The Future Regional Energy, 20 - 21 June 2023 Demänová Resort, Liptovský Mikuláš

District Heating in Denmark

Birger Lauersen, Manager International Affairs

Danish District Heating Association

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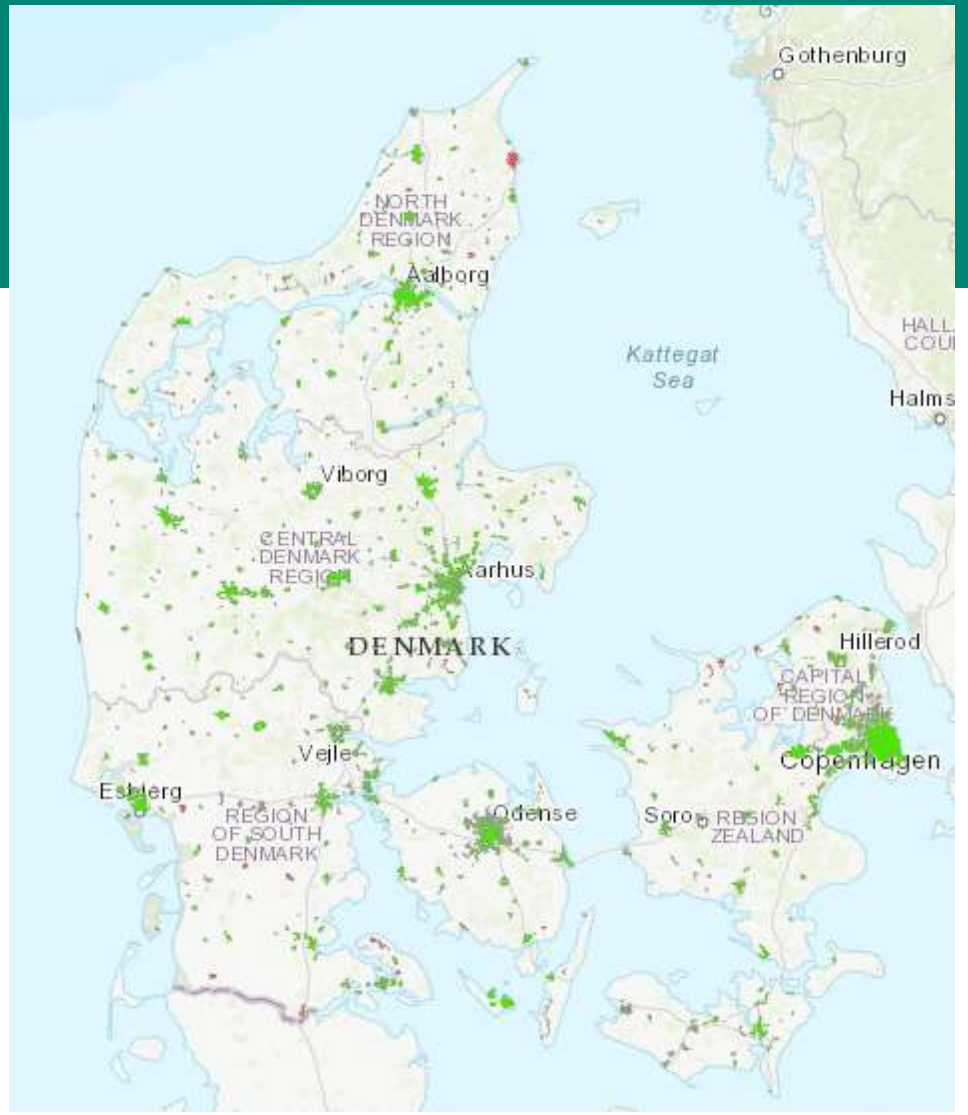
A bit of background

Preconditions prior to 1970'ties:

1. Strong cooperative movement in Denmark
   - Agricultural sector since 1866, electricity since early 1891, DH since mid 1900'
2. Coastal country
   - All fuels imported through cities
   - Power plants in city harbours - heat markets nearby
   - 30 % district heating
3. Energy crisis in 1970'ties hit hard
   - No domestic coal, oil, gas or hydro (North Sea gas and oil came later)
   - Energy and heat planning initiated
   - District heating regulation – monopolistic non-profit sector

Results:

- 67,5 % of households have district heating
- Approx. 330 cooperatives & 40 municipally owned DH-utilities (more coming ☺)
- Non-profit sector – attractive prices



Energy Efficiency Directive , 2012/27/EU) art. 2, (42):

- Efficient DHC, EED
- Non-efficient DHC

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Municipal role in Danish heating sector

<u>Before 2019</u>: Planning with intent - Now less stringent

Heat zoning based on lowest socio-economic cost:

- Zones suitable for ”collective supply”
  - Heat density (urban & suburban areas)
  - Availability of heat sources or gas (gas eliminated as option in 2022)
  - District heating or natural gas (gas eliminated as option in 2022, now individual heat pumps)
  - Municipalities request construction by utility
  - Permitting (grid and production)
  - Optionally impose obligation to connect/remain connected (option removed 2019)
  - Issue loan-guarantee (grid and production)

- Zones for individual solutions (countryside)

Consumer protection through national legislation!

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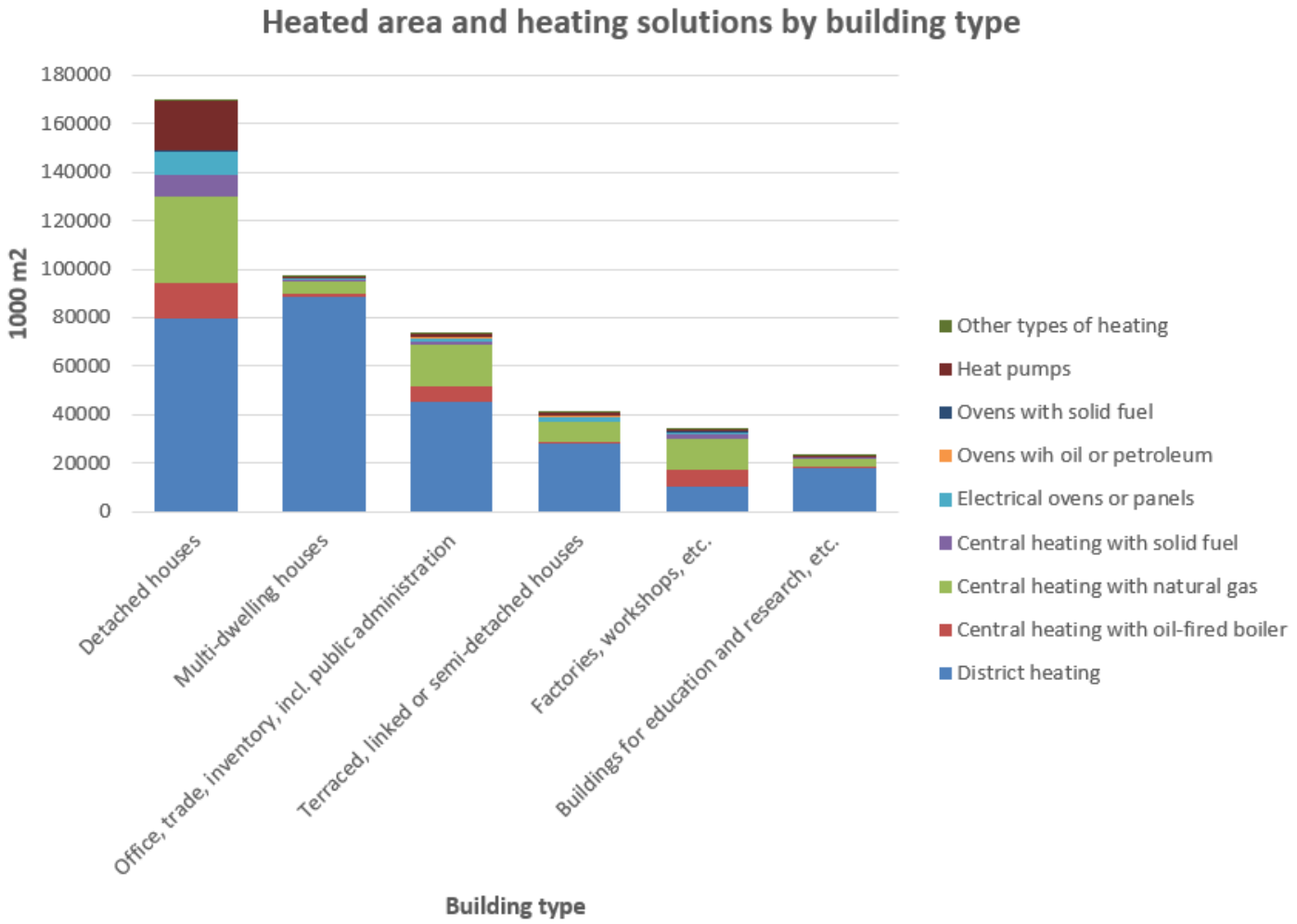
Heated area and heating solutions by building type



- High share among detached houses – almost 50% of the heat demand of this sector is supplied by district heating.
- District heating covers almost all heating in multi-dwelling houses and buildings for education and research. High shares in offices, trade and administration.

Source: Statistics Denmark 2023.

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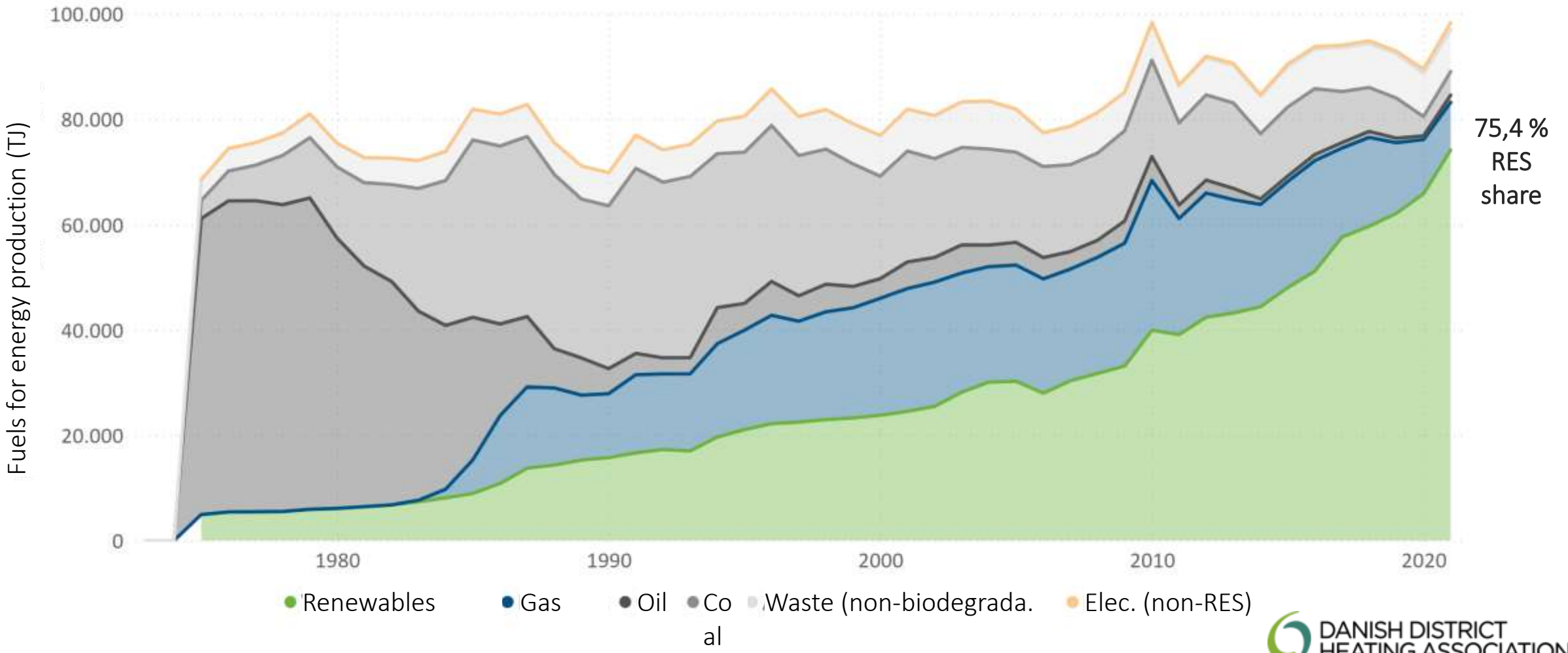
District heating production



Source: Danish Energy Agency, Energy Statistics 2020.

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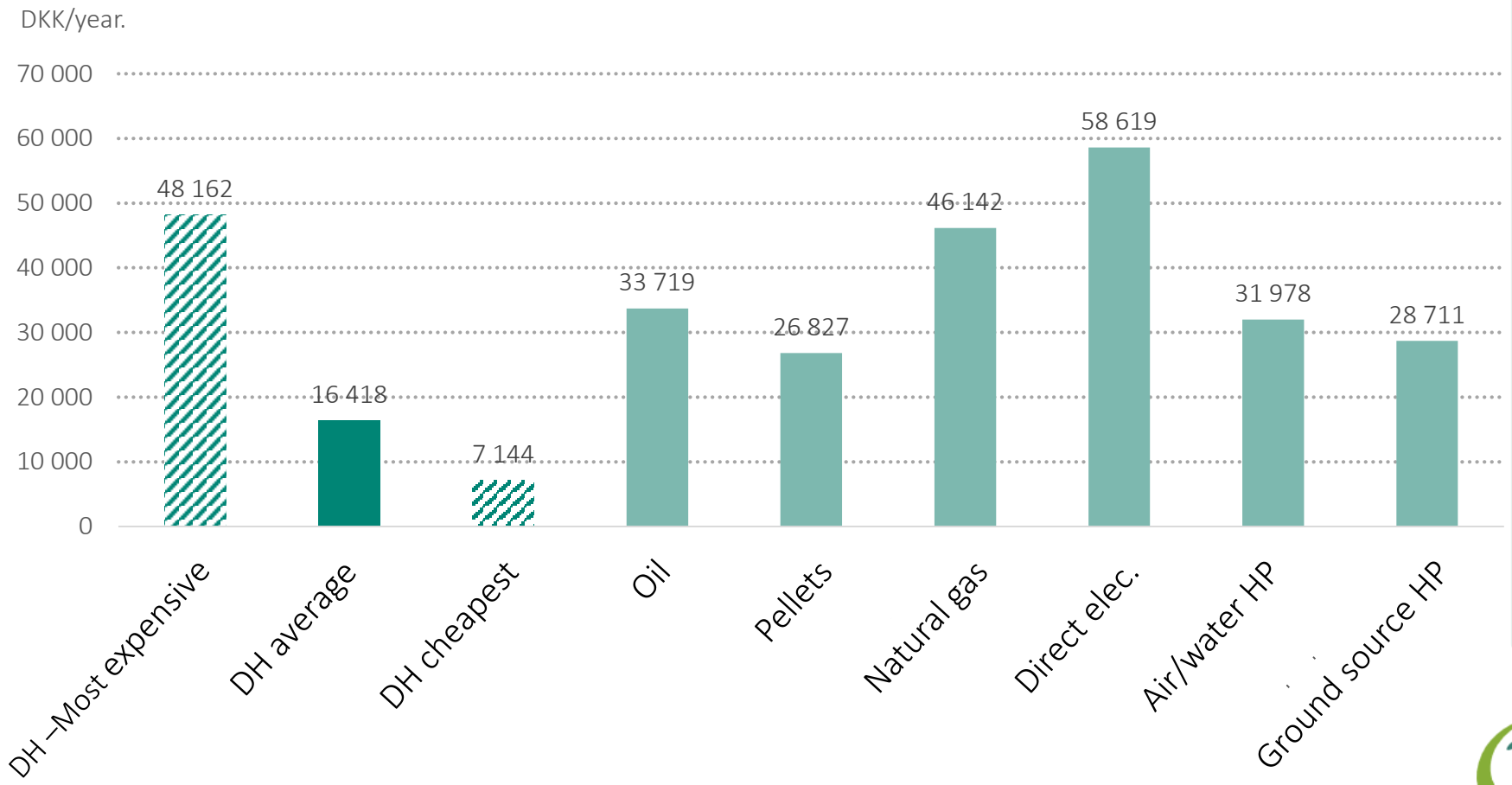
What were the annual heating costs in 2022?

€1= 7,5 DKK



- DH companies with most options and technologies were the cheapest
- DH companies using much gas or electricity had the highest prices
- Average DH price increase 01/2022-01/2023: 17,8 %

Note: Annual cost estimation ”standard house”, prices as of August 2022, incl. capital costs and maintenance

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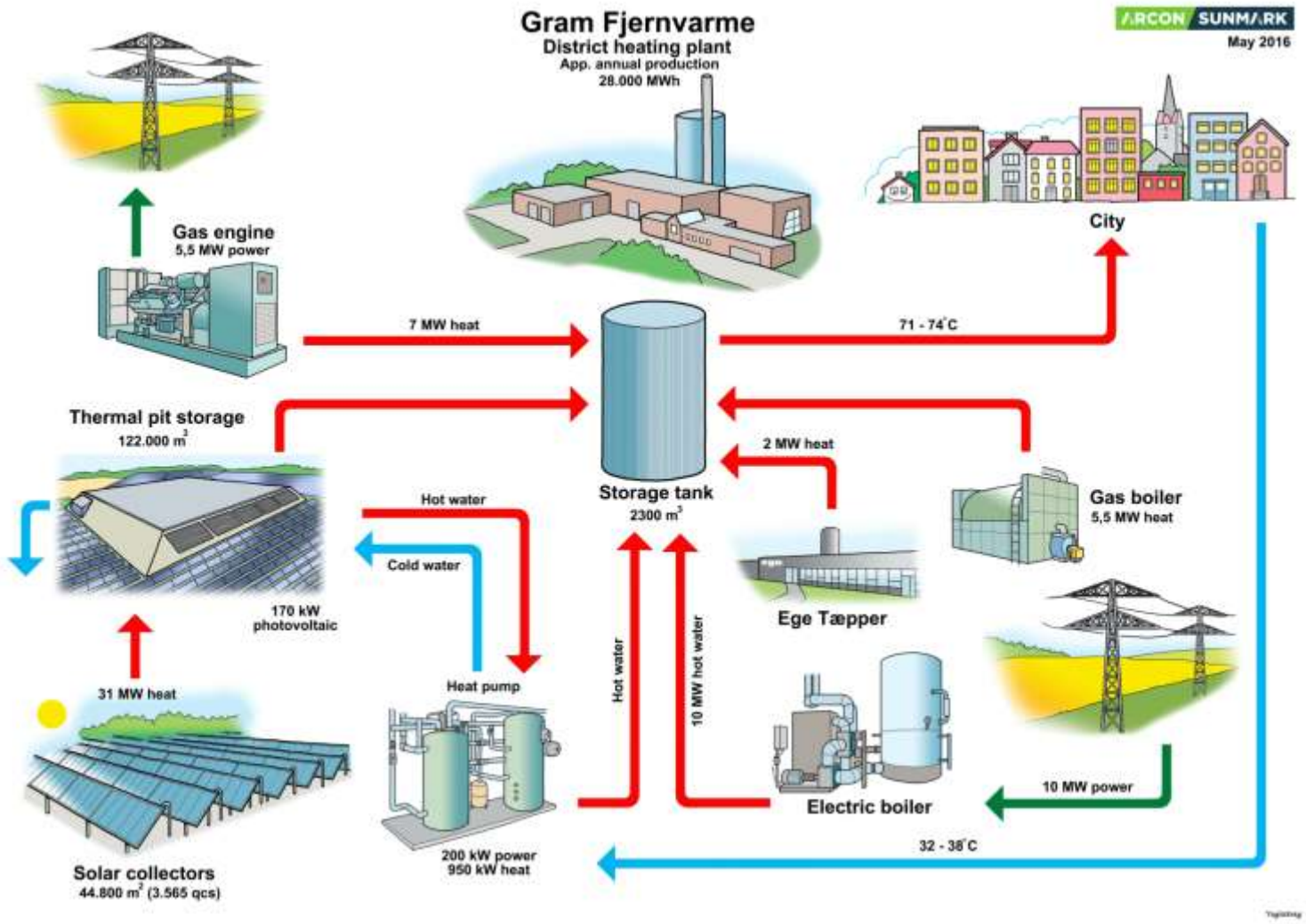
Gram District Heating



- Consumer cooperative
- Until 2009 based on natural gas, CHP units and boilers.
- Solar field added in 2009, expanded in 2015 to 44.800 m^2 of solar collectors providing 60% of total heat demand.
- From 2016 onward excess heat from carpet factory is added to the district heating network.
- Gram has 2.486 indbyggere

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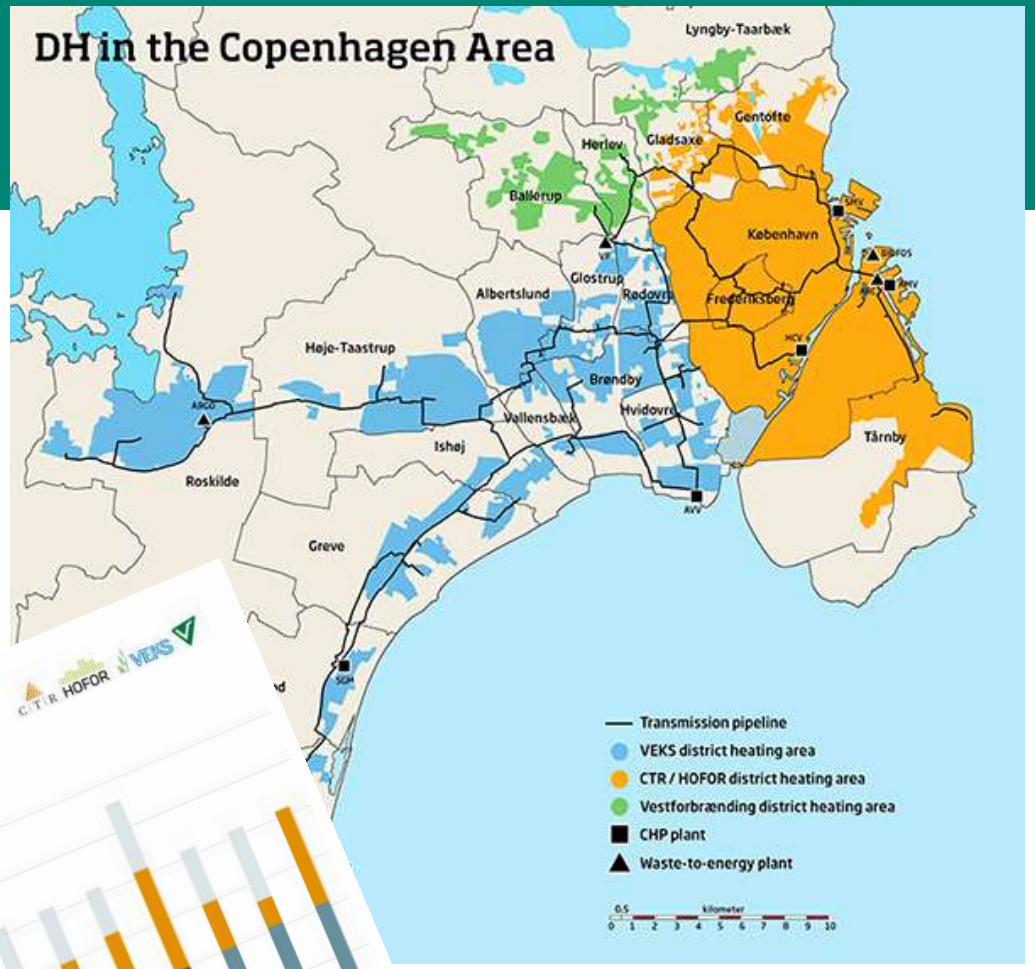
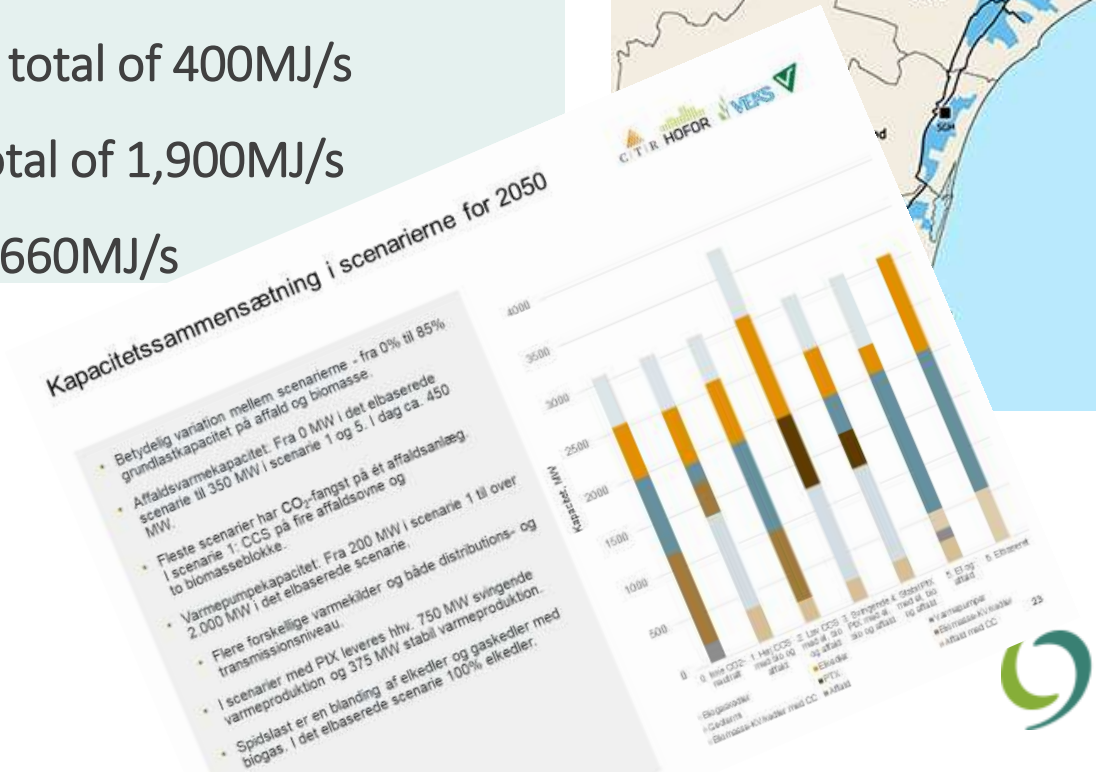
Copenhagen district heating

- 500.000 households
- 2 heat TSO's, 20+ heat DSO's
- Four CHP plants of a total of 2,050MJ/s. The plants are owned by three different companies: Oersted, HOFOR and VEKS
- Three waste-to-energy facilities of a total of 400MJ/s
- Reserve and peak load plants of a total of 1,900MJ/s
- Two heat accumulators of a total of 660MJ/s





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