



## Barriers for flexibility in the district heating-electricity interface

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**Flex4RES**

Flexible Nordic Energy Systems



# Barriers for flexibility in the district heating-electricity interface

International Energy Conference

ENERGY EFFICIENCY DIRECTIONS IN  
THE NORDIC COUNTRIES AND LITHUANIA,  
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Nordic Energy Research

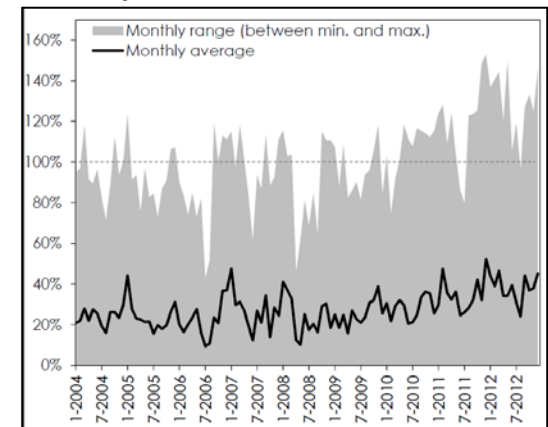
# Motivation - Flex4RES



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- The new electricity systems: From centralised and fossil-intensive systems to sustainable and integrated
- Increasing shares of variable renewable energies (VRE)
- Integration costs expected to increase  
Need of more *flexibility*
- *Potentials and technological solutions exist* - both
  - locally in the power market,
  - from other regions through the transmission lines, or
  - by coupling to the heat, gas or transport sectors, or even storage facilities.
- Need for
  - *REthinking of the framework conditions*  
*Why are the potentials not used today? Barriers/drivers*

Wind production share in DK-West



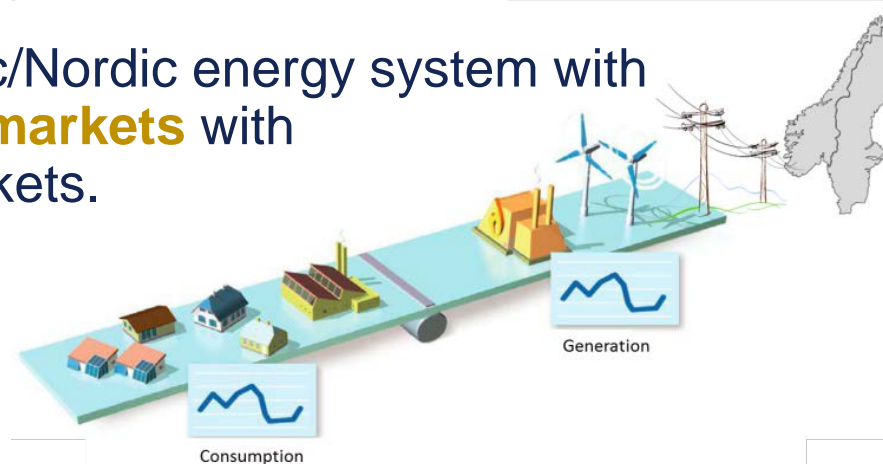
# Hypotheses

**Comparative advantages of combining different energy markets**, both with respect to flexibility, but also with respect to synergy and economics.

The Baltic/Nordic power market is well functioning despite a few technical challenges.

**With the right coupling to the underlying national and local energy markets for heat, gas, and transport fuels, enough flexibility can be generated** in a cost efficient way and so embrace a larger amount of VRE.

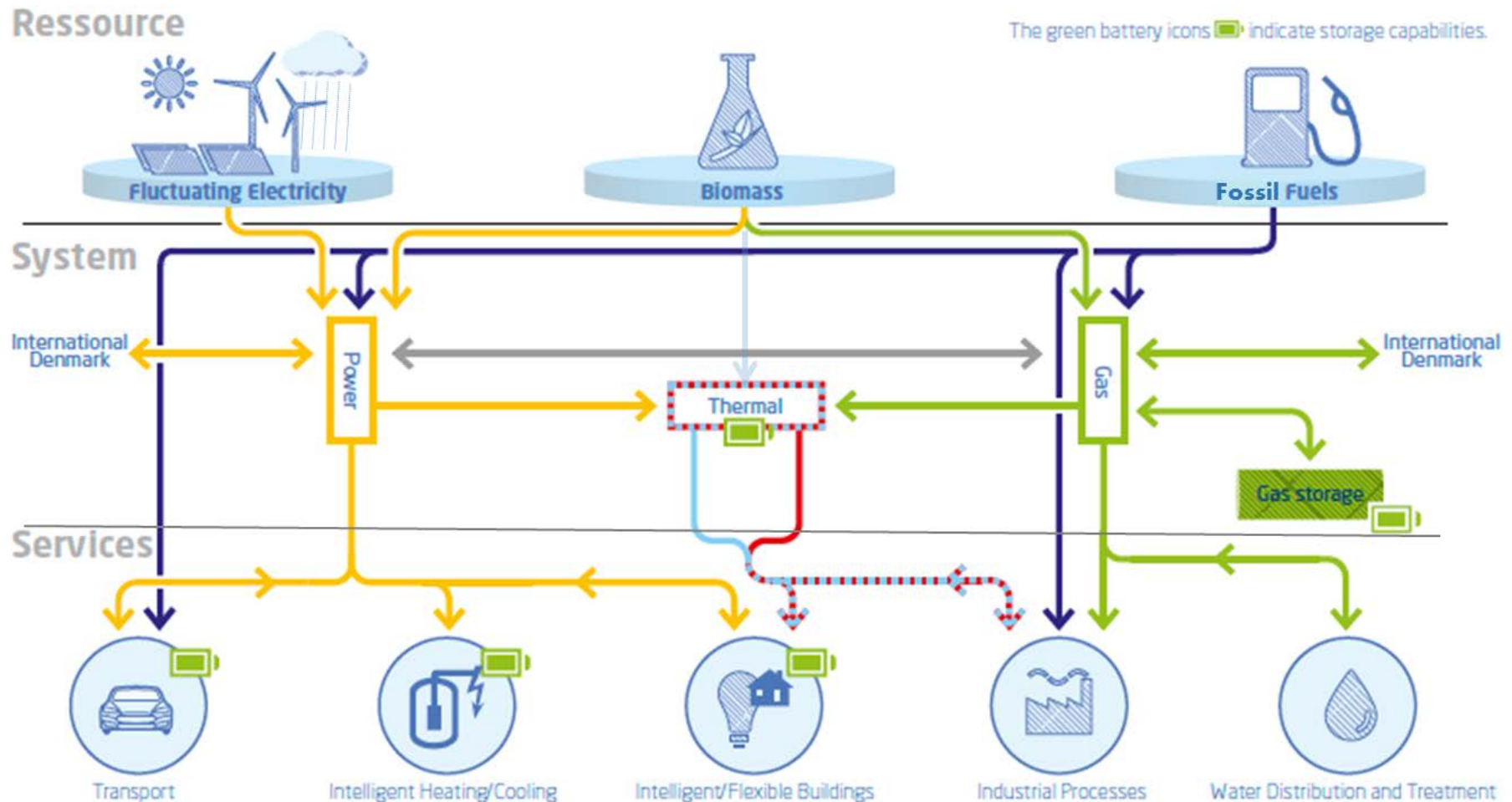
Holistic system approach to the Baltic/Nordic energy system with **flexibility obtained across energy markets** with respect to flexibility at the power markets.



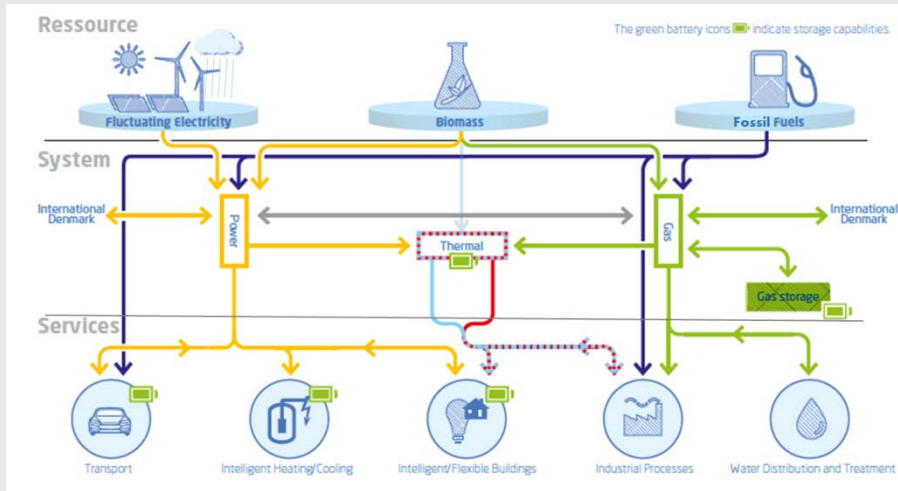
# Integrated Coherent Energy Systems



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# Challenges in a larger perspective



Energy system integration



Energy Efficiency



CCS

Infrastructure



Regulation & market design

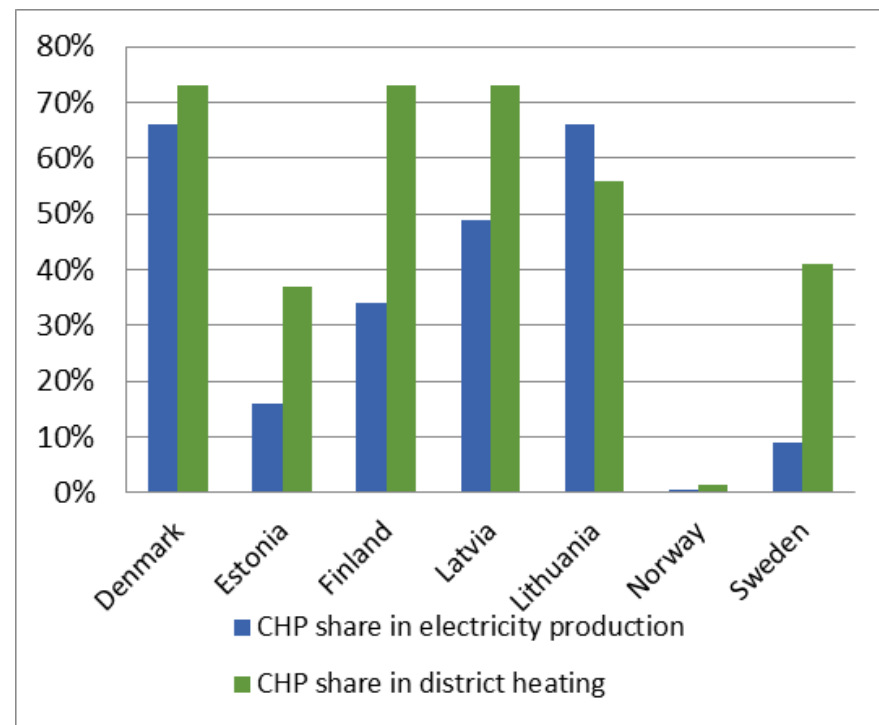
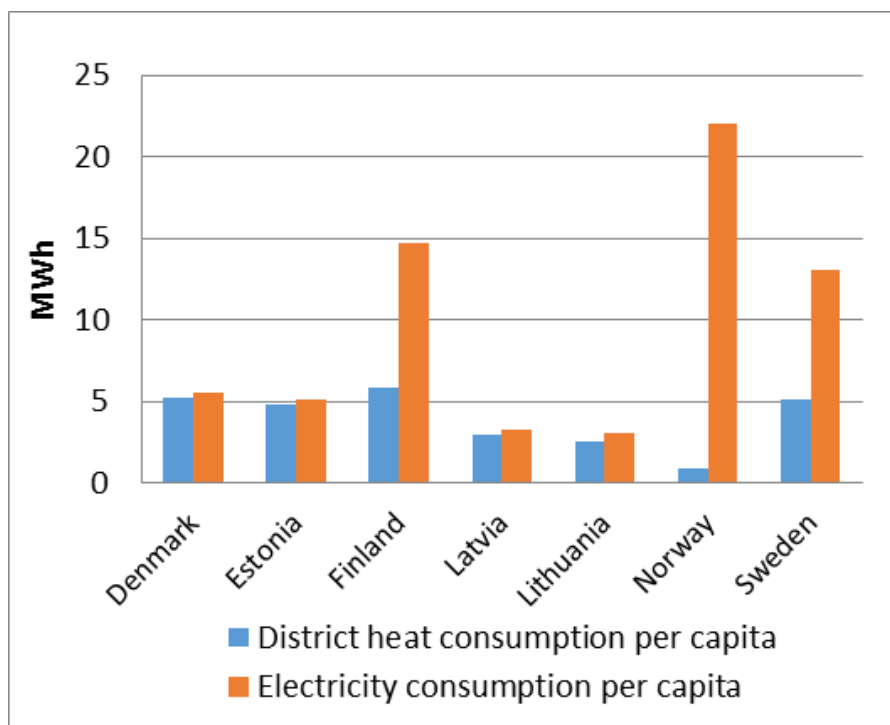
Biomass Supply



# Outline of the talk today

- District heating-electricity interface
- Barriers for flexibility
- Discussion

# District Heating in the Baltics/Nordics



Source: Euroheat, 2015

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



# Which technologies can provide flexibility?



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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

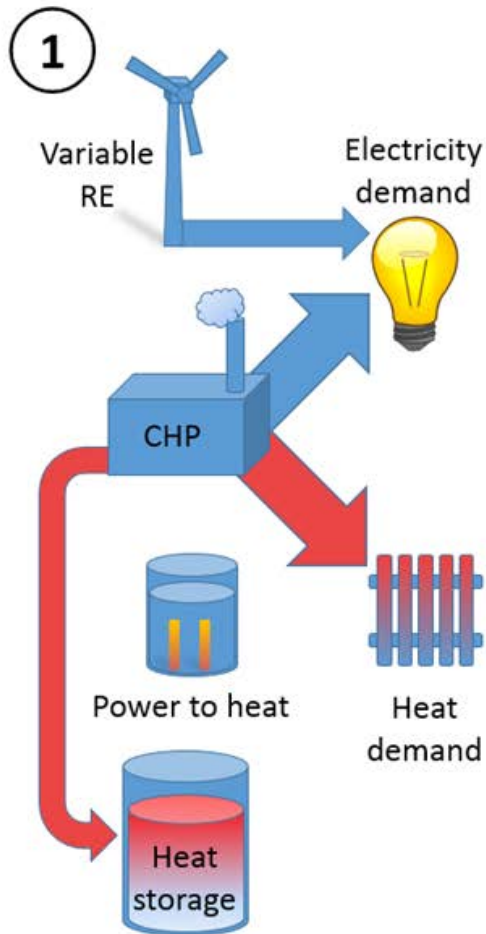
Electric boilers and large heat pumps

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

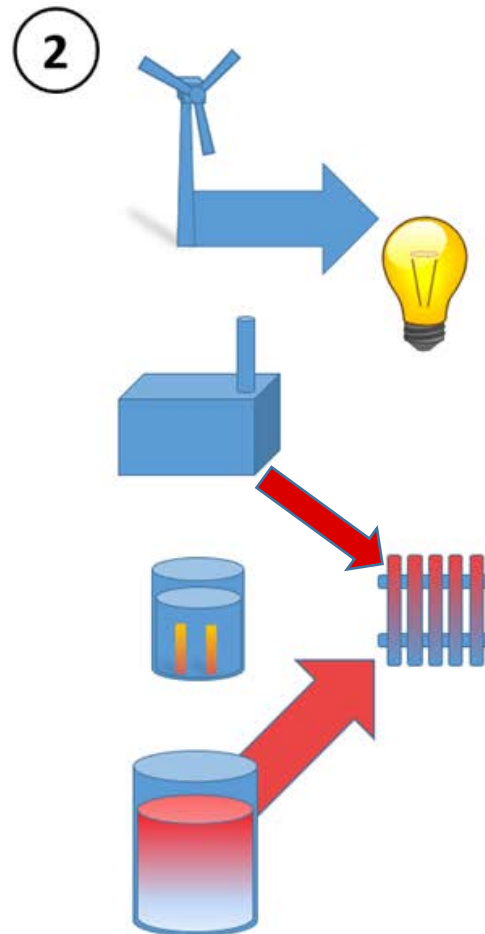
# District heating-electricity interface



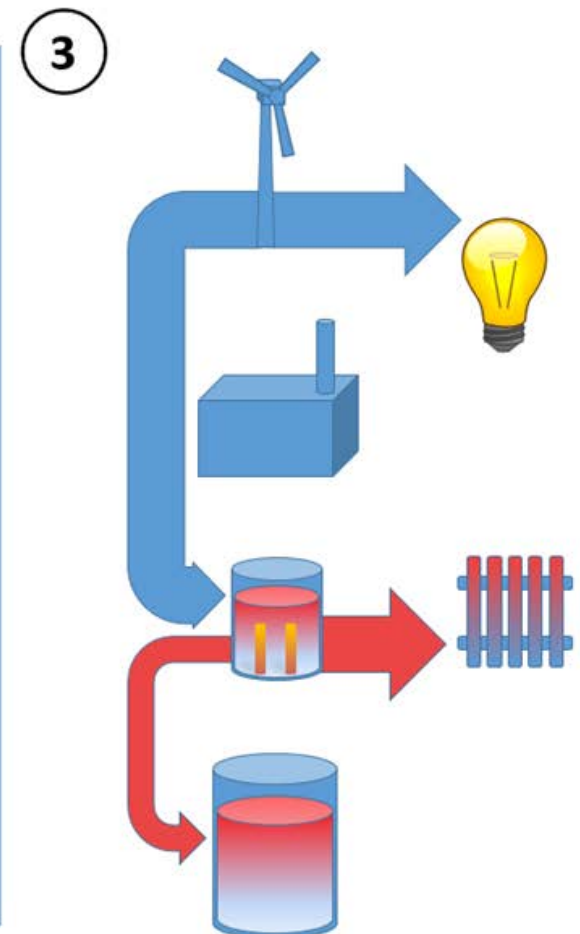
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Power demand exceeds the VRE supply



No need for additional flexibility



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 designed to provide integration with the power market
- National rules sometimes work against DH providing flexibility services to the power market

# 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.

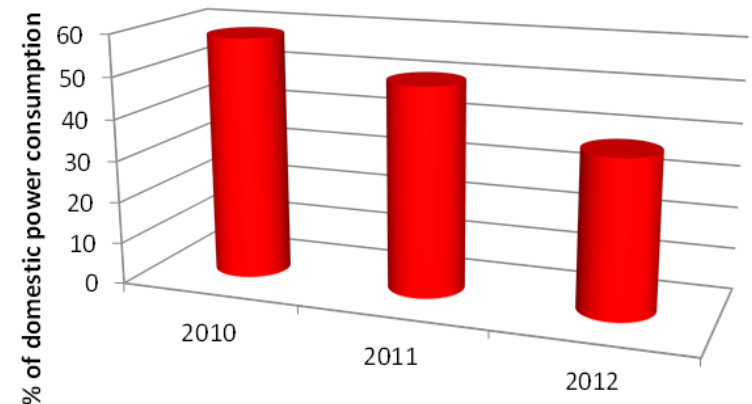
- grid tariffs and taxes on electricity use
- local DH utilities prefer to substitute gas-fired CHP by biomass heat-only boilers due to tax exemptions for biomass

## Baltics:

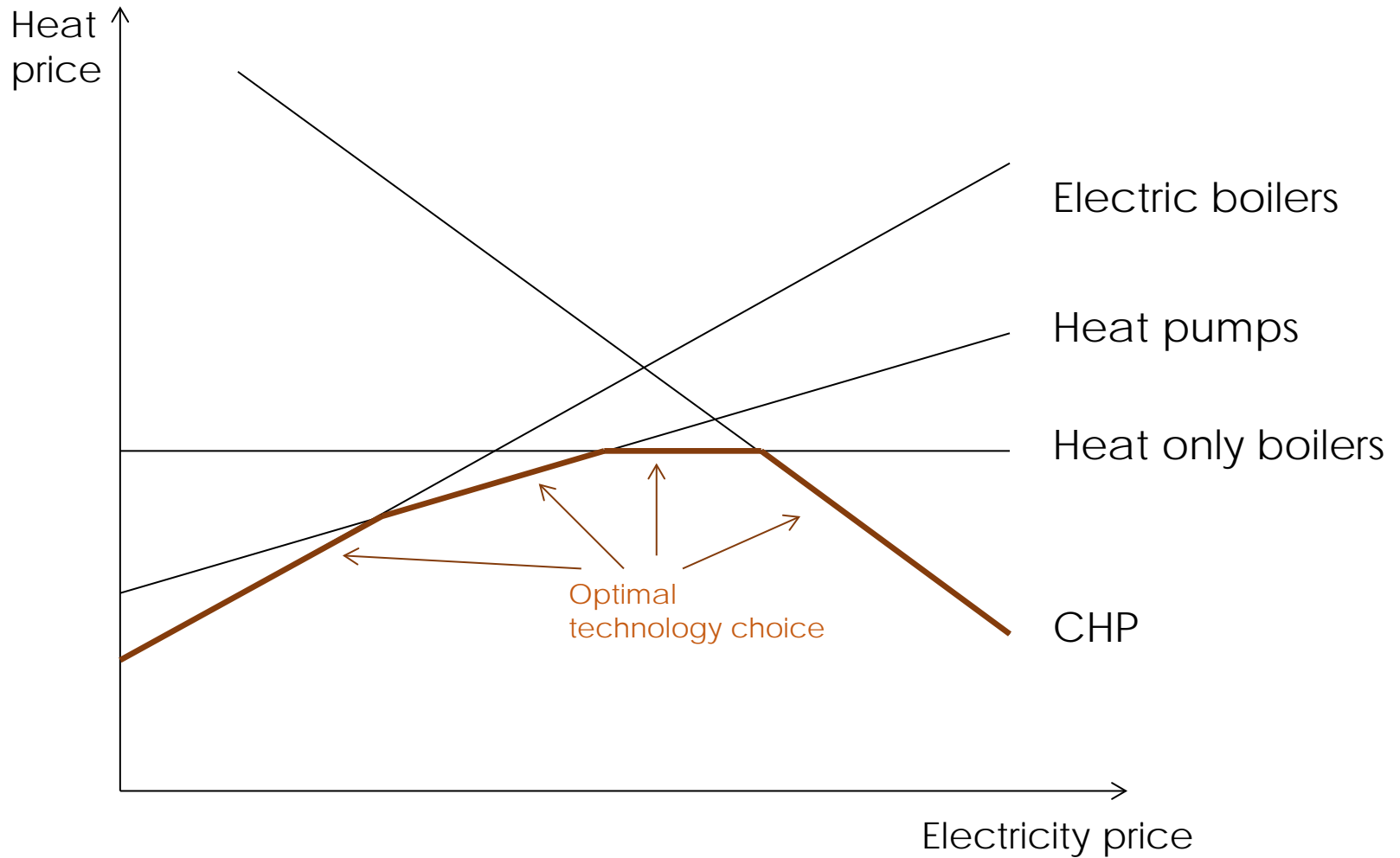
### Limited use of

- market prices for CHP
- thermal storages/water tanks

Central power plants' share of domestic power consumption



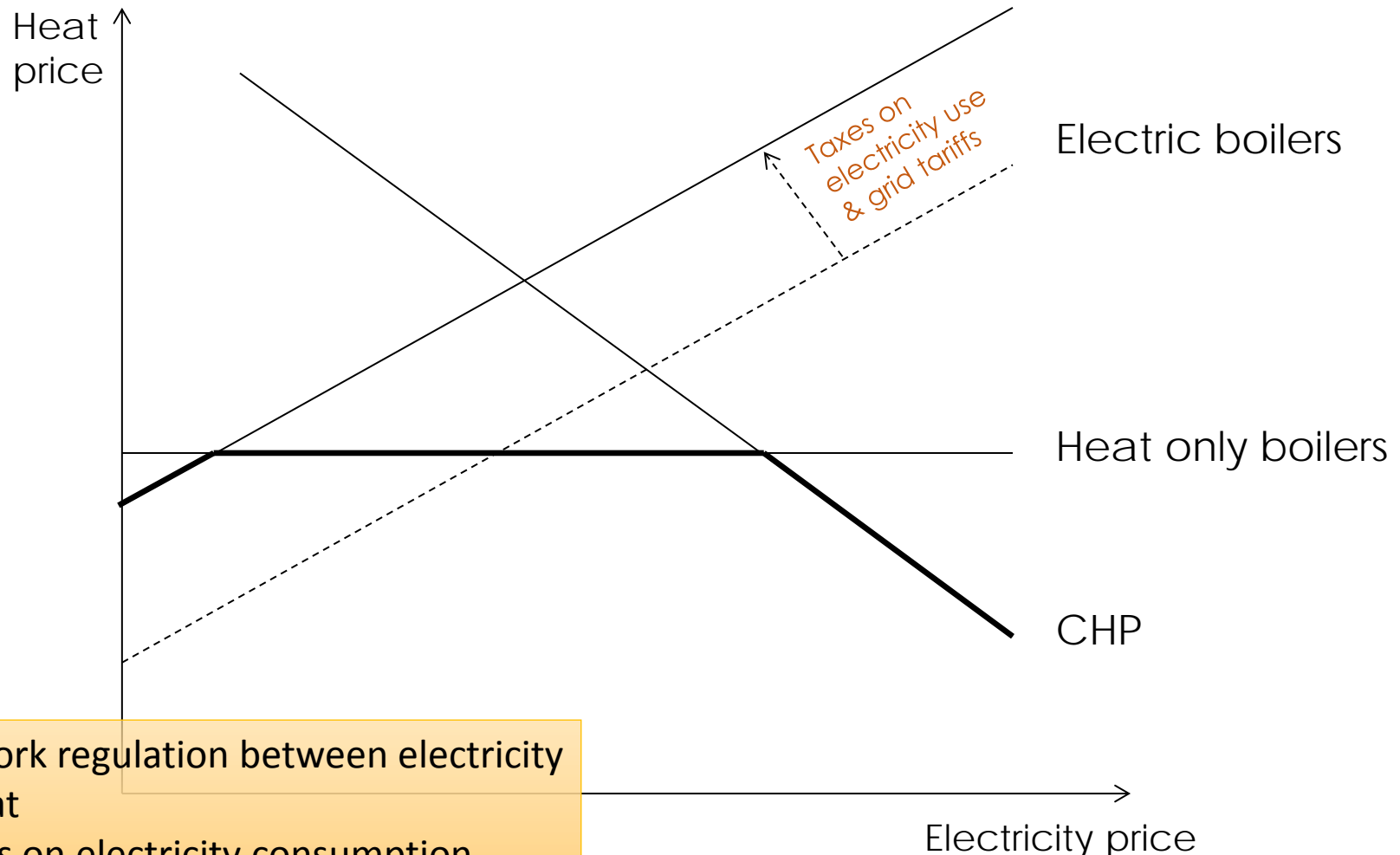
# Choice of heat supply - different el prices net costs



# Choice of heat supply - at different electricity prices



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Patchwork regulation between electricity and heat

- Taxes on electricity consumption
- Heat is taxed at the fuel input
- Biomass exempted for taxes



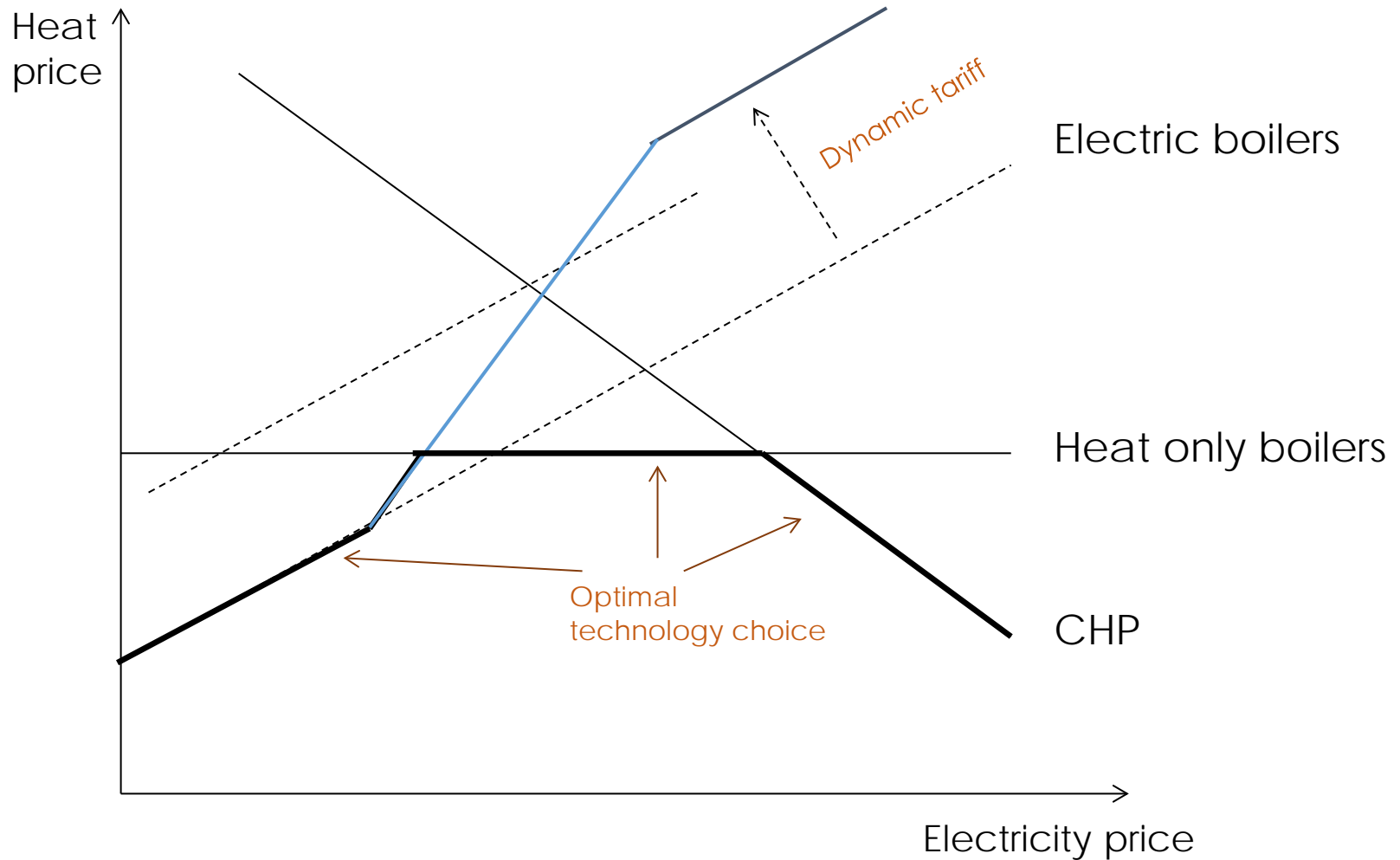
More heat only boilers.  
Decoupling of electricity  
and heat markets

# Choice of heat supply

## With dynamic tariffs



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# 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



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Questions ?



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