

Local Success Stories

Country

Denmark

Copenhagen district heating

District heating is an important part of the energy infrastructure in Copenhagen and today more than 98 % of the heat demand in the City of Copenhagen is covered by district heating. District heating will remain the corner stone in a future energy system based on renewable energy. District heating system in Copenhagen started in the mid twenties and today a 1,500 km network provides heat for approx. 500,000 inhabitants.

The Greater Copenhagen area district heating transmission system and areas covered. (Source: CTR)

The system is part of the greater Copenhagen district heating system, which supplies the Greater Copenhagen area with energy efficient, reliable and affordable heat.

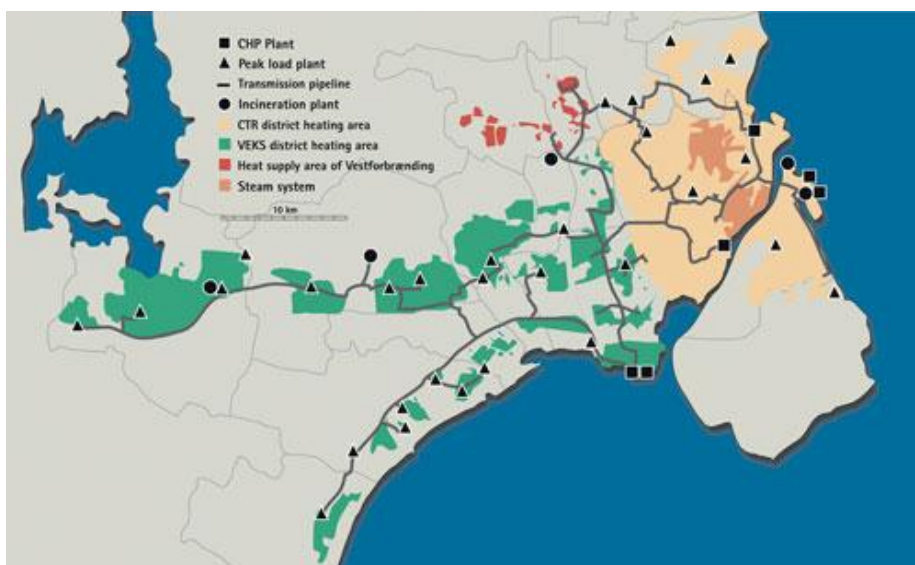
Heat consumption is around 33,000 TJ in all, a little more than half covers heat consumption in the City of Copenhagen. The heat comes from the CHP plants and waste incineration.

Municipal heat planning

The municipality of Copenhagen and its utility Copenhagen Energy have been the driving forces in the development of the district heating system. When heat planning was launched in Denmark in the 1970'ties, it involved both municipalities and district heating utilities. The heat supply act enabled municipalities to perform heat planning and make it mandatory for households to connect to district heating. Consumers saved on heating costs and saved energy and increased security of supply. In Copenhagen the Heat Plan Copenhagen was launched in 1984 and the municipality implemented an obligation to connect to district heating. Massive investments in district heating and CHP took place in the metropolitan area in the 1980'ties, with two new CHP plants constructed. The municipalities formed two companies, CTR and VEKS, to transmit heat from the new large CHP units to the expanding distribution networks.

When from the beginning of the 90'ties environment became the main concern, coal fired units at two CHP plant were converted to natural gas. This also reduced local environmental problems caused by the coal use. Further environmental benefits were gained when two of the CHP plants in greater Copenhagen converted to biomass.

Today increased use of biomass is supported by subsidies and the energy taxation system, which taxes fossil fuels but not renewables. This also supports the use of heat from waste incineration CHP plants. Waste incineration covers approx. 30 % of the heat demand in the City of Copenhagen.



Future developments

The City of Copenhagen has an ambitious plan to combat climate change. The city has already reduced CO2 emissions from all sectors by more than 20 % over the last 10 years, and now wants to reduce CO2 emissions by an additional 20% between 2005 and 2015, and further aims at becoming carbon neutral by 2025.

The energy sector is responsible for 75 % of the goal of 20 % CO2-reduction in 2015. Initiatives include: Renewable fuels to a great extent replaces coal at two CPH units and a new CHP plant on renewables might be added. Extra wind turbines will add green electricity green electricity and the district heating network is modernized to reduce heat losses. Geothermal heating should grow six-fold, and efficiency in waste incineration should be improved.

Reducing energy consumption is a priority in all renovation and construction projects, and all new neighborhoods in Copenhagen Municipality are 'low energy areas', required to comply with the strictest standards of the building code.

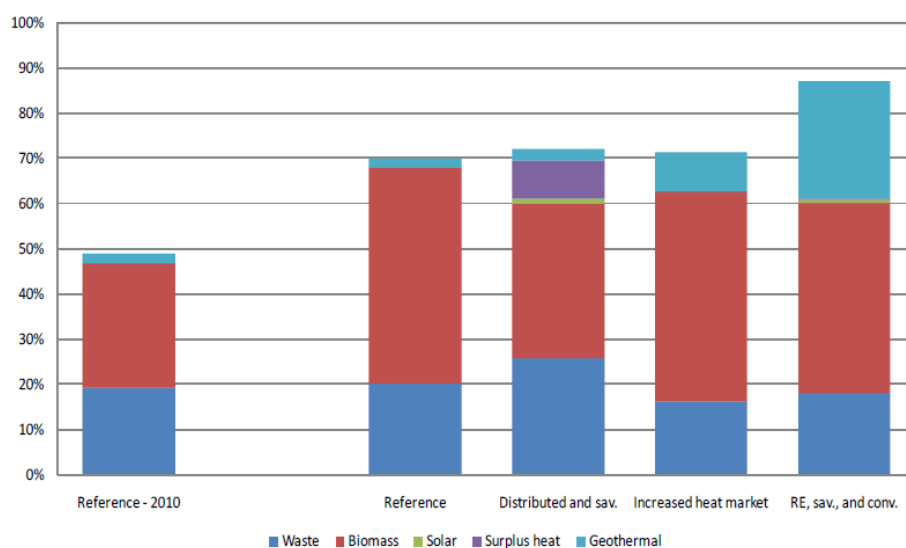
Heat plan updated

The new Heat Plan Greater Copenhagen from 2009, prepared by Copenhagen Energy together with the transmission companies CTR and VEKS, covers the entire metropolitan area. It uses 4 scenarios for the heat supply system in the metropolitan area by 2025, based on present and future regulatory framework and an evaluation of future technologies, to demonstrate possibilities.

Reference scenarios:

- The applicable legislative framework and decisions are maintained.
- Distributed and savings scenario: Ambitious heat savings in buildings (25 percent in 2025), heat pumps, solar heat for district heating. Two smaller CHP plants closed, district cooling.
- Increased heat market scenario: Conversion from individual natural gas based heating to district heating, geothermal energy, surplus industrial heat, additional district cooling.
- RE, savings and conversion: Heat savings (25 percent in 2025), conversion from individual natural gas to district heating, geothermal energy (3 large plants), additional district cooling. This is a combination of the two scenarios above, but with reduced dependency of biomass.

A further Perspective scenario – 2050, with 100 percent RE, all existing CHP plants gone, but two new high efficient CHP plants. Increased heat savings and focus on geothermal energy and heat pumps for district heating.



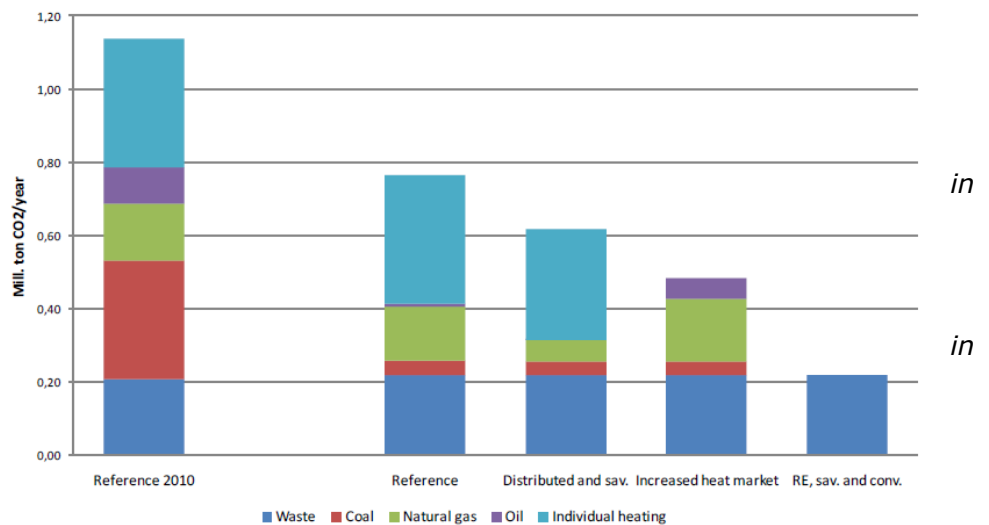
The percentages of renewable energy in the four scenarios in 2025, and the fifth in 2050 compared with the expected percentage in 2010 (Source: Heat Plan Copenhagen)

The analyses shows it will be both possible and economically feasible to rapidly and massively convert from coal to biomass in the existing CHP plants. Such a

conversion should be followed by a gradual long-term conversion to other kinds of renewable

energy in the system, as experiences with these technologies are obtained. Utilization of geothermal energy can reduce dependency on biomass in the system.

CO₂ emissions in the four scenarios in 2025, divided into types of fuel and compared with the expected emissions 2010. In the first scenario, the emissions from the individual heat supply are included in the calculations, unlike the third and fourth scenarios, where these households are supplied with district heating. (Source: Heat Plan Copenhagen)



The Heat Plan Copenhagen is a formally binding heating plan, but indicates a number of possible actions that can be taken.

Municipalities and heat companies

According to the plan, local authorities and heat companies should focus on converting heating districts from natural gas to district heating as heat supply, and on achieving heat savings with end-users. The aim must be to ensure a long-term drive to cost-effectively reduce heat consumption. New energy sources for district heat production, including geothermal plants and solar heating must simultaneously be developed by energy producers and district heating companies, in order to reduce the long term dependence on biomass.

Preconditions

A stable, consistent energy policy, that enables long term investments in the district heating system, must be developed and maintained, if the plan and its possible reduction in CO₂ emission are to be realised. That includes a energy taxation system that favours renewable energy, strong regulation to achieve heat savings in connection with renovation and urban development and an energy research and demonstration program for new technology in district heating.

PART 3: Local success stories

Country

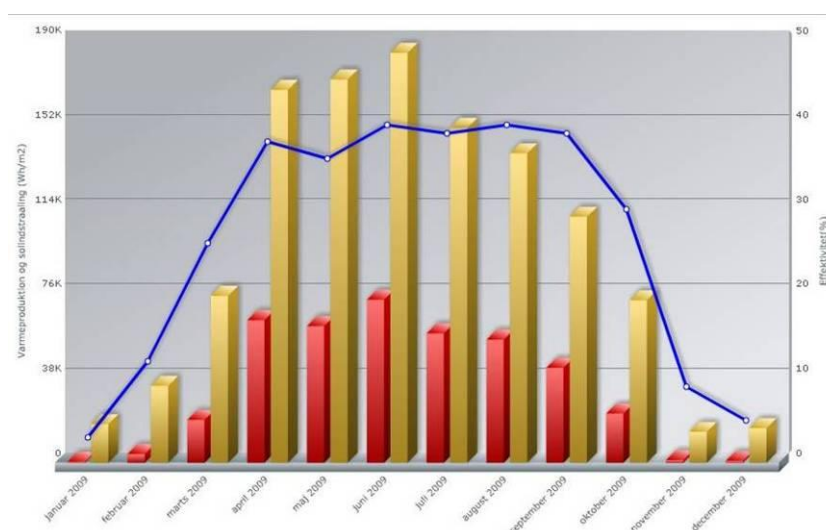
Denmark

Brødstrup district heating

Brødstrup Fjernvarme a.m.b.a. (Brødstrup District Heating, cooperative with limited liability) is directly owned by the district heating consumers in Brødstrup. The company owns the network and heat meters and delivers district heating to almost 1.400 households, and covers around 95 % of the heat demand in the town. Supply temperatures are between 72°C in summer and 80°C in winter, and all heat meters are remotely read at years end. General assembly is held once a year, mostly in March, and all members of the cooperative have access. Brødstrup Totalenergianlæg A/S (Brødstrup Total Energy Ltd) is a full owned subsidiary that owns the production facilities that produces approx. 45 GWh heat for the district heating network approx. 30 GWh of electricity, which is sold to the grid. Part of the production takes place on two 18 cylinder engines using natural gas. Another part of the heat production takes place in gas boilers and an 8.000 m² solar array. In many ways, a typical Danish district heating company.



It is the stated ambition of Brødstrup Fjernvarme to "(..) operate plant and distribution network technically, economically and environmentally at an optimum to produce energy(..)". This led the company to decide at the general assembly in 2006 to invest in a major solar panel installation. Financial support was received from the national TSO (€480.000), and installation took place in 2007 and the array was inaugurated August the same year.



Solar heat production from the 8.000 m² solar array was 3,229 GWh in 2009. Graph shows solar radiation pr m² (yellow), heat production pre m² (red) and degree efficiency (blue, left axis) per month. Source: Brødstrup Fjernvarme)

Next project is to expand the solar array to more than twice the size of the existing, and to develop a heat storage based on 100 holes in the ground, each with a pipe loop, wher surplus solar heat can be stored and extracted later with the help of heat pumps. Financial support has also been applied for and received for this experimental project to the sum of €850.000. If it goes well, further expansion is foreseen.