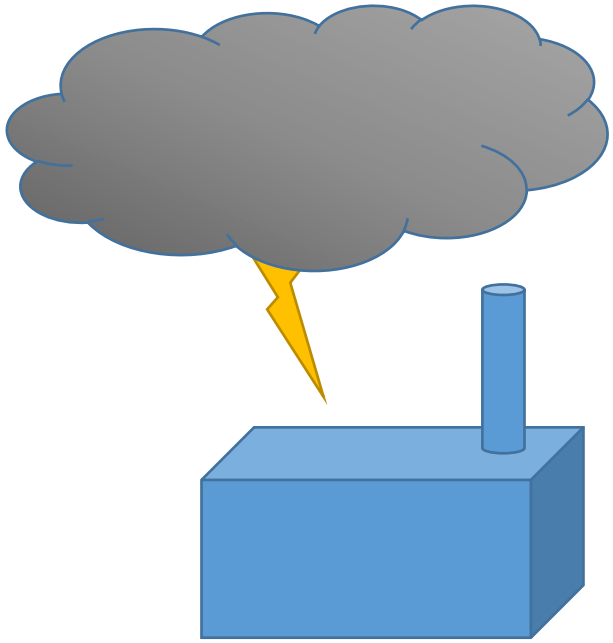
More feasible to invest in biomass-fired heat-only boilers





CHP-units threatened by market development

Power-to-heat technologies

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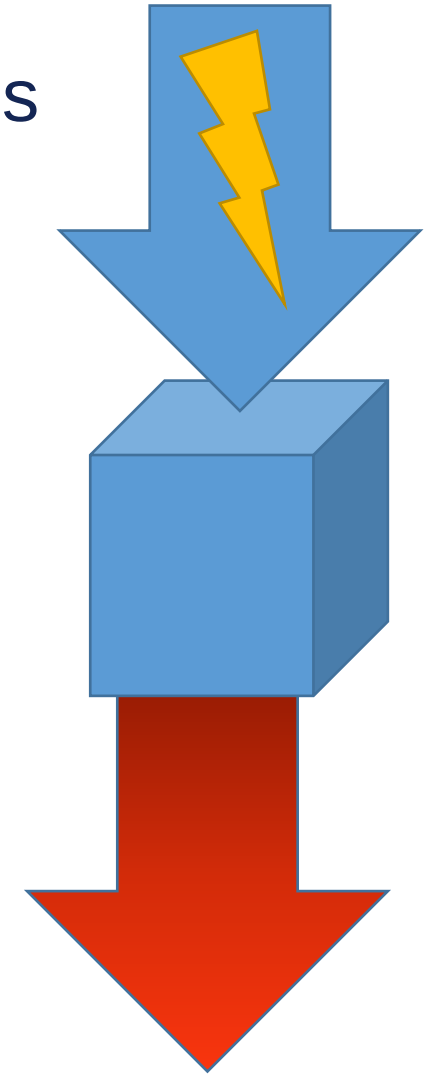
- Important in Norway – but here DH is marginal – and in Sweden
- In the other countries P2H is either marginal or non-existing
- Electricity prices including taxes + tariffs are the main barriers



Key findings: General

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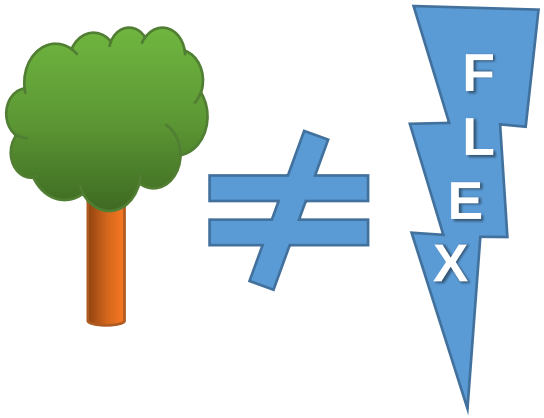
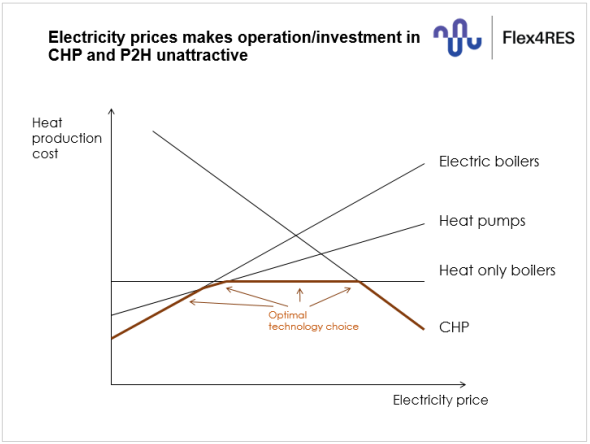
1. No policy for flexibility in any of the countries



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

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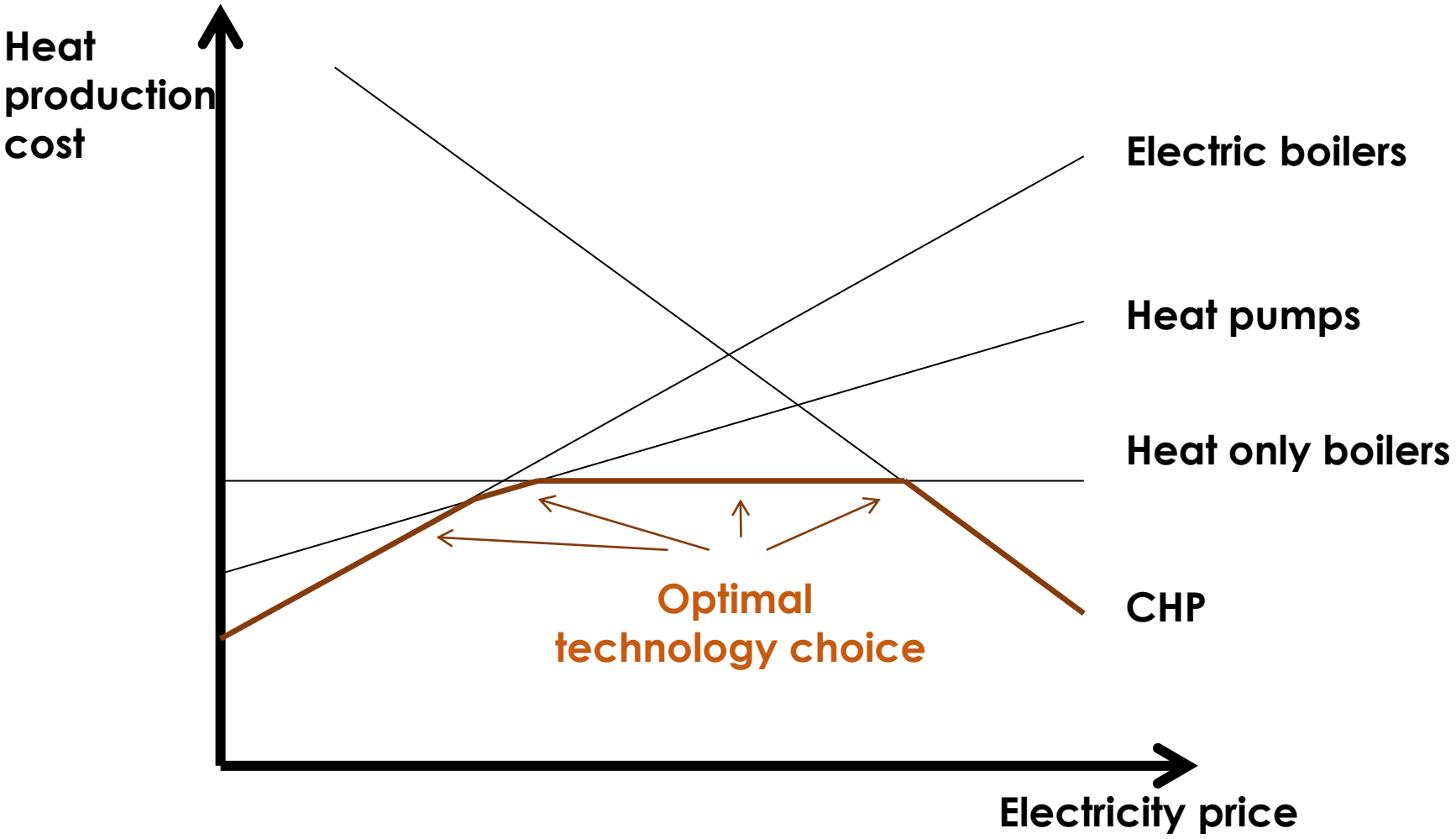

Key findings: CHP

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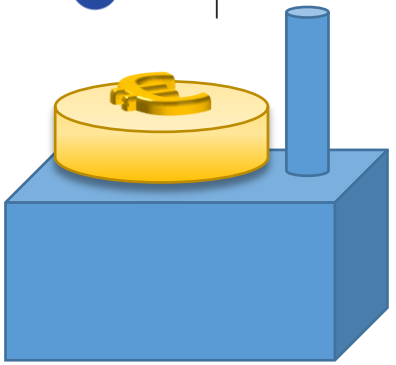
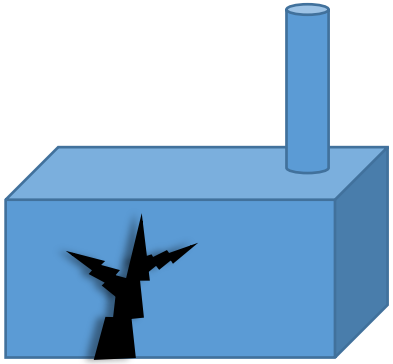
1. All countries support CHP, but in different ways



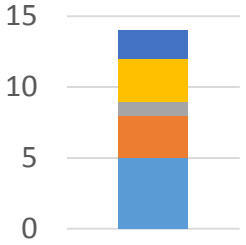


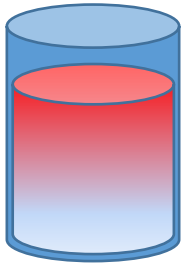
2. Preservation of existing CHP a challenge

3. Limited exposure to market prices in Baltics. FiT + mandatory procurement prevent flexibility

Key findings: P2H + other DH-elements

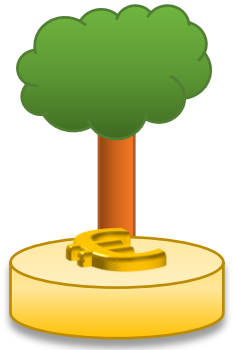
1. All countries have levies on electricity used for P2H → Higher P2H marginal heat production cost





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!

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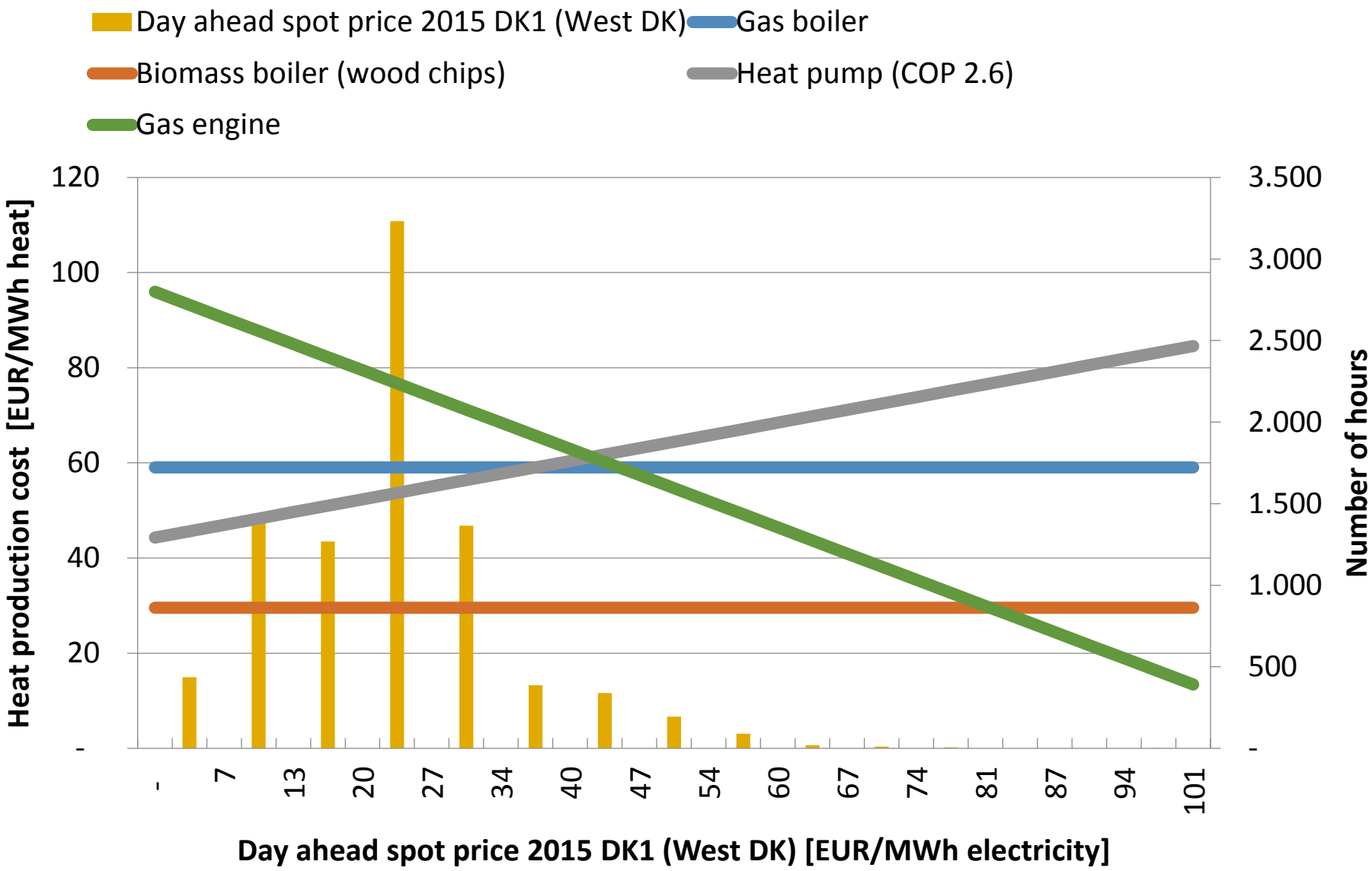
Extra: Danish example



Extra: Approach to the study

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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