Implementation of low temperature district heating systems
– Successful case studies of IEA DHC Annex TS2

Dietrich Schmidt, Fraunhofer IEE/Germany
Solutions for urban districts
Innovative heat supply on a community level

„Low temperature district heating is a key technology for an efficient integration of renewable energy sources and waste heat in our energy systems.“

IEA DHC Annex TS1
IEA DHC Annex TS2

Implementation of low temperature district heating systems

=> The purpose of Annex TS2 is to facilitate the wider implementation of 4GDH systems.

- Participating countries: Austria, Denmark, Germany, Norway, Sweden, and United Kingdom.
- Observing partners from Ireland and Korea

Coordination by Halmstad University/Sweden: Kristina Lygnerud & Swen Werner

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Demonstration projects from Annex TS2

- Demonstration of realized projects: New construction
- Demonstration of realized projects: Conversion and existing projects
- Demonstration of realized projects: Building scale
- Demonstration of simulation and design studies
- Demonstrators on lab scale

In total 39 demonstrators from 9 countries reported so far...

Examples.....

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Aalborg University Denmark
reINVEST
sEEnergies
District Energy in Cities Initiative
Innovation Fund Denmark
4DH

Fonden Energi- & Miljødata
www.emdfonden.dk
Woergl (AT)
⇒ Realised new construction

Low temperature secondary network for 20 affordable row houses (60/40)
• Innovative pre-fabricated piping systems
• Heat supply form industrial biomass plant and from 3 heat pumps
• Direct connection of the heating system
Benjamin Franklin in Mannheim (GER)
⇒ New construction and existing buildings

Smart thermal subgrid

• Integration of renewable heat (ca. 20%) from heat pumps / PV systems (ca. 25,000 m²) in addition to the classic district heating supply
• Heat pumps are operated with 100% PV power
• Utilization of surplus electricity in summer time for the operation of cooling machines
• Smart control of subgrids
• Modular expansion
Copenhagen Fredriksberg (DK)
⇒ Building scale

Return temperature optimization in cities
• Central substation including weather compensation
• Online control of substation
• Radiators are equipped with smart electronic thermostats and return pipe temperature sensor
• Optimisation of operation and monitoring
Darmstadt „Lichtwiese“ (GER)

⇒ Simulation study

Energy efficient campus Lichtwiese
• Heating and cooling network
• Based on monitoring a virtual model / digital twin has been up
• Strategy developed to reduce network temperatures
• Waste heat utilisation from high performance computer centre

See presentation for more details later

Source: TU Darmstadt
Sigtuna (SE)

⇒ Realised new construction

Low temperature neighbourhood (60°C supply)
• Solar heating parking (1000m² collector)
• Electric heat pumps with geothermal source
Lagarde District in Bamberg (GER)

⇒ New construction and existing buildings

Innovative energy supply
• Ultra-low temperature heating network (10°C) and conventional grid
• Different ground collectors, DH pipes and fresh water as heat source
• Heat pump on building level
• High temperature cooling for offices
• Sector coupling / e-mobility / PV

Source: SW Bamberg and architects
Kassel „Zum Feldlager“ (GER)

⇒ Simulation study

Geo-solar district heating
• Low temperature DH (40°C) with ground coupled HP and solar collectors
• Decentral DHW-preparation
• Solution for new housing areas
• New business and pricing models
Internal „Demonstrator“ report
⇒ actual information on demonstrators

Work in progress.....
• Just an overview inside TS2
• Draft from May 18, 2019
• 191 pages
• Draft for the final report
Brochure of Case Studies
⇒ example from former Annex TS1

5th International Conference on Smart Energy Systems
Copenhagen, 10-11 September 2019
#SESAAU2019
Review/analysis of case studies from others

⇒ TS2 gross list with 132 identified cases

• Cases from different countries:
  Austria, Belgium, Canada, Switzerland, Germany, Denmark, Estonia, Spain, France, Ireland, Italy, Netherlands, Norway, Serbia, Sweden, Finland, Turkey, United Kingdom, United States

• Various system configurations:
  Innovative 3GDH, 4GDH with 2, 3 & 4 pipes, ultra-low temperature, multi-level supply, secondary grids, return temperature reduction….

• Work in progress….
Summary

• IEA DHC Annex TS2 is facilitating the wider implementation of 4G District Heating Systems

• Many successful implementation projects show that 4GDH is a proven technology

• Implementation cases in many countries & various system configurations

• Important/mandatory technology for the decarbonisation of the heating sector and for sector coupling!

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1st preparation Phase Meeting
September 12-13, 2019 at DTU in Lyngby-Copenhagen/Denmark

www.iea-dhc.org
Contact

Tekn. Dr. Dietrich Schmidt

Head of Department Heat and Power Systems
Fraunhofer Institute for Energy Economics and Energy System Technology IEE
Mail: dietrich.schmidt@iee.fraunhofer.de
Phone: +49 561 804-1871
http://www.iee.fraunhofer.de