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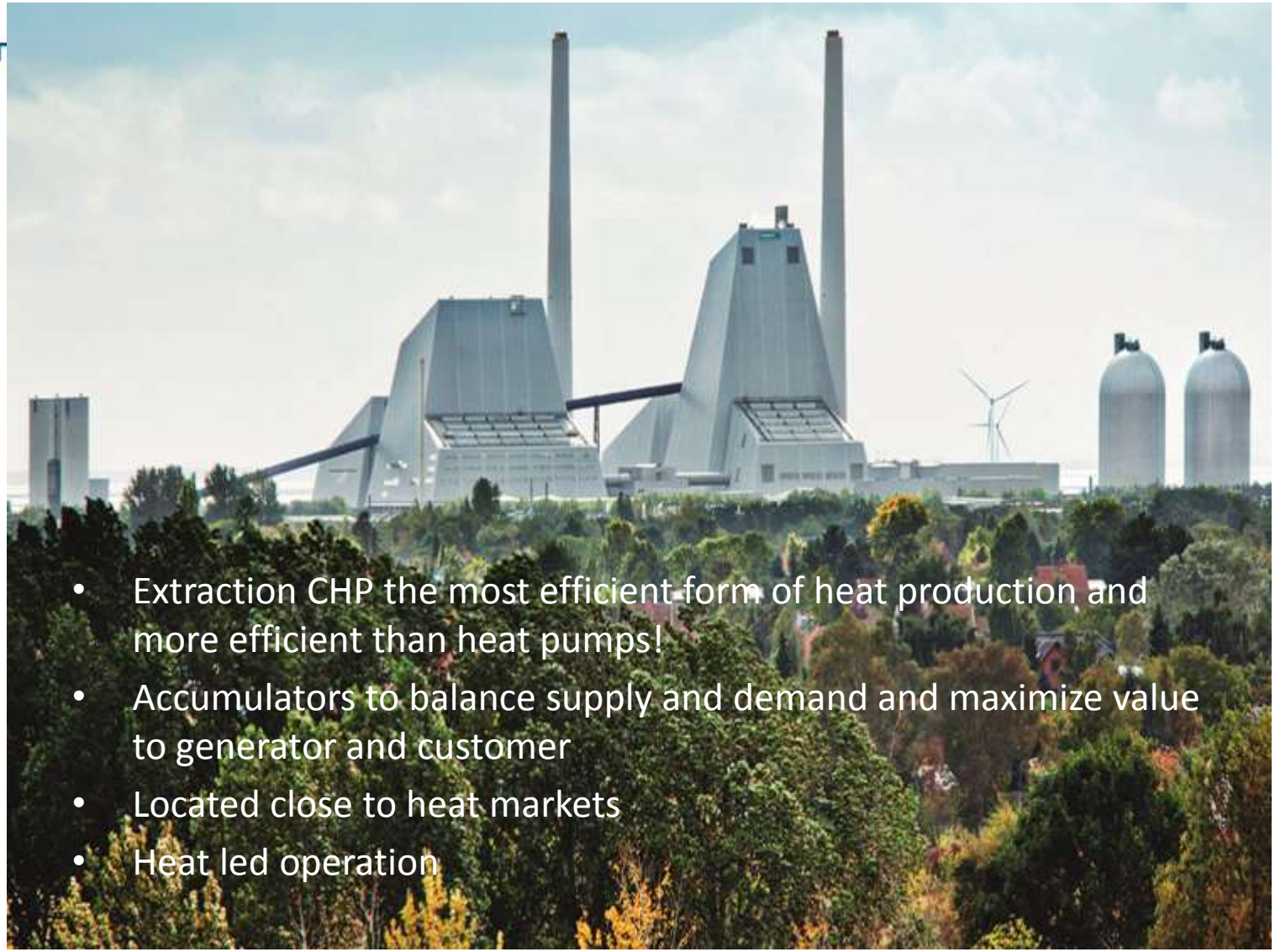
PROGRAMME FUNDED BY THE EU

Roadmap on the Development of District Heating in Azerbaijan until 2020 INOGATE Technical Secretariat & Integrated Programme

Klaus Fafner

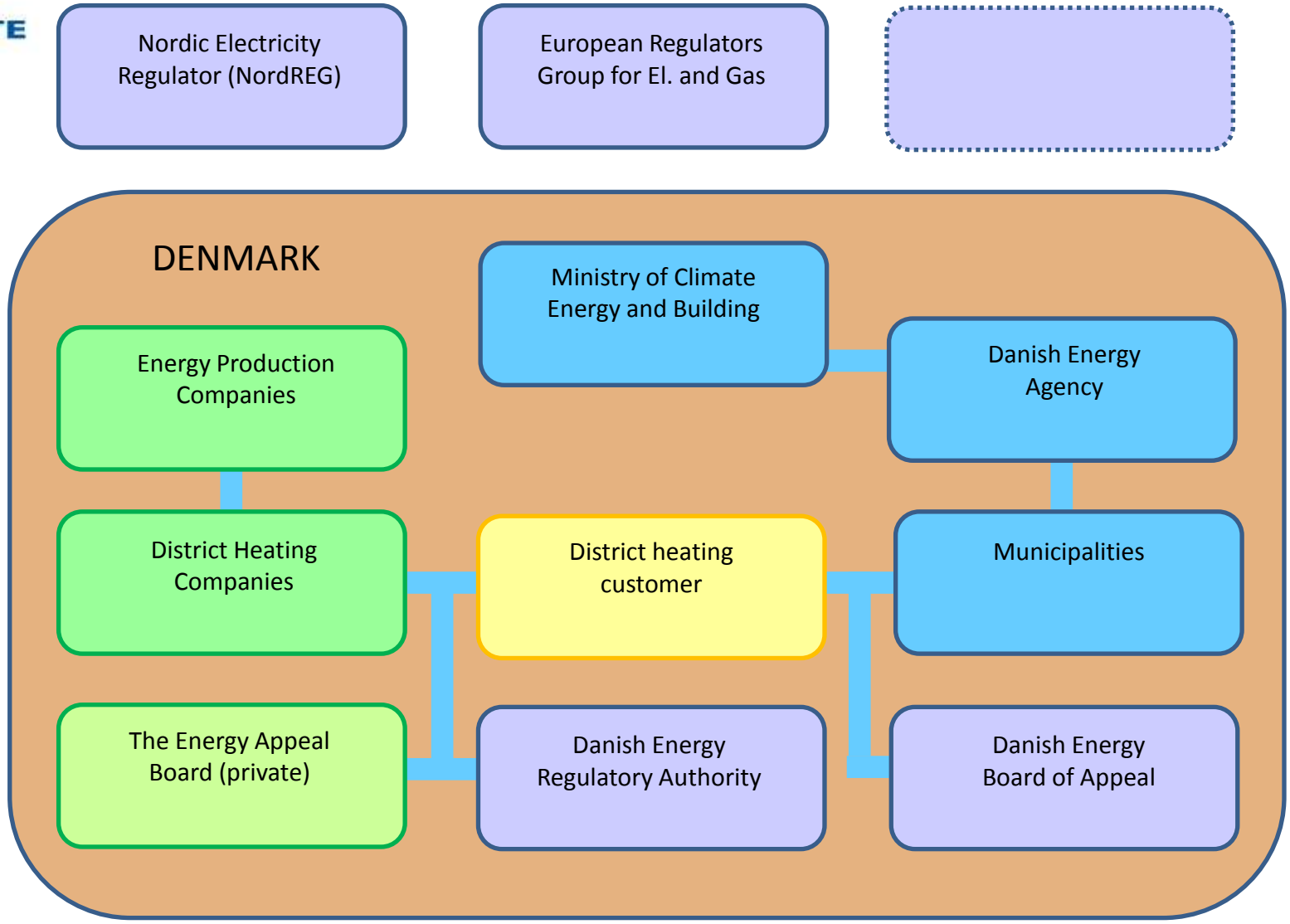
BUILDING PARTNERSHIPS FOR ENERGY SECURITY

District Heating in Denmark



- Extraction CHP the most efficient form of heat production and more efficient than heat pumps!
- Accumulators to balance supply and demand and maximize value to generator and customer
- Located close to heat markets
- Heat led operation

Danish District Heating Sector



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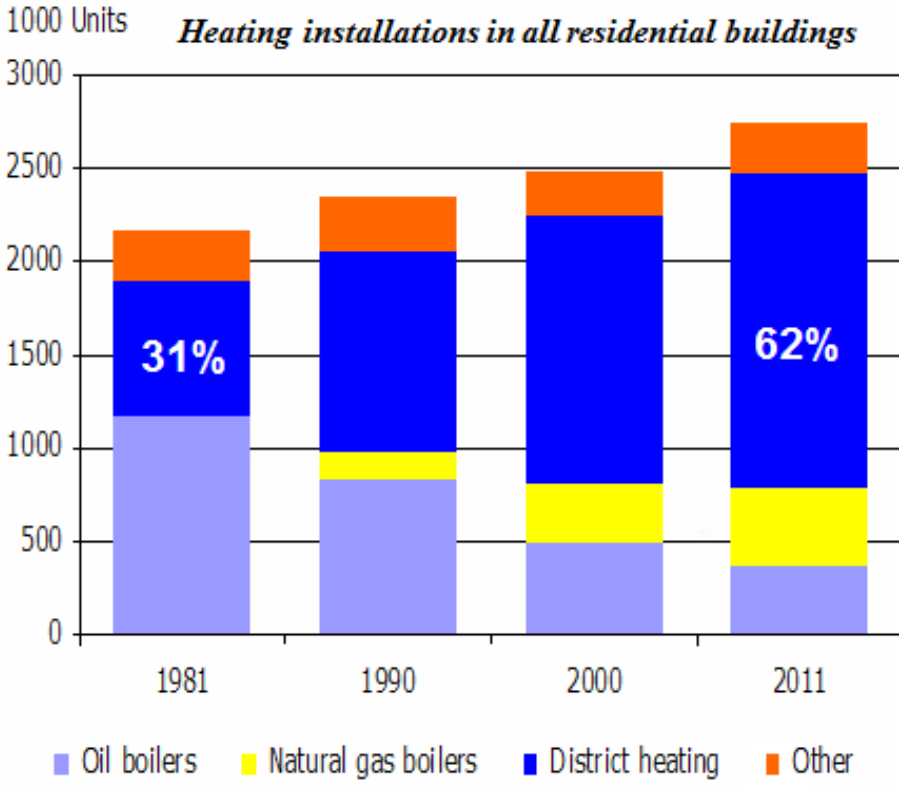
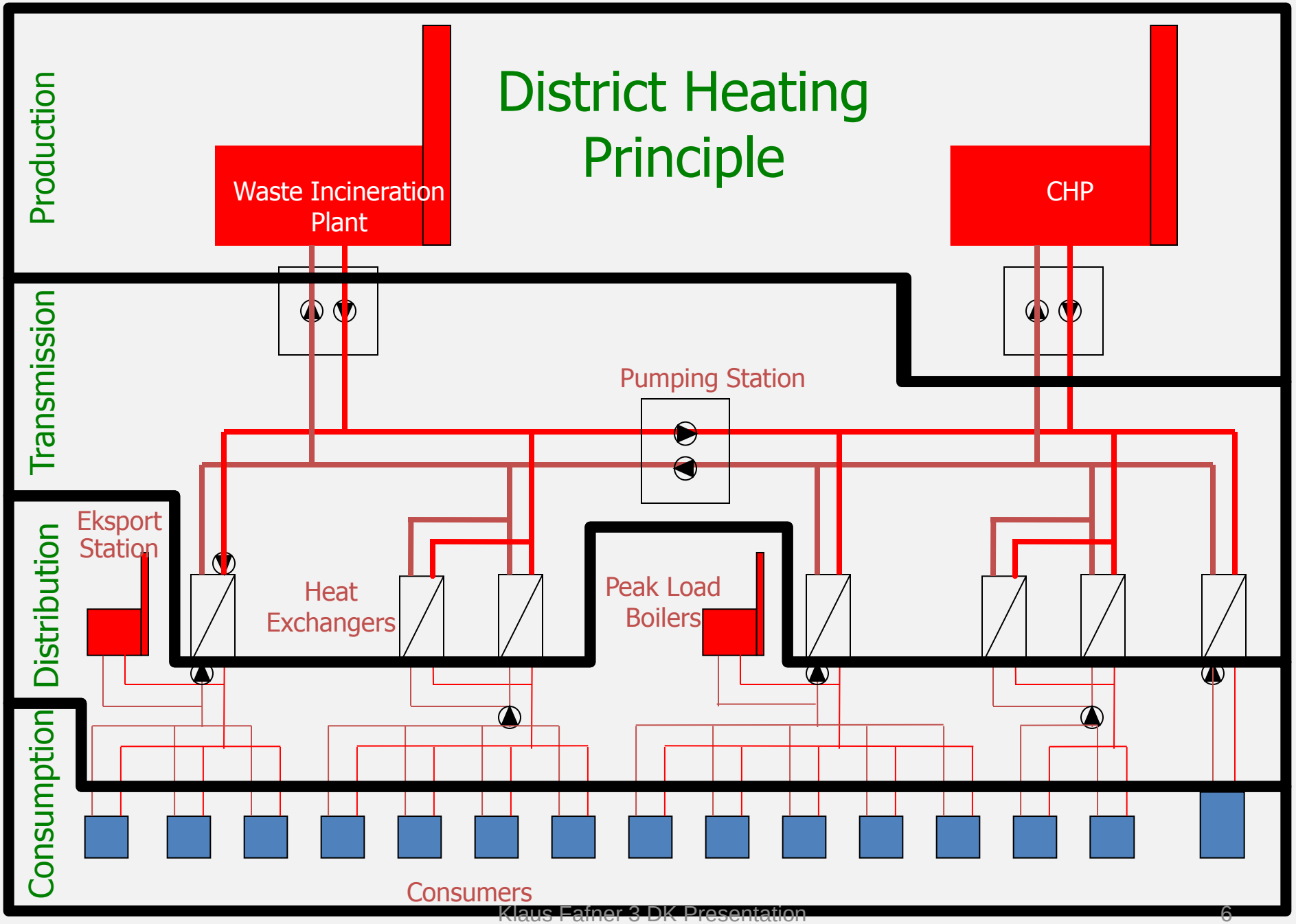
Danish District Heating Sector

- 5.4 million inhabitants
- 50,000 km. district heating pipes all over Denmark.
- 62 pct. of all houses DH-heated
- Average heat consumption: 8.3 MWh per person per year.
- District Heating = 17% of DK's final energy demand.
- Annual turn-over of DH: 2.8 Billion US$ (= ¾ % of GDP).
- Direct Employment = 10,200 persons at plants and suppliers (indirect employment = 25,000).

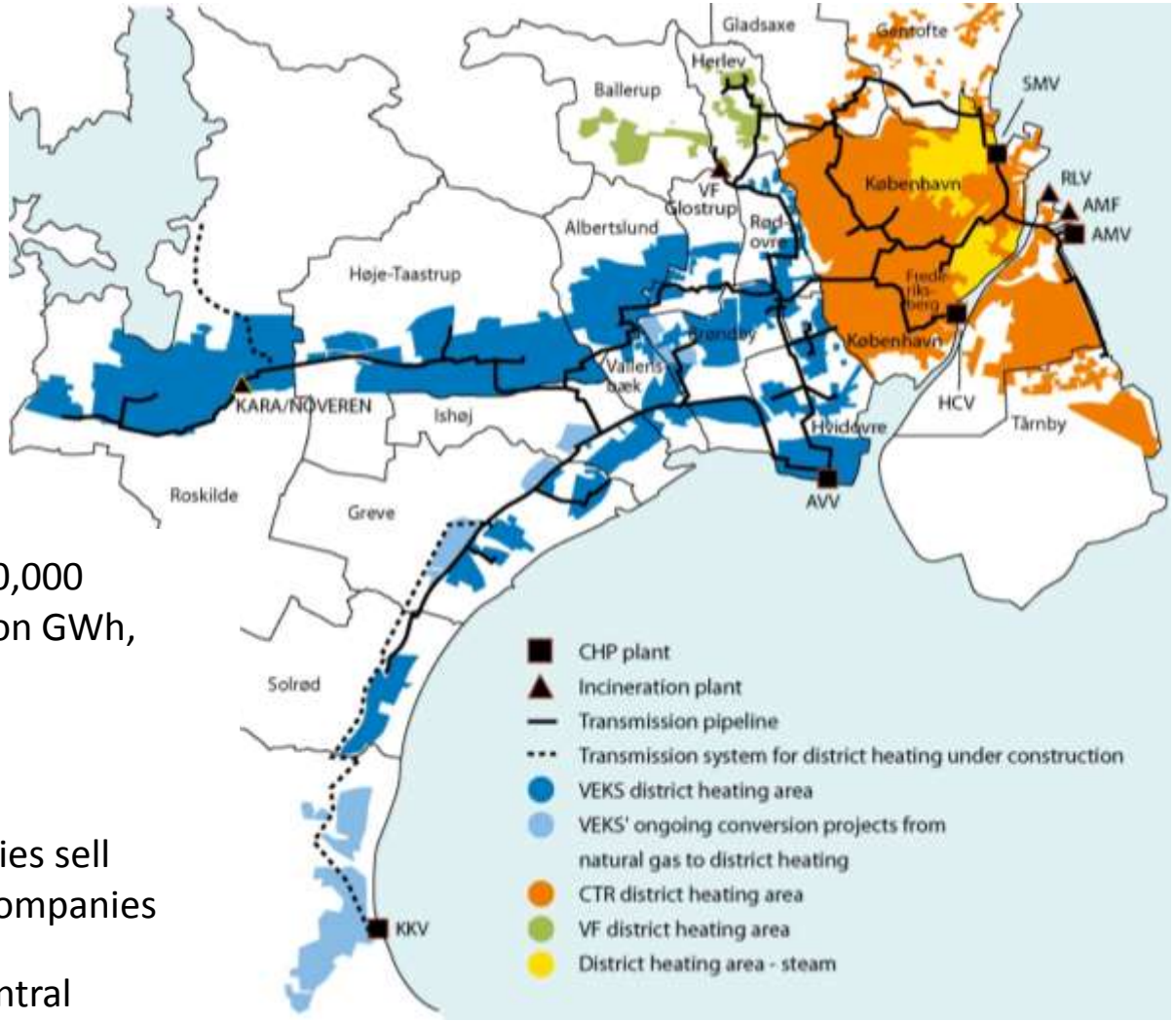
Danish District Heating Sector

- Till the 1980's most DH was produced as a by-product from electricity around the cities.
- In the 1980's and -90's most new DH was a main-product. Produced as DH or CHP in towns.
- The share of DH doubled from 1980. Today 1.7 mio. houses supplied with DH.



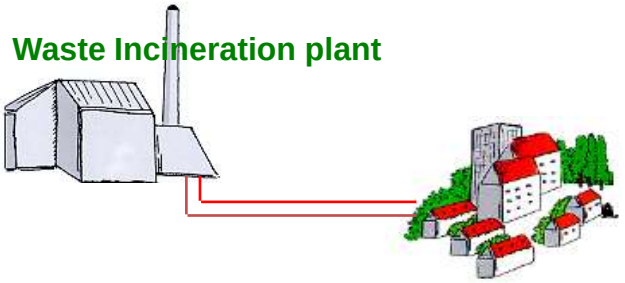

District Heating Principle
Production
Transmission
Distribution
Consumption
Waste Incineration Plant
CHP
Pumping Station
Eksport Station
Heat Exchangers
Peak Load Boilers
Consumers

Centralized and Integrated Systems
Example Capital Copenhagen

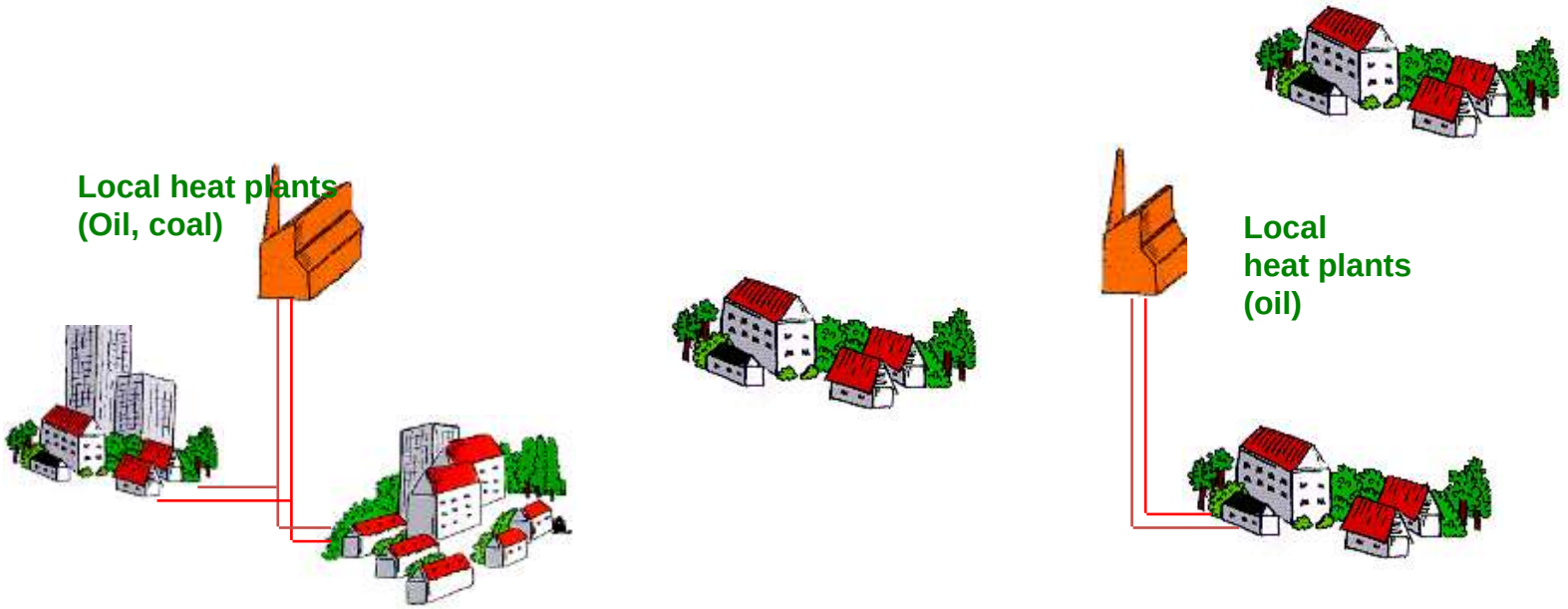


- 18 municipalities, 500,000 customers, 8,25 million GWh,
- 98% connection rate
- 4 integrated systems, transmission companies sell heat to distribution companies
- Pool system, large central producers, many peaking plants

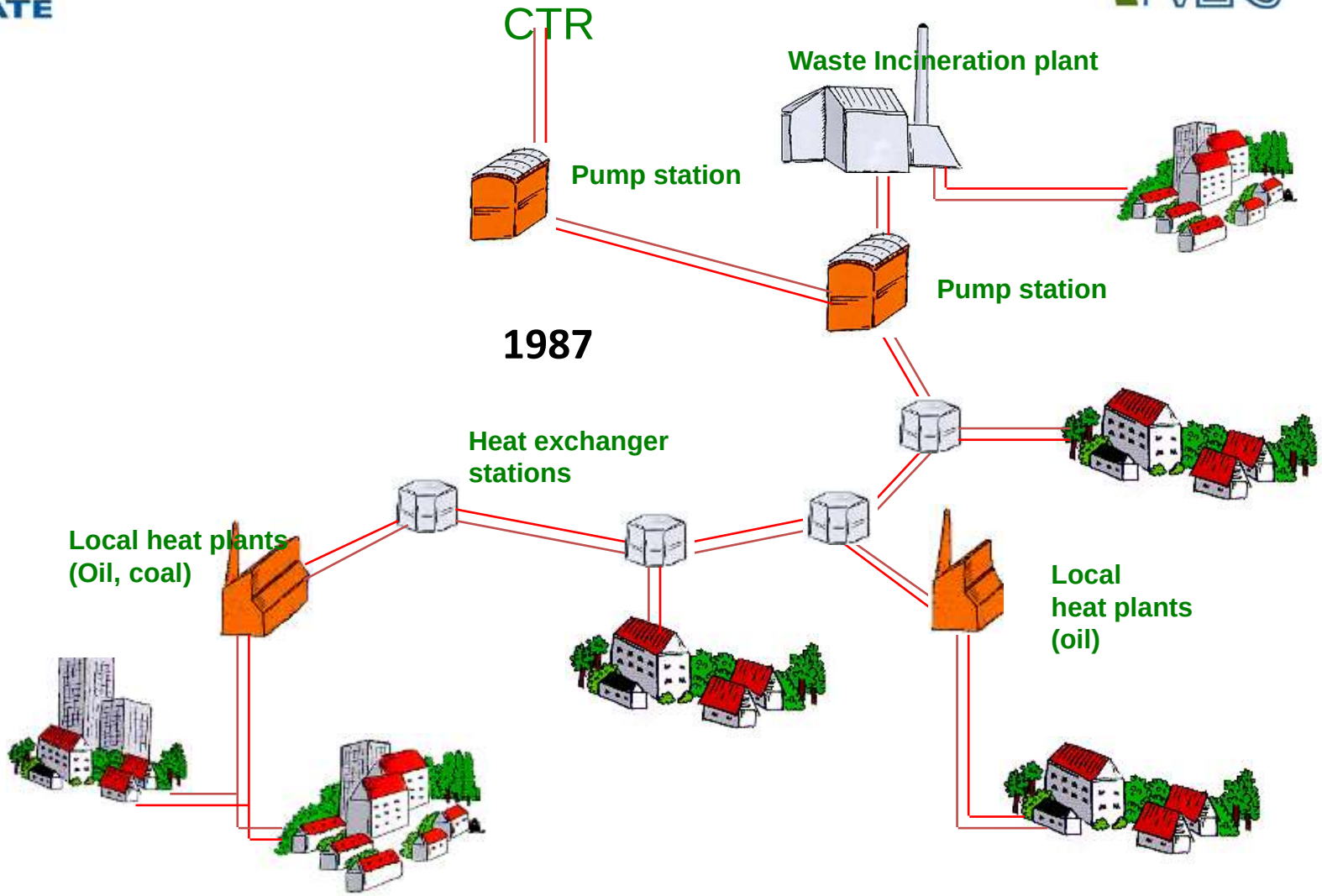
System Centralization and Integration
VEKS Phase 0



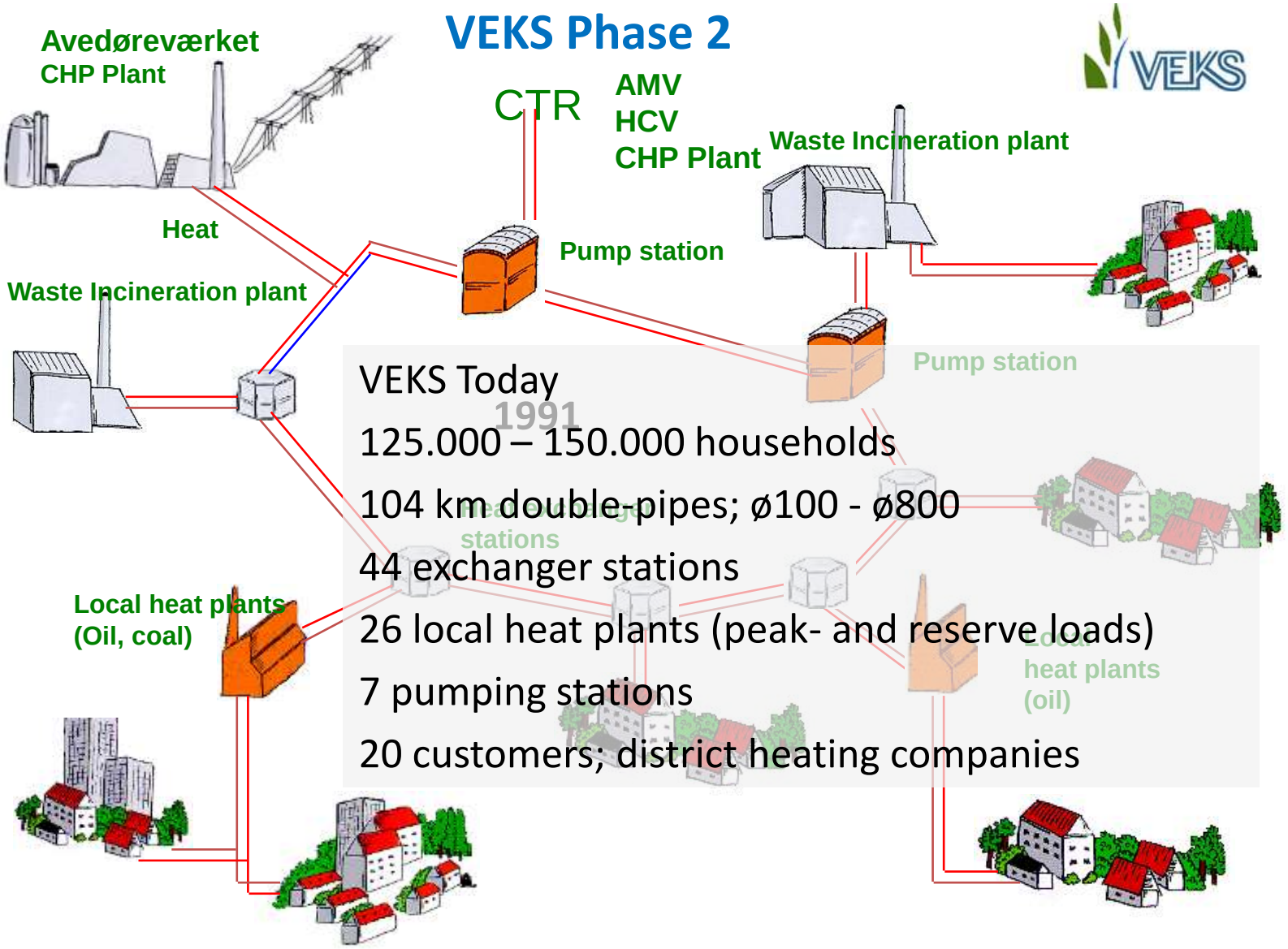
1985



System Centralization and Integration
VEKS Phase 1



System Centralization and Integration
VEKS Phase 2



VEKS Today

125.000 – 150.000 households

104 km double-pipes; ø100 - ø800

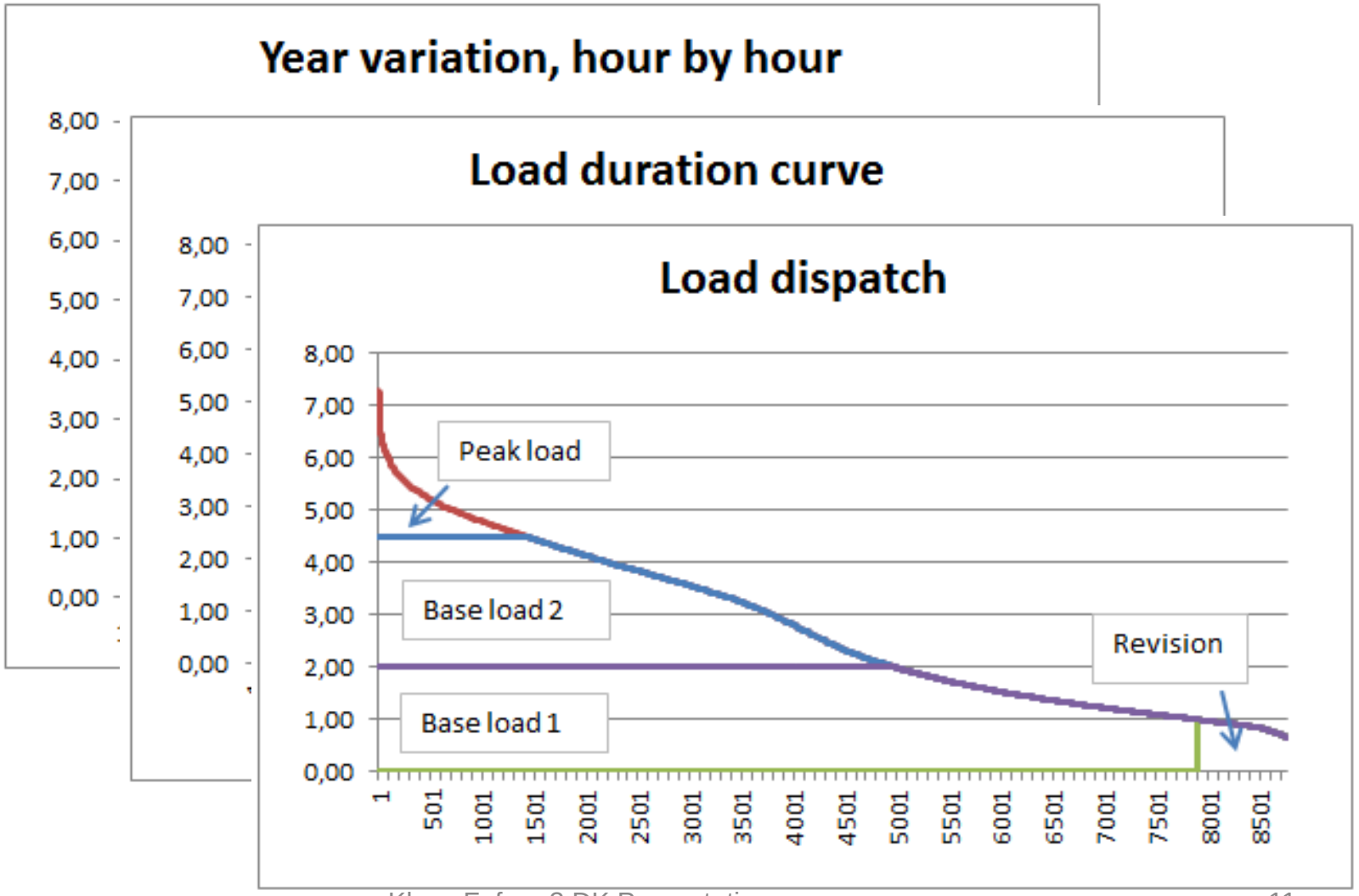
44 exchanger stations

26 local heat plants (peak- and reserve loads)

7 pumping stations

20 customers; district heating companies

Load dispatch
Variable flow regime



Heat Accumulation

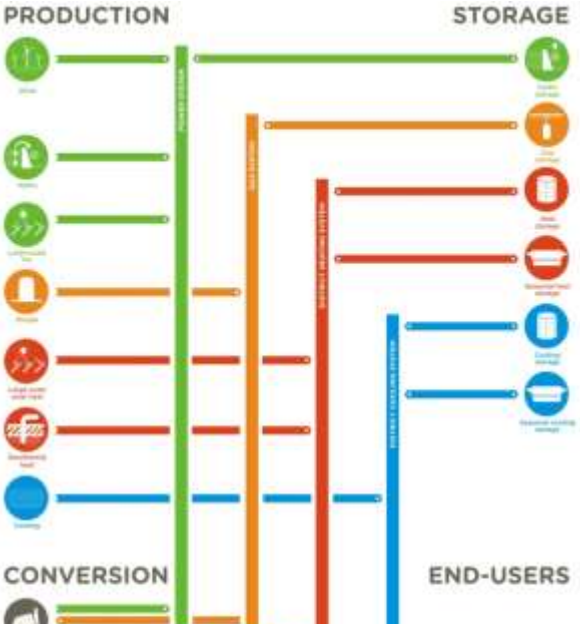
Practically all CHP plants in Denmark are equipped with heat accumulator

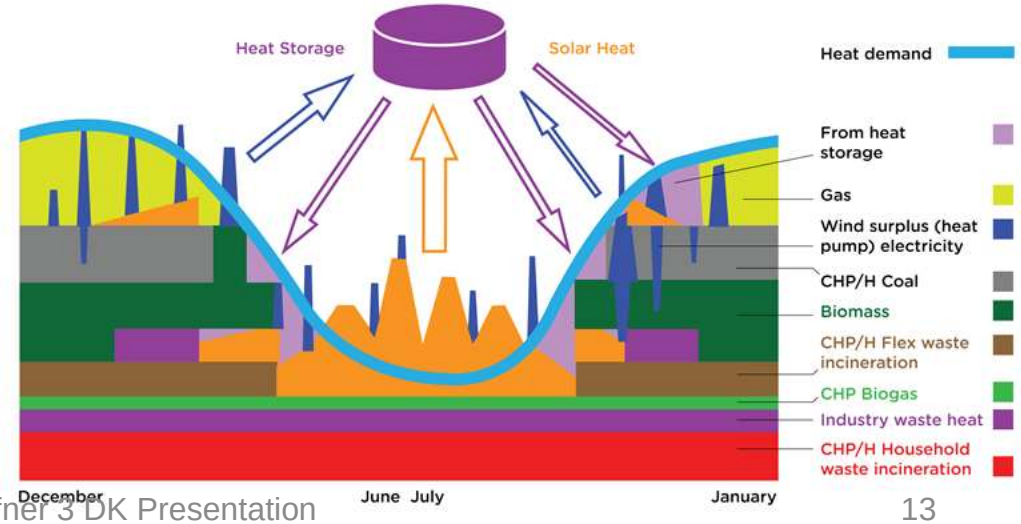
Heat accumulators at Avedøre Power Station.

Height 50 m, Diameter 26 m,
2 x 22.000 m3, 2x 2.000 Gcal,
Pressurized heat accumulator ,120 deg C

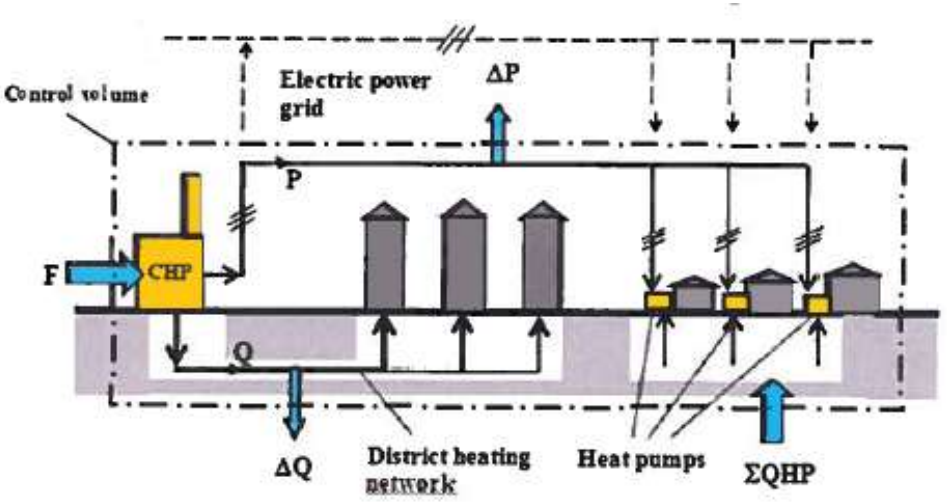
Source: Heat Plan Denmark, Ramboll

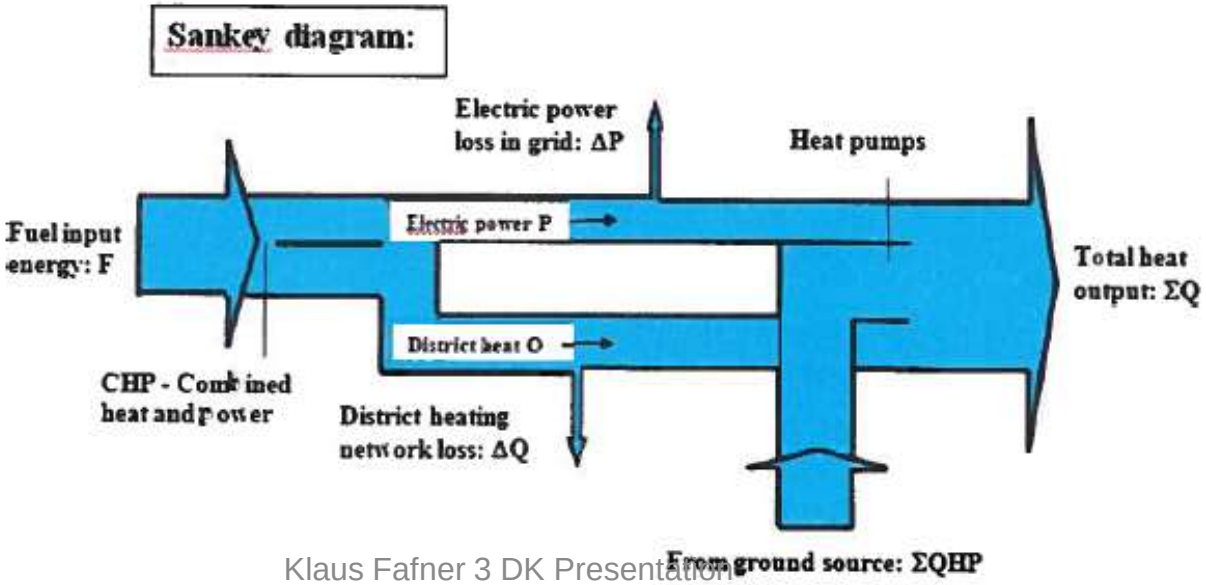
Smart Grid Systems



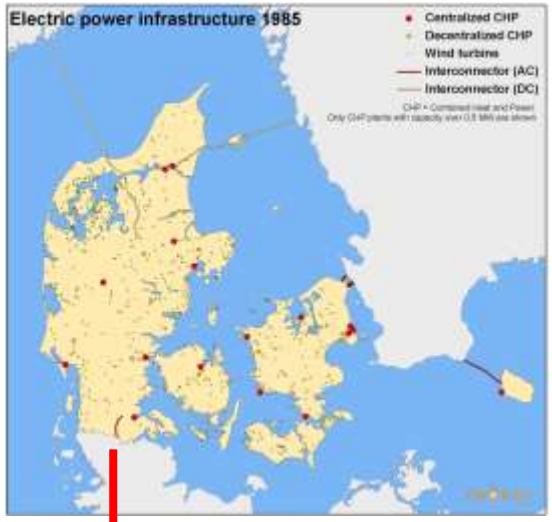


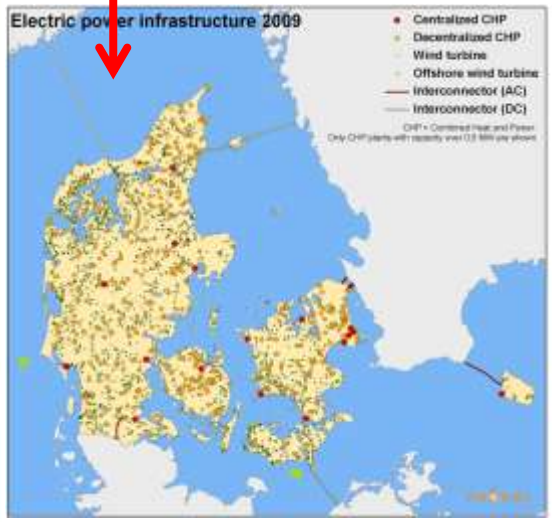
Coordination and Cooperation



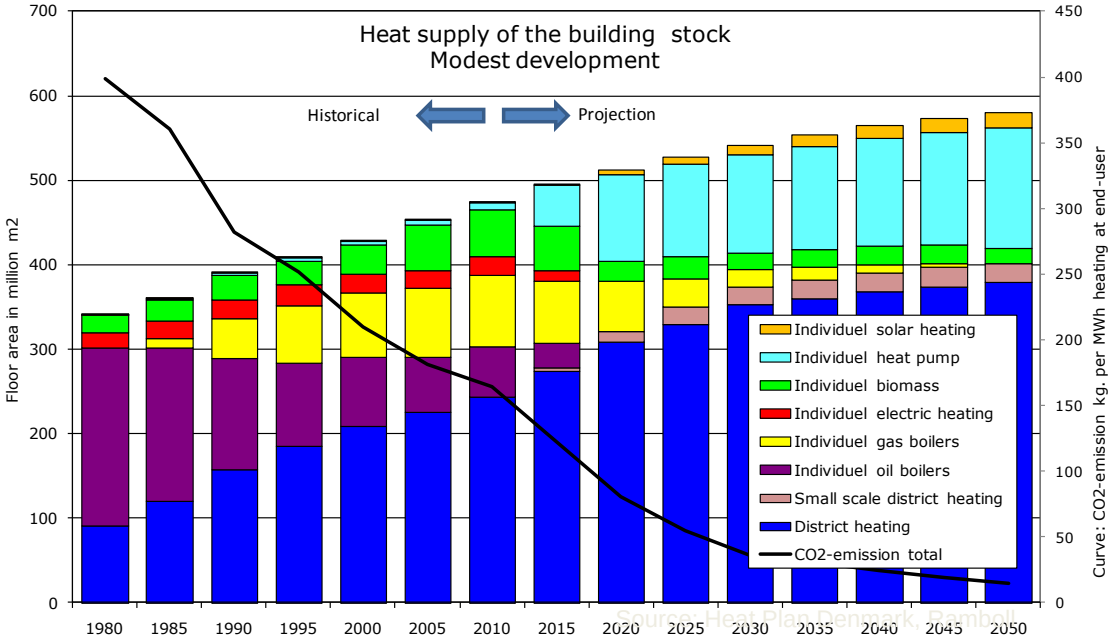


Roadmap to 2050 for Danish Heating Sector





Heating sector almost CO_2 neutral by 2030
Delivered through increased DH and heat pumps
Phasing out of individual boilers



Source: Heat Plan Denmark, Aalborg

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Roadmap to 2050 for Danish Heating Sector

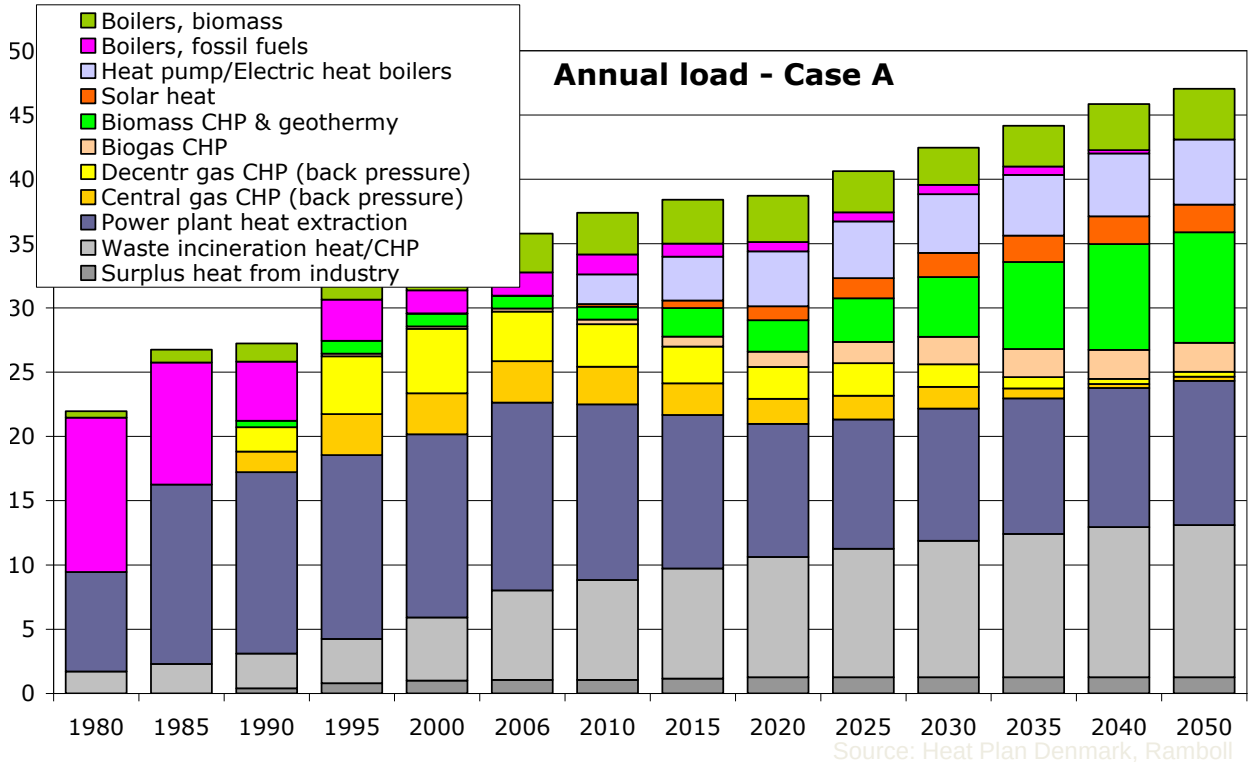
Waste incineration CHP and fossil fuel CHP continuing as predominant sources

Growth in biomass CHP, not biomass boilers

Deploying heat pumps and electric boilers to harness wind, geothermal and low grade industrial heat

Phasing out of gas engine CHP and fossil fuel boilers

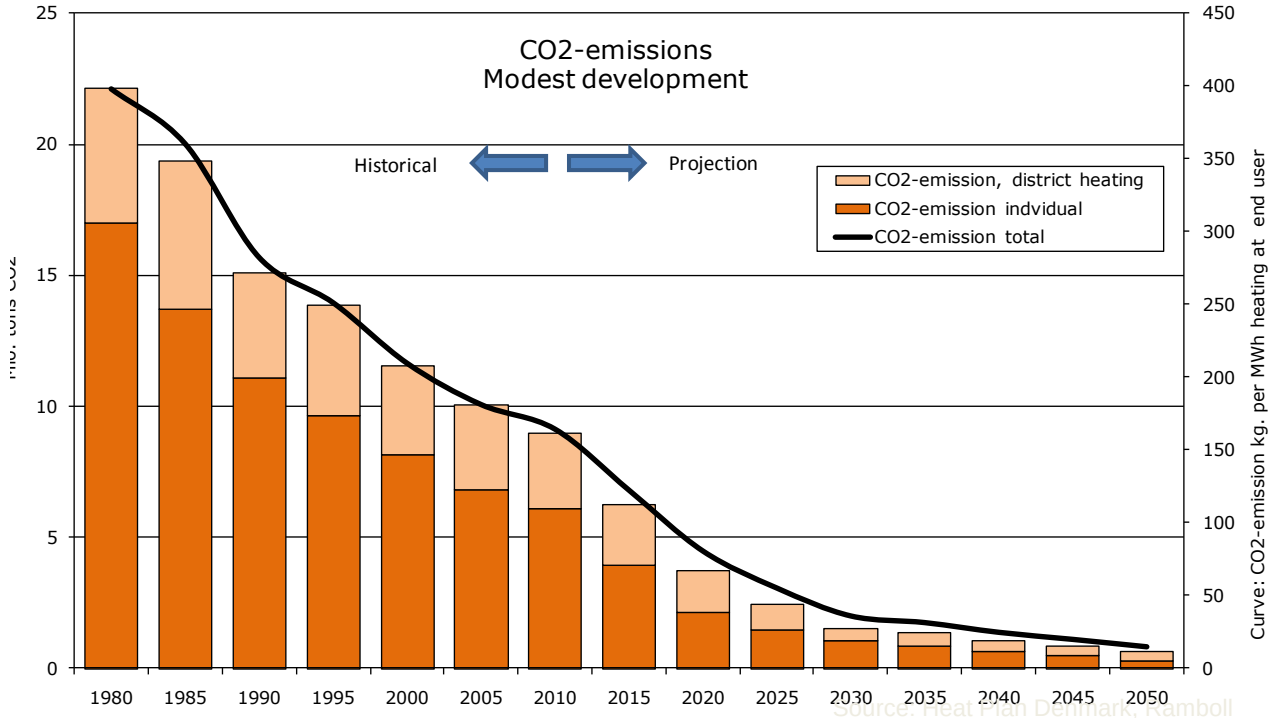
Solar thermal district heating



Source: Heat Plan Denmark, Ramboll

Roadmap to 2050 for Danish Heating Sector

Almost CO2 neutral in 2035



Source: Heat Plan Denmark, Ramboll

District cooling in Denmark

Downtown Copenhagen has district cooling today:
Major shopping centres, and banks with large server rooms among customers

Benefits include:
Space savings
No noise
Simple operation
Low environmental impact

Electricity savings potential:
60,000,000 kWh/year

Heat Planning in Denmark

Energy Infrastructure is **long term** investments

- Buildings ~ 100 years
- District energy ~ 50 years
- Power plants ~ 40 years
- Boilers ~ 25 years

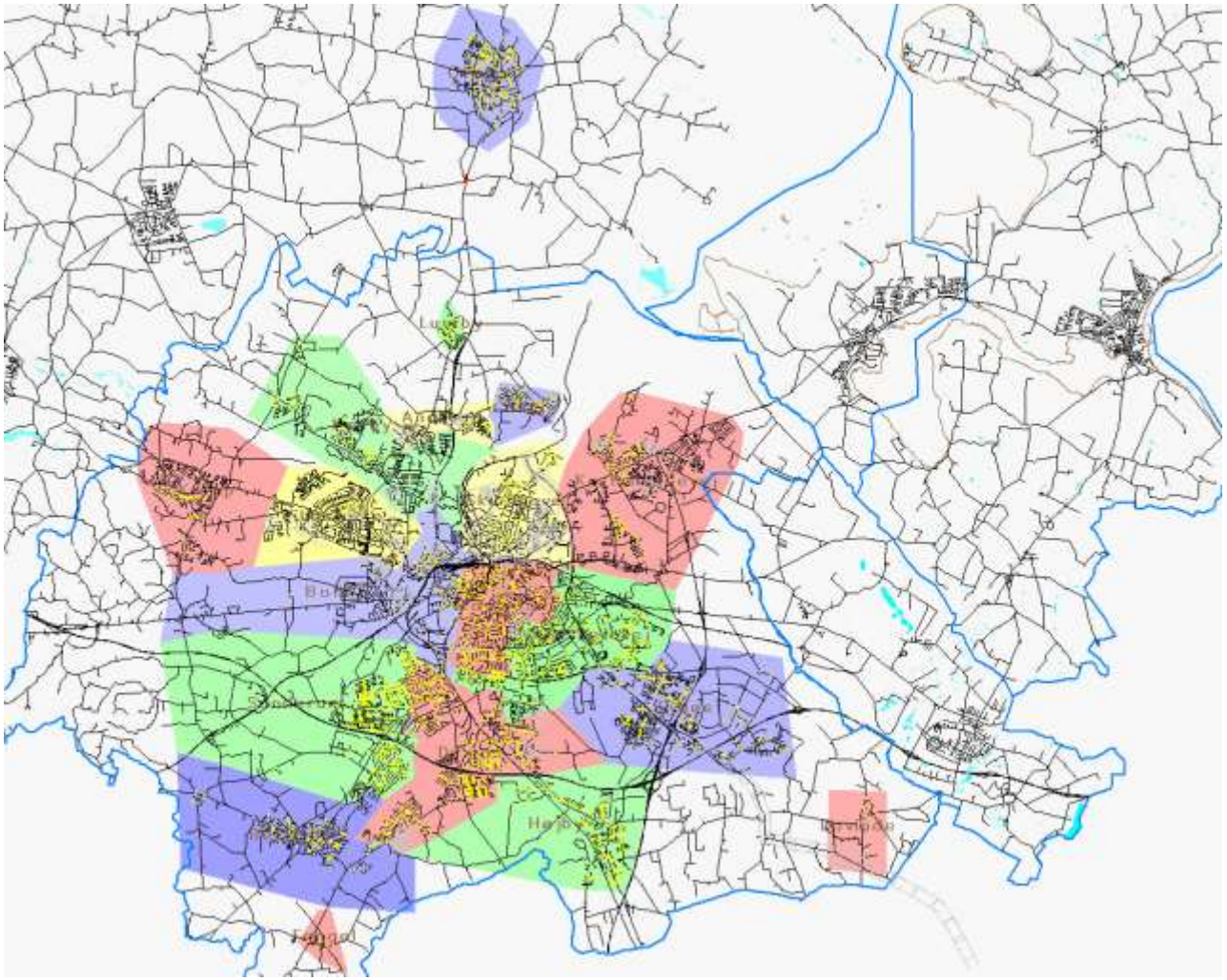
Political cycles are short ~ 4 years

- Political consensus needed
- Leads to stable frameworks
- Investor certainty

Cooperation usually leads to far better solutions!

It doesn't matter if you're smart and green,
we **all** have to be smart and green

Zones for Heat Systems in Denmark



Thank you for your attention!

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