An analysis of cascaded low-temperature sub-networks in existing district heating networks

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Agenda

Structure of research

- Introduction to the project CASCADE
- Aim of the research and status
- Defined definition of a sub-LTDHN
- Overview of identified sub-LTDHN examples
- Lessons learnt
- Barriers and drivers of sub-LTDHNs

Background and aim of the research

Background

- Urban DHNs operate on relatively high temperatures (90-130°C)
- LTDHNs operate on lower temperatures (50-70°C)
- Creation of a sub-LTDHN by the integration of a LTDHN into an existing DHN (cascading)
- Key enabler in decarbonization of urban DHN (efficiency, integration of renewables, etc.)

Aim of the research

- Identify best practice examples and derive lessons learnt of sub-LTDHNs
- Analyze the design and operation of sub-LTDHNs
- Evaluate the scalability and the added value of sub-LTDHNs in the overall DHNs in terms of decarbonization strategies and interaction
- Development of generalizable guidelines and recommendations for the integration of sub-LTDHNs (information reviewing of existing systems, revision of modelling tools, analysis of novel and innovative business models, etc.)

Methodology and status

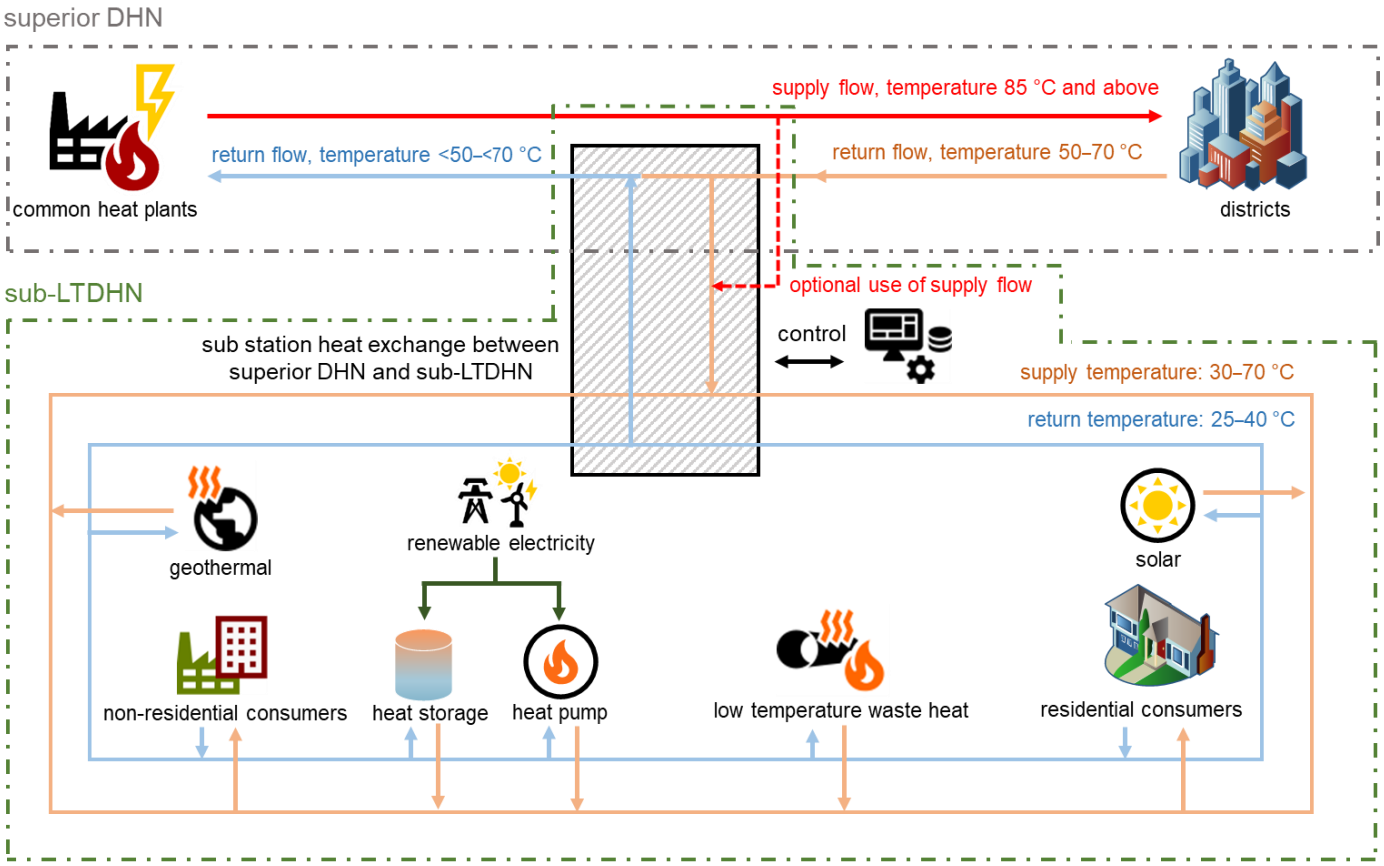
Methodology of identifying best practice examples:

- Literature research with focus on Austria, Germany, Nordic and Baltic countries
- Contact to DH-operators (via mail, expert interviews, expert meetings)
- Derive lessons learnt of sub-LTDHNs

Ongoing work of partners:

- **Tallin University of Technology, Estonia:**
  - Identify and analyse barriers and enablers of sub-LTDHNs
  - Describe the triggers of implementation
- **SINTEF Energy Research, Norway:**
  - Technical solutions for the implementation and control of sub-LTDHNs.
  - Examine different solutions for the connection and control of a single sub-LTDHN using dynamic simulations and existing data from case areas
- **Austrian Institute of Technology, Austria:**
  - Conduct scalability analyses and techno-economic analysis
  - Interactions of integrating multiple sub-LTDHN in one main network

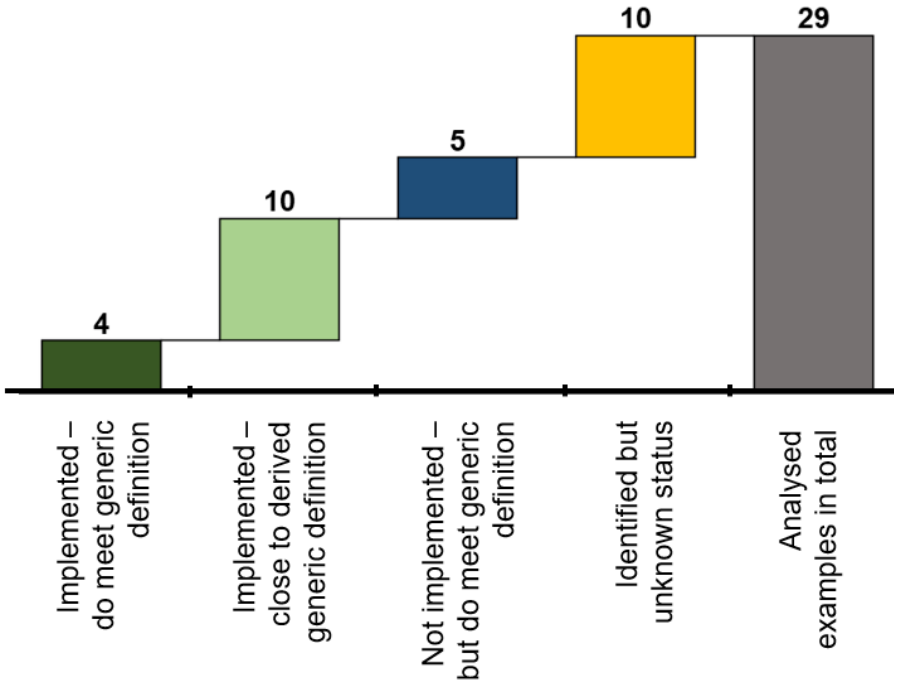
Defined generic definition of a sub-LTDHN

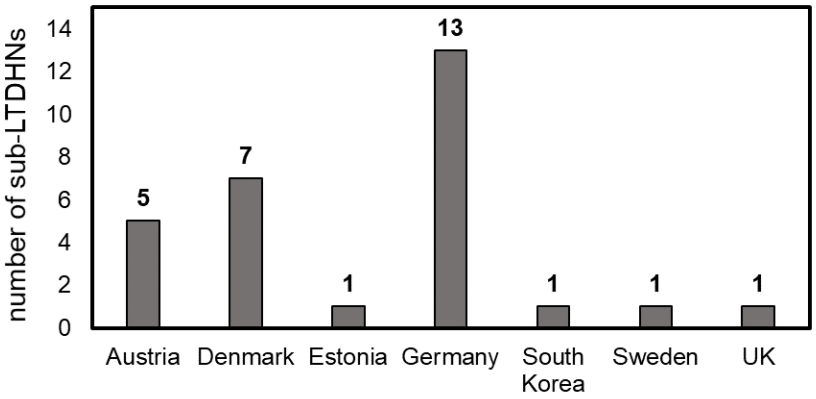


- Connection and interaction with main DH network
- Sub-network primarily uses the return flow
- Sub-network must be low-temperature
- Sub-network must be more than one customer

Identified examples

Result of analyzed good practice examples





Implemented sub-LTDHNs which do meet generic definition:

Lystrup (DK), Sønderby (DK), Berlin-Adlershof (DE), Mannheim (DE)

Lessons learnt

a) Sub-LTDHNs are often considered operative as day to day business

b) Organizational hindrances within companies

c) In addition to new city districts which are in construction/planning, recently built/new buildings are favourable for the implementation of sub-LDHNs

d) Capacity increase of DHN

e) Complex control and potential risks

f) Sub-LTDHN needs to be located near heat generation unit of main DHN (mass flow)

Barriers and enablers

Survey

Based on

- previous research
- analysis of case studies and realised projects
- workshops with experts
- Interviews with district heating companies

Structure

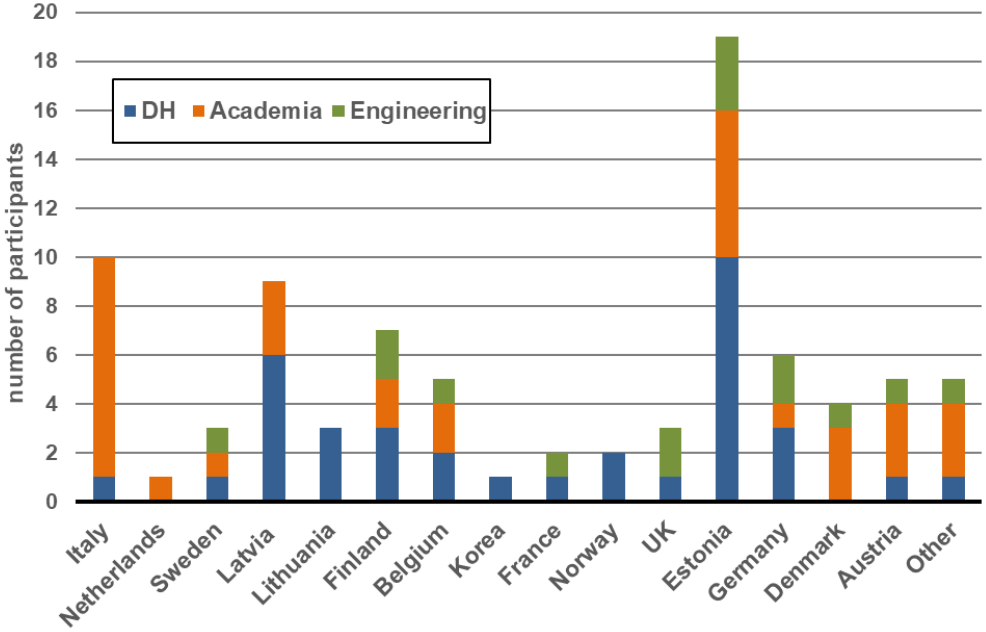
- Short introduction about the sub-LTDHN concept
- In the case of a DH company: information of main parameters (temperatures, length, generation)
- Evaluation using range of 1 (not important) to 5 (very important)
  - Technical barriers (i.e. low return temperature, limited mass flow, hydraulic issues, etc.)
  - Non-technical barriers (i.e. lack of required technical competences, high investment costs, etc.)
  - Drivers (i.e. better utilisation of generation capacity, tariffs that takes into account temperatures, etc.)

Already contacted experts: IEA DHC member countries and Baltic states (DH companies, DH researchers, partners, international organizations etc.)

Survey participation

Current participation: around 85 participants

- District heating company (DH): 42%
- Engineering company, technology provider: 18%
- Academia, research organization: 40%



Participation link: https://energieinstitut-linz.typeform.com/to/EGVbu2zU