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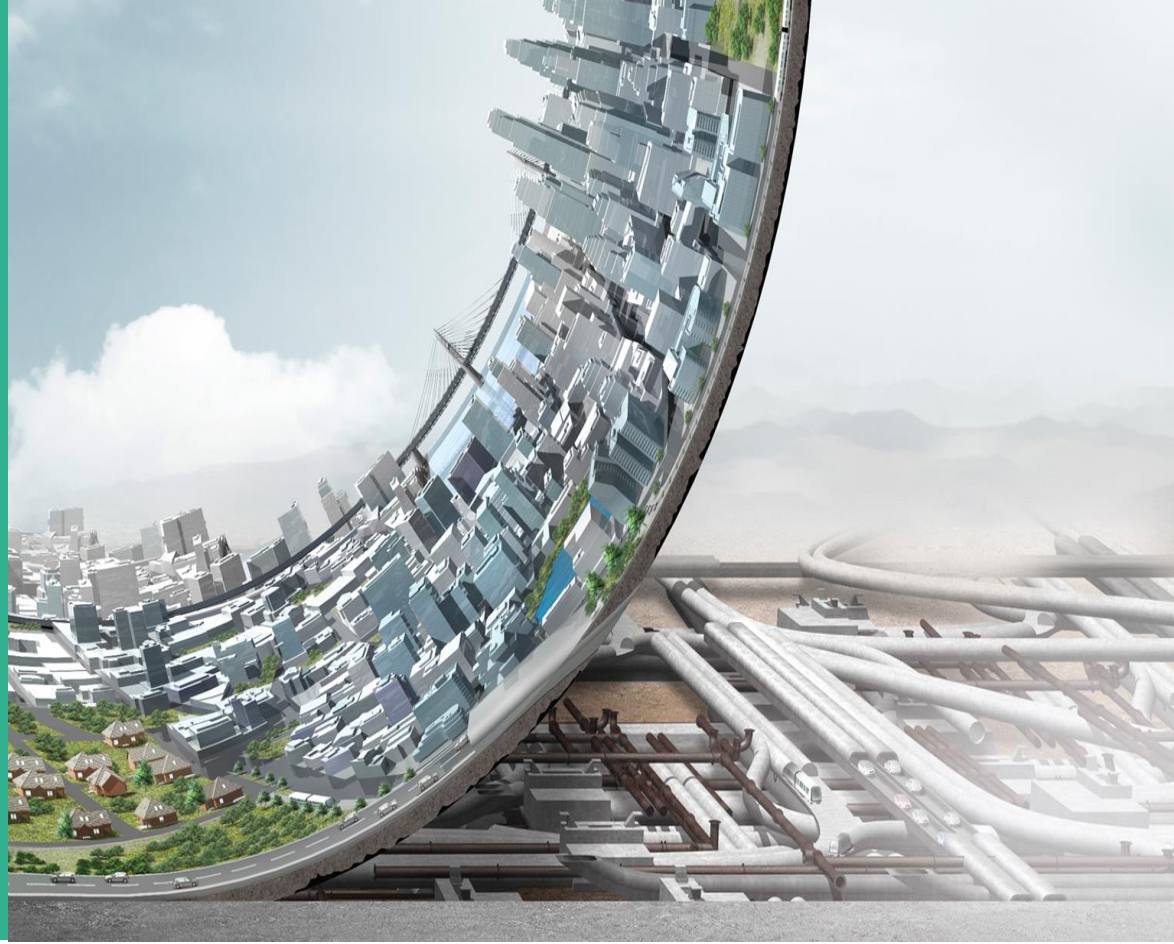
District Energy

- Let's decarbonize together

April 17th, 2023

Nikolaj Clement



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Agenda

- Introduction to COWI and Energy International
- Our services and capabilities in relation to net zero heating networks
- District Heating in Denmark
- Overview of heat sources (energy sources)
- Questions

Who am I?

Nikolaj Clement, Civil engineer within Strategic Energy Planning and Management

- A. Business Development Director

Employment record at COWI:

- 2018 – Project Engineer
- 2019 – Project Manager
- 2021 – Project Manager and Business Development Specialist
- 2022 – Associate Business Development Director

World-class knowledge combined with worldwide presence

BAHRAIN
1 office

BELGIUM
1 office

CANADA
3 offices

CHINA
1 office

DENMARK
10 offices

GERMANY
1 office

GREENLAND
1 office

INDIA
3 offices

LITHUANIA
1 office

MOZAMBIQUE
1 office

NORWAY
24 offices

OMAN
1 office

POLAND
3 offices

PHILIPPINES
1 office

QATAR
1 office

SOUTH KOREA
1 office

SWEDEN
19 offices

SINGAPORE
1 office

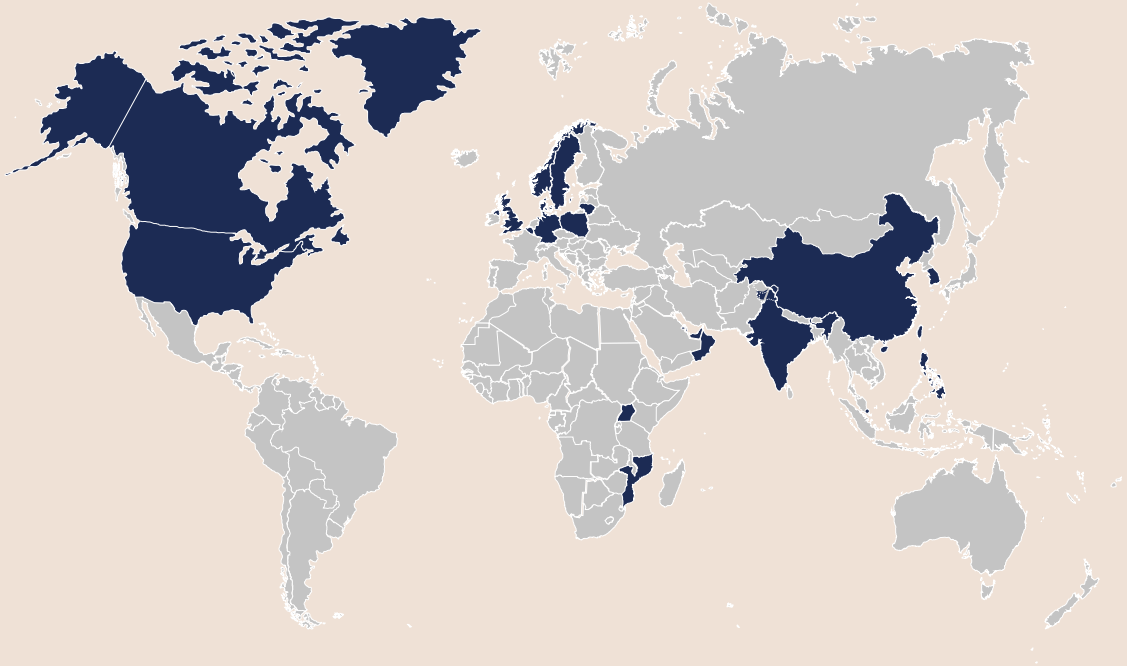
TAIWAN
1 office

UAE
2 offices

UGANDA
1 office

UNITED KINGDOM
6 offices

USA
6 offices



Energy

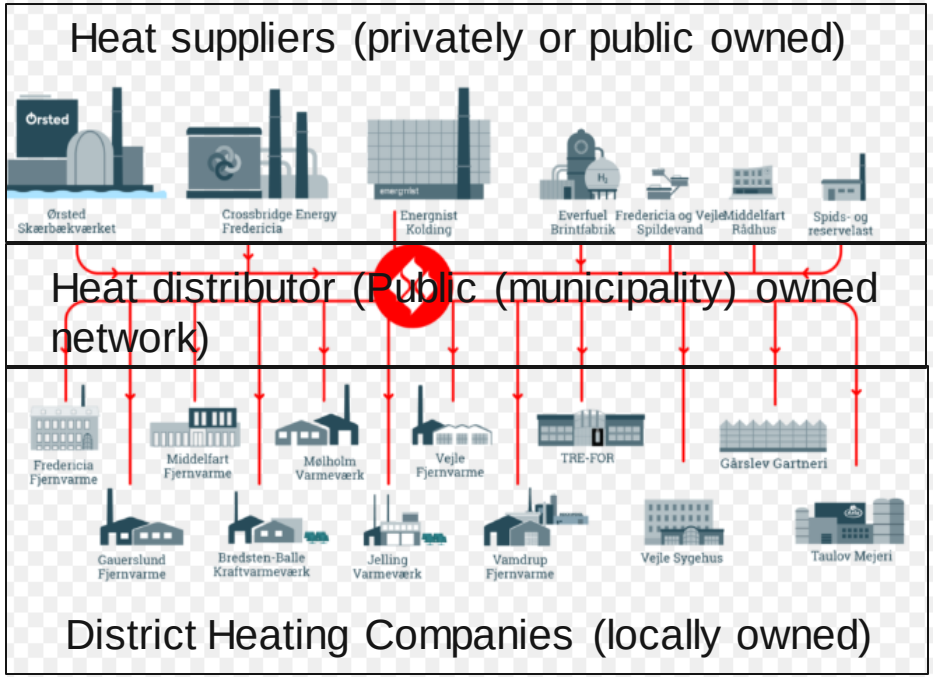
- Energy storage and transmission
- District heating and cooling
- Heat Pumps
- Biomass and waste-to-energy
- Green fuels, power-to-x
- Wind energy
- Solar photovoltaic energy
- Carbon capture, storage and utilization
- Oil and gas (not anymore)
- Climate change

District Energy in Denmark – regulation and framework

Ownership models

- Heat Supply Act ensures that District Energy Companies is a non-profit organization
- District Heating Systems can be either locally owned (consumer owned) or public owned (municipality)
- The municipalities are the central players in the collective heating supply
  - They carry out heating planning
  - Are responsible for ensuring that the extension of DH
  - And changes in the DH system are in line with the heating supply law.
  - Supports large investments through attractive interest loans.

An example of an ownership model in Denmark for a large District Heating System



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Energy transition in Denmark – a flexible system

High temperatures (steam) of 200/80°C

Medium temperatures (hot water) of 95/50 °C

Low temperatures (hot water) of below 80/40 °C

First WTE plant

Coal era

Last coal plant
Super critical

Gas era

Biomass era

Electrification

PTX/CCS
?

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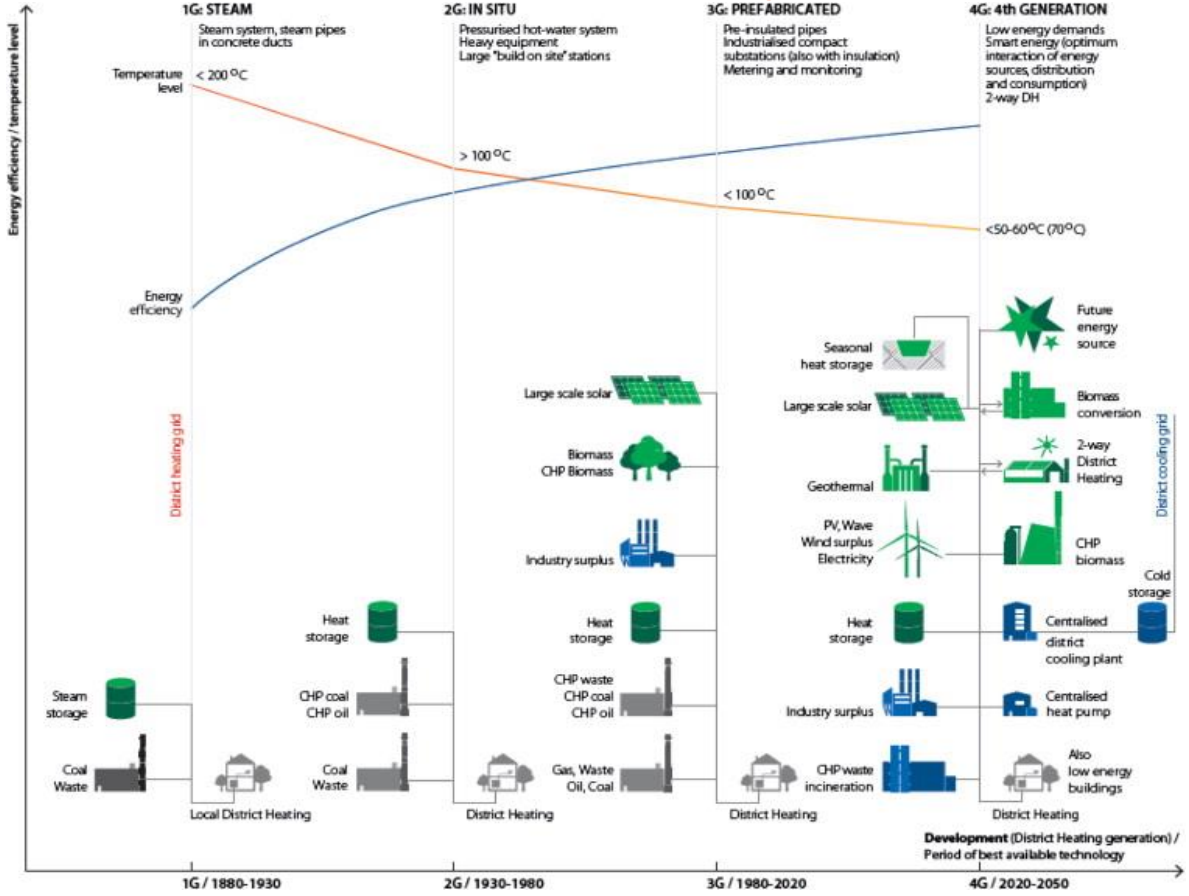
Energy transition in Denmark – a flexible system



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Political goals and framework conditions

Government

What is District Energy in Denmark today?

Many District Energy Utilities used to focus on delivering electricity now – these areas are key:

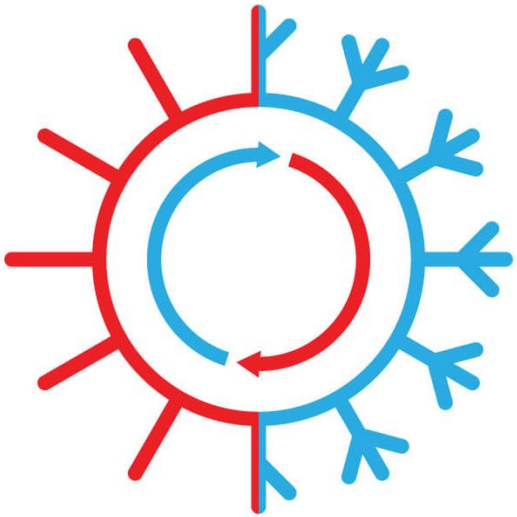
Heat production

- Geothermal Energy
- Biomass boilers
- Heat pumps for combined heat and cooling (air source, Industrial water, sewage, sea water)
- Solar collectors
- Electric boilers (to balance the electricity market – fast regulation)
- Natural gas boilers for peak load

Electricity production to produce cheap heat

- Wind turbines and photovoltaic panels
- Biomass combined heat and power production (CHP)
- Waste to Energy (CHP)
- Natural gas CHP motors and turbines

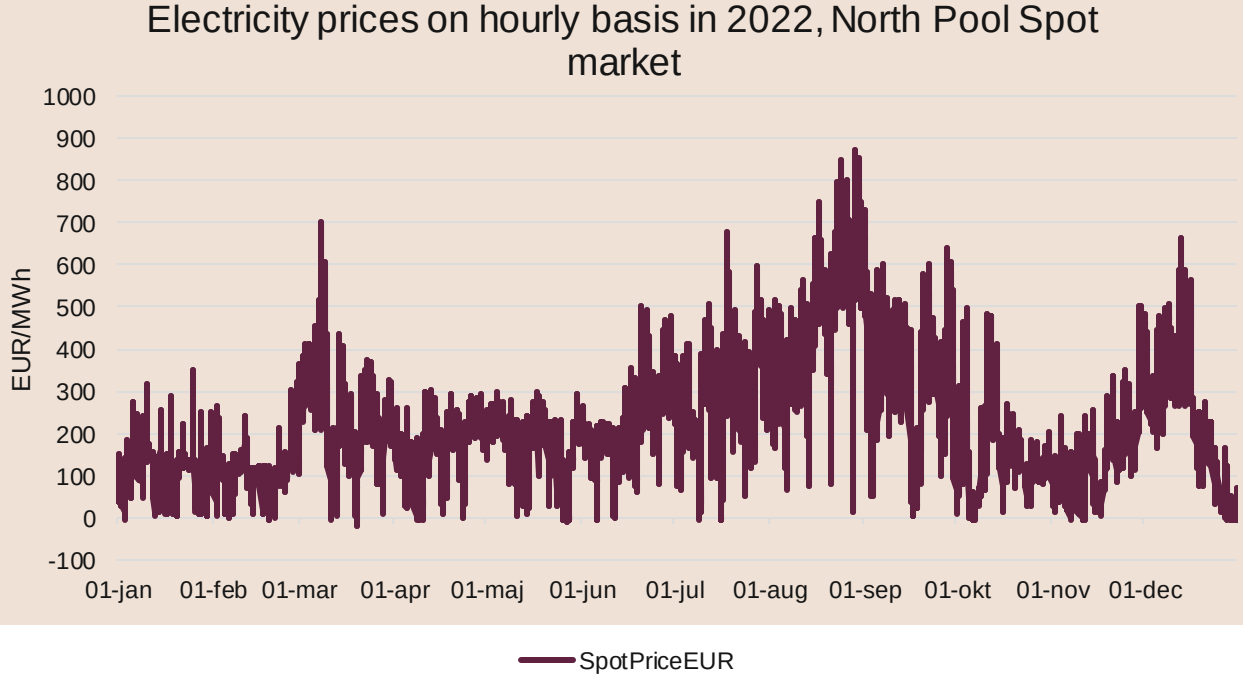
Accumulation Storages are key!

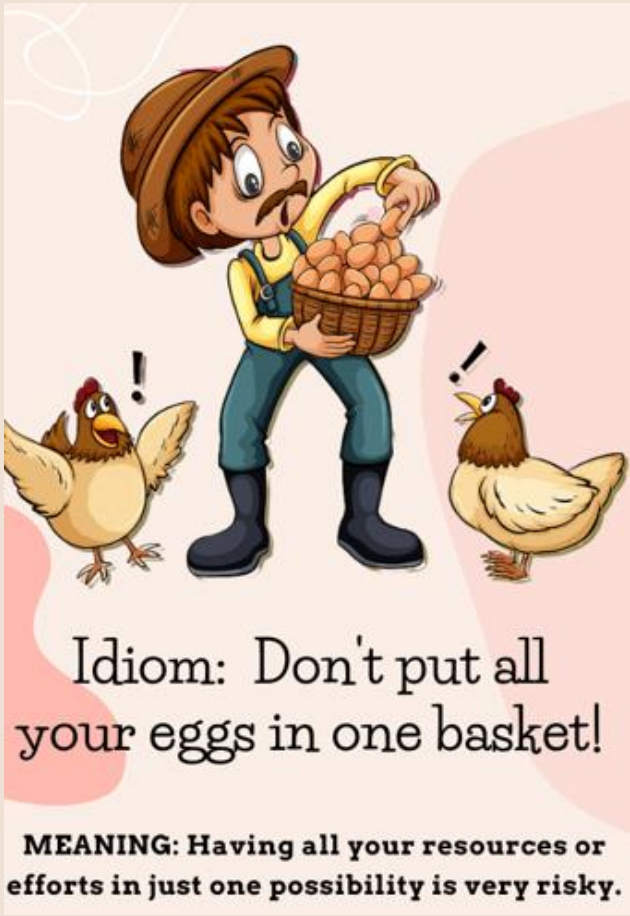


District Cooling – Fast rising market

- Large public buildings (hospitals, schools, airports etc)
- Private companies
- Excess heat companies (Datacenter, biogas producers, industrial purposes)

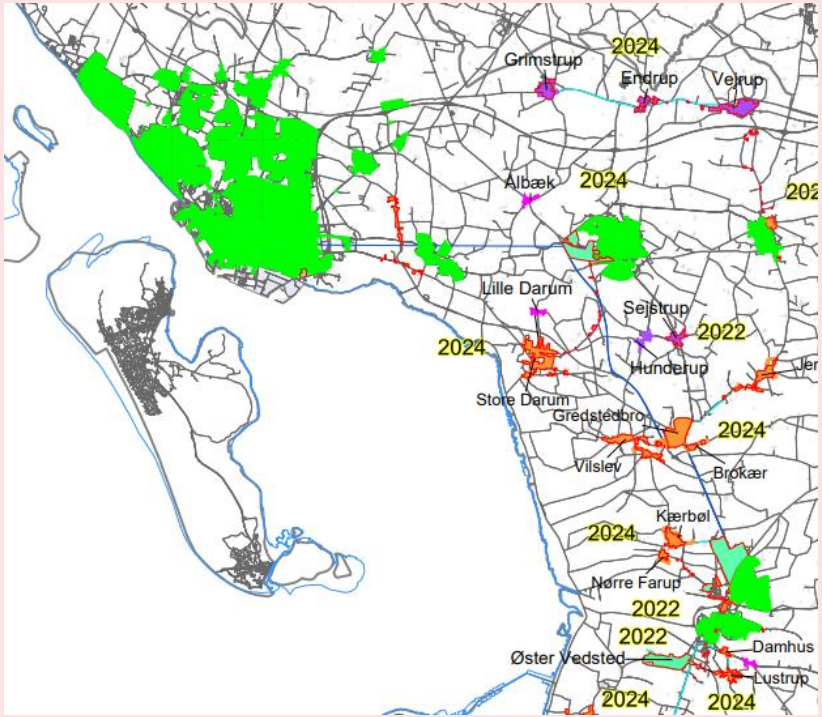
Flexibility is key for stabile energy prices





From Planning to Execution

Esbjerg Municipality – Heating plan



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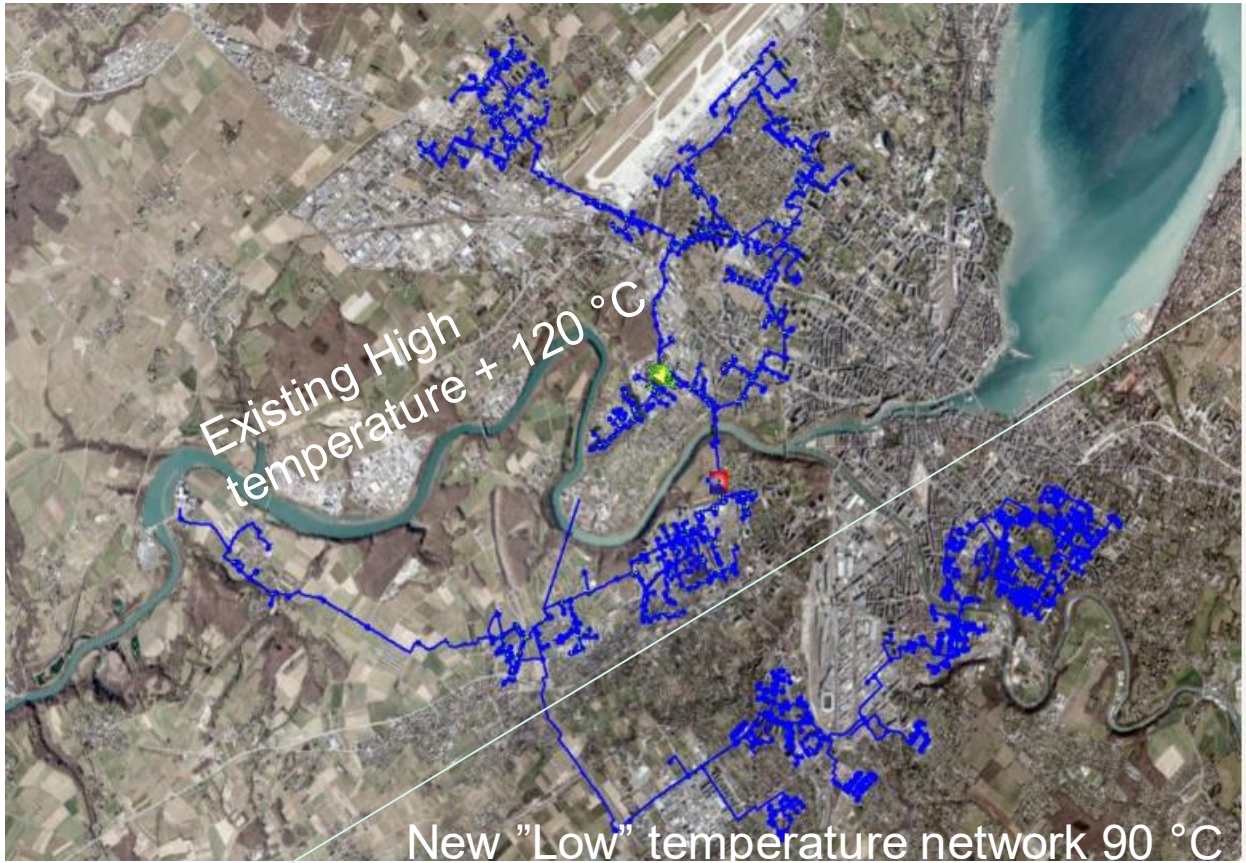

Switzerland

Geneva Master planning

PERIOD: 2019-2021

CLIENT: SIG - Services industriels de Genève

THE PROJECT:

Connecting networks and preparing for the future: Move towards a sustainable and connected society.

COWI'S SERVICES:

- District Heating Planning and Project Design
- Termis Hydraulic Simulations
- Real-time Modelling & Optimizations
- Pipe Network Design
- District Cooling (from Lake Geneva)
- Energy Production

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Questions?

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