Heat Roadmap Europe 2050

The Role of District Heating in a Decarbonised European Energy System

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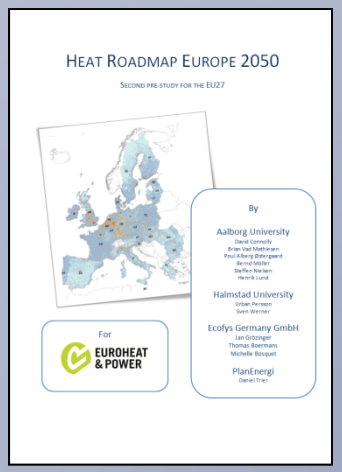

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Heat Roadmap Europe 2050

How Should Europe Heat Its Buildings in the Future?

Insights from Heat Roadmap Europe

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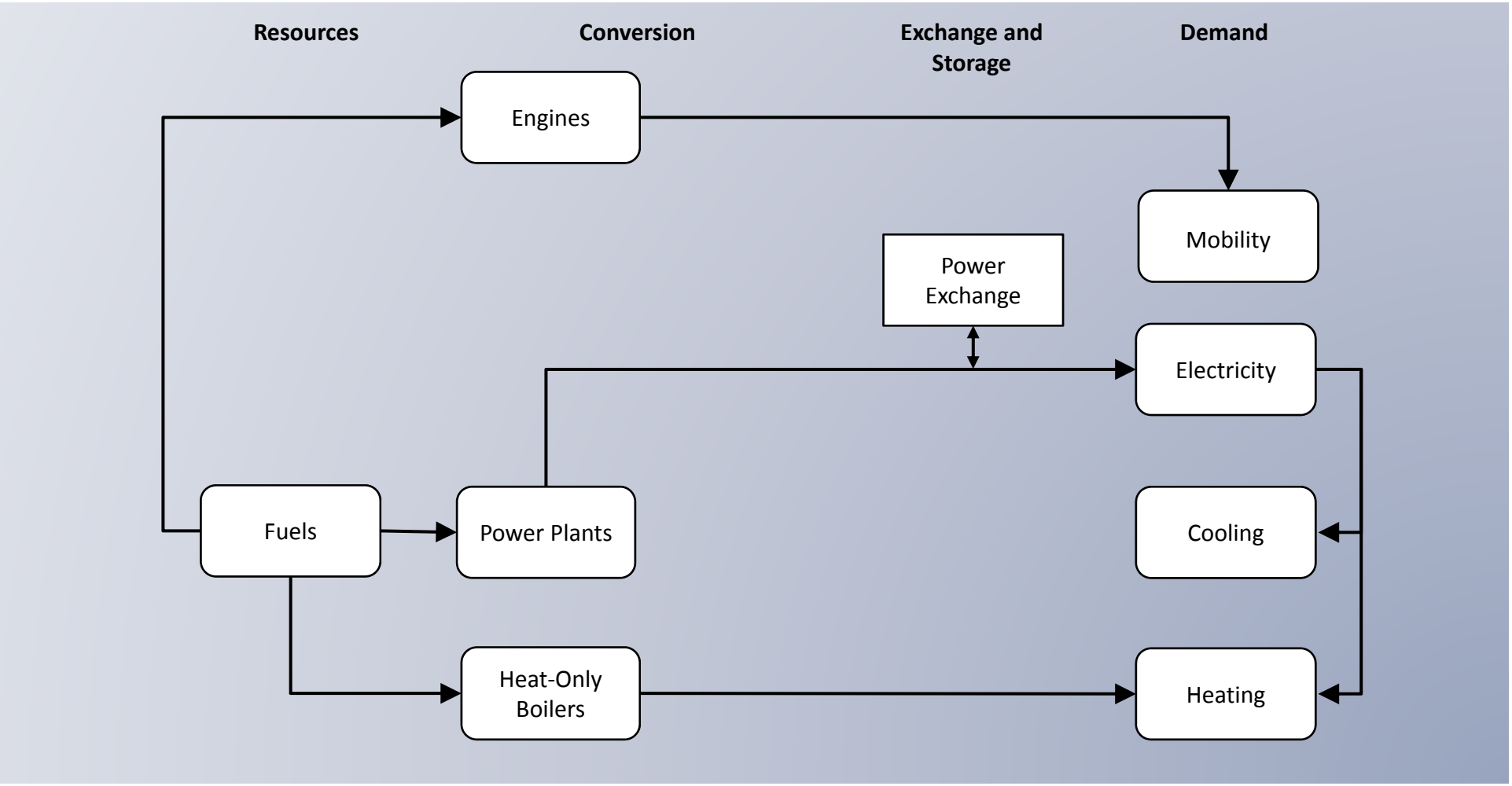
Today's Energy System



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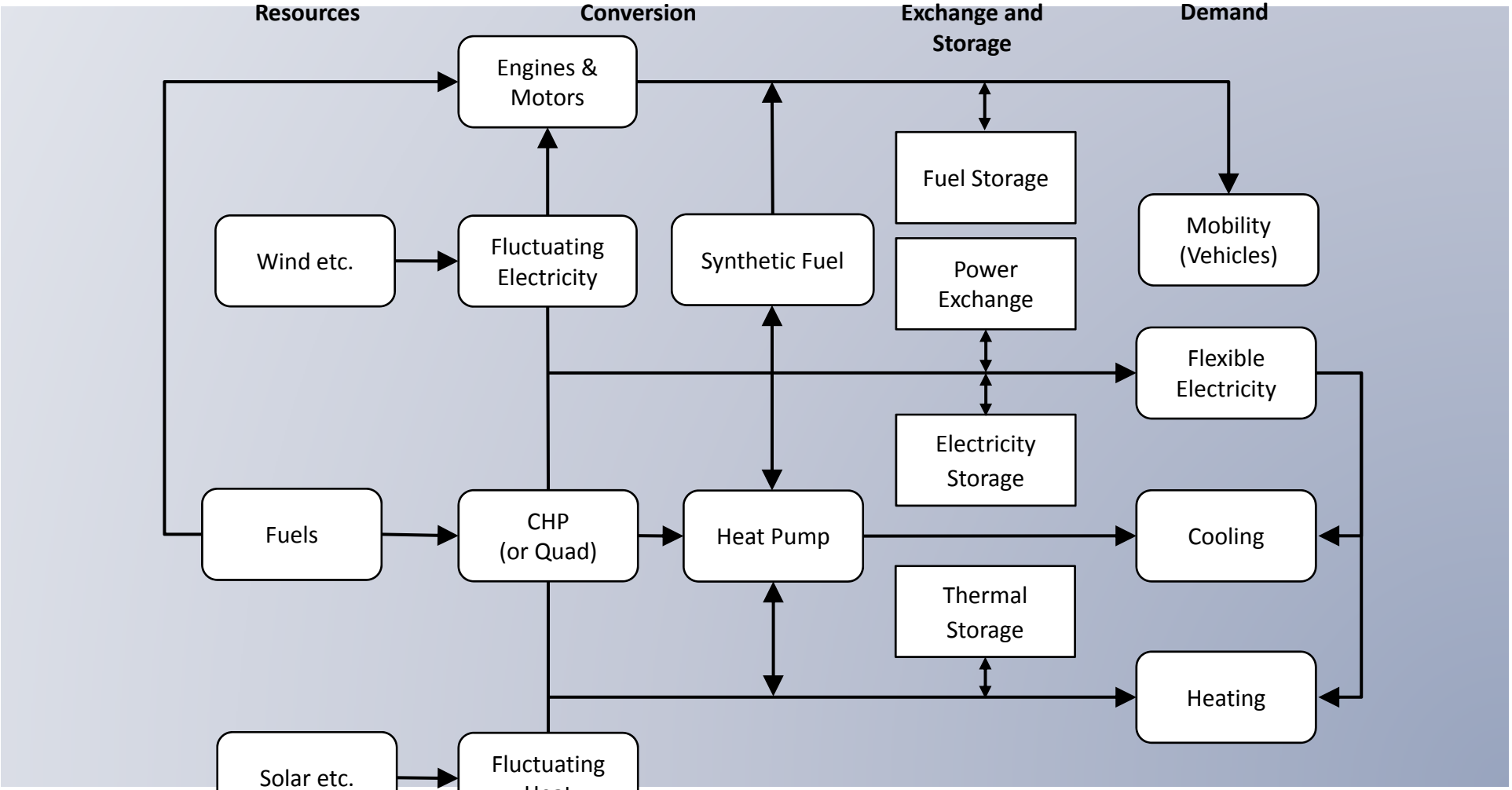
Smart Energy System



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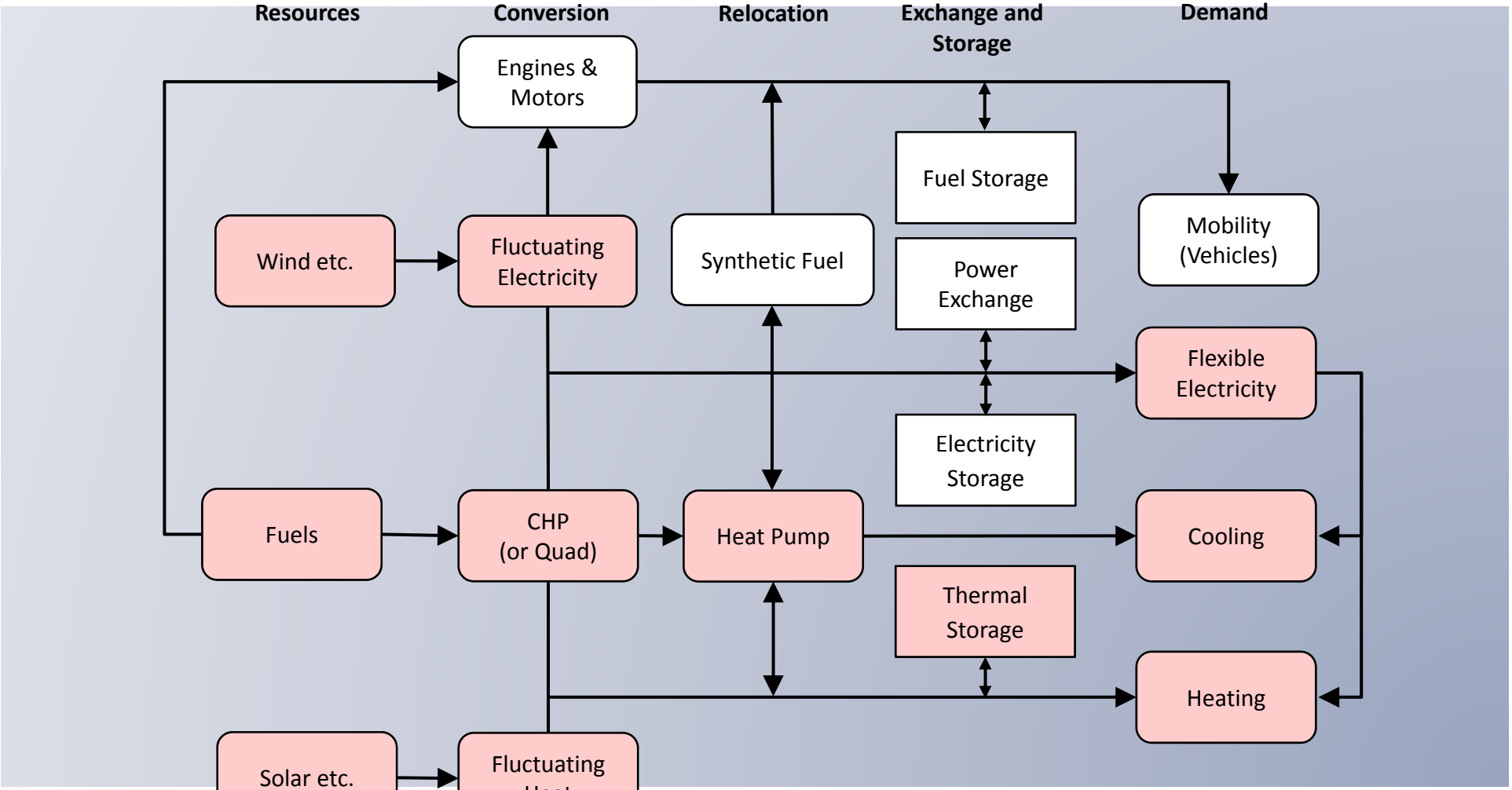
Heat Roadmap Europe 2050

An Integrated Heating Sector



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What Options do we have in the Heat Sector?

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3 Options for the Heat Sector

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3 Options for the Heat Sector

1. Savings (Everywhere)

- Reduce our demand for heat:
  - Space heating
  - Hot water

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3 Options for the Heat Sector

1. Savings (Everywhere)

- Reduce our demand for heat:
  - Space heating
  - Hot water

2. Individual Units (Everywhere)

- Use a heating unit in each building:
  - Boilers:
    - Oil
    - Biomass
  - Heat Pumps
  - Electric Heating

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3 Options for the Heat Sector

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- Reduce our demand for heat:
  - Space heating
  - Hot water

2. Individual Units (Everywhere)

- Use a heating unit in each building:
  - Boilers:
    - Oil
    - Biomass
  - Heat Pumps
  - Electric Heating

3. Networks (Urban Areas)

- Share a heating network:
  - Gas
  - Water (i.e. district heating)

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1. Heat Savings

How much?

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1. Savings

- We should implement heat savings until the price of sustainable supply is less than the marginal price of additional savings

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1. Savings

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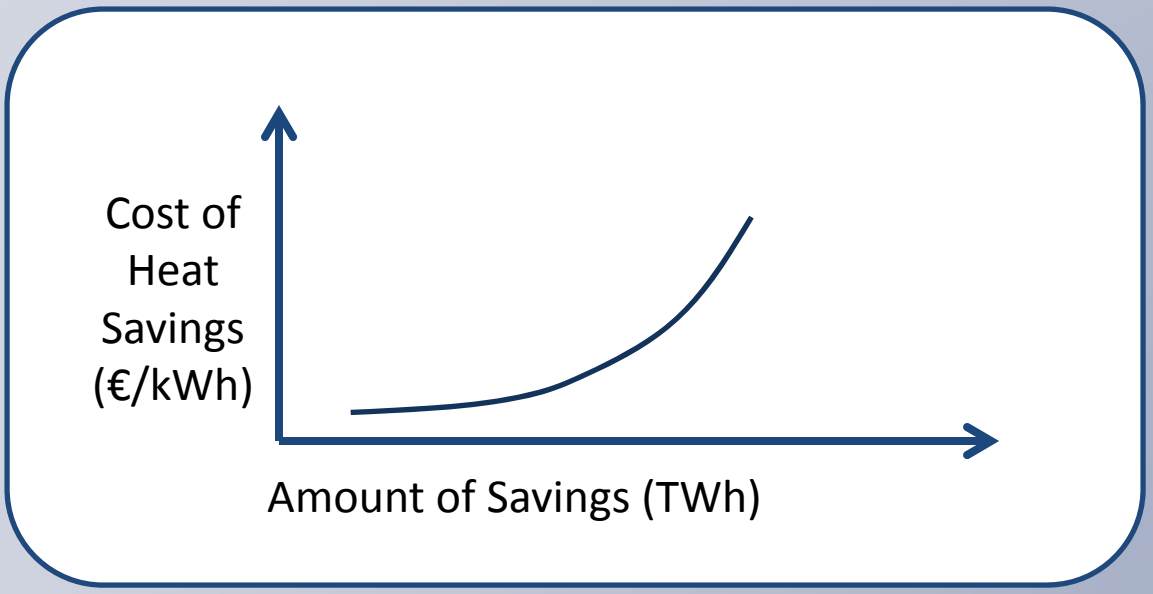

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1. Savings

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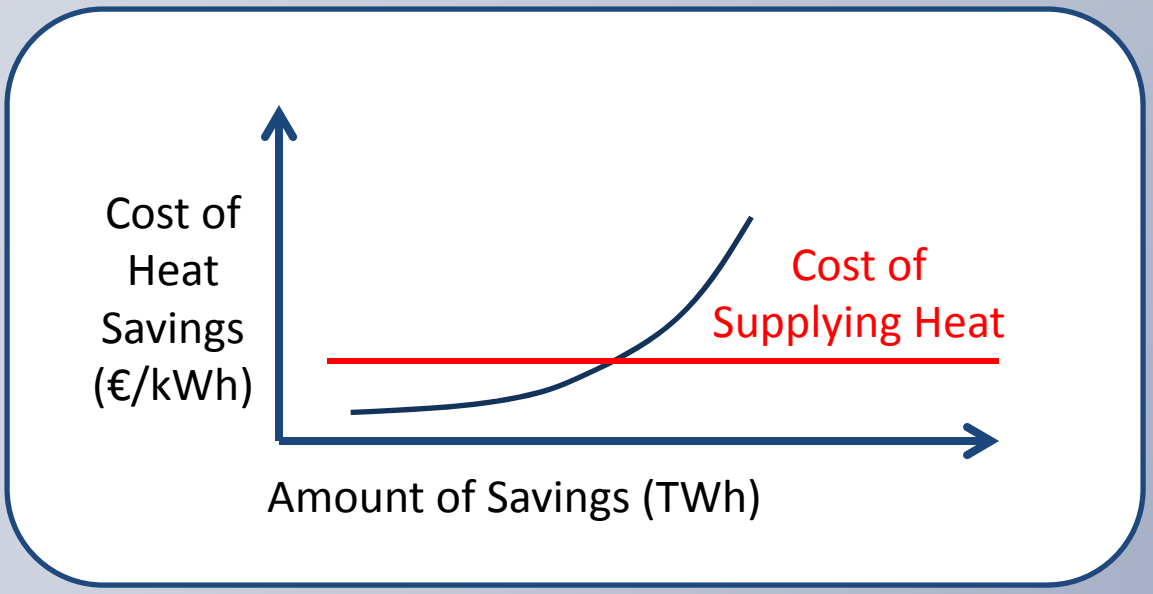

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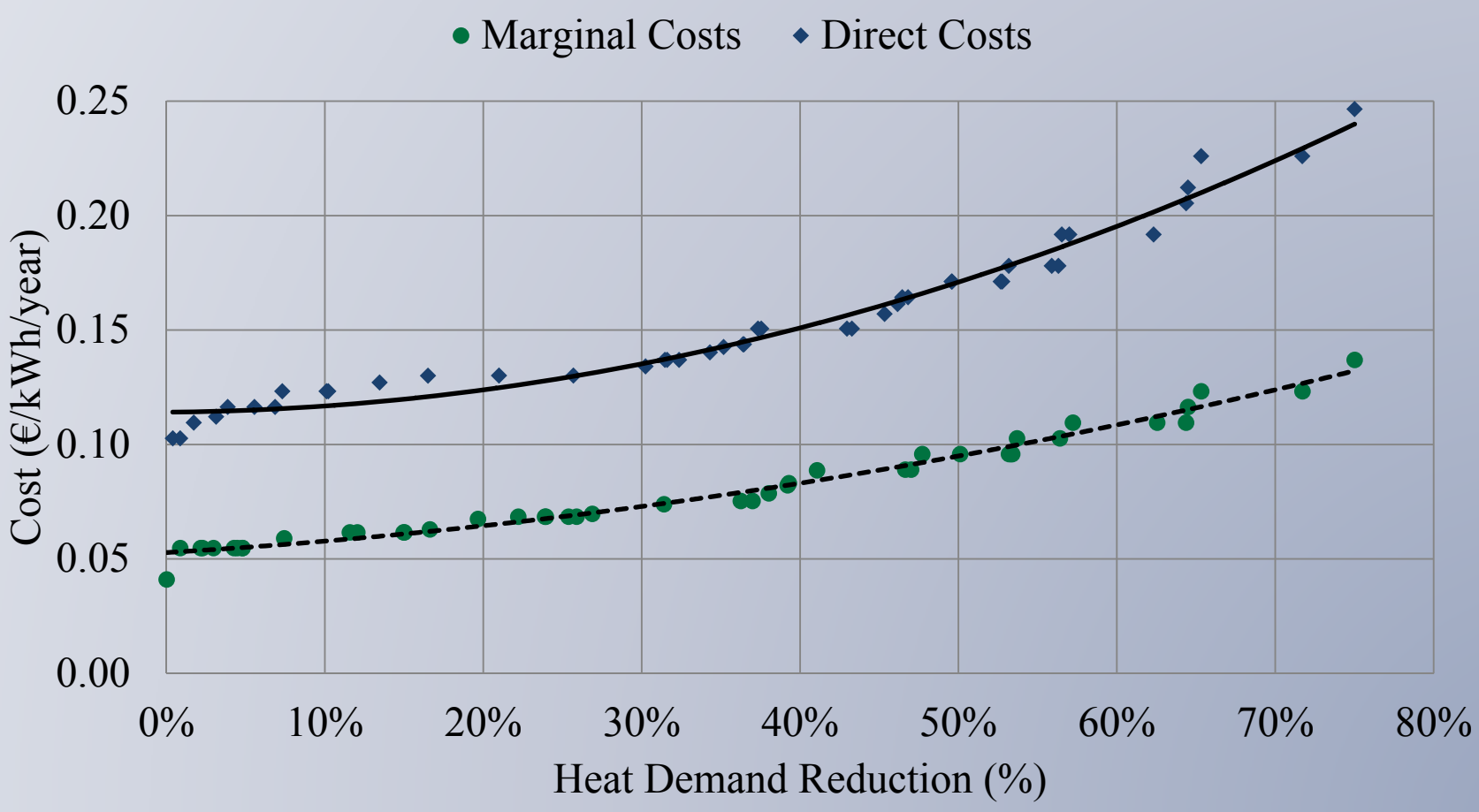
Savings Identified in HRE



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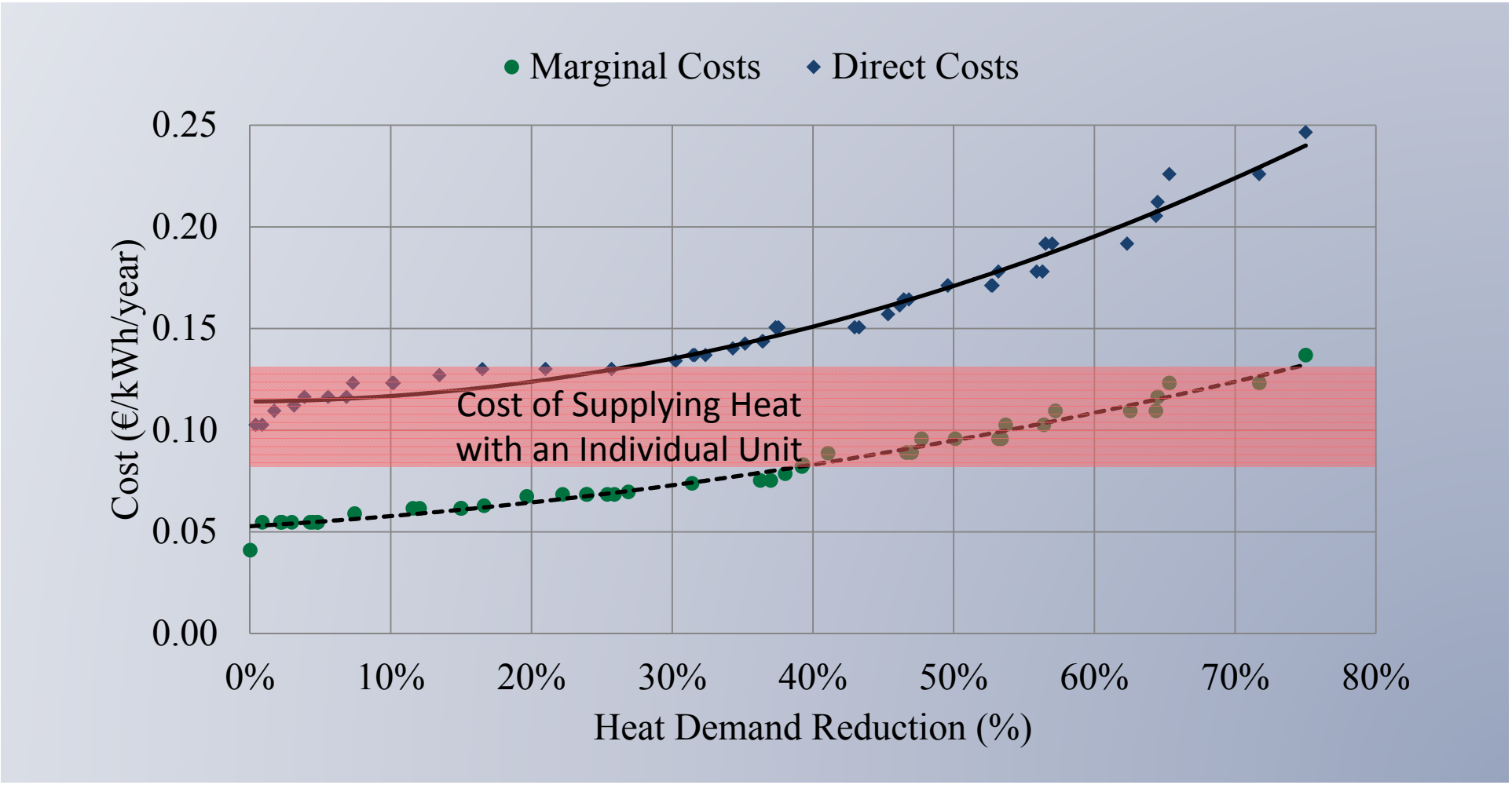
Savings Identified in HRE



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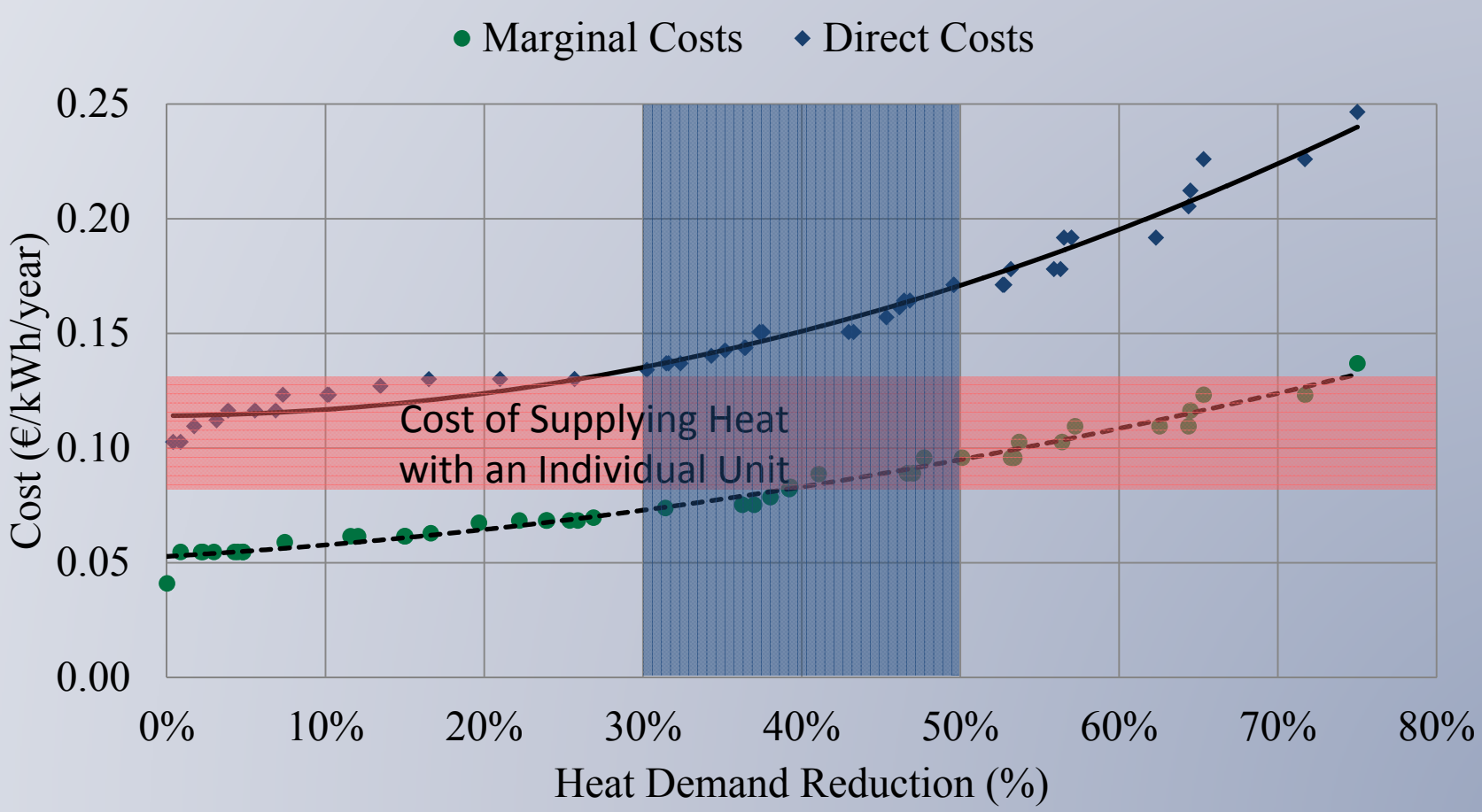
Savings Identified in HRE



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Heat Roadmap Europe 2050

3 Options for the Heat Sector

1. Savings	2. Individual Units	3. Networks
➥ Reduce our demand for heat: ➥ Space heating ➥ Hot water	➥ Use a heating unit in each building: ➥ Oil ➥ Biomass ➥ Heat Pumps ➥ Electric Heating	➥ Share a heating network: ➥ Gas ➥ Water (i.e. district heating)
Max 50% Marginal		

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2. Individual Units

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Individual Heating

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

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Heat Roadmap Europe 2050

Individual Heating

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

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Heat Roadmap Europe 2050

Individual Heating

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

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Individual Heating

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

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Individual Heating

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

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Individual Heating

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

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3 Options for the Heat Sector

1. Savings	2. Individual Units	3. Networks
➥ Reduce our demand for heat: ➥ Space heating ➥ Hot water	➥ Use a heating unit in each building: ➥ Oil ➥ Biomass ➥ Heat Pumps ➥ Electric Heating	➥ Share a heating network: ➥ Gas ➥ Water (i.e. district heating)
Max 50% Marginal	Heat Pumps (with solar)	

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3. Heat Networks

Do we need them?

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3. Networks

1. Options:
   - Gas Grid
   - Water Grid (i.e. District Heating)

2. Do we need them?

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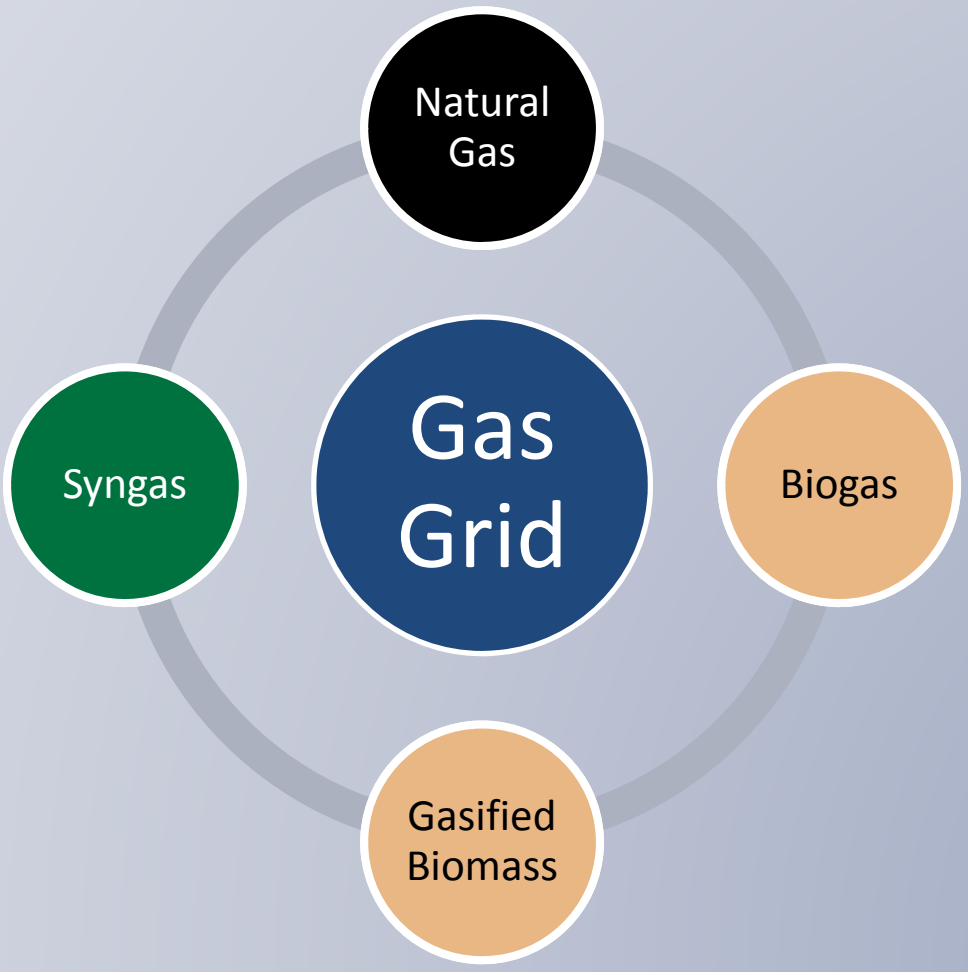
Gas Grid

High quality energy for a low quality demand



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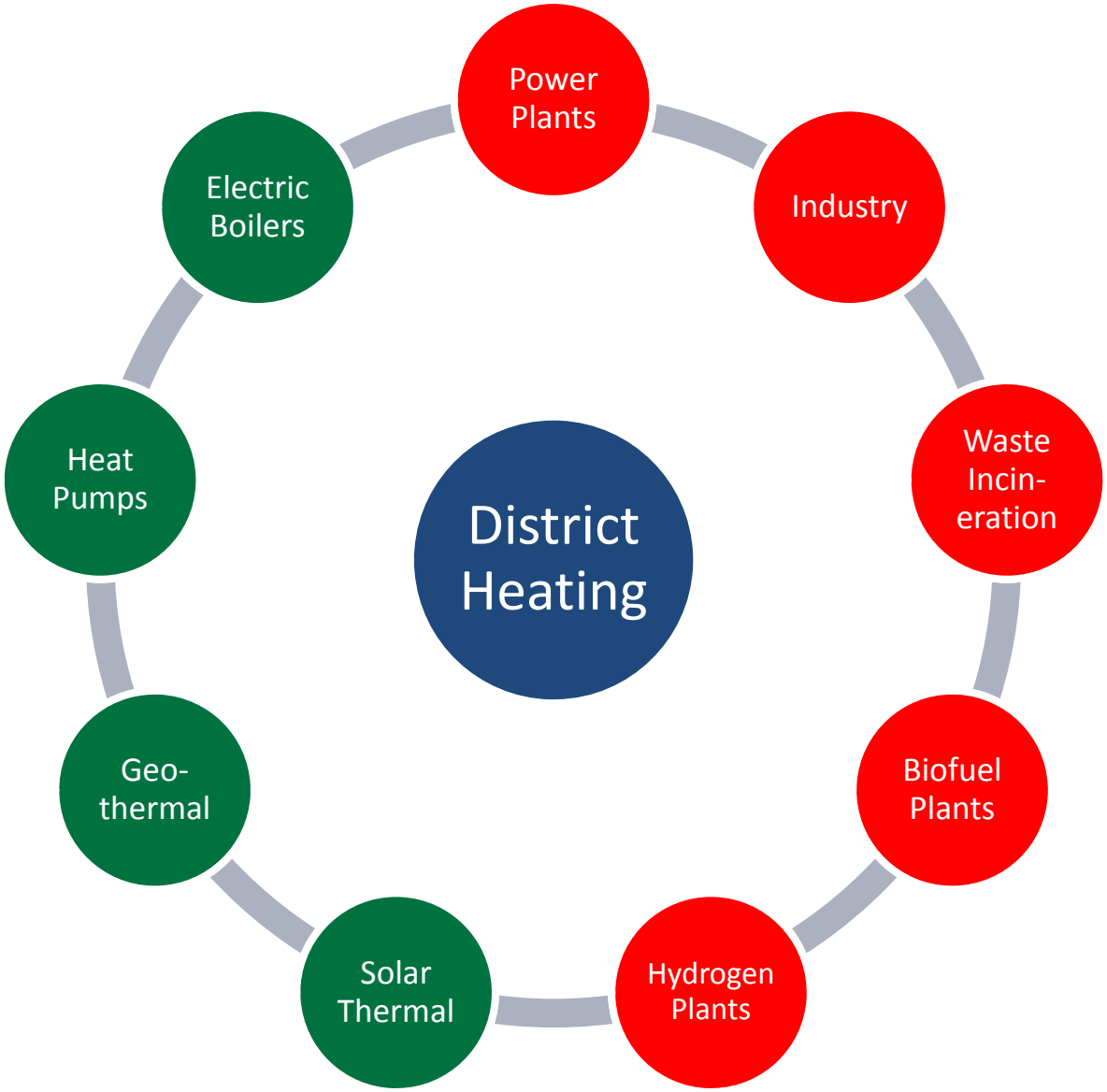
District Heating

Low quality energy for a low quality demand



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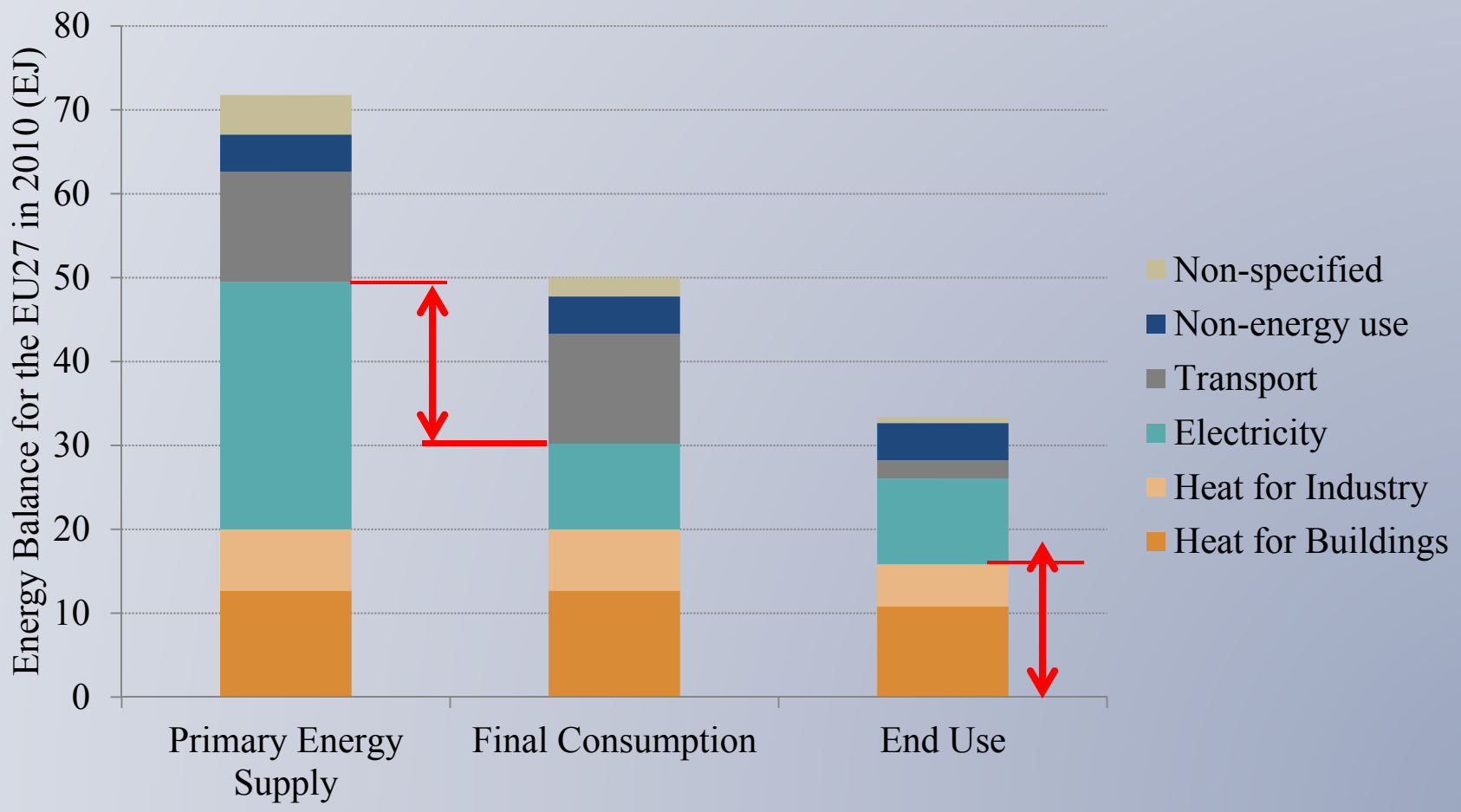
Surplus Heat in Europe Today!



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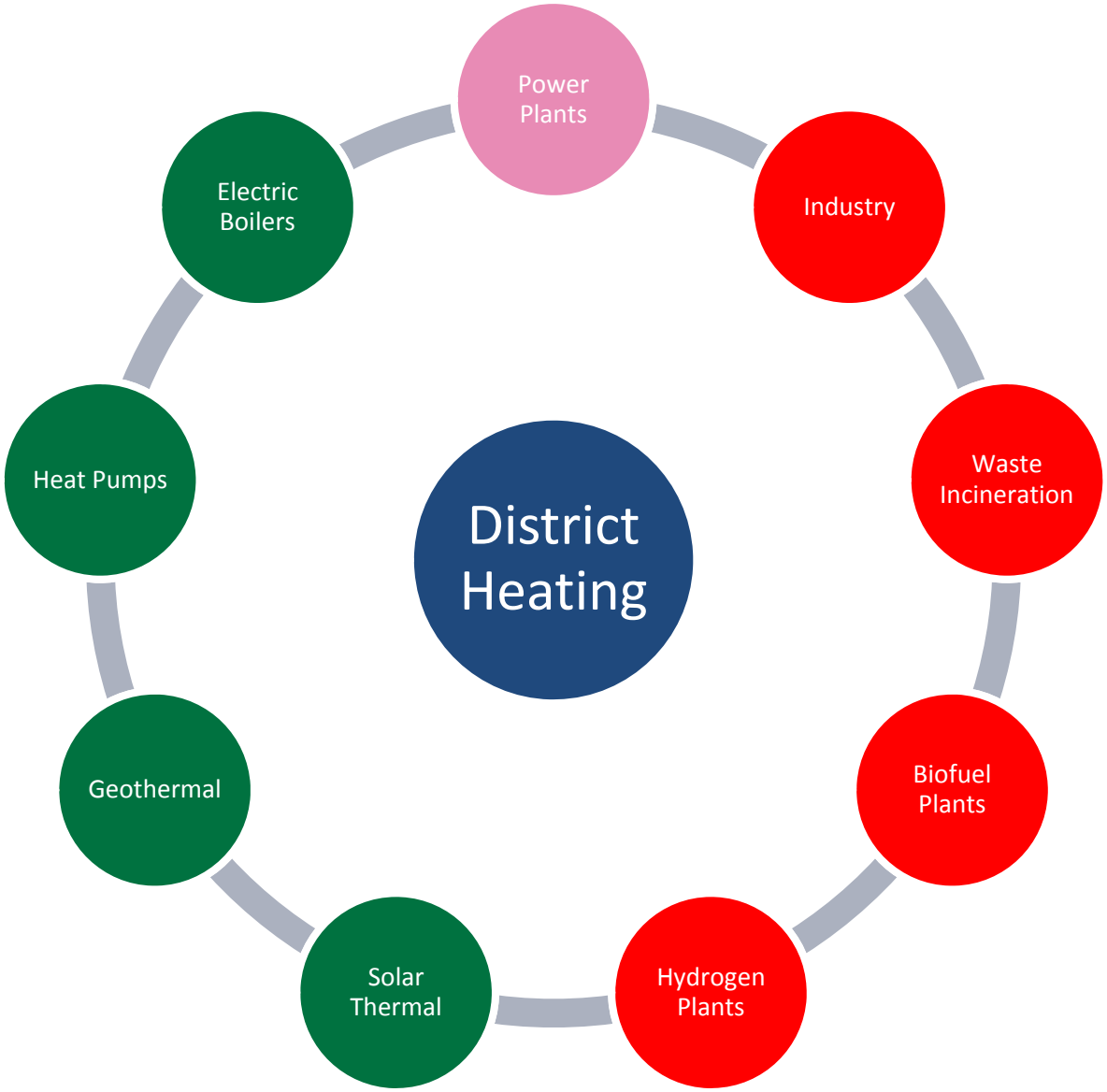
District Heating

Low quality energy for a low quality demand



Heat Roadmap Europe 2050

Heat Networks

Heating Unit	Sustainable Resources	Efficient	Cost	Cost Sensitivity
Gas Grid				
District Heating				

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Heat Roadmap Europe 2050

Heat Networks

Heating Unit	Sustainable Resources	Efficient	Cost	Cost Sensitivity
Gas Grid	☹	😐		
District Heating	☺	☺		

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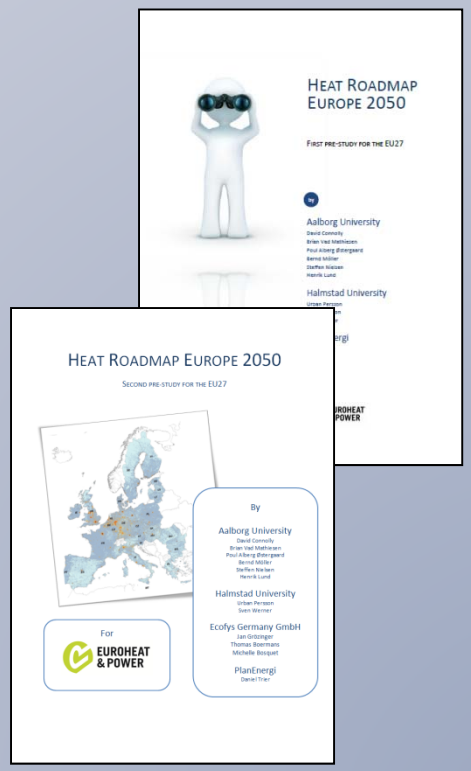
Heat Roadmap Europe

- Two Reports:
  - Pre-study 1 (2012): is DHC beneficial in a business-as-usual scenario
  - Pre-study 2 (2013): is DHC beneficial in a low-heat demand scenario
    - This is also a complete heat strategy



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Heat Networks

Heating Unit	Sustainable Resources	Efficient	Cost	Cost Sensitivity
Gas Grid	☹	😐	😐	☹
District Heating	☺	☺	☺	☺

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3. Networks

1. Options:
   - ~~Natural Gas~~
   - Water Grid (i.e. District Heating)

2. Do we need district heating?
   - Only if the heat density is high enough

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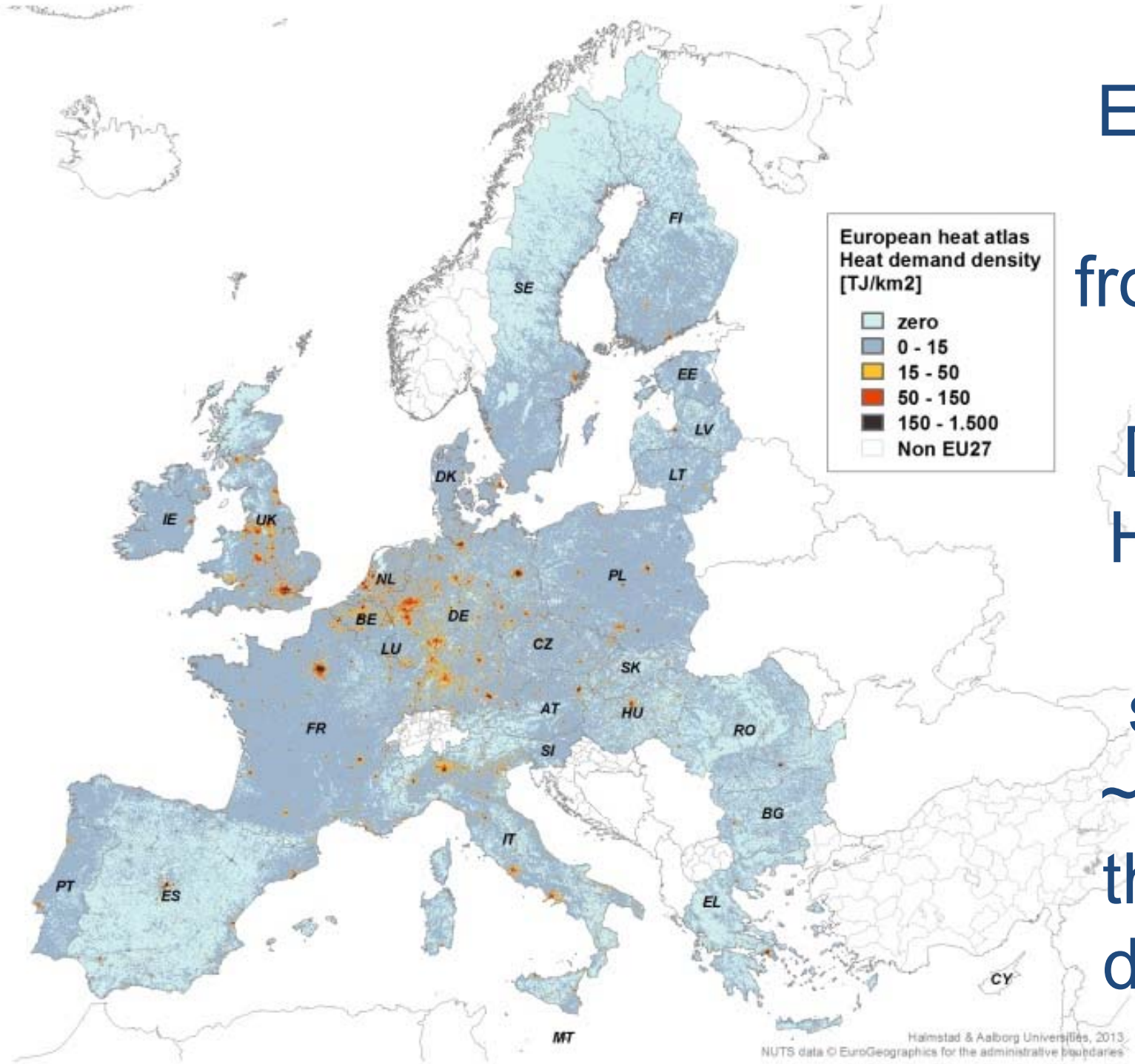
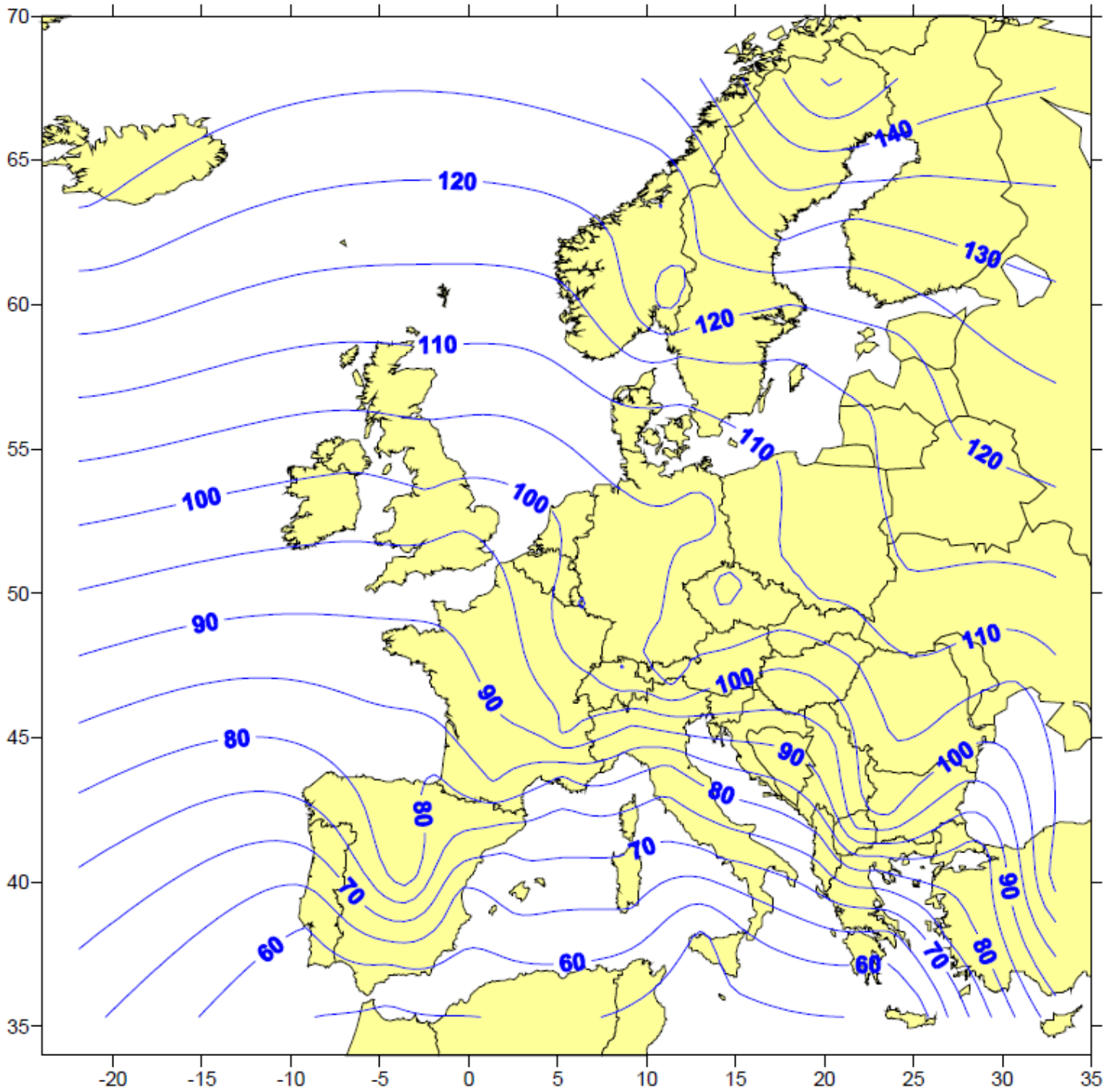


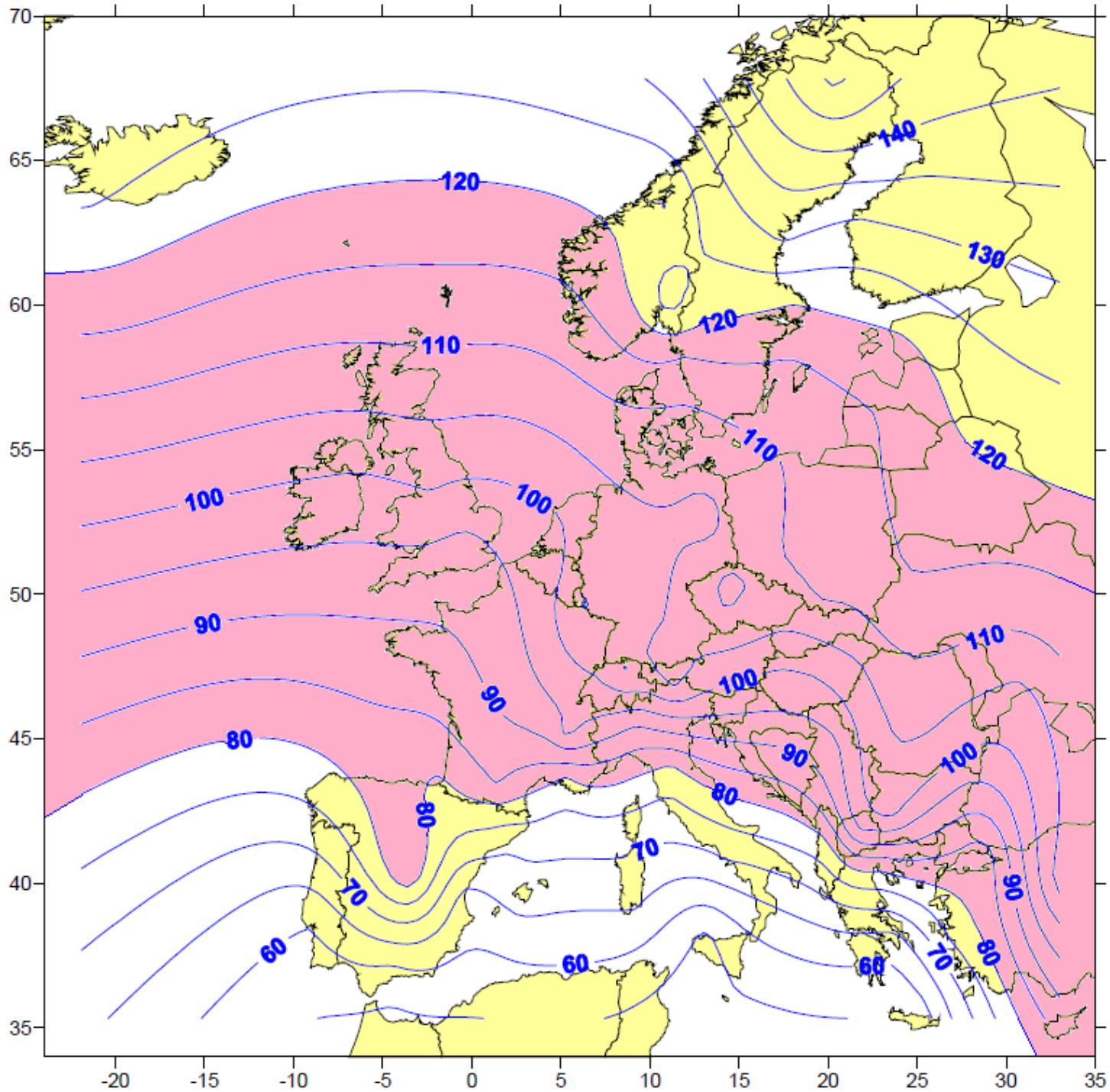
EU Heat Atlas from HRE

District Heating can supply ~50% of the heat demand



European Heating Index

(Source: ecoheatcool)



European Heating Index

(Source: ecoheatcool)

+/- 20%

Heat Roadmap Europe 2050

3 options for the Heat Sector

1. Savings	2. Individual Units	3. Networks
➥ Reduce our demand for heat: ➥ Space heating ➥ Hot water	➥ Use a heating unit in each building: ➥ Oil ➥ Biomass ➥ Heat Pumps ➥ Electric Heating	➥ Share a heating network: ➥ Gas ➥ Water (i.e. district heating)
Max 50% Marginal	~50% Heat Pumps	~50% District Heating

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Heat Roadmap Europe

A Sustainable Heat Strategy for Europe Between Now and 2050

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Heat Roadmap Europe 2050

STUDY FOR THE EU27

by

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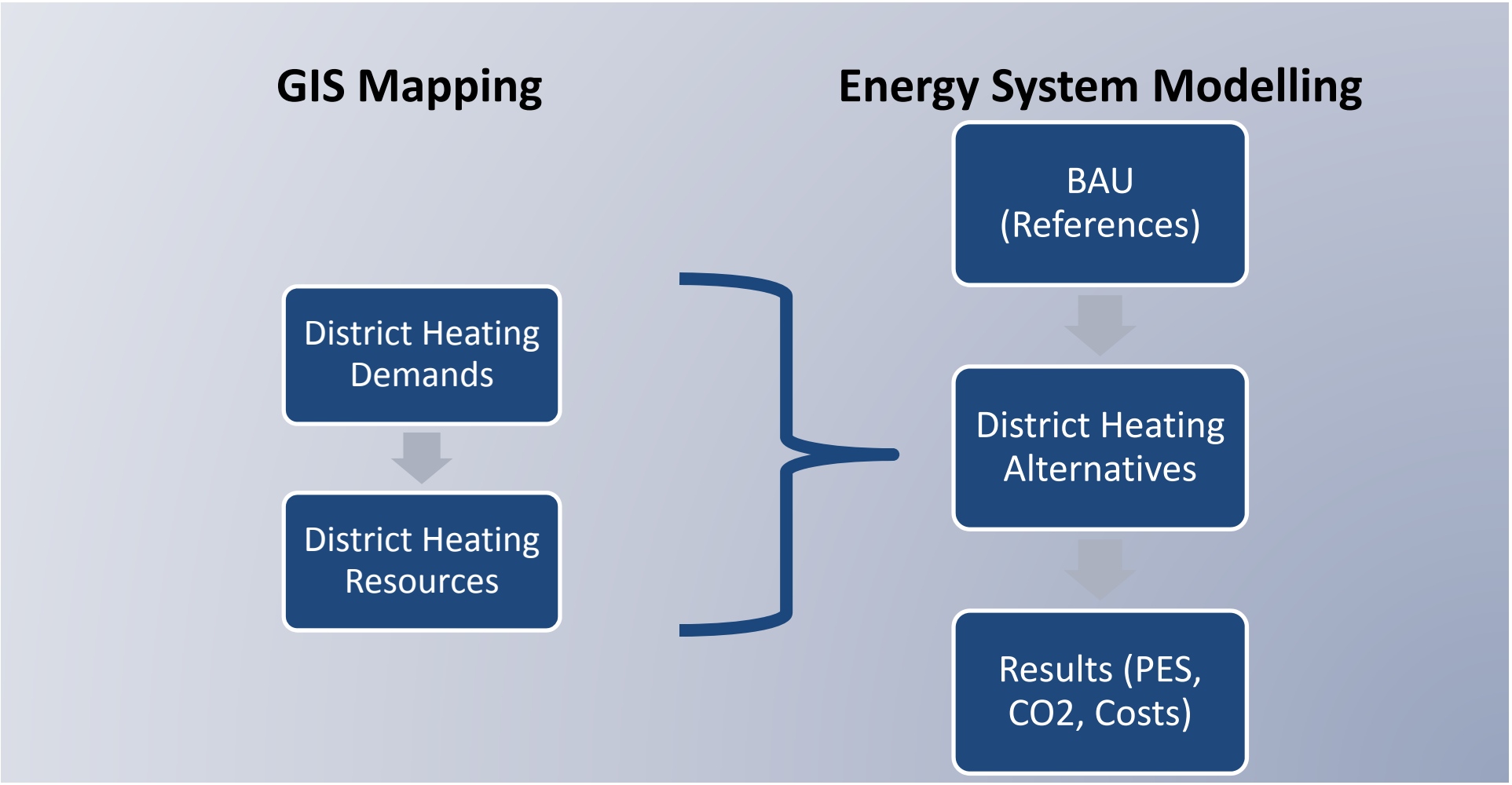
Methodology



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HRE: Key Conclusion

- A combination of:
  - 50% District Heating (*Cities*)
  - 50% Heat Pumps (*Rural Areas*)
  - 35% Energy Savings (*Everywhere*)

Can enable the EU to reach its CO2 target in 2050 for €100 billion/year less than energy savings on their own.

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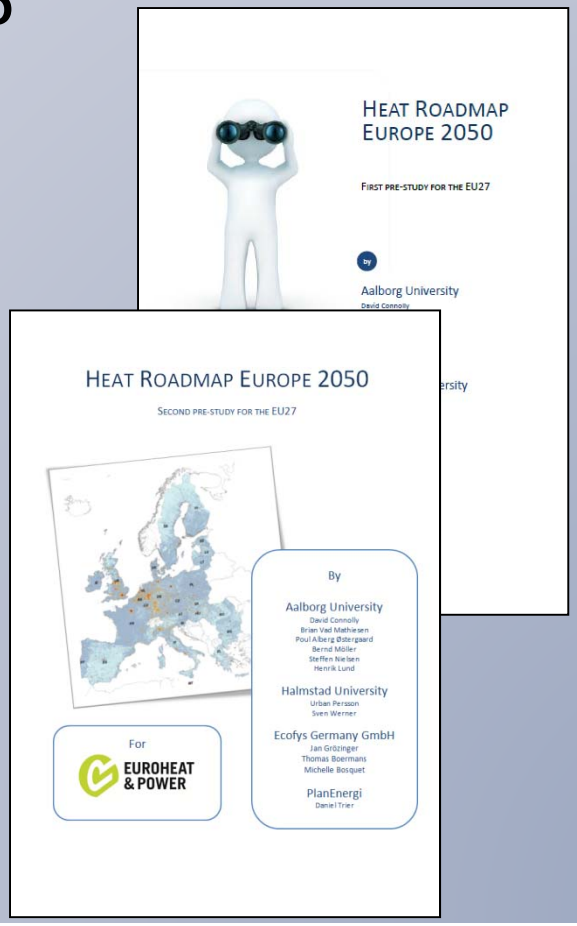
Thank you

- Need a copy of the reports?
- david@plan.aau.dk
- www.heatroadmap.eu



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