

Socio-technical design in the next generation of thermal energy systems

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**Project E: Modelling Lab for smart grids,
smart policies and smart entrepreneurship**

Content

- Introduction
- Project purpose
- Research design
 - Question
 - Sub-questions
 - Methods
- Expected result
- Discussion

Next generation of thermal systems



Next generation of thermal systems

Smart thermal grids*

- networks of pipes
- built environment
- suppliers: CG and DG

4th Generation of district heating*

- smart thermal grids + other
- + multiple actors
- + institutions

Smart thermal **socio-technical** systems

*[Lund et al., 2014] Lund, H., Werner, S., Wiltshire, R., Svendsen, S., Thorsen, J., Hvelplund, F., and Mathiesen, B. (2014). 4th generation district heating (4gdh). integrating smart thermal grids into future sustainable energy systems. Energy, 68:1–11.

Project purpose

To provide insights and tools for the
socio-technical design in the
next generation of (smart) thermal systems

Research question

What would the **next generation** of thermal systems look like for a **given district**?

Research sub-questions

- What are districts?
 - municipalities, neighborhoods,
- Which demands are included?
 - (non)-Residential, horticulture, industrial, livestock, agriculture
- Type and extent of supply?
 - Centralized, decentralized, mixed
- Degree of market opening?
 - Monopoly, network of prosumers
- What changes would the system require?
 - Technical, economic, institutional

Research methods

- Institutional analysis
- Agent-based modelling
 - Engineering optimization
 - Game theory
- Stakeholder participation/interviews

Expected result

A multi-perspective modelling lab to assist **socio-technical design** of the next generation of thermal energy systems

Discussion points

- What are districts?
 - municipalities, neighborhoods,
- Which demands are included?
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- Ideas for case studies
- Other ...