Heat Roadmap Europe
RE Scenarios and Results for decarbonising Heating and Cooling in the European Union

Agenda

• Heating and cooling in Europe
• The Heat Roadmap Europe project series
• Strategies in the European Union
• Approach and Methods
  • Interaction between energy models
  • Scenario structure
  • Cost balance: Savings vs. supply
• Results
  • Reduction of thermal demands
  • Heat pumps vs. DH
  • General results
Heating vs other sectors

Heating and cooling demand in 2015 in the EU28 by end-use compared to total final energy demand
- Large share for all Member States (not just the 'cold' North)
- Overall cooling share in general is 10-15%

HRE 1, 2, 3, 4

- Study 1 (2012): will district heating play a role in the decarbonisation of the European energy system?

- Study 2 (2013): what is the balance between heat savings and heat supply at an EU level?

- Study 3 (2015, STRATEGO WP2): low-carbon heating and cooling strategies for five member states

HRE4 – A large collaboration

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 695989.

Targets and challenges in Europe

- Long-term target (2011)
  - 80-95% reduction of CO\textsubscript{2} emissions in the energy sector
- Short term in the energy union (2015)
  - Security of supply, solidarity and trust (gas, oil, electricity)
  - An integrated market (electricity)
  - Energy efficiency (first)
  - Lower CO\textsubscript{2} emissions
  - Research and innovation
Focus in Europe

- Energy Savings (energy efficiency first principle)
- More electricity in the energy system
- More distributed production
- Gas in a transition
- Contribution from nuclear
- Much more Renewable Energy
- Reductions in energy imports and prices
- More investments – less costs for fuels
- Increasing electricity prices until 2030 – then decreases
- Large reductions in emissions is technically and economically possible.

An EU Strategy for Heating and Cooling

- A first attempt a holistic approach to the heating and cooling sectors
- The first move from only looking at buildings to also looking at buildings as part of the energy system
- Energy savings, energy efficiency, electricity AND district heating is mentioned in the first line of the European Commission’s new Vision for Heating and Cooling
- Synergies by looking across sectors is in focus
Heating and Cooling Can Have Very High Renewable Energy Penetrations

Source: Mapping and analyses of the current and future heating-cooling fuel deployment, 2016

Renewable Energy vs. District Heating

Source: www.heatroadmap.eu
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Why isn’t it happening?

- Heating is complex
- Heating is local
- Heating is long term
- Lack of knowledge
- Heat savings and district heating have large investment costs
- Heating is cultural, ownership problems and profit margins

Our Purpose

- Creating scientific evidence to support long-term energy strategies at local, national, and EU level and empower the transition to a low-carbon energy system
- By quantifying the impact of various alternatives for addressing the heating and cooling sectors
**Relationship Between the Energy Models**

- **EnergySystem in Detail**
  - (Electricity, heating, cooling, and transport)
  - **Hourly resolution**
  - **Sector integration**
  - **Aggregated**
  - **Smart energy system approach**

**Energy system dynamics**

- **Transition**
- **Single Years**
- **Heating and Cooling Sectors in Detail**

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Data flows between models

Balance between savings and supply

- Savings
  - Residential
  - Service
  - Industry
- Supply
  - Heat pumps
  - District heating

Cost of Heat Savings (€/kWh)

Amount of Savings (TWh)

30-50%
Balance between savings and supply

• Reductions in demand do not affect the HP / DH balance and vice versa
• Industry and service savings generally feasible
• Residential savings differ between countries
• DH feasible in all countries but different levels

<table>
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<th>Percentage of market share covered by DH</th>
<th>Residential sector space heating savings (additional to a 30% reduction already in the Baseline)</th>
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Development of thermal demands

• Total of 30% reduction in space and hot water demand
• More than current EU policy
• Combining refurbishment and new efficient buildings
• Cooling demands expected to increase
Heat pumps and district heating shares

- Building Heat pumps
  - Increase in share from 1% to about half of the heat market
- DH supply
  - Increase from 12% to cover the other half of the heat market
- Fuel boilers and electric heating for heating should be limited as far as possible / eliminated

Feasible shares of DH

![Graph showing feasible shares of district heating across different countries and years.](image-url)
District heating production

- Large variety of heat sources
- The feasibility of DH is not dependent on any single heat source
- Cogeneration of heat and power production may decrease with increasing RES

Primary energy supply

- Same range as 2015 but different sources
- Large reduction in fossil fuels
- Total reduction in fuel
  - But increase in biomass
  - This should be reduced further
Total energy system costs

- Reduction of ~150 B€/year
- Increase in investment costs
  - Job creation
  - Reduced energy price fluctuation
- Decrease in fuel costs
  - Lower dependence on import of fossil fuels

Emission comparison
More information