HEAT PUMPS: THE FUTURE OF DISTRICT HEATING?

RAMBOLL ENERGY
• Independent engineering and design consultancy and provider of management consultancy
• Founded 1945 in Denmark
• 13,000 experts
• Close to 300 offices in 35 countries
• Particularly strong presence in the Nordics, the UK, North America, Continental Europe, Middle East and Asia Pacific
• EUR 1.4 billion revenue
• Owned by Ramboll Foundation

• Services across the markets:
  - Buildings
  - Transport
  - Planning & Urban Design
  - Water
  - Environment & Health
  - Energy
  - Oil & Gas
  - Management Consulting
CURRENT STATUS OF DISTRICT HEATING IN THE UK

3rd Generation District Heating Network Temperatures; <90°C Flow

- Existing Buildings dictating design (82/71°C)

Typical Technologies:

- Gas-fired CHP – Can provide both CO2 and financial savings
- Gas Boilers (Typically back up)
- Thermal Storage (Several hours storage)
- Series 1 or 2 Pipework
DECARBONISATION OF THE ELECTRICITY GRID

• Reduced carbon savings through electrical generation with CHP

• Based on a 20 year lifespan CHP need to deployed by 2023 to offer a net saving in CO2

• Increased carbon savings through electrically driven heat pumps.
HEAT PUMPS IN DISTRICT ENERGY (HEATING & COOLING)

• Challenges:
  • High Network temperatures
  • High capital costs? (depending on source)
  • High Electricity prices
  • Low number of demonstrator project in the UK
  • Reliance on Subsidies (depending on the source)
  • Availability of Source
  • Complex Design

• Potential Solutions:
  • High temperature heat pumps <90°C
  • Combination of Technologies
  • Reducing Building Design Temperatures
  • Move towards 4th Generation Temperatures (~55°C)
  • Low Temperature Heat Storage (Improve economics)
  • Code of Practice
UK PROJECTS EXAMPLES

• Bunhill Phase 2
• University of the west of Scotland – Paisley Campus
• Shetland Heat & Power
• Birmingham Canals
• Edinburgh BioQuarter
The world’s largest solar heating plant for district heating
- 70,000 m² solar heating plant
- 200,000 m³ underground thermal pit
- 3 gas engines,
- 10 MW electric boiler,
- absorption heat pump
- gas boilers.
GRAM FJERNVARME - SOLVARME ETAPE II

- Network Demand = 29,000 MWh
- 44,000 m² solar heating plant (19,000 MWh/year – 65% of total heat demand from the DH-Network)
- 122,000 m³ pit heat storage
- 10 MW electrical boiler
- 900 kW electrical heat pump
- 2,000 MWh/year – Industrial surplus heat
- 5.3 MWe gas engine
- 2No. 5 MW gas fired boiler
TOFTLUND FJERNVARME

- Network Demand = 28,000 MWh
- An increase of the solar heating plant from 11,000 m² to approx. 27,000 m². (Yearly heat production = 13,500 MWh)
- A pit heat storage of 80,000 m³
- 3 MW electrical boiler (Produces hot water up to 150 degrees)
- 4.5 MW gas fired boiler (Produces hot water up to 150 degrees)
- Surplus heat from a food industry plant (Potato flour) (Approx. 1,500 to 4,000 MWh/year)
- Existing Absorption heat pump
LØGUMKLOSTER DISTRICT HEATING - SOLAR HEATING PLANT

- 50,000m² solar thermal
- 150,000m³ heat storage pond
- 2MW Biomass pellet boiler
- Heat Pumps (Electric & Absorption)
- CHP Units
- Boilers
SILKEBORG VARME – SOLAR ENERGY PLANT

- 150,000m² solar thermal + CHP
- 20% of the annual heat demand in the Municipality of Silkeborg
- 10,000 customers
Surplus biomass for CHP plant
Surplus straw for CHP plant
Offshore wind farm
Heat Pumps
Residential building
Harbour, unloading of biomass
Wastewater treatment and biogas plant
Solar heating plant and heat storage
Distant building w/solar PV
Outskirt building w/heat pump, solar PV and wind turbine
CHP plant fuelled by gas, straw, wood, city waste + heat storage
District heating/cooling plant + cold water storage
Industry with process energy and surplus heat
ANY QUESTIONS?