Demonstration

- Implementation of Low Temperature District Heating Systems

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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|CHP

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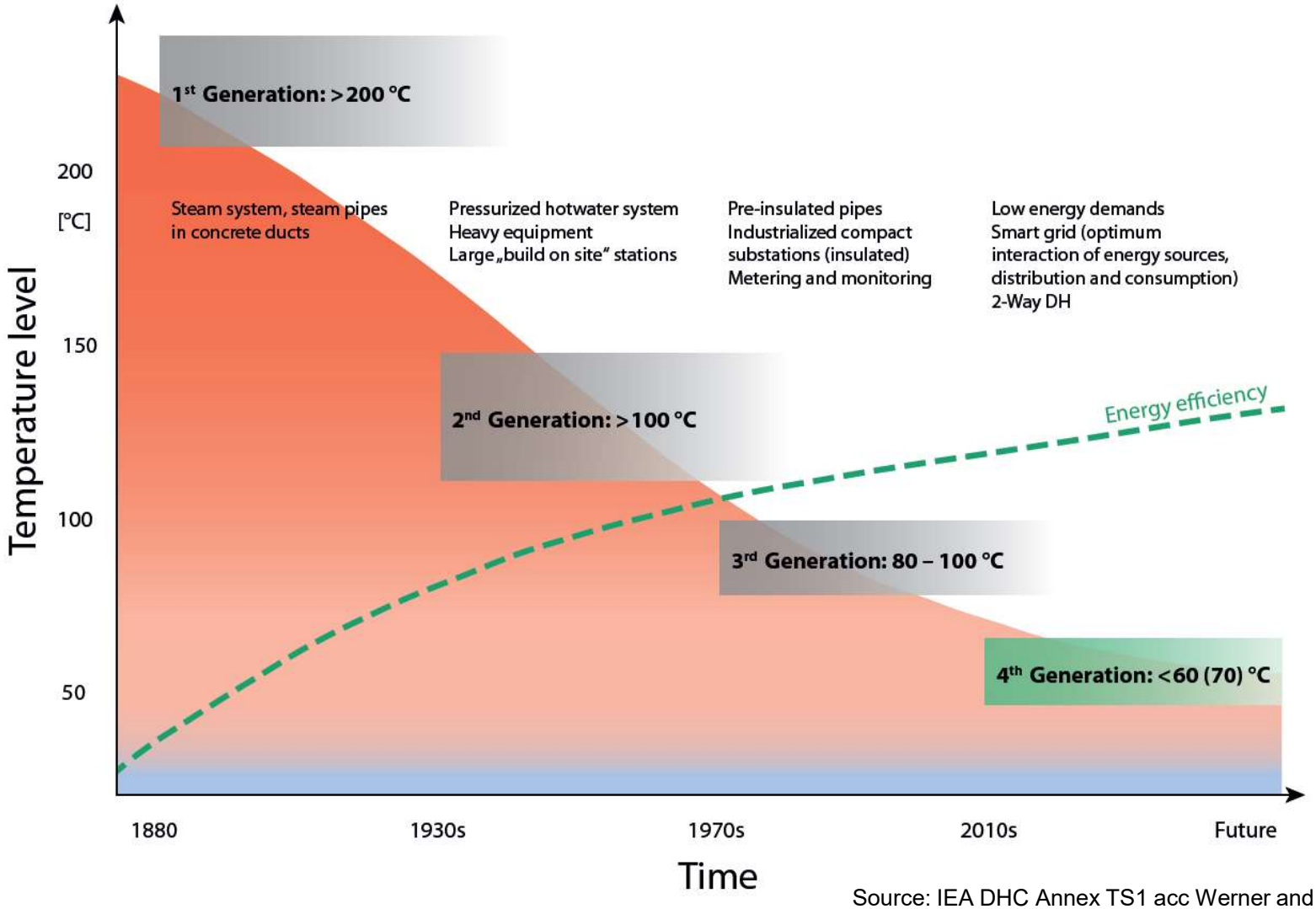
Low Temperature District Heating



Source: IEA DHC Annex TS1 acc Werner and Fredirksen 2014

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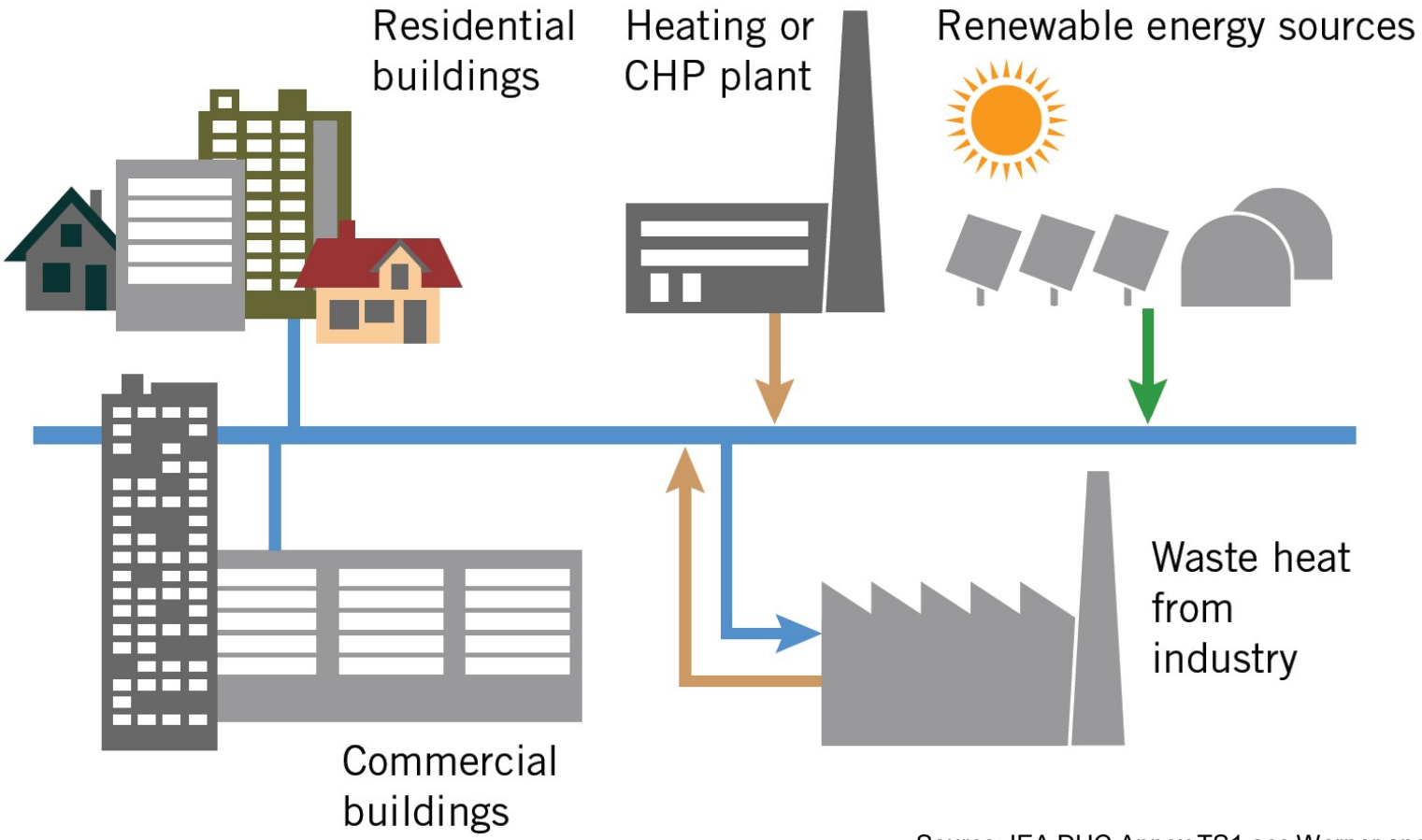
Low Temperature District Heating Systems
- integration of decentral and renewable heat sources



Source: IEA DHC Annex TS1 acc Werner and Fredirksen 2014

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Demonstration projects on various scales

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

In total 33 demonstrators from 9 countries reported so far…

Hyvinkää (FI)

⇒ Realised new construction

Building fair with passive houses

- 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

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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

Source: Thermaflex

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Sigtuna (SE)

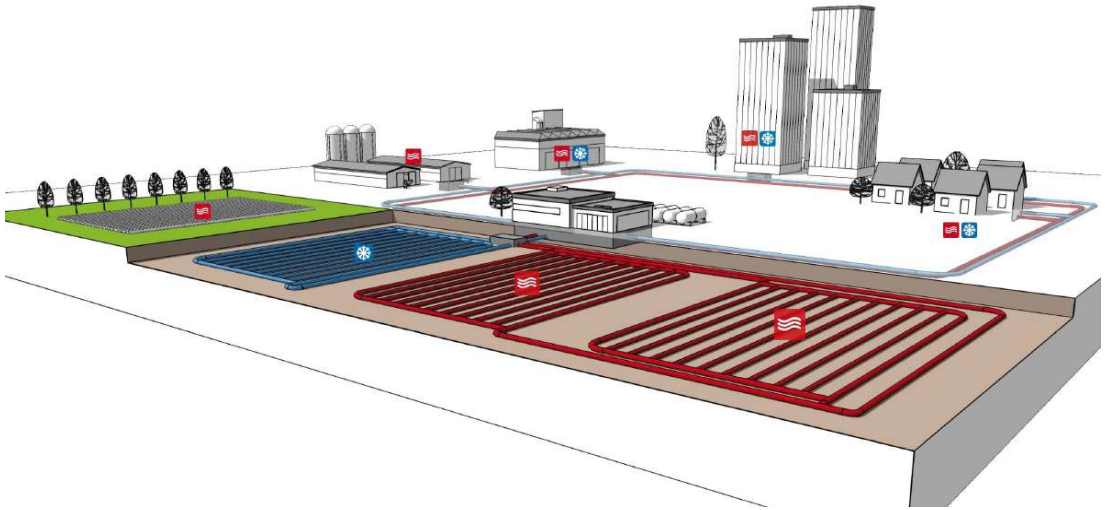
⇒ Realised new construction

Low temperature neighbourhood (60°C supply)

- Solar heating parking (1000m² collector)
- Electric heat pumps with geothermal source

Wüstenrot (GER)

⇒ Realised new construction



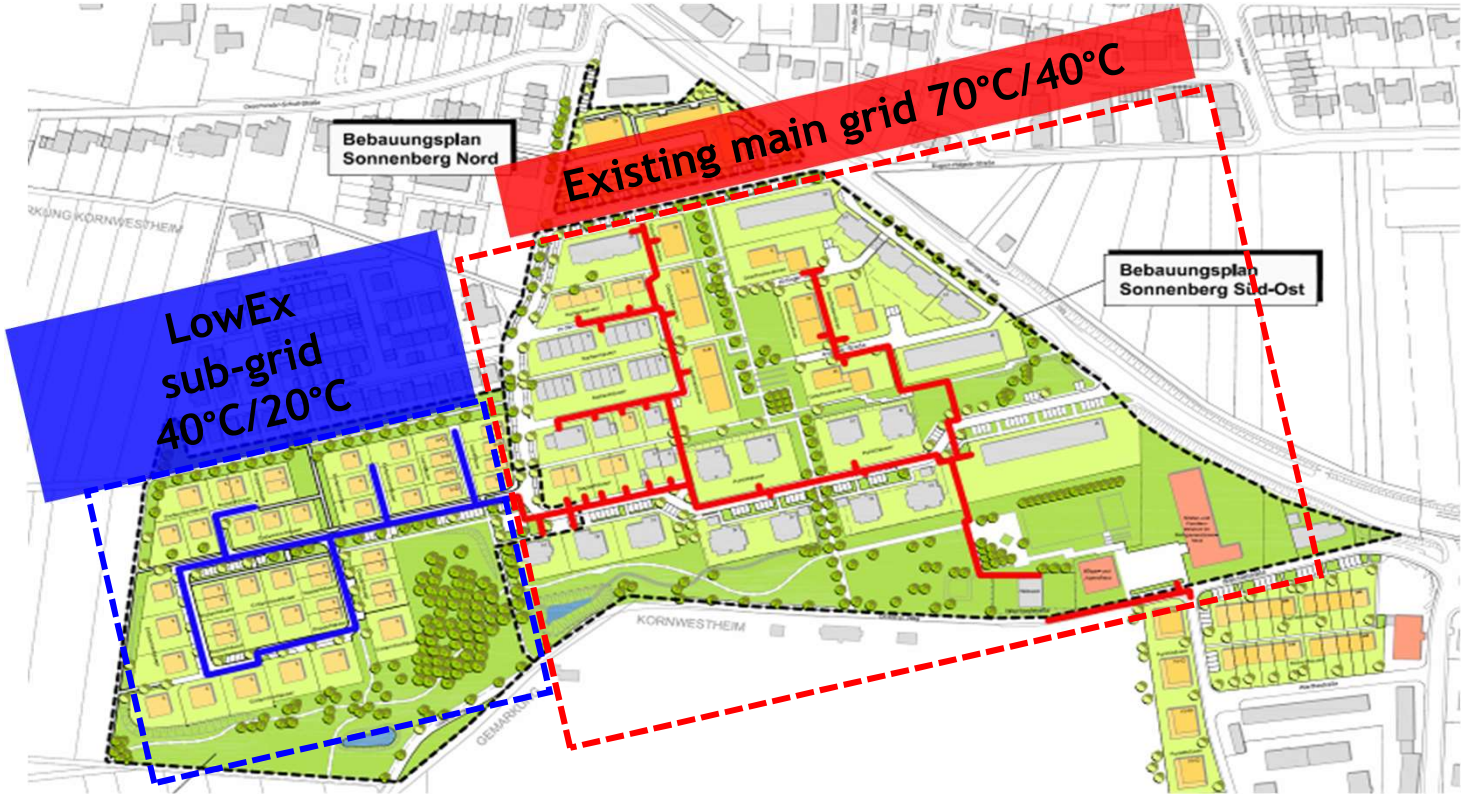
Agrothermal low temperature district heating

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

Source: HfT Stuttgart

Ludwigsburg (GER)

⇒ New construction and existing buildings



LowEx grid extemsion with passive houses

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

Source: HfT Stuttgart

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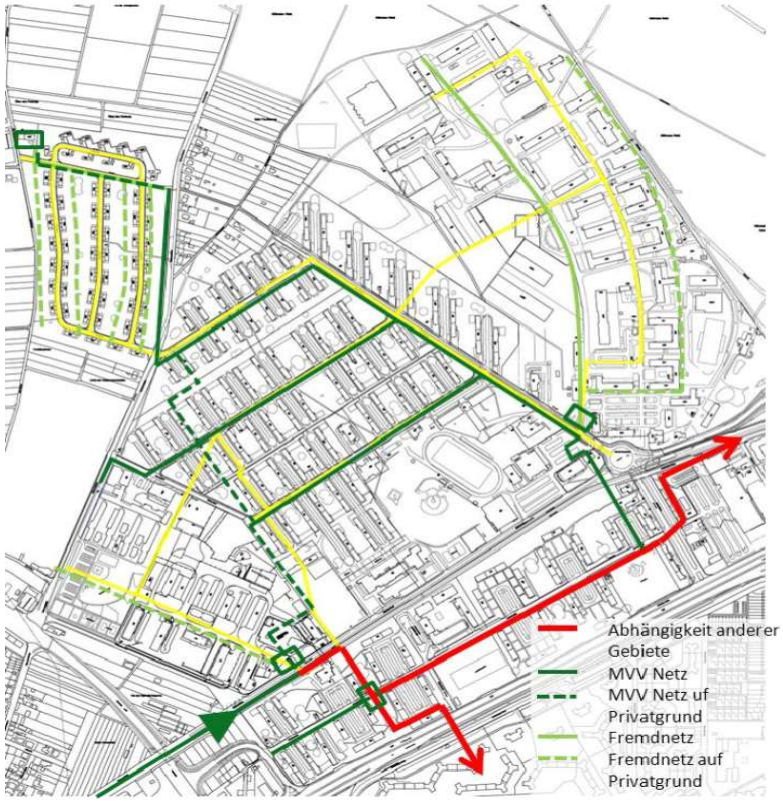
Benjamin Franklin in Mannheim (GER)

⇒ 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

Source: MVV Netze

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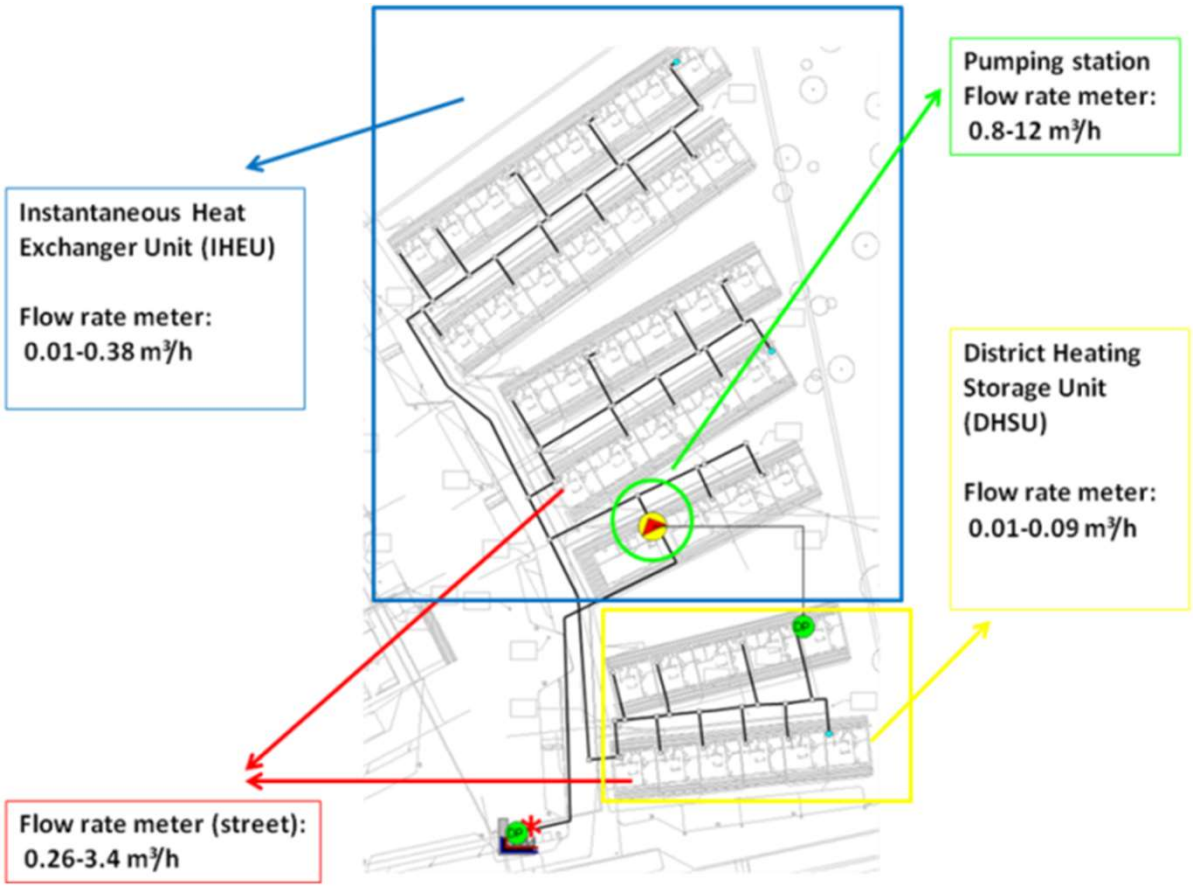
Lystrup (DK)
⇒ Existing buildings



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

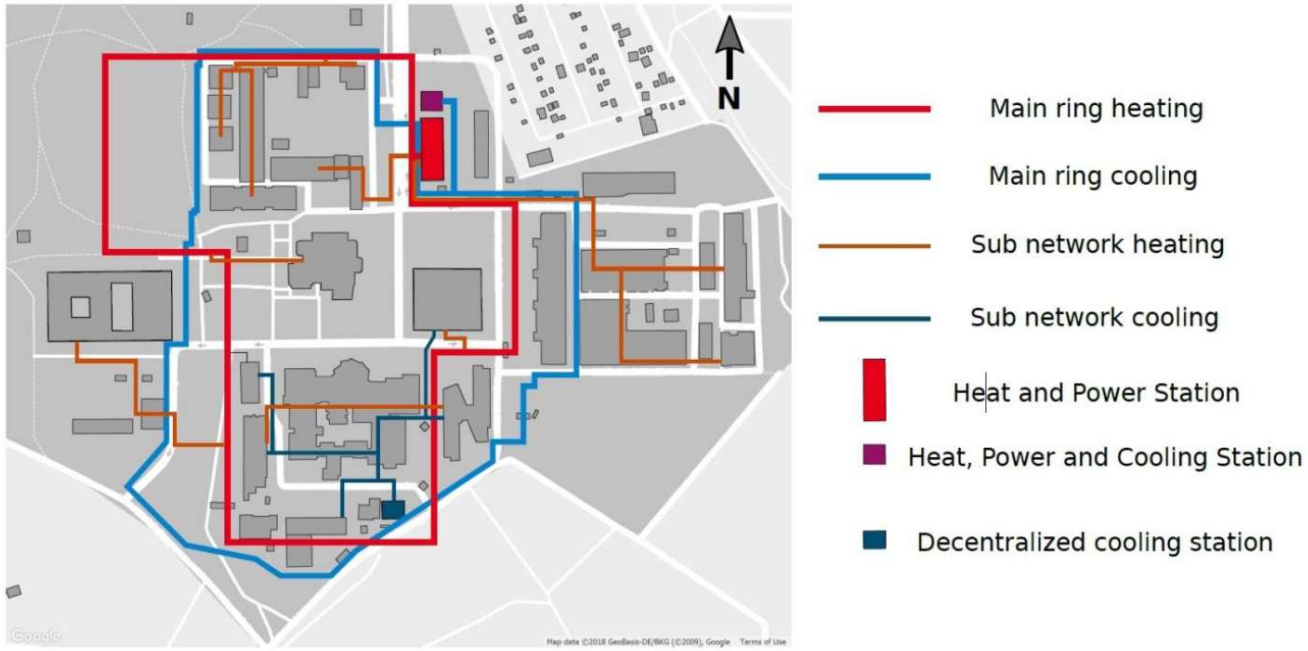
Copenhagen Fredriksberg (DK)
⇒ Building scale

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



Source: TU Darmstadt

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

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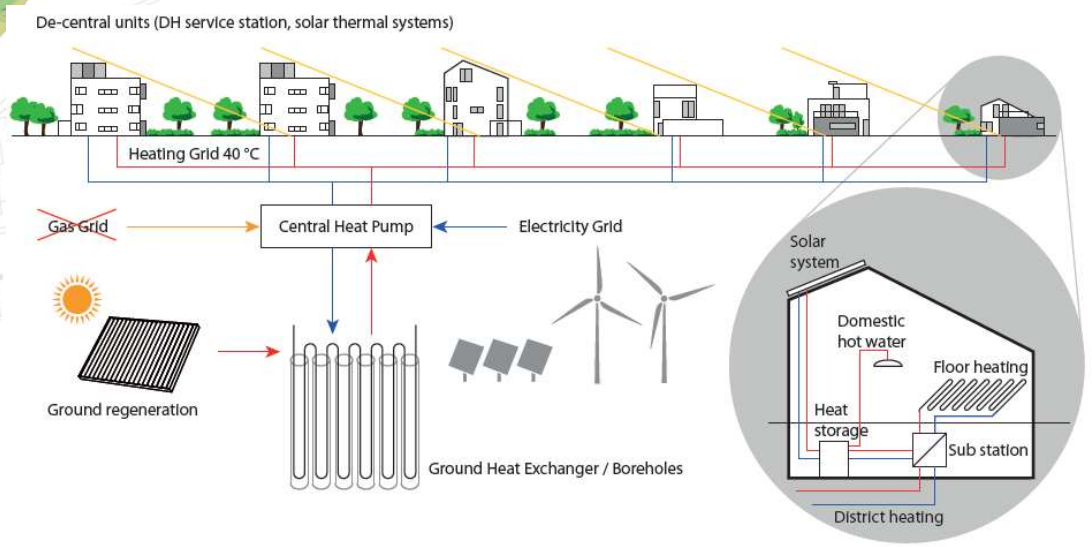
Kassel „Zum Feldlager“ (GER)

⇒ Simulation study

Geo-solar district heating

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



Source: IBP/IEE, UniK, SWKs & City of Kassel

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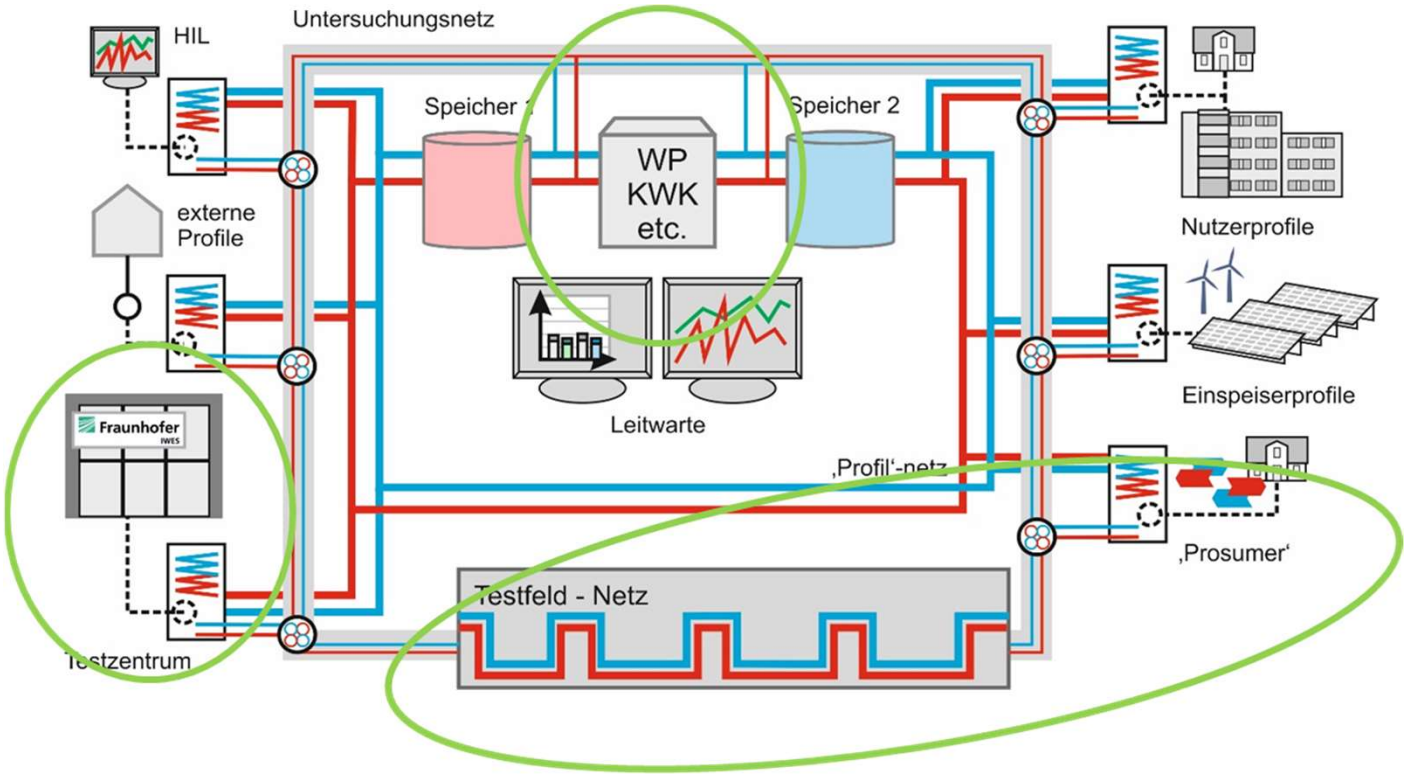
District LAB in Kassel (GER)

⇒ Lab scale

Experimental facility for innovative district heating systems on a community scale



4 Focus areas :

1. Innovative district heating grid with decentralized feed in
2. Mechanical tests – piping systems
3. Central heat supply – big heat pump
4. Smart Energy Utilization/Test building

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Location at the new Fraunhofer IEE office building in Kassel

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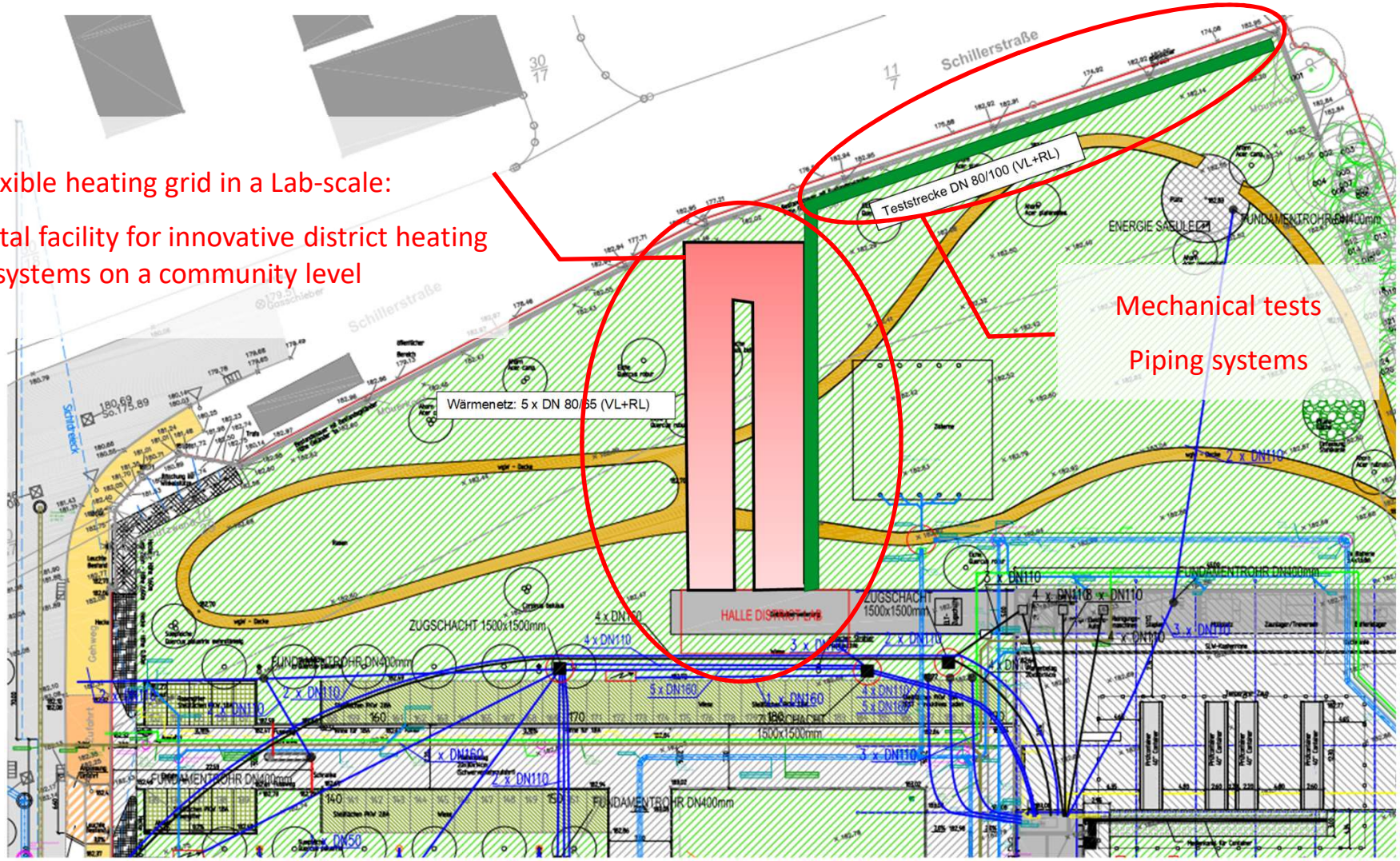
District LAB - concept

Flexible heating grid in a Lab-scale:

Experimental facility for innovative district heating systems on a community level



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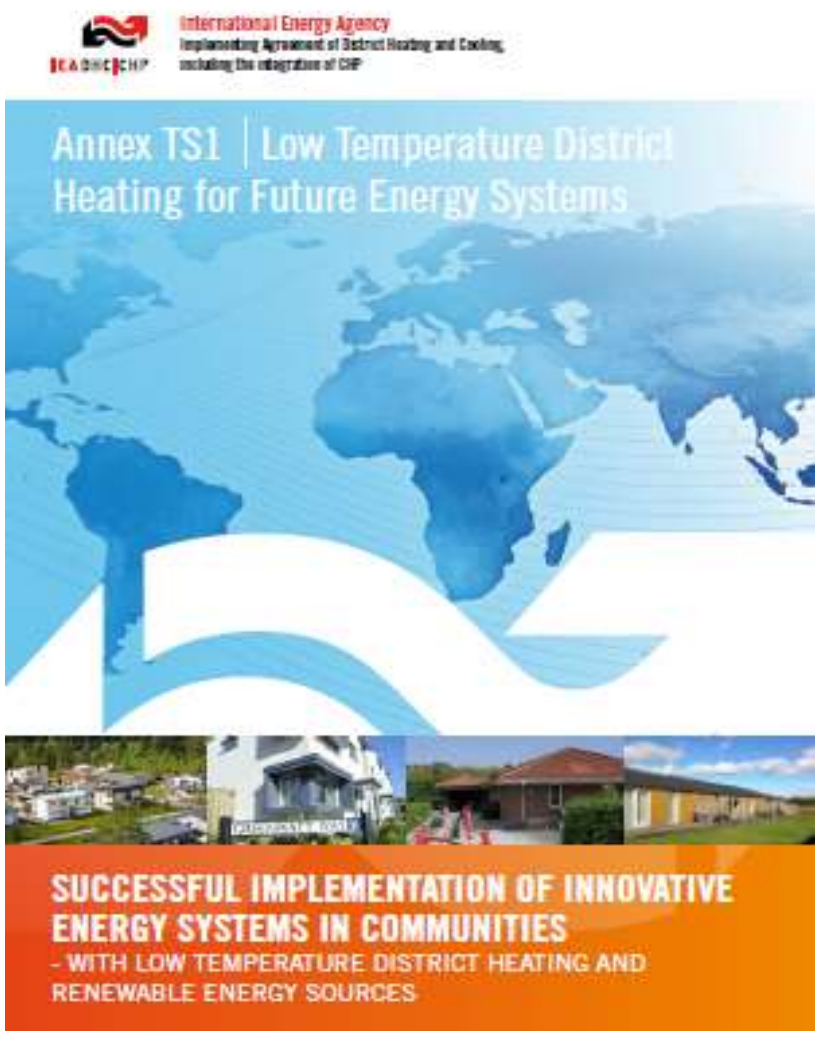
First project ideas

1. District heating grids and new operational strategies
   - Dynamic and changing boundaries for feed-in and utilization
   - Grid operation with new temperature regimes
   - Dynamic pressure- and temperature variations
2. Tests of components
   - Piping systems
   - Heat exchanger / sub-stations
   - Pumps
   - Control elements
3. Development of simulation tools and validation
   - Static hydraulic simulations incl. heat losses
   - Dynamic simulations of control sequences and pressure surges

Brochure of Case Studies (from IEA DHC Annex TS1)



available at **www.iea-dhc.org**

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Conclusions

- Low temperature is a proven heat supply technology
- Many cases show the advantages and cost efficiencies
- “Right” business models are important

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Contact

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