

# Low Temperature District Heating for Future Energy Systems

3<sup>rd</sup> International Conference on Smart Energy Systems and 4<sup>th</sup> Generation District Heating  
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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.

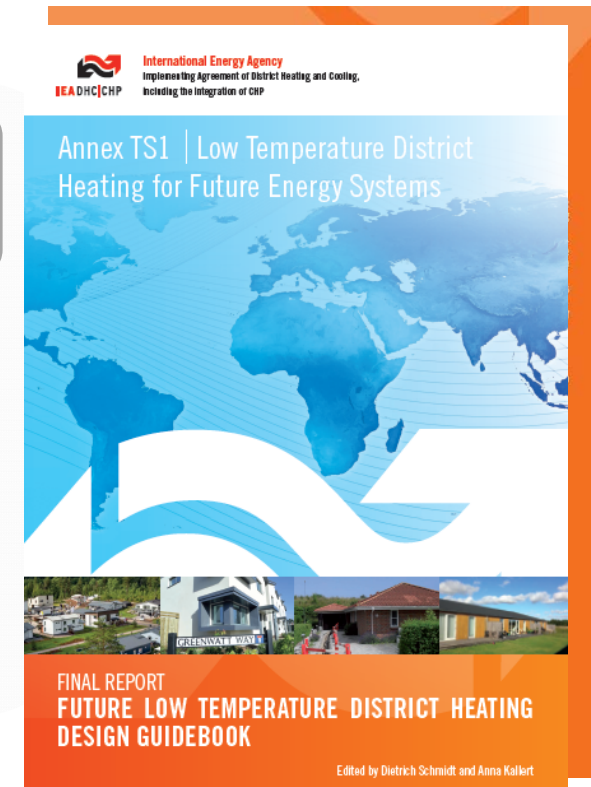
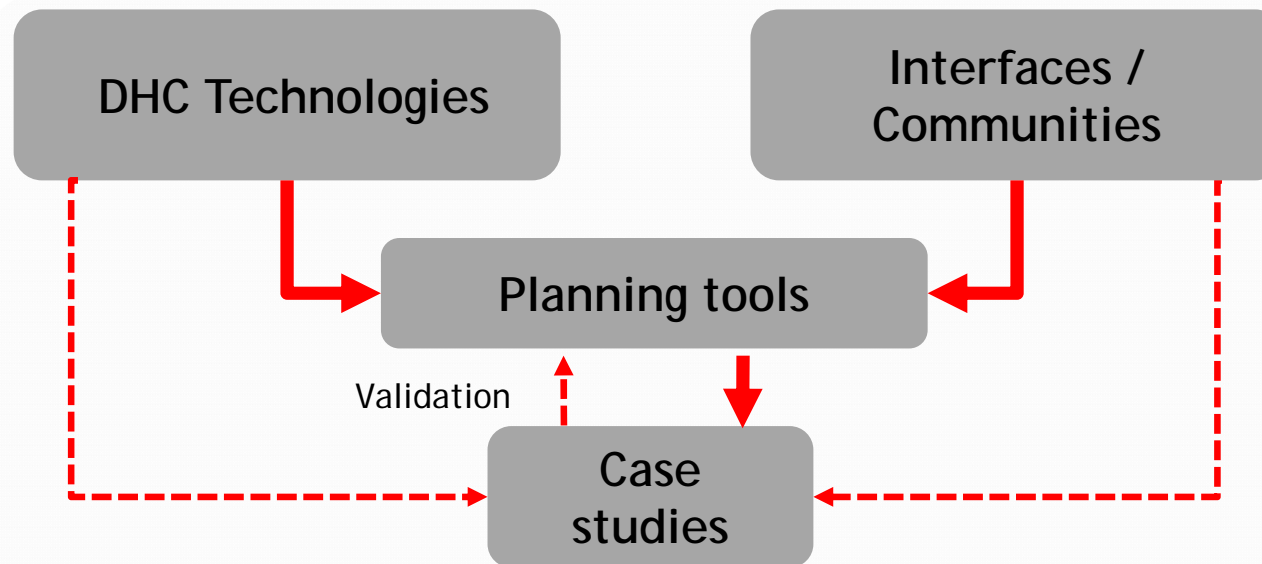


# Objectives of IEA DHC Annex TS1

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

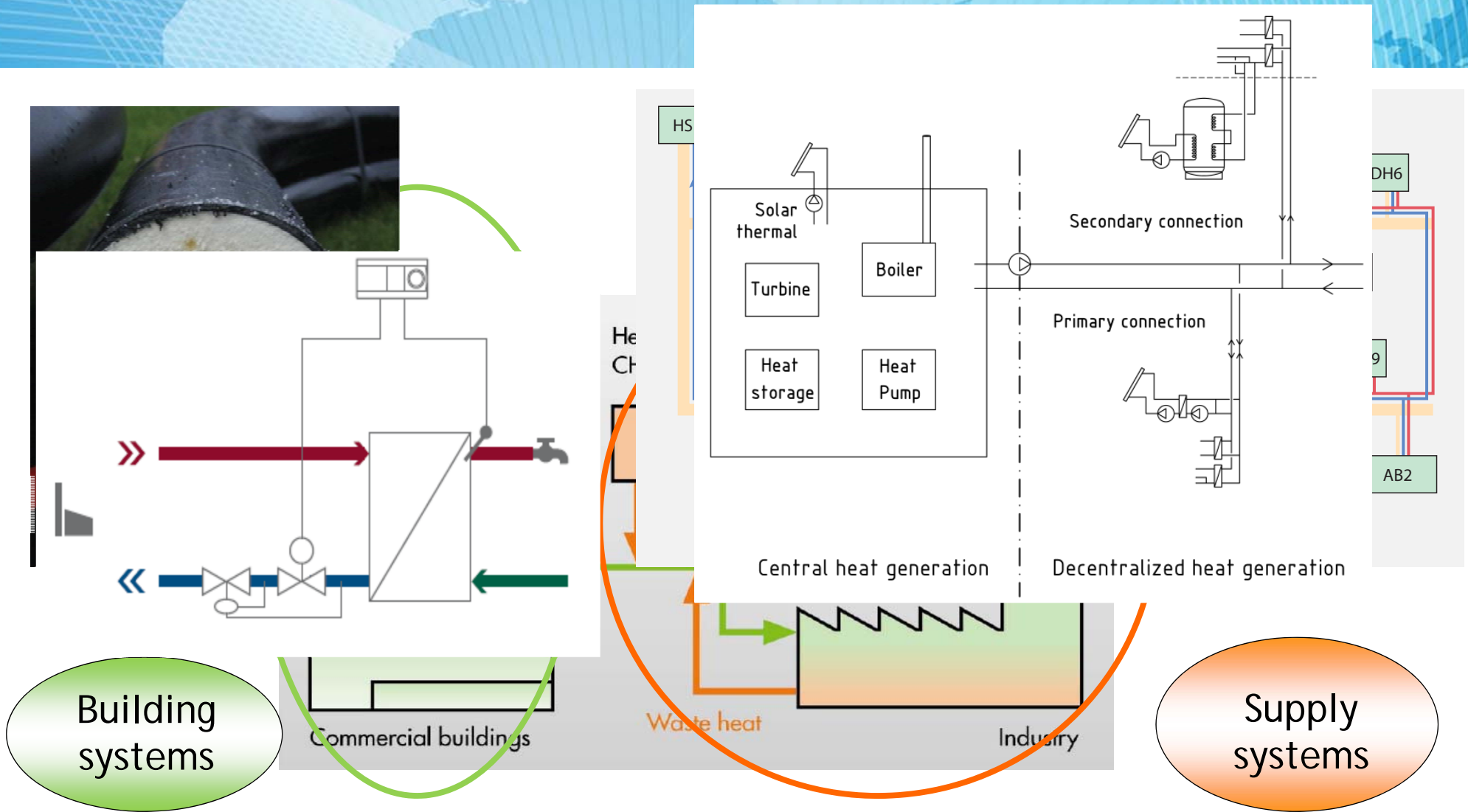


Outcome:

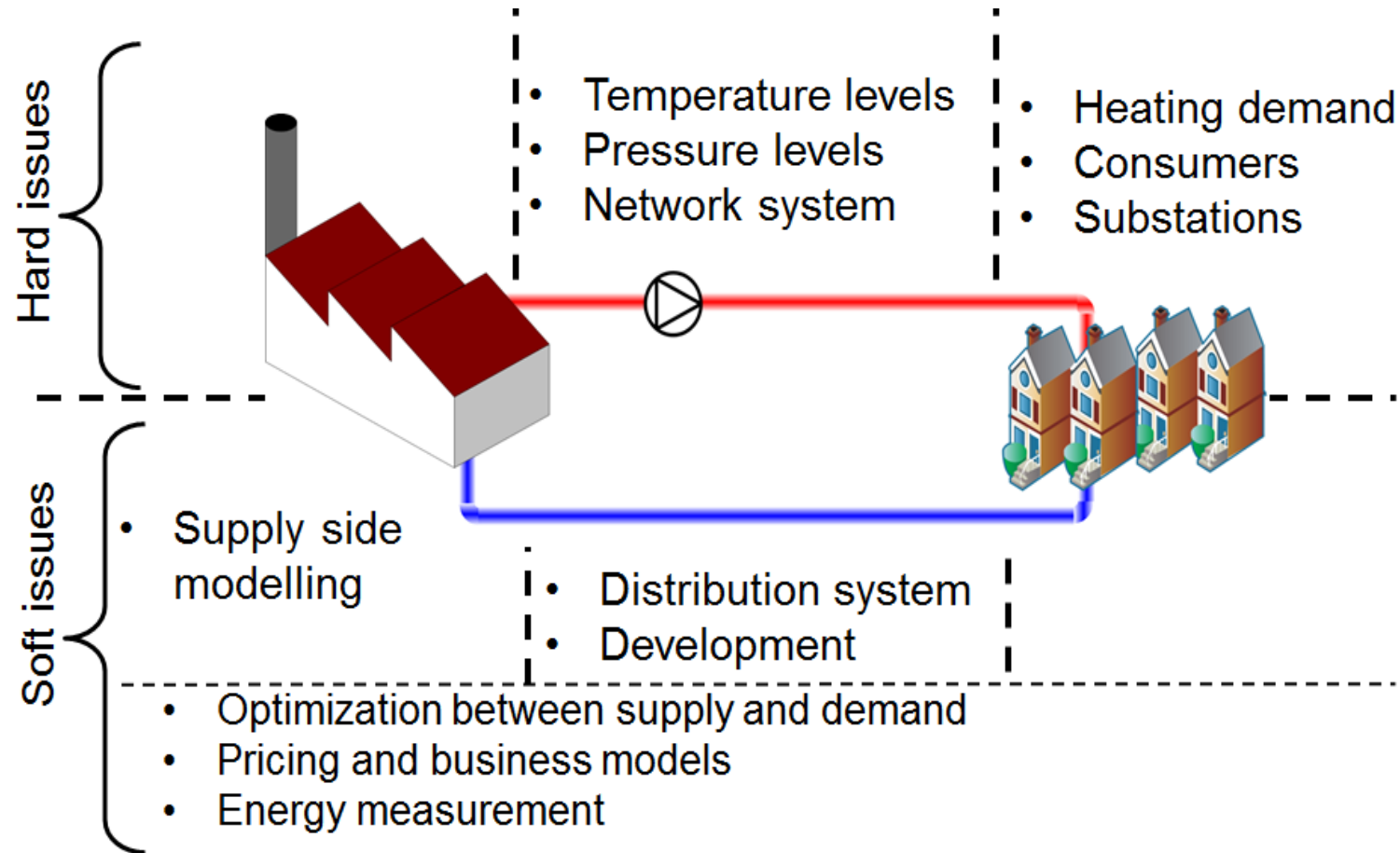
**Future Low Temperature District Heating Design Guidebook**

for key people in communities (*will be published in November 2017 / approx. 80 pages*)

# Low Temperature District Heating Technologies



# 6 Interfaces: actors and boundaries



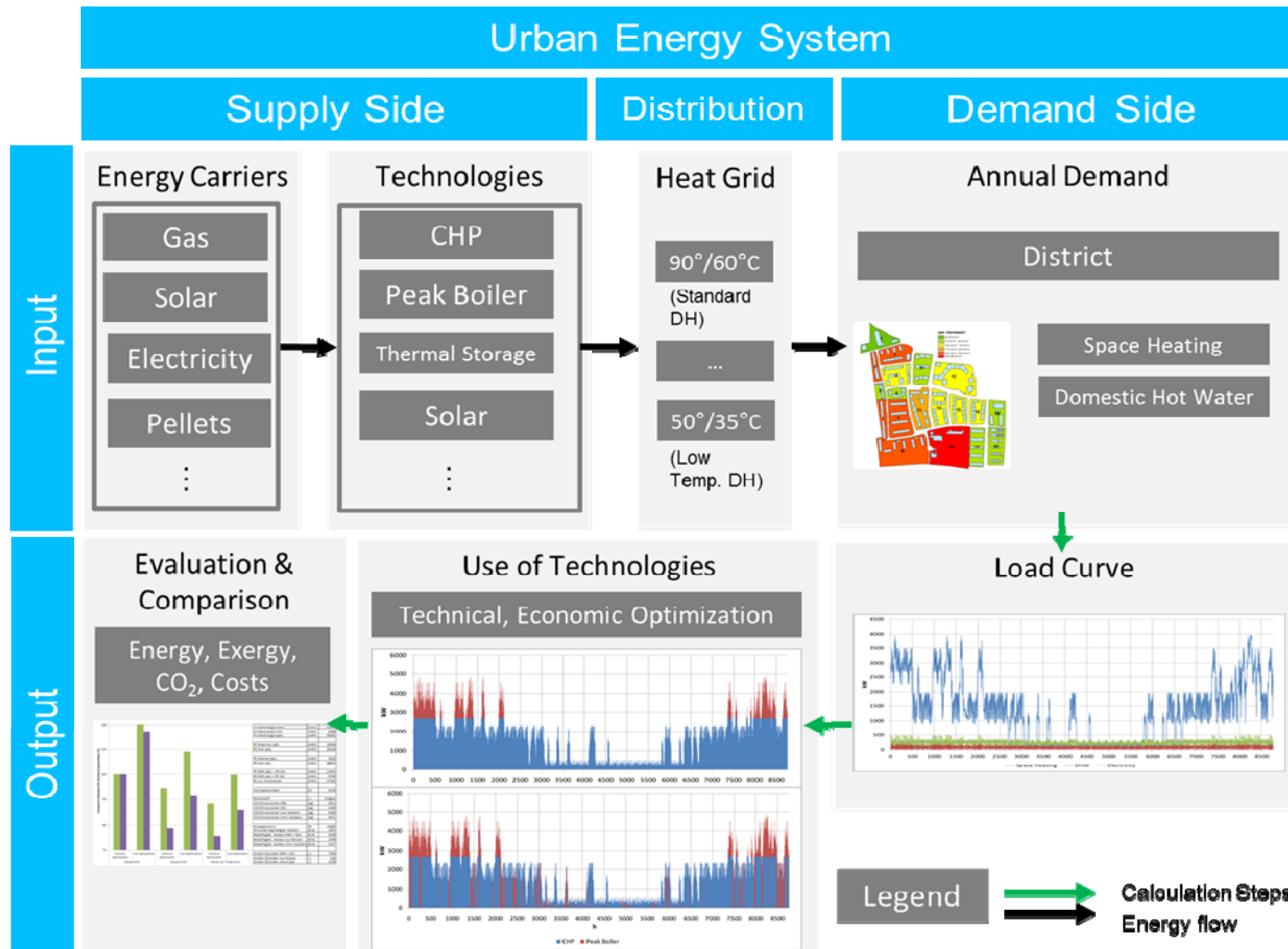
# 7 Methods and Planning Tools

Energy System Models		
EnergyPLAN	KOPTI	LowEx-CAT
SIMUL_E.NET	TIMES Local	
Thermodynamic Models		
HeatNET	LowEx-CAT	NET Local
SIMUL_E.NET	spHeat	Termis
Others		
District ECA	EME Forecast	Exergy Pass Online

## 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





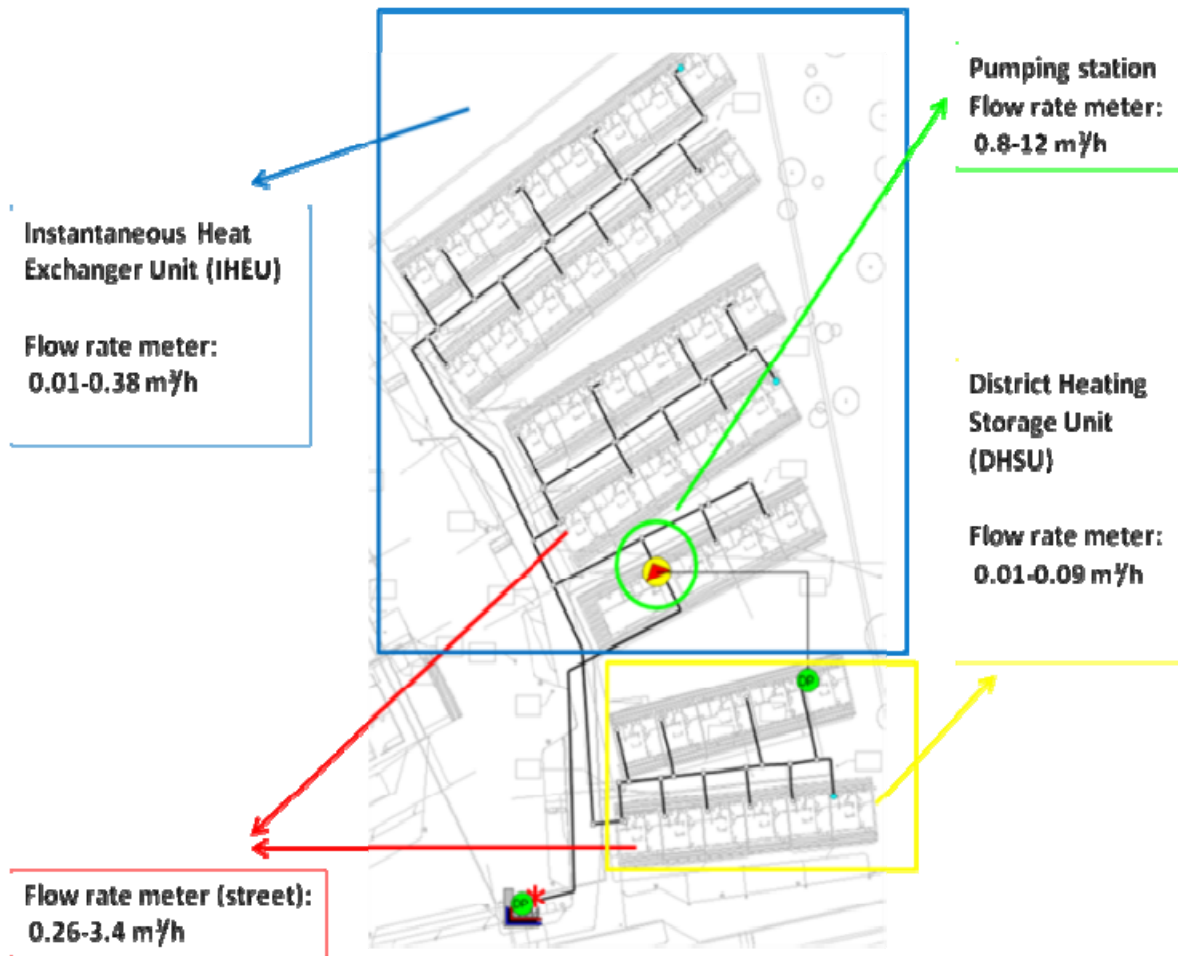
# Example: Hyvinkää (FI)



- 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

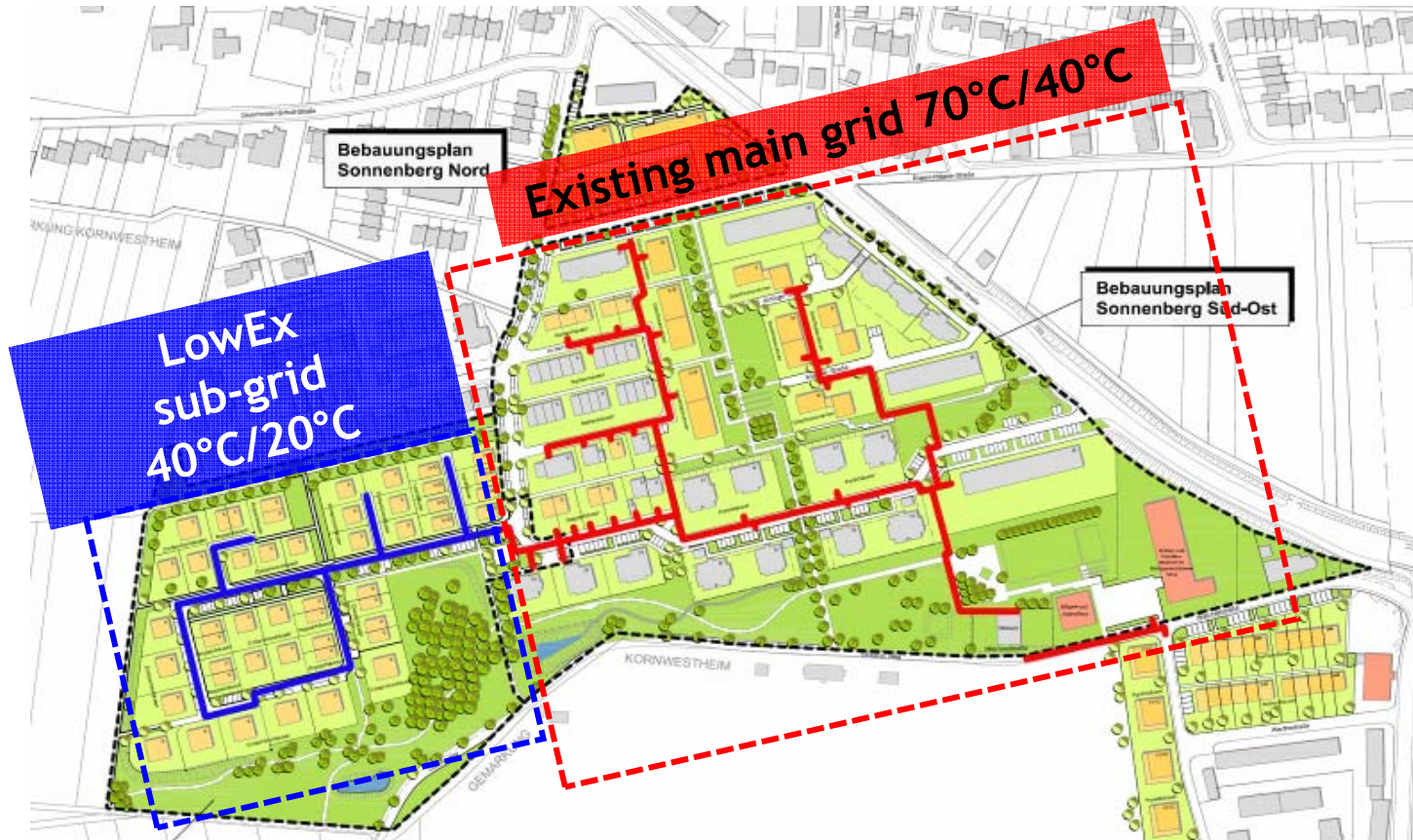
# Example: Lystrup (DK)



- 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

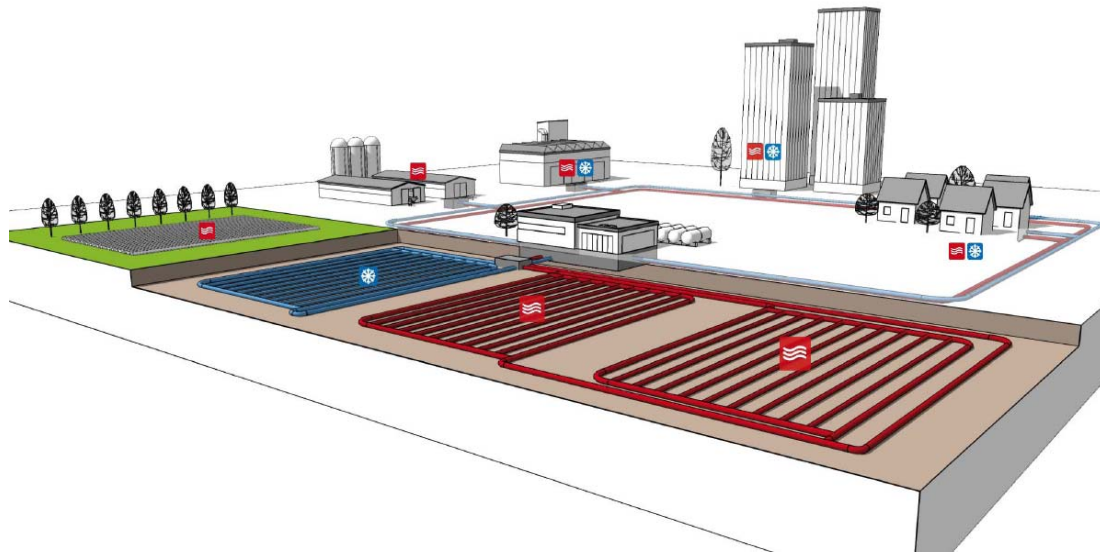
# Example: Ludwigsburg (GER)



- 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

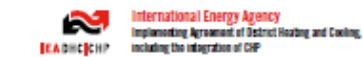
# Example: Kassel (GER)



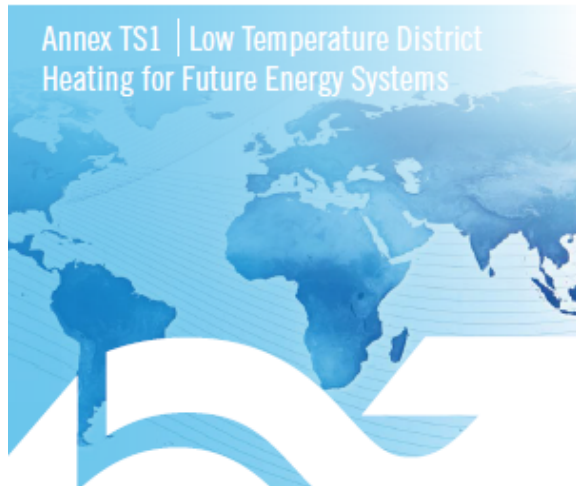
- Low temperature DH with ground coupled HP and solar collectors
- Decentral DHW-preparation
- Solution for new housing areas
- New business and pricing models

Source: IBP, UniK, SWKs & City of Kassel

# 1 Brochure of Case Studies



International Energy Agency  
Implementing Agreement of District Heating and Cooling  
including the integration of CHP



**LOW TEMPERATURE DISTRICT HEATING IN EXISTING BUILDINGS - DENMARK - SINDSBØ, DENMARK**

The high energy requirements of an average Danish housing type, together with the heating, hot water and electricity demands, make the heating system a challenge to the energy sector. The IEA DHC|CHP is exploring how to address the energy requirements of such buildings in a way that is both energy efficient and cost-effective. The project is based on a low temperature district heating system, which is connected to a renewable energy source. The system is designed to provide a comfortable indoor climate while minimizing energy consumption. The project is a pilot study, and the results will be used to inform future district heating projects in Denmark and other countries.

**PASSIVE HOUSE BUILDING FAIR - RYHYKÄLÄ, FINLAND**

The project is a passive house building fair, which is a demonstration project for passive house buildings. The project is based on a low temperature district heating system, which is connected to a renewable energy source. The system is designed to provide a comfortable indoor climate while minimizing energy consumption. The project is a pilot study, and the results will be used to inform future district heating projects in Finland and other countries.

**SUCCESSFUL IMPLEMENTATION OF INNOVATIVE ENERGY SYSTEMS IN COMMUNITIES**

Low temperature district heating offers a range of benefits, including reduced energy consumption, lower operating costs, and improved indoor climate. The system is designed to provide a comfortable indoor climate while minimizing energy consumption. The project is a pilot study, and the results will be used to inform future district heating projects in communities.

**COMMUNITY SCALE ENERGY SYSTEMS CAN BE MAINTAINED THROUGH INTEGRATED COMPONENTS OF AN ENERGY DELIVERY SYSTEM**

The project is a community scale energy system, which is a demonstration project for community scale energy systems. The project is based on a low temperature district heating system, which is connected to a renewable energy source. The system is designed to provide a comfortable indoor climate while minimizing energy consumption. The project is a pilot study, and the results will be used to inform future district heating projects in communities.

**THE LOW TEMPERATURE DISTRICT HEATING RESEARCH PROGRAM**

The IEA DHC Annex TS1 aims to identify holistic and innovative approaches to commercial low temperature heat supply by using district heating. It is a framework that provides the discussion of future but also existing heating networks with an international group of experts.

The goal is to define a common development direction for the wide application of low temperature district heating systems in the near future. District cooling can also be integrated into the activities but is not the focus. The gathered research which is going to be collected within this Annex should contribute to establishing DHC as a significant factor for the development of 100% renewable energy based commercial energy systems in practice.

By connecting the demand side (community/building stock) and the generation side (different energy sources which are available to be fed in the DHC grid), this technology provides benefits and challenges at various levels. The activities are strongly targeted at DHC technologies and the economic boundary conditions of this field of technology.

**MORE INFORMATION ABOUT THE PROGRAM:**  
Up to date information about the participants and the progress of the research program is available on the web page: [www.iea-dhc.org](http://www.iea-dhc.org)

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**The participating countries are:**  
- Denmark  
- Finland  
- Germany  
- Norway  
- South Korea  
- United Kingdom

This document is prepared on behalf of the IEA DHC Annex TS1 working group members but does not constitute an official IEA DHC position. The IEA DHC Annex TS1 is not responsible for the contents of this presentation.



## INTERNATIONAL ENERGY AGENCY IMPLEMENTING AGREEMENT ON District Heating and Cooling including Combined Heat and Power



# The DHC Annex TS1 participants

8<sup>th</sup> working phase meeting  
September 2016  
DHC2016 Seoul/Korea



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



**IEA DHC|CHP**

IEA DHC Annex TS1:

# Low Temperature District Heating for Future Energy Systems

[www.iea-dhc.org](http://www.iea-dhc.org)



# Thank you for your attention!

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District Heating and Cooling including Combined Heat and Power

