Best Practice No. 2

1 Motivation – On the road to Low Temperature District Heating (LTDH)

The main motivation and goal are to present various possible roads to low temperature (4. Generation) district heating implementations. Here we concentrate on the issue of possible LTDH implementation in new urban developments, surplus heat and heating/cooling systems.

2 Testing LTDH in various developments

2.1 Implementation of LTDH concept in new urban developments and local heating systems

2.1.1 LTDH network with solar feed-in in new residential area – „Living on Campus", Berlin (DE)

Goal: Implementation of a low-temperature network with bidirectional house connection and network feed-in stations

Lessons learned:
It is possible and feasible to integrate photovoltaic panels, a battery system, and LTDH which can save 65 % in primary energy compared to decentral (individual) building heating systems.

2.1.2 4Gen city heating/cooling system – Ectogrid, E.ON in Lund (SE)

Goal: Balancing the demand of houses for heat and cooling, while heat/cooling is needed a heat pump use energy from the line

Lessons learned:
It is possible and feasible to balance all thermal energy flows in a building cluster, built-in flexibility of the system for heat and cooling demand, while integrating all energy needs (e.g., eMobility, electricity production from PV) in the building cluster.

2.1.3 Alternative to LTDH: energy self-sufficient buildings – Sonnenhäuser, Cottbus (DE)

Goal: Replacement of the use of a district heating system (due to economic reasons) with a combination of mainly renewable and minimal fossil energy sources

Lessons learned:
It is possible and feasible to operate self-sufficient apartment buildings with large heat storage, as well as lithium-ion batteries to store renewable energy, and photovoltaic installations and solar thermal collectors.

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2.1.4 Innovative low temperature district heating from surplus heat – Brunnshög in Lund (SE)

Goal: Supply district heating system in Brunnshög with waste/surplus heat from different facilities, including scientific ones

Lessons learned:

It is possible and feasible to supply district heating system with waste heat from scientific installations, as well as a large-scale biofuel-based CHP facility, and heat pump for recovery of heat from sewage, as well other renewable energy sources.

2.1.5 Waste heat utilization in small/medium companies – TERMA, Gdansk suburb (PL)

Goal: possibilities of waste heat utilization from soldering furnaces in LT heating systems of industrial plants

Lessons learned:

There are very big possibilities of using waste heat in industrial plants, enabling to meet a significant part of the plants' own energy needs and achieving significant energy and economic effects in the form of avoided purchase of external energy carriers, as well as environmental effects in the form of avoided CO_2 emissions.

2.1.6 Waste heat utilization in Kalundborg (DK)

Goal: Estimating the cost of heat and feasibility (taking into account thermodynamic and economic conditions) of using surplus (waste) heat in a densely populated and industrial region of the city

Lessons learned:

The obtained results have shown that the low temperature heat might be transferred economically and ecologically over a distance of 20 km.

2.1.7 Industrial waste heat utilization from Hamburg Aurubis plant – HafenCity Hamburg (DE)

Goal: Implementation of the next step towards the transition to a Low-Carbon Economy in Hamburg based on industrial waste heat recovery from the Copper Smelter – use industrial energy resources

Lessons learned:

The Hamburg Aurubis plant has three production lines, each could provide 160 GWh of thermal energy annually and 18 MW of thermal power (one line is sufficient to supply HafenCity East; the other two lines will also be converted in the future, once the technical, financial, and contractual foundation has been established). Using it will save 20,000 t of CO_2 emissions per year, both through its use at HafenCity East and at the plant.

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2.1.8 Geothermal heat utilization in Geotermia Podhalańska (PL)

Goal: Exploration of the possibilities of fuller use of geothermal heat in district heating systems and various industry sectors using low-temperature heat

Lessons learned:

Geothermal heat used in DH system constitutes only a small part of energy extracted from the production wells, the surplus heat can be used in other LT systems in economy and industry sectors.

3 Conclusions

- Usage of surplus heat from large facilities, like the research facilities in Brunnshög, are a good opportunity to heat a larger district with fossil-free energy but this is only possible in specific areas where enough heat can be provided.
- In Brunnshög, so much heat is produced, that heating of public grounds like bus stops is considered as well, demonstrating that heat is important in every aspect of private and public life.
- In various companies there are available surplus (waste) heat sources which can be used for local DH network.
- Heat produced by the solar thermal (also private) systems can be fed into the district heating network.
- Equipping buildings with large-scale solar systems and corresponding storage tanks can be an economically viable alternative to connecting them to a centralized district heating network.
- Geothermal heat is an alternative way to supply the LTDH systems.
- Battery systems for photovoltaic panels increase the amount of electricity that is self-consumed.

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