

District Heating in Denmark

"Some would call it a Fairy Tail"

Frederiksberg, December 17th, 2009



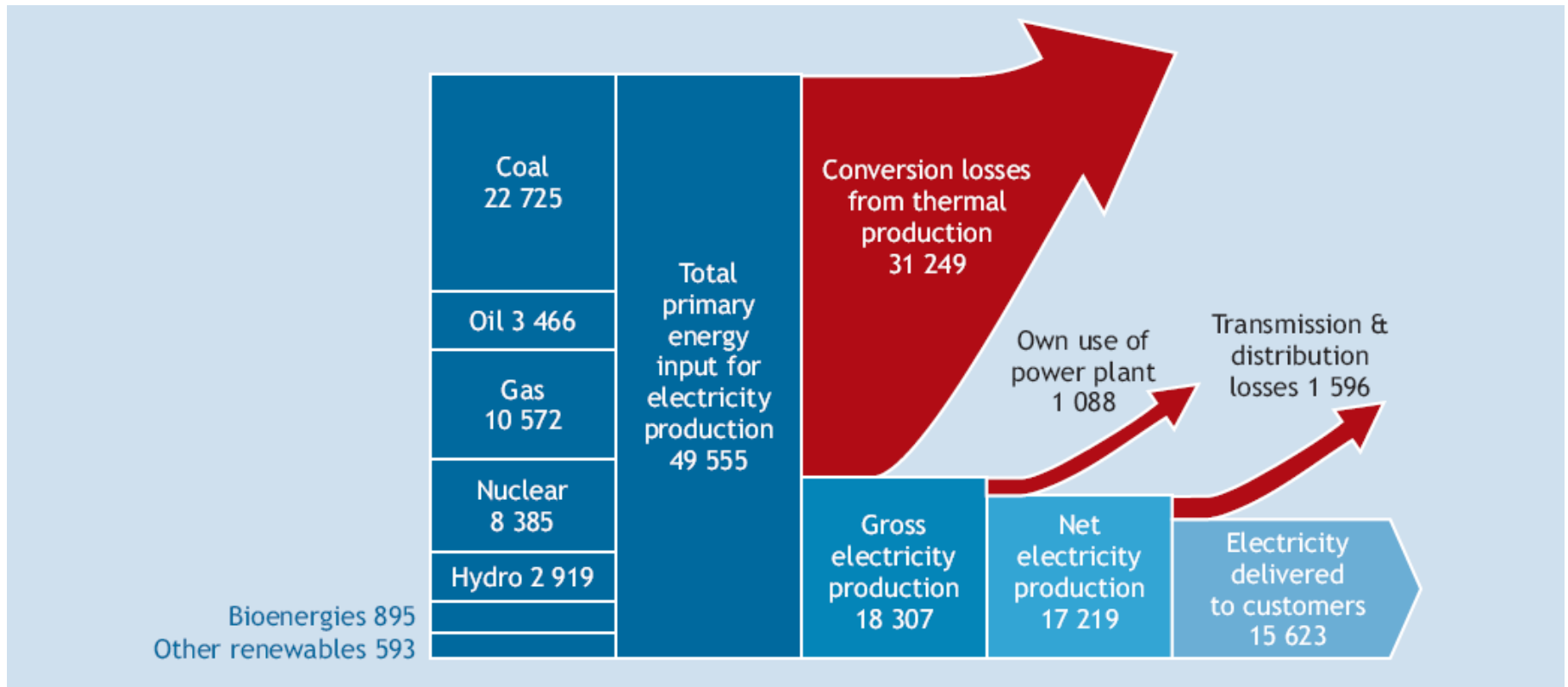
Jes B. Christensen
Managing director, DBDH

➤ DBDH – organises the sector



- Organization for leading actors in the District Heating and Cooling Sector
- Established in 1978 (- 2009)
- 40 members
 - (i) Manufacturers, (ii) Consulting Engineers and (iii) Utilities
- Magazine HOT|COOL
 - Quarterly Journal (subscribe and read online)
- www.dbdh.dk
 - 160,000 Monthly Hits
 - 5,000 Unique Monthly users

➤ Wasted Energy is a huge opportunity



Source: IEA, CHP: Evaluating the Benefits of Greater Global Investment (2008).

➤ “2/3 of the fuel we use to produce power is wasted – CHP can more than double this efficiency”, Executive Director Mr. Nobou Tanaka, IEA

➤ Denmark's Wake-Up Call was 35 Years Ago

- 1973-74 oil crisis
- 2 countries were 99% dependent on imported energy: Japan and Denmark (oil and coal)
- Supply situation exacerbated by inefficient energy use
- Sharply rising oil prices caused severe economic crisis and high unemployment.



A matter of national security and top economic priority to embark on new sustainable solutions



➤ Legislation in Denmark

➤ Energy Legislation

- 1976 – Electricity Supply Act
- 1979 – Heat supply act
- 1986 – decentralised CHP to promote domestic fuels, e.g. biomass
- 1990 – increase use of biomass by building new CHP and converting existing coal and oil fired CHP's to e.g. biomass
- 1993 – Concrete measures to increase use of biomass to 20 PJ/Year
- 2008 – Further increase use of biomass by 700.000 tons or 1,2 increase in total RE share



DONG Energy: Avedøre Combined Heat and Power Plant

▸ Legal Framework of District Heating

- Heat Supply Act sets frame for local decisions
- Municipalities have traditionally had the authority
- All DH companies are non-profit entities
- Prices = Sum of true costs (no local subsidies)
- DH company forwards the heating bills directly to the consumers – not via local government
- All consumers can complaint about irregularities or misuse of tariffs and prices to an independent state regulatory authority.

All DH companies must report on prices, budgets and delivery conditions to this authority

➤ Economic Incentives behind Development of Decentralized DH/CHP

- Investment grants for biomass DH and CHP (1981)
- Subsidies for CHP electricity (1984: RE/1992: NG)
- Financial support to establish or enlarge DH based on bio fuels or CHP on natural gas (1994).
- High energy tax and CO2 tax on fossil fuels for DH (1991) = Incentive to energy-efficient DH and co-production + conversion to environmentally friendly fuels.



All subsidies via state budget. The subsidies are cost-neutral for the state due to energy/CO2-taxes.

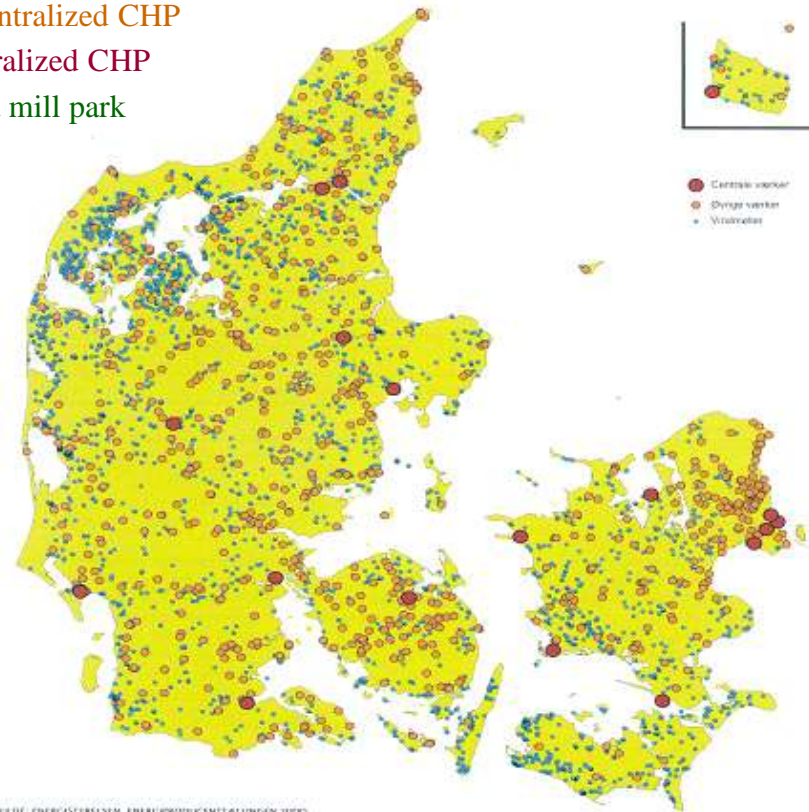
➤ From Centralized to Decentralized CHP

Centralized production in 1985

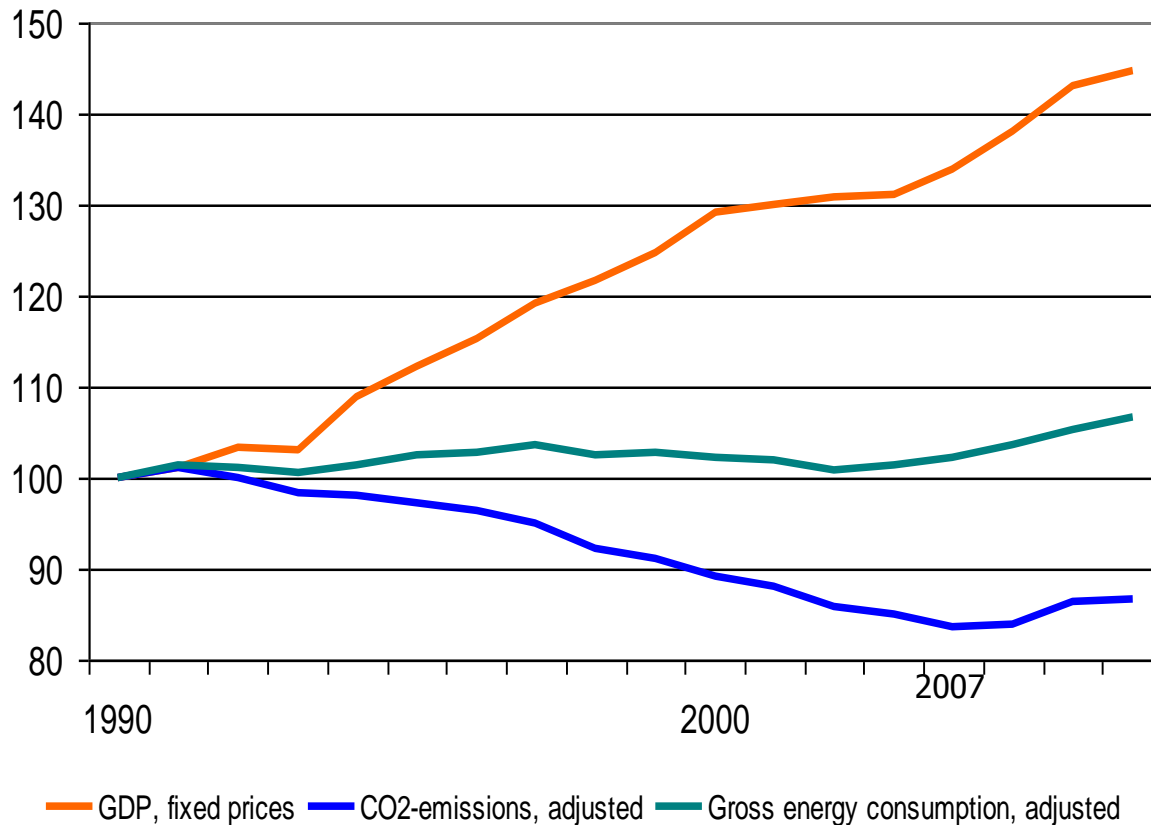
Decentralized production of today

Legend:

- Decentralized CHP
- Centralized CHP
- Wind mill park



➤ 'The Danish Example' – creates attention...

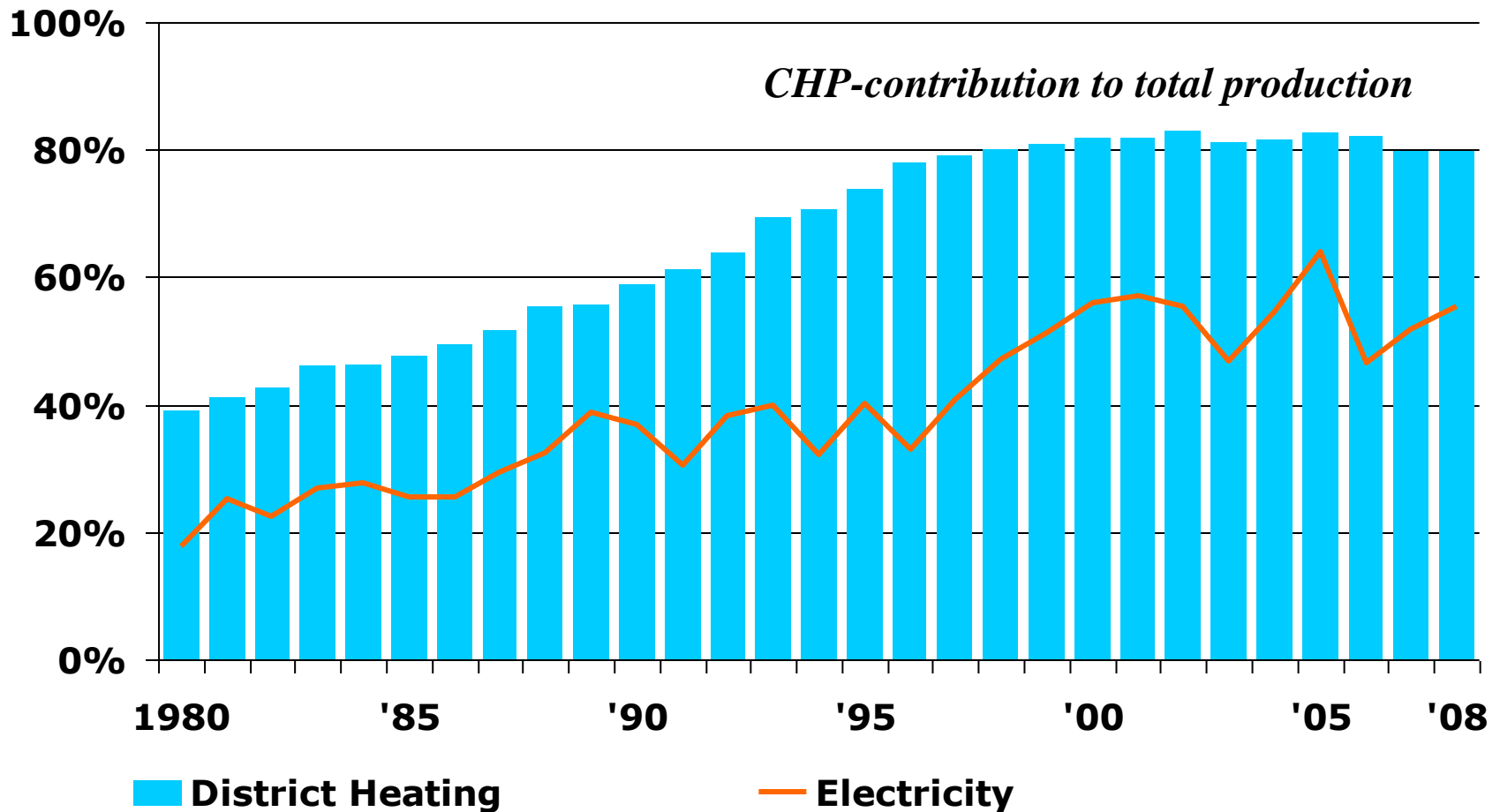


- In 25 years Denmark's economy has grown nearly 80 % with basically unchanged energy consumption.
- In 25 years Denmark has converted from being 98 % dependent on imported fuel to be the only country in EU that are energy self-sufficient.
- During the last 25 years the share of renewables in district heating has increased by 300 % to a total share of approx. 46 %

3 reasons: 1) CHP/DHC, 2) Energy Efficiency, 3) Renewables

Source: Danish Energy Authority

DH as Combined Heat & Power

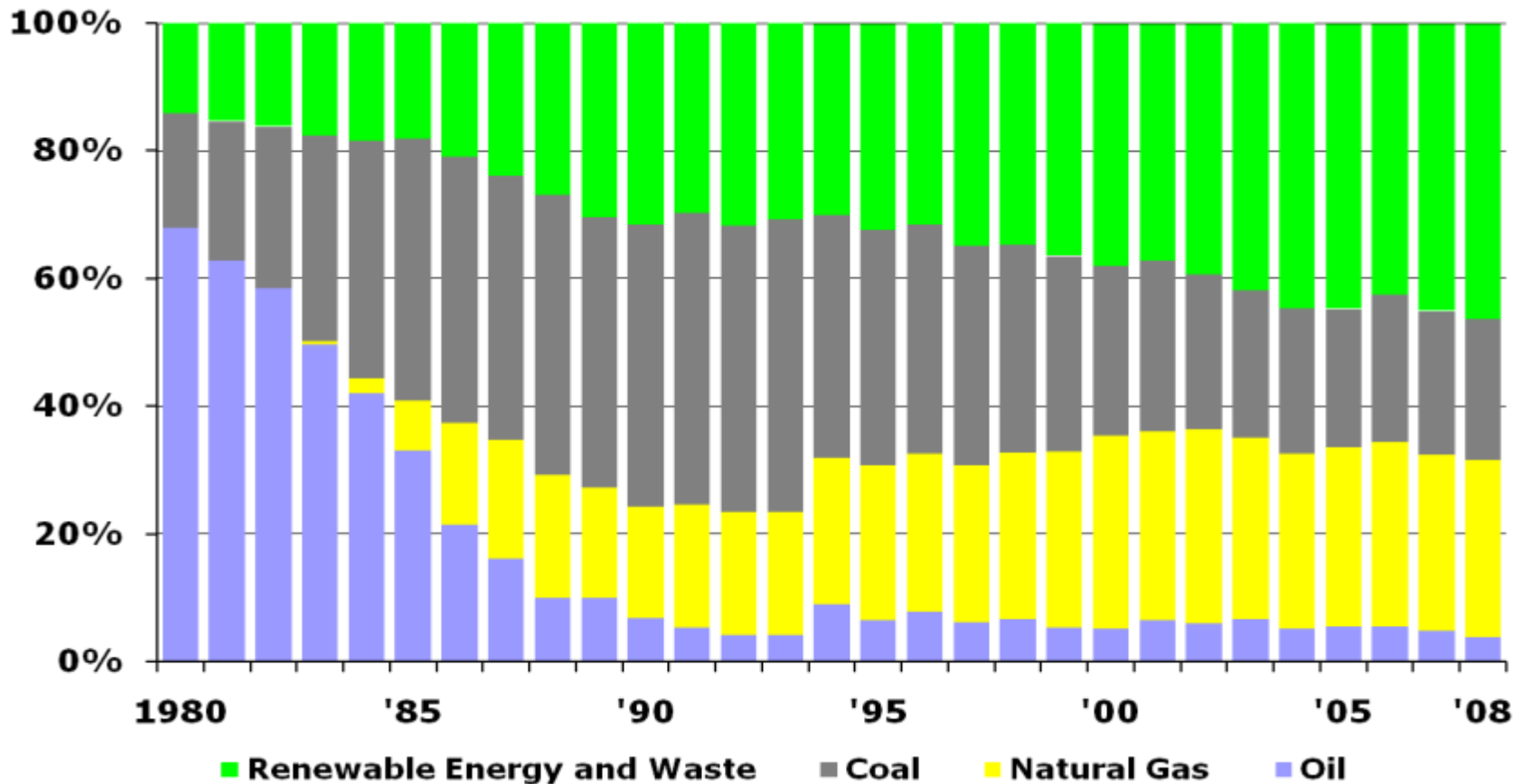


Source: Danish Energy Authority

CHP-share:

Electricity: 53% AND District heating: 81%

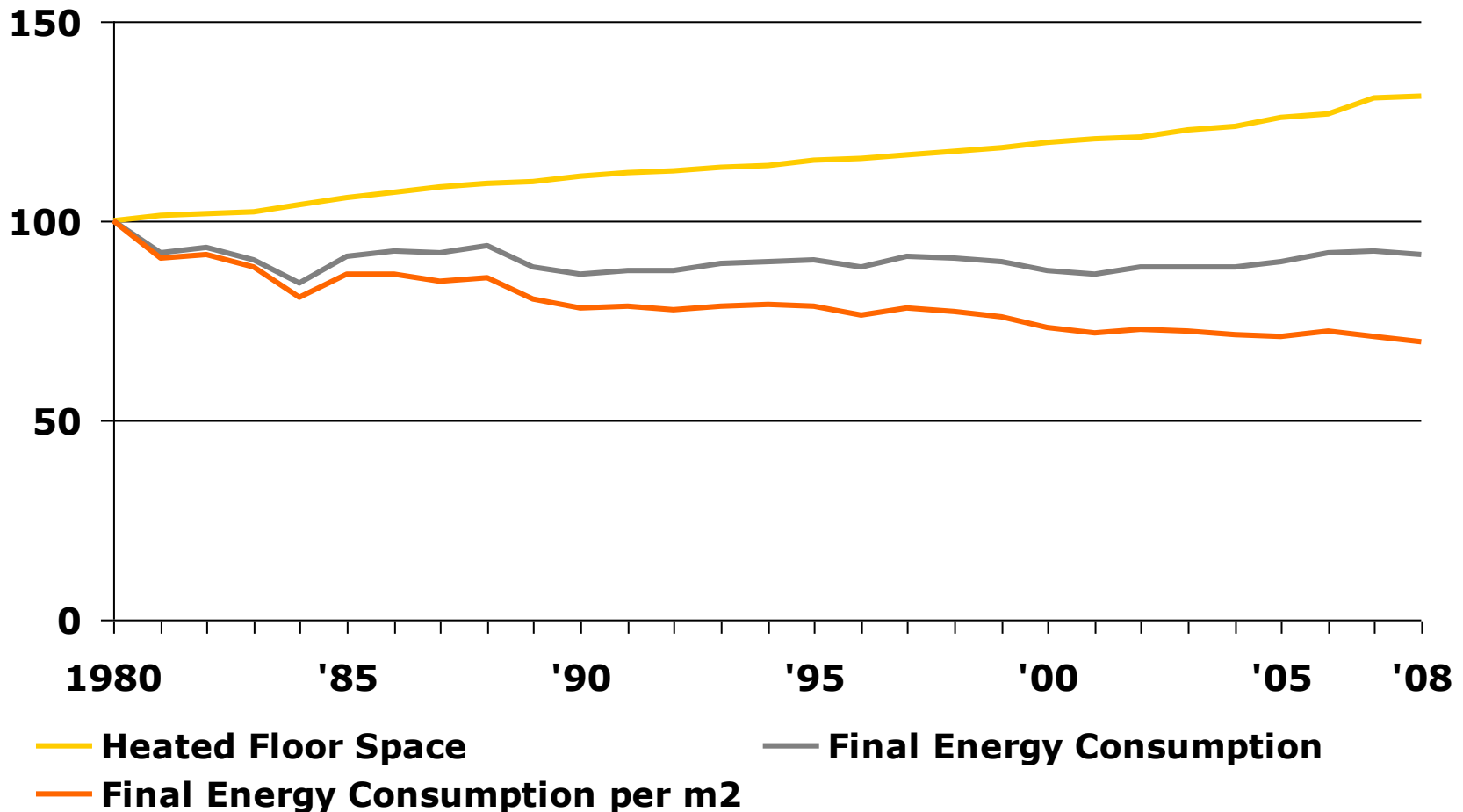
➤ District Heating Production by Fuel



District Heating = Heat supply for 60 pct. of all buildings.
 25% of all houses in Denmark are heated by biomass-based DH

Source: Danish Energy Authority

➤ The Heating Sector after Oil Crisis in 1973

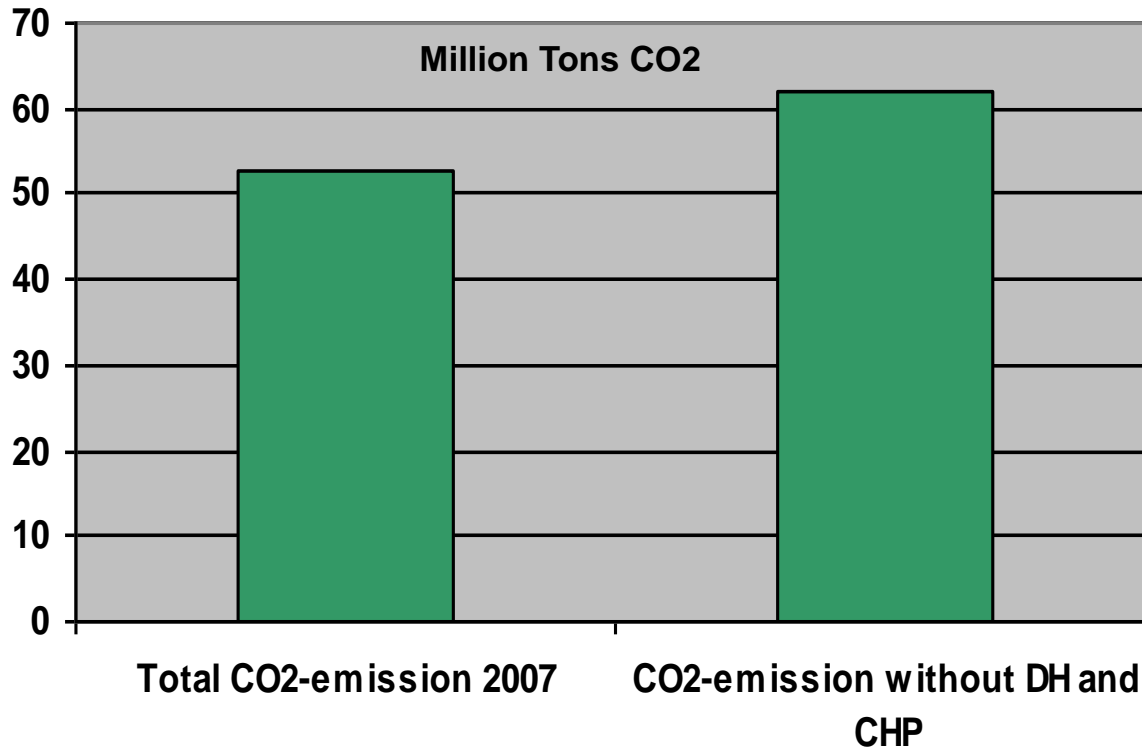


RESULT: Energy consumption per m2 reduced by 30% compared to 1980 and approximately 50% compared to 1970.

Source: Danish Energy Authority



Danish CO₂-reduction from DH and CHP



Denmark's CO₂-emission would have been 8-11 Million Tons higher without district heating and CHP.

District heating and CHP have reduced Denmark's CO₂-emission by 20%.

District heating/CHP is the most important factor behind Denmark's CO₂-reduction.

Danish Kyoto Obligation: CO₂ reduced by 21 pct. from 1990 to 2008-12
= Worlds most ambitious target for CO₂ reduction (Kyoto)

Source: Danish Energy Authority

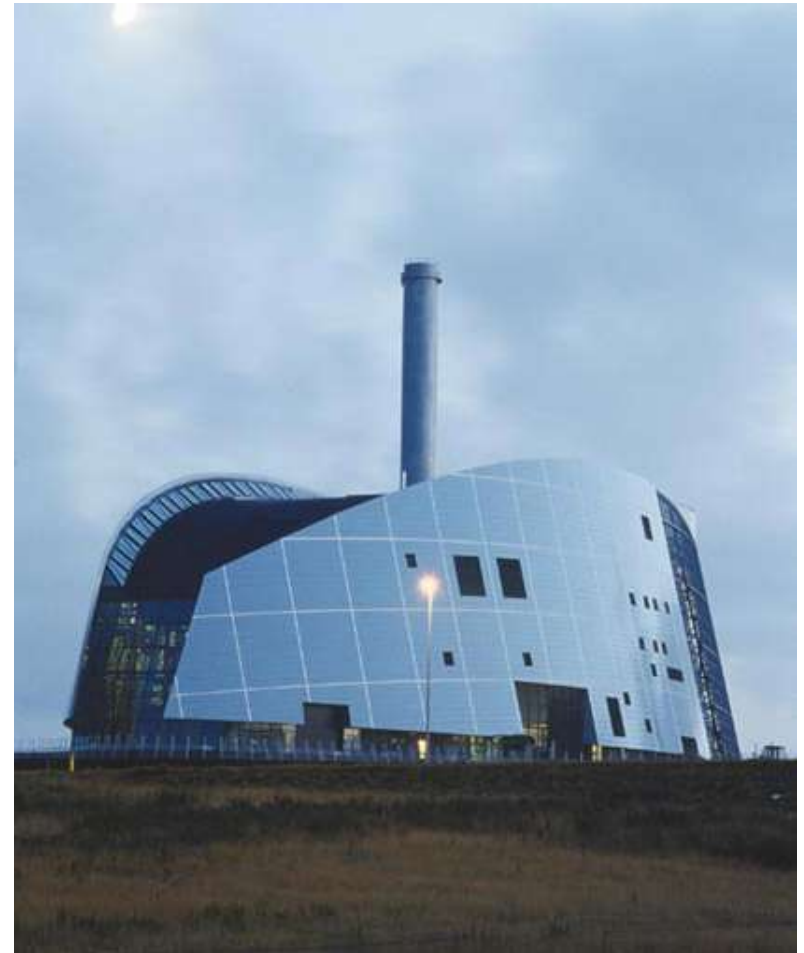
➤ Consumer Prices for District Heating

District heating is significantly cheaper than alternative supply:

- 97% of all district heating consumers pay less for their heat compared to heat from household-based oil stoves
- Compared to the cost of heat from an individual natural gas boiler, 87% of DH customers pay less (Jan.-Sep. 2008).
- On average the district heating consumers in larger cities pay around half the price compared to individual solutions.



DH consumer price averages
2,000 Euro (18.1 MWh/year)
= about 3% of HH income.



Statistics from Danish District Heating Association

➤ Today – 35 Years Later

Main Results - Denmark:

- Net exporter of oil and gas
- Lowest energy consumption per GDP-unit in EU
- Highest contribution to electricity from new renewables (non-hydro RE) in the world
- Most efficient clean coal technology world wide
- Leading nation of advanced energy solutions (district heating and CHP, wind turbines, biomass plants, energy saving technologies ...)





Thank you!

Source: www.dbdh.dk