



2050

Heat Roadmap Europe

A low-carbon heating and cooling strategy

Heat pumps on a city scale – assessing optimal scales of implementation

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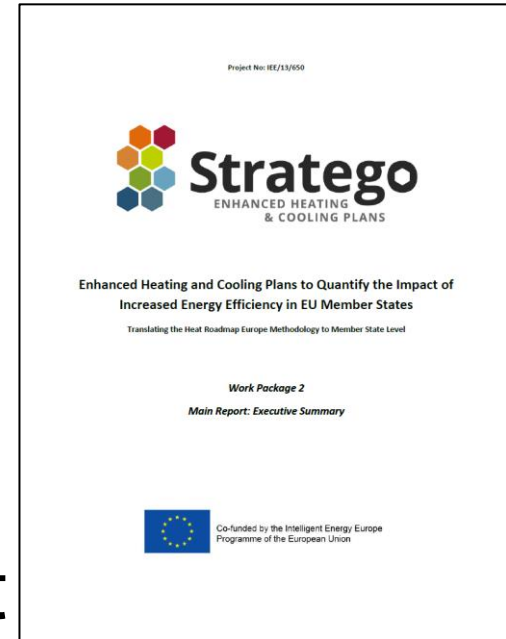
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Aims and objectives

- Work with Stratego results
 - Peta and EnergyPLAN models
 - Moving from country to local
- The role of networks in urban areas, especially in the context of heat pumps



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Stratego

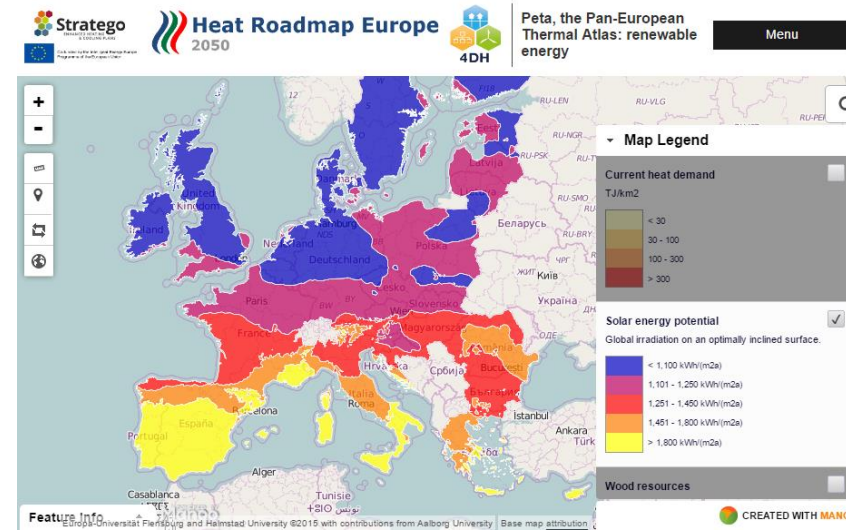
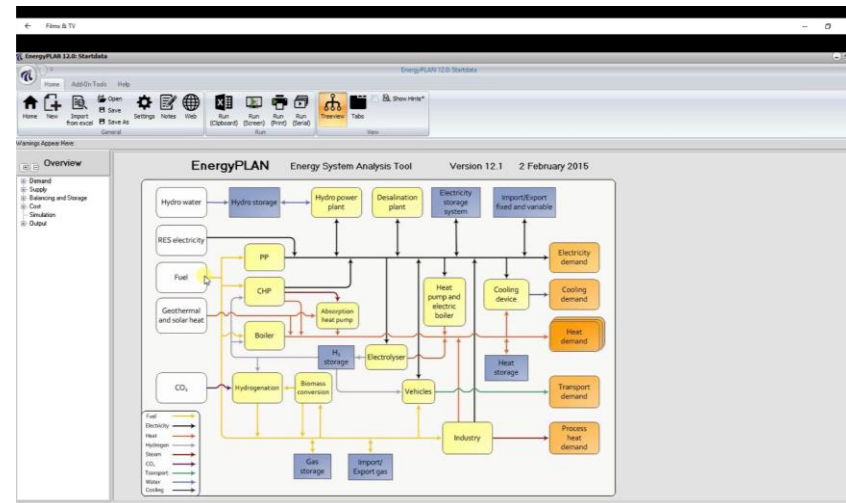


- Overall aim :
 - To develop national low-carbon heating and cooling strategies (Heat Roadmaps)
 - To quantify the impact of implementing them at national level
 - For CZ, HR, IT, RO, UK

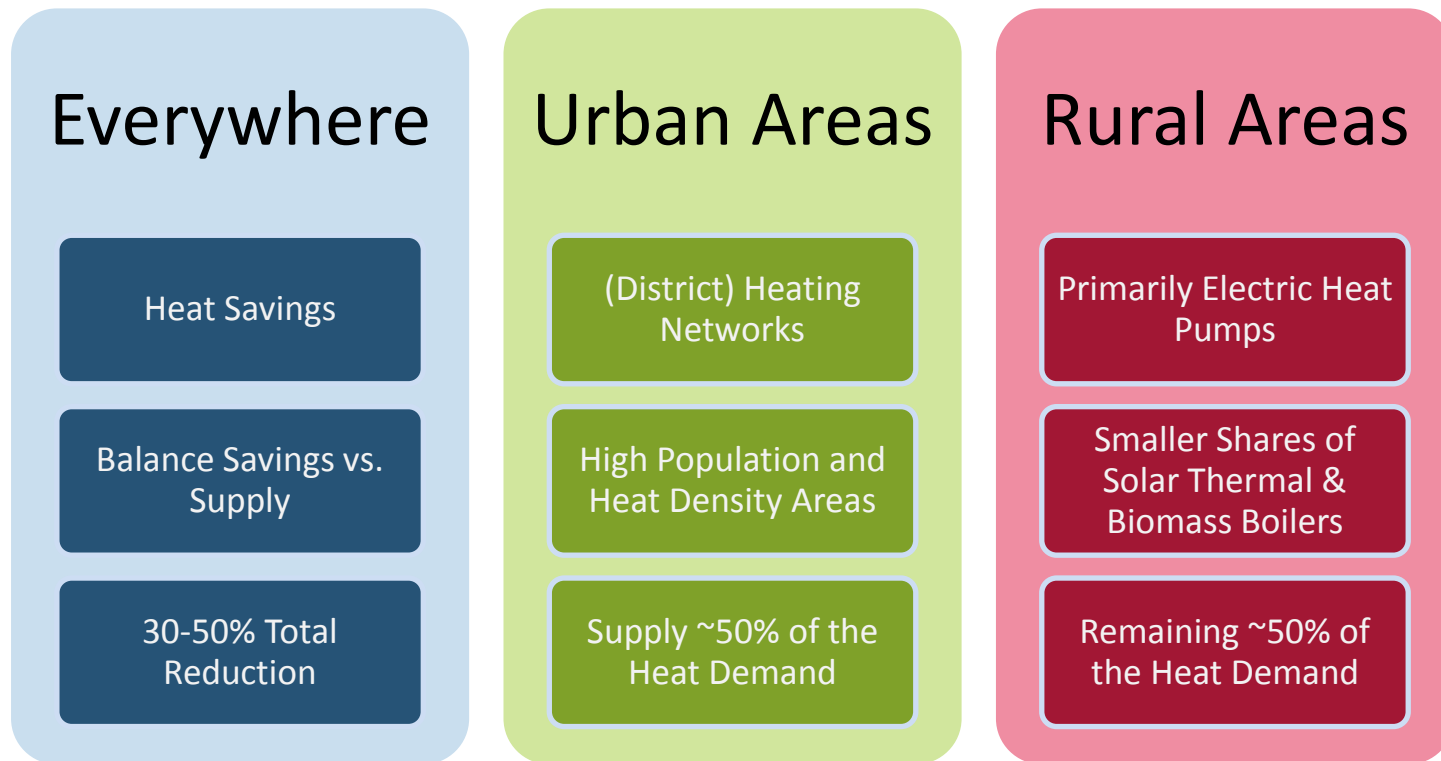
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Stratego: Heating Options



















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Stratego: Individual Heating Options

Heating Unit	Sustainable Resources	Efficient	Cost	Cost Sensitivity
Electric Heating				
Heat Pumps				
Oil Boilers				
Biomass Boilers				



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Objective

- To use a local case study using (mainly) Stratego resources.
- To understand how to best employ heat pumps in cities
 - On a large scale, with a DH network for distribution
 - In each building, individually
 - Control: gas network



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Applicability of heat pumps

- What seemed reasonable based on other examples
 - Stockholm – 250 MW
 - Helsinki – 90 MWth



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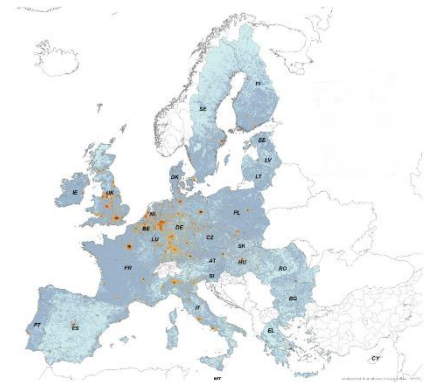
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Methodology: local cases based on Stratego resources

- Use Peta3 to identify areas
 - Bristol – looked promising by waterway
 - York – no immediate sources for large heat pumps
 - Dundee – located by the sea

Peta
Pan European Thermal Atlas

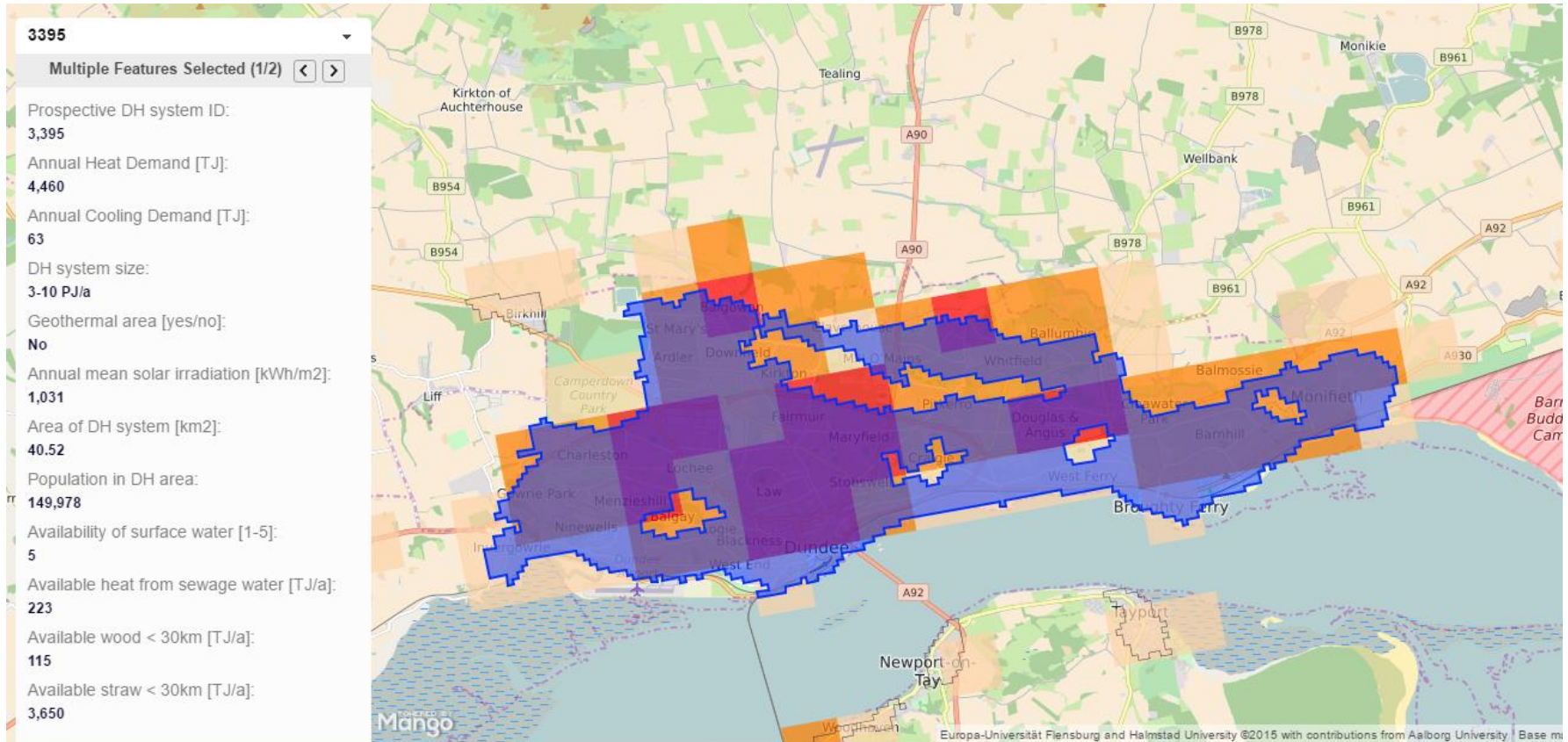


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Dundee



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Building the scenarios

- What is EnergyPLAN?
- Hourly distributions– UK Energy Model (<http://heatroadmap.eu>)
- Electricity: all imported, with UK average CO₂ content
- Technology data & costs: Danish Energy Agency database (updated)

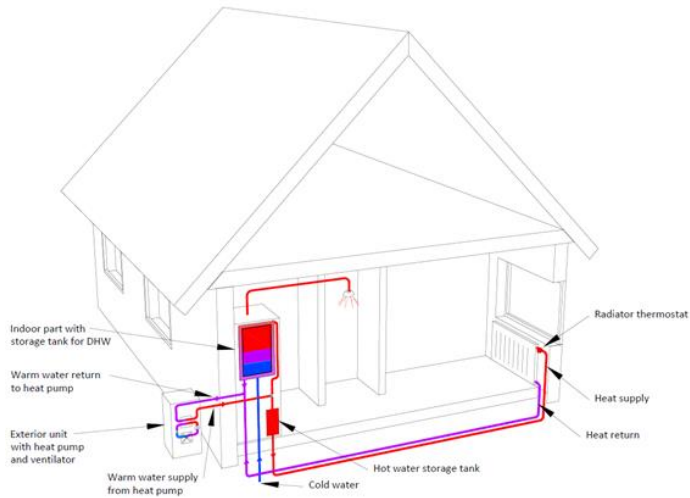


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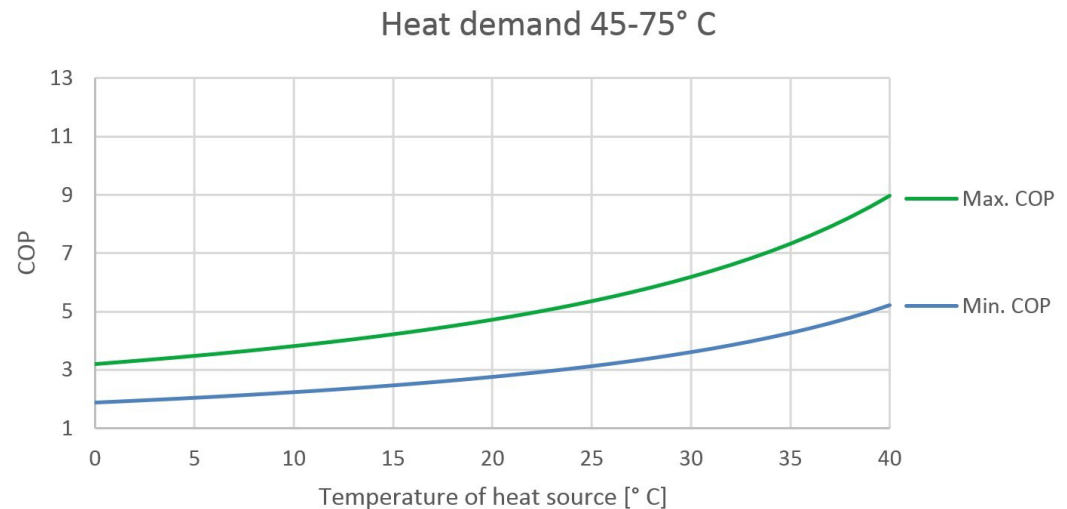


How it works



Prove the principle rather than having an optimized model

Both individual and large scale heat pumps have the same COP ~3,3



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Results

- Energy efficiency (fuels used)
- CO₂
- Costs

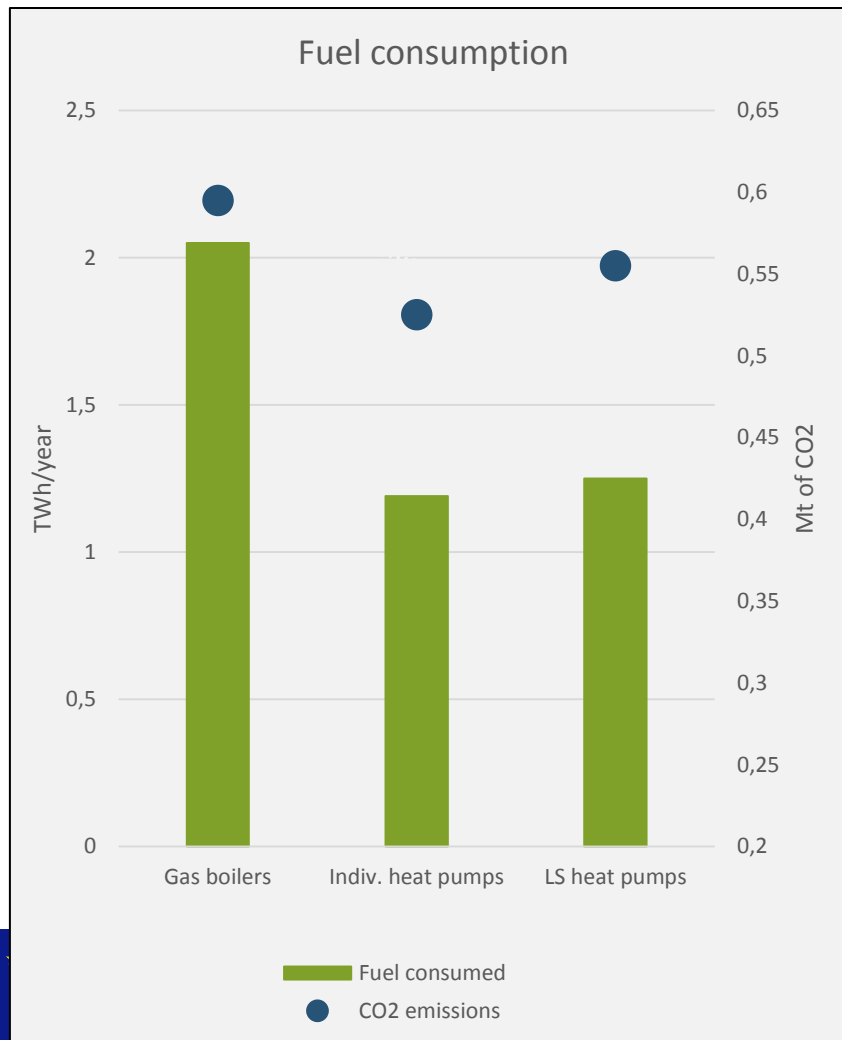


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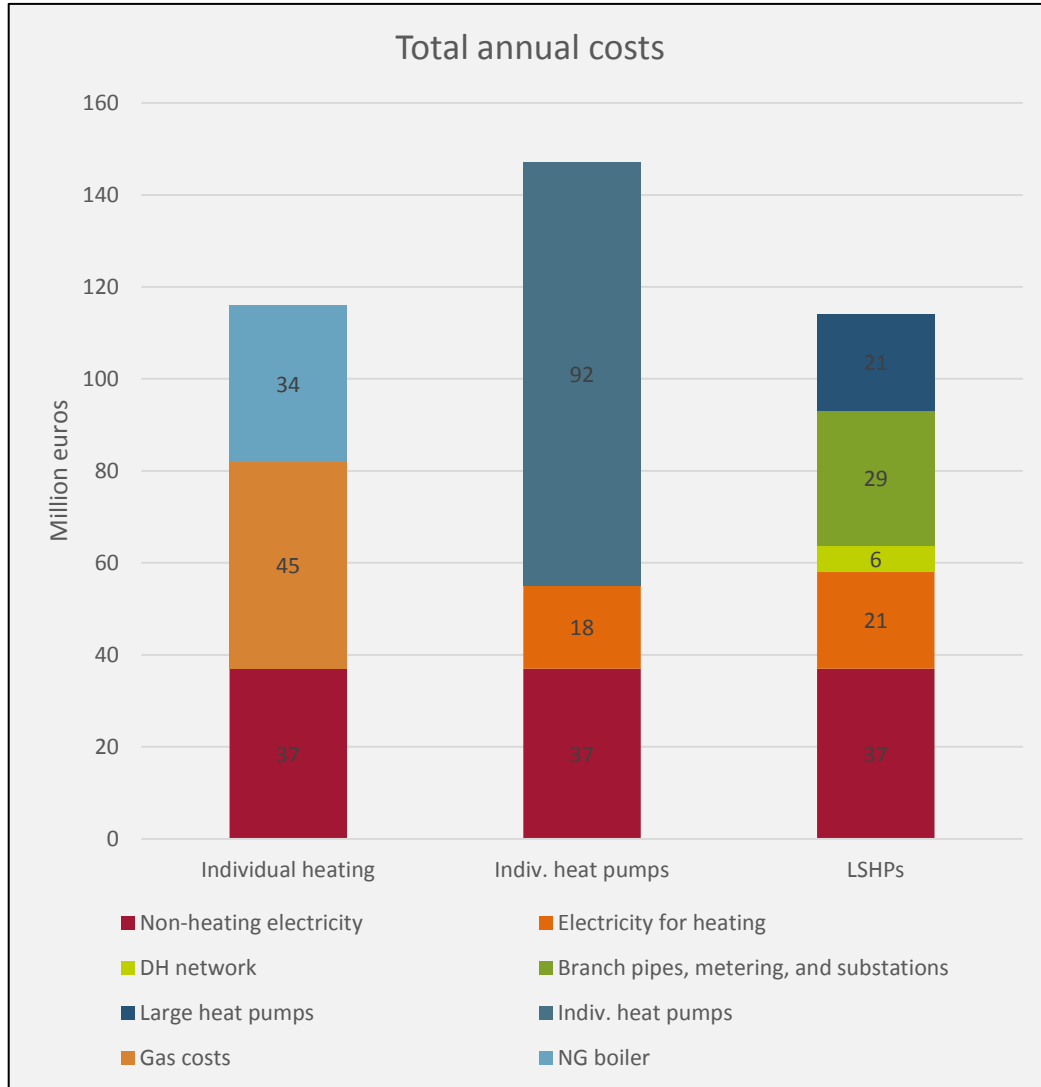
Results



- Efficiency of heat pumps
- CO₂: Dependent on the carbon content of the electricity system



Results



- (variable) Fuel costs
- Network costs: 5% of total
 - Substations
- Investment costs for HPs



Discussion

Objective: use Stratego resources for a city case

- Delineating boundaries
 - Urban agglomerations; can be organisational, physical
- Integrating the electricity sector
 - local forms of electricity generation

Objective: understand the best employ of heat pumps

- Network solution is preferred
- LS heat pumps can provide heating at higher efficiency and similar cost to gas boilers, if sources are available.



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Next steps

- SES: integrate storage, assess effects on integrating RES
- Optimise other heat sources for DH
- Local planning processes: use of results (HRE4)
- Heat pumps: continue survey
- Consider variations and intermediaries



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Questions/suggestions?

THANK YOU!



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