Low Temperature District Heating for Future Energy Systems

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Challenges in the energy sector

- Buildings/cities are main users of energy
- New buildings shall be developed as small power stations!
- Retrofit rates need to be increased!
- Developments are focusing more and more on a community level.
The objective is to **demonstrate** and **validate** the potential of low temperature district heating as one of the most cost efficient technology solution to achieve 100% renewable and GHG emission-free energy systems on a community level.

⇒ **DHC is an enabling technology** to increase the integration of renewable and waste energy for heating and cooling (Solar thermal, Biomass CHP, HP to use excess wind power)
The IEA DHC Annex TS1

Outcome:
Future Low Temperature District Heating Design Guidebook for key people in communities (will be published in November 2017 / approx. 80 pages)
Low Temperature District Heating Technologies
Interfaces: actors and boundaries

Hard issues

- Temperature levels
- Pressure levels
- Network system

Soft issues

- Supply side modelling
- Distribution system
- Development

- Optimization between supply and demand
- Pricing and business models
- Energy measurement

- Heating demand
- Consumers
- Substations
## Methods and Planning Tools

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### Classification categories:
- analytical approach,
- target audience,
- level of detail (geographical scope, time horizon),
- model type (simulation, optimization),
- demand sectors,
- final energy consumption
- solution variables (energy / costs)
Easy District Analysis (EDA) – A Simplified Tool

Urban Energy System

Supply Side
- Energy Carriers: Gas, Solar, Electricity, Pellets
- Technologies: CHP, Peak Boiler, Thermal Storage, Solar

Distribution
- Heat Grid: 90°/60°C (Standard DH), 50°/35°C (Low Temp. DH)

Demand Side
- Annual Demand: District, Space Heating, Domestic Hot Water

Input

Output
- Evaluation & Comparison: Energy, Exergy, CO₂, Costs
- Use of Technologies: Technical, Economic Optimization
- Load Curve

Legend: Calculation Steps, Energy flow
Example: Hyvinkää (FI)

- Improving the competitiveness of district heating in small houses (LCC)
- Design criteria for new small houses according to 2012- and 2021 regulations
- Solutions for new 2012- and 2021 small house districts
- New business and pricing models

Source: VTT/Espoo
Example: Lystrup (DK)

- Lowering of the grid temperatures for existing buildings
  - Hydraulic and thermal simulations
- Realisation and monitoring
- Low energy houses with low temperature radiators

Source: DTU Lyngby / COWI
Example: Ludwigsburg (GER)

- Grid extension as low temperature DH
- Decentralised heat storages inside the buildings
- New buildings in Passive House standard

Source: HfT Stuttgart
Example: Wüstenrot (GER)

- Heat demand supplied via heat pumps combined with agrothermal collectors
- Integration of different users
- Decentral DHW-preparation

Source: HfT Stuttgart
Example: Kassel (GER)

- Low temperature DH with ground coupled HP and solar collectors
- Decentral DHW-preparation
- Solution for new housing areas
- New business and pricing models

Source: IBP, UniK, SWKs & City of Kassel
Annex TS1 | Low Temperature District Heating for Future Energy Systems

SUCCESSFUL IMPLEMENTATION OF INNOVATIVE ENERGY SYSTEMS IN COMMUNITIES - WITH LOW TEMPERATURE DISTRICT HEATING AND RENEWABLE ENERGY SOURCES

INTERNATIONAL ENERGY AGENCY IMPLEMENTING AGREEMENT ON District Heating and Cooling including Combined Heat and Power
The DHC Annex TS1 participants

Denmark, Finland, Norway, United Kingdom, South-Korea, Sweden, Germany

8th working phase meeting
September 2016
DHC 2016 Seoul/Korea
IEA DHC Annex TS1: Low Temperature District Heating for Future Energy Systems
www.iea-dhc.org
Thank you for your attention!

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