The Swedish policy case for Cogeneration and District Heating

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Swedish Energy Agency

National snapshot of DH and CHP

IEA, Paris, 2013,12-13 February

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Purpose and scope of presentation

- **Overview of the Swedish district heating market.**
- **Overview of the Swedish development of combined heat and power generation.**
- **How cogeneration and district heating has developed as a consequence of *political goals and policy instruments.***

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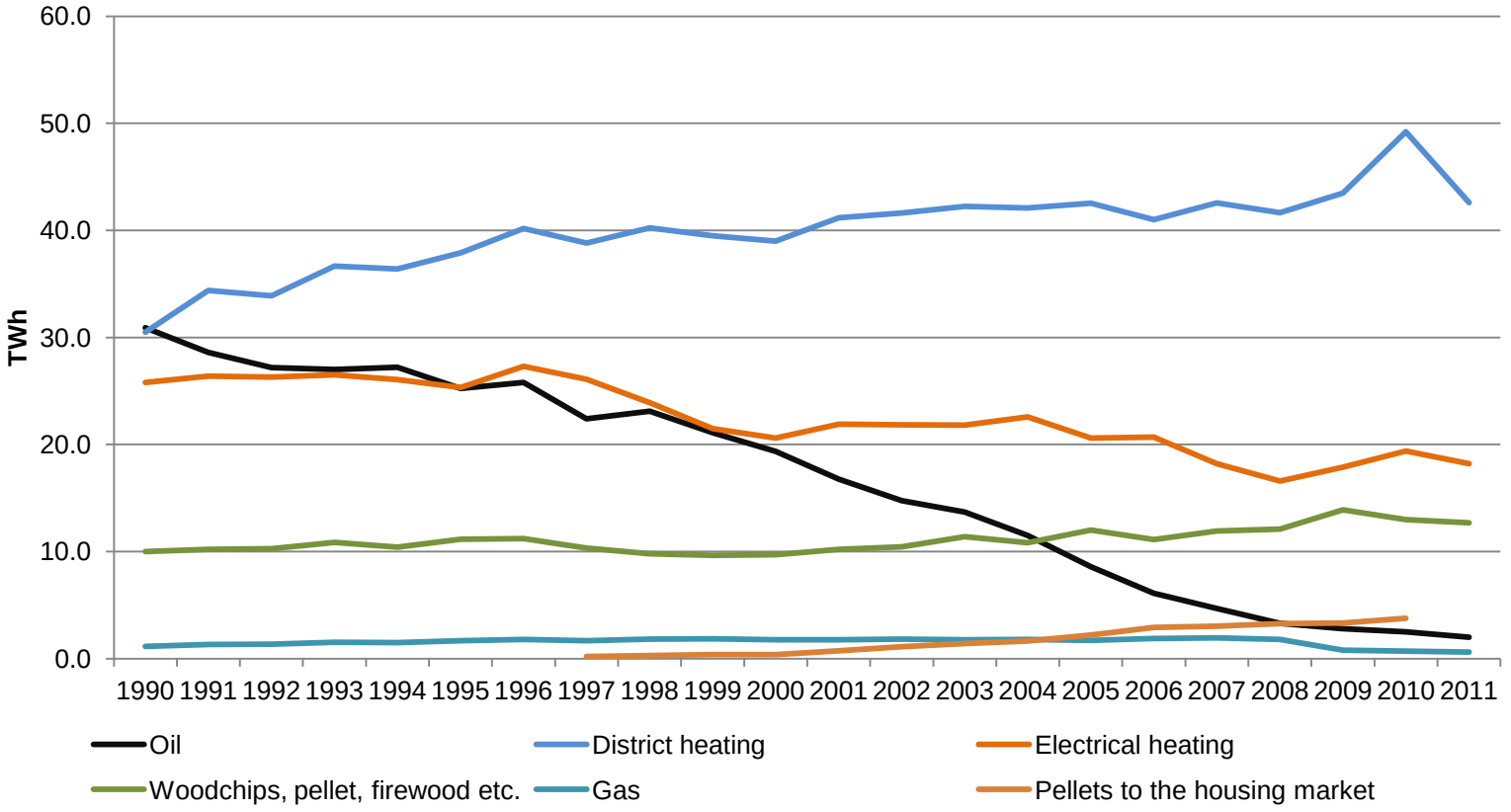
Energy usage in the residential sectors, TWh



- Oil usage is down with 90 per cent since 1990
- Electricity used for heating is down with 30 per cent since 1990
- District heating is up with 40 per cent!

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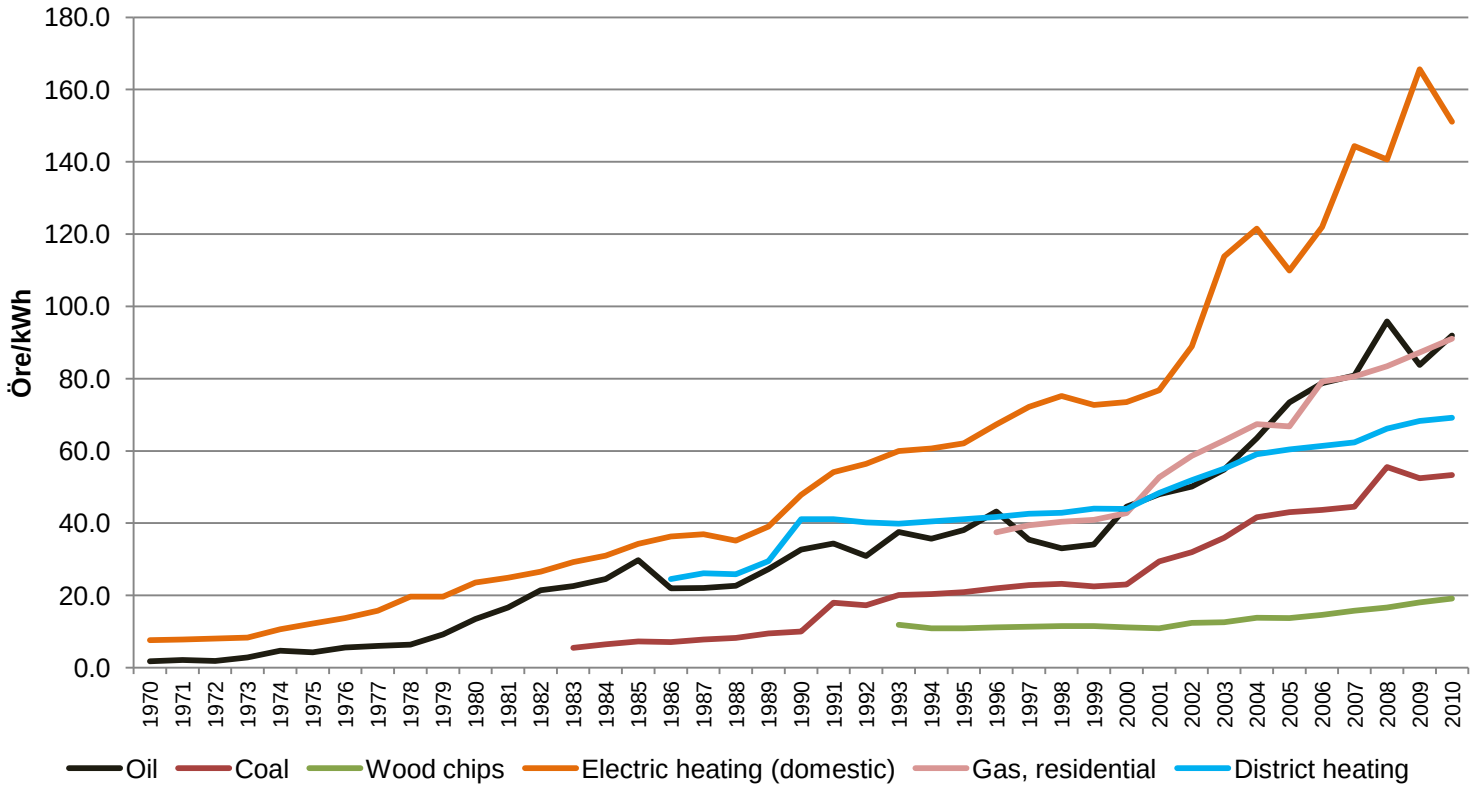
Source: SCB and Swedish Energy Agency

Actual commercial energy prices in Sweden (taxes included) 1970–2010, öre/kWh



- Soaring electricity prices has been a driver for CHP development. (Electricity prices have doubled in 10 years!)
- District heating prices increasing more sharply since 1996

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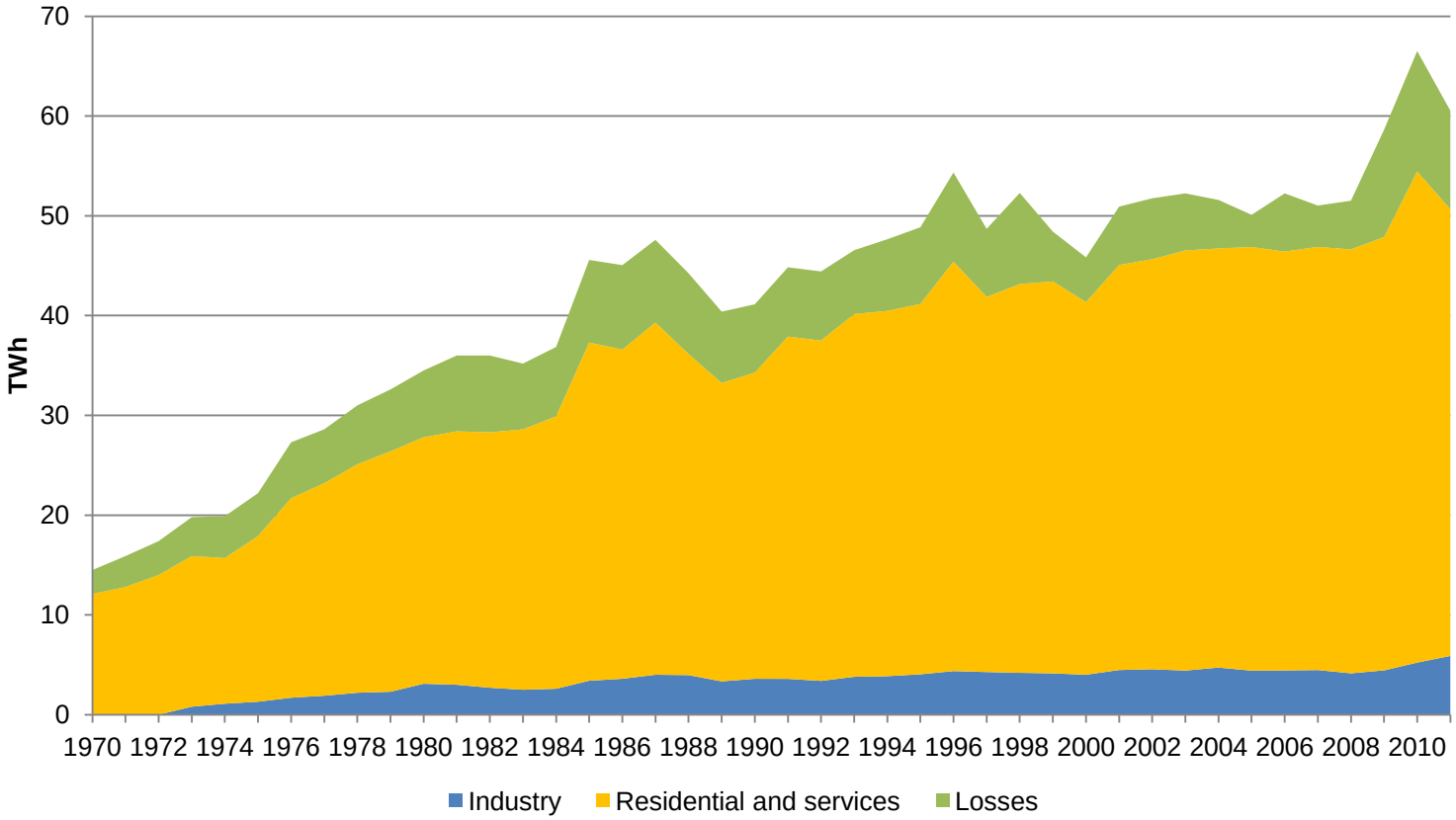
Source: SCB and Swedish Energy Agency

Usage of district heating,1970-2011,TWh



- Usage primarily in the housing sector
- Share of losses has diminished from around 19 per cent in the 1980s to around 11-12 per cent today.

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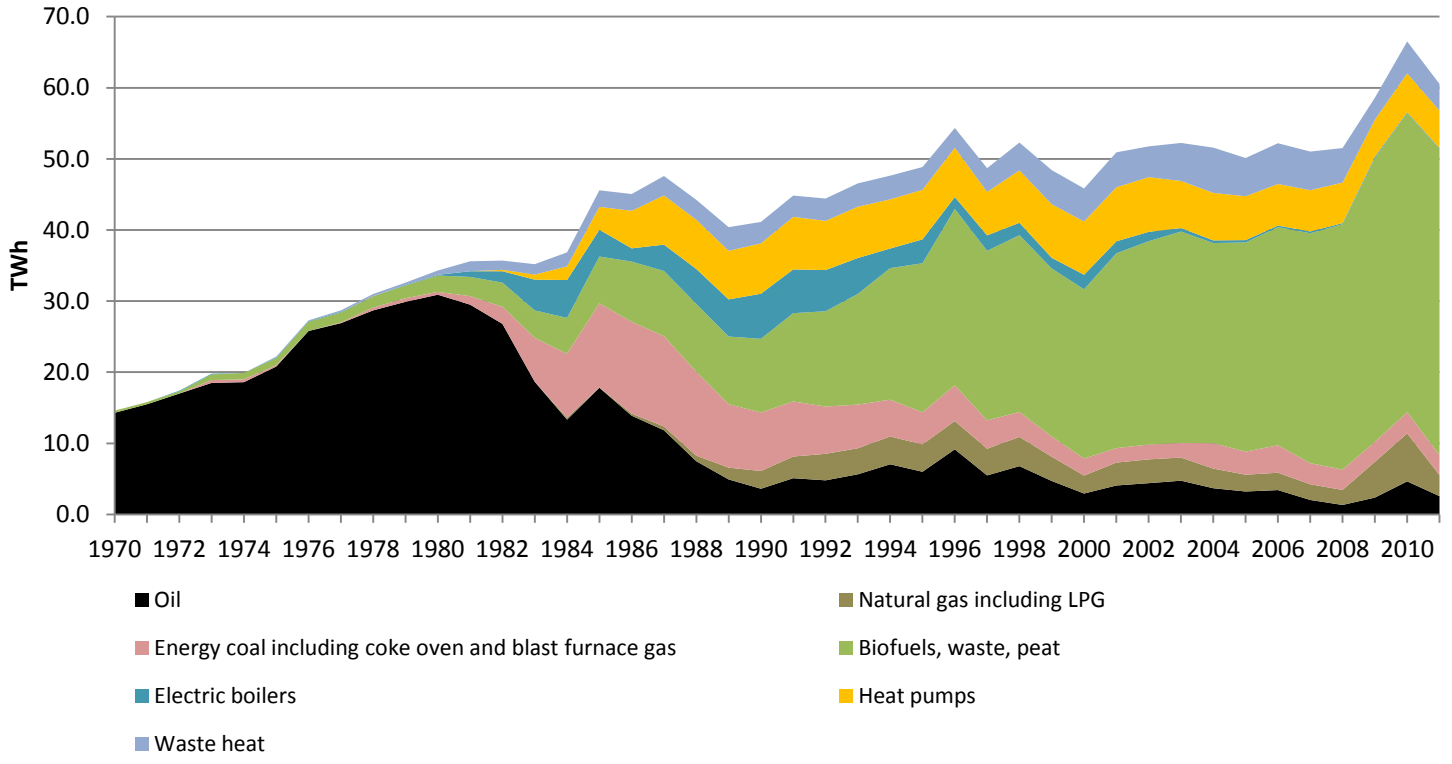
Source: SCB and Swedish Energy Agency

Energy supplied to district heating,1970-2011,TWh



- Year 1980 oil = 90 percent of district heating production , year 2011 oil = 4 percent!
- Year 2011 biomass, refuse, peat and waste heat = 71 percent.
- Electricity consumption in the district heating sector is declining

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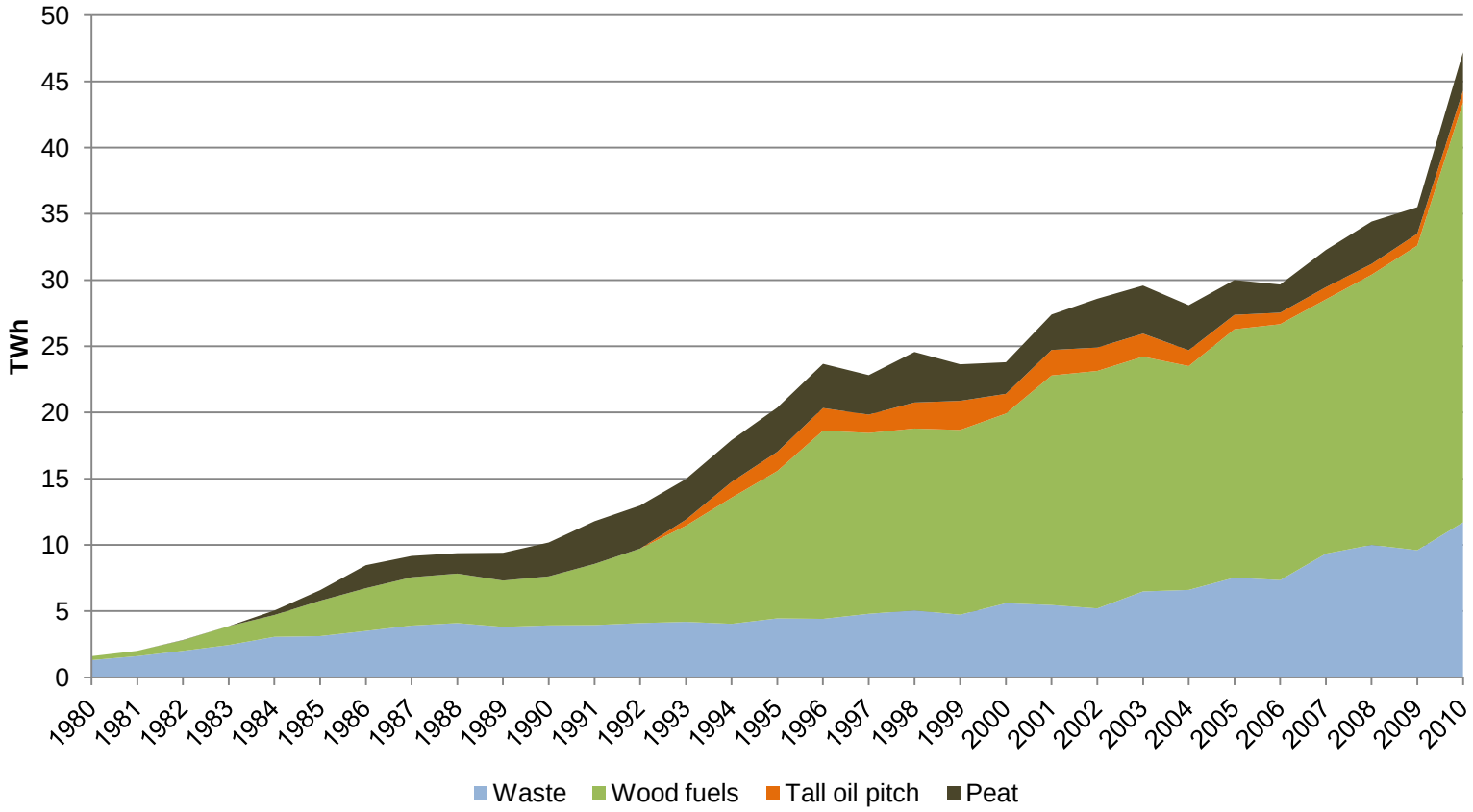
Source: SCB and Swedish Energy Agency

Use of biofuels, peat and waste in district heating plants, 1980–2010, in TWh



- Woodfuels = 31,7 TWh in 2010
- Waste (refuse) = 11,7 TWh in 2010

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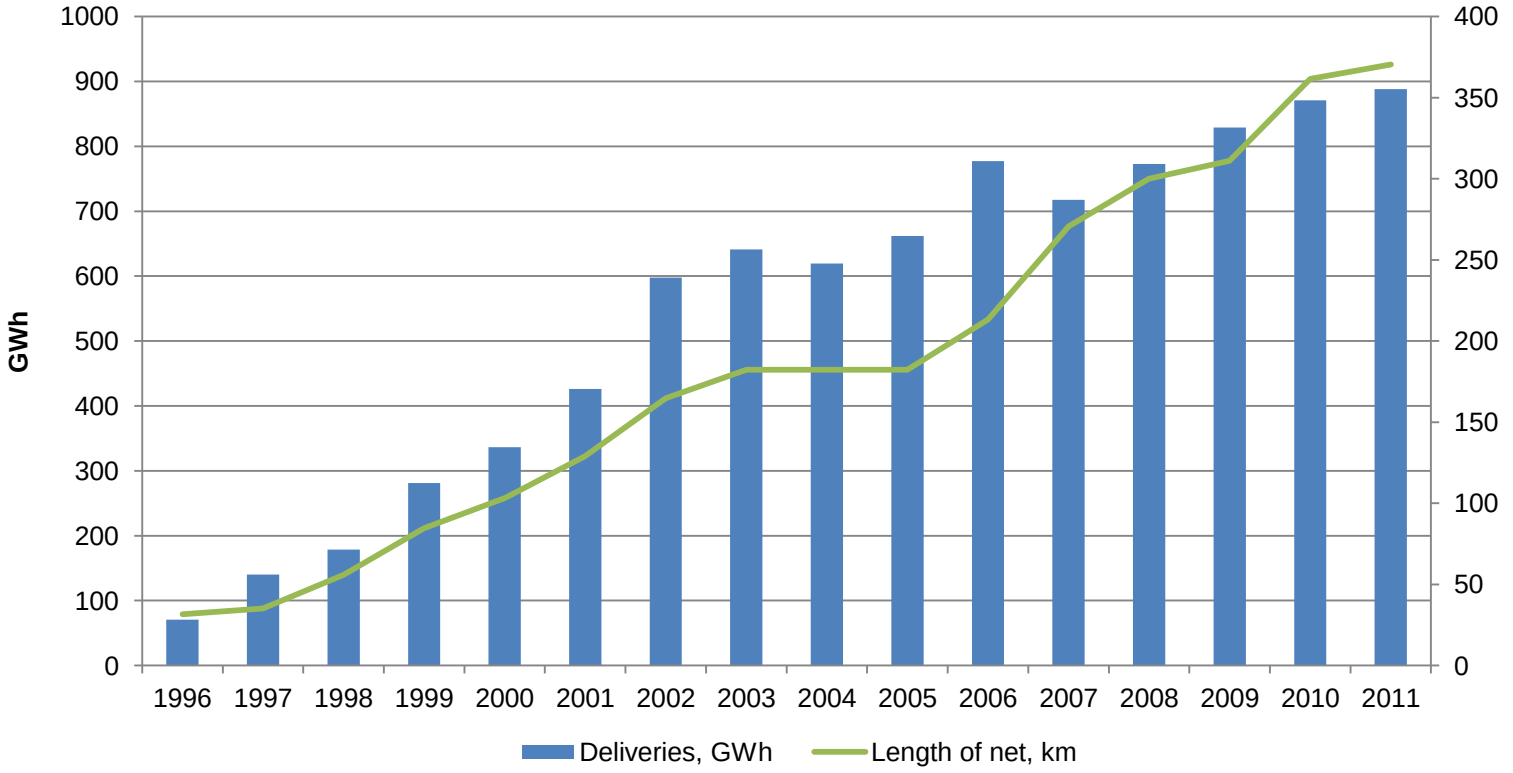
District cooling is increasing in Sweden



- The main use of district cooling is for offices and in the service sector.
- 28 % of DH companies forsee supplying DC 2015. Today 22 % deliver DC.
- Prognosis for DC is an increase from ca. 0,9 TWh today to 1,3 TWh 2015

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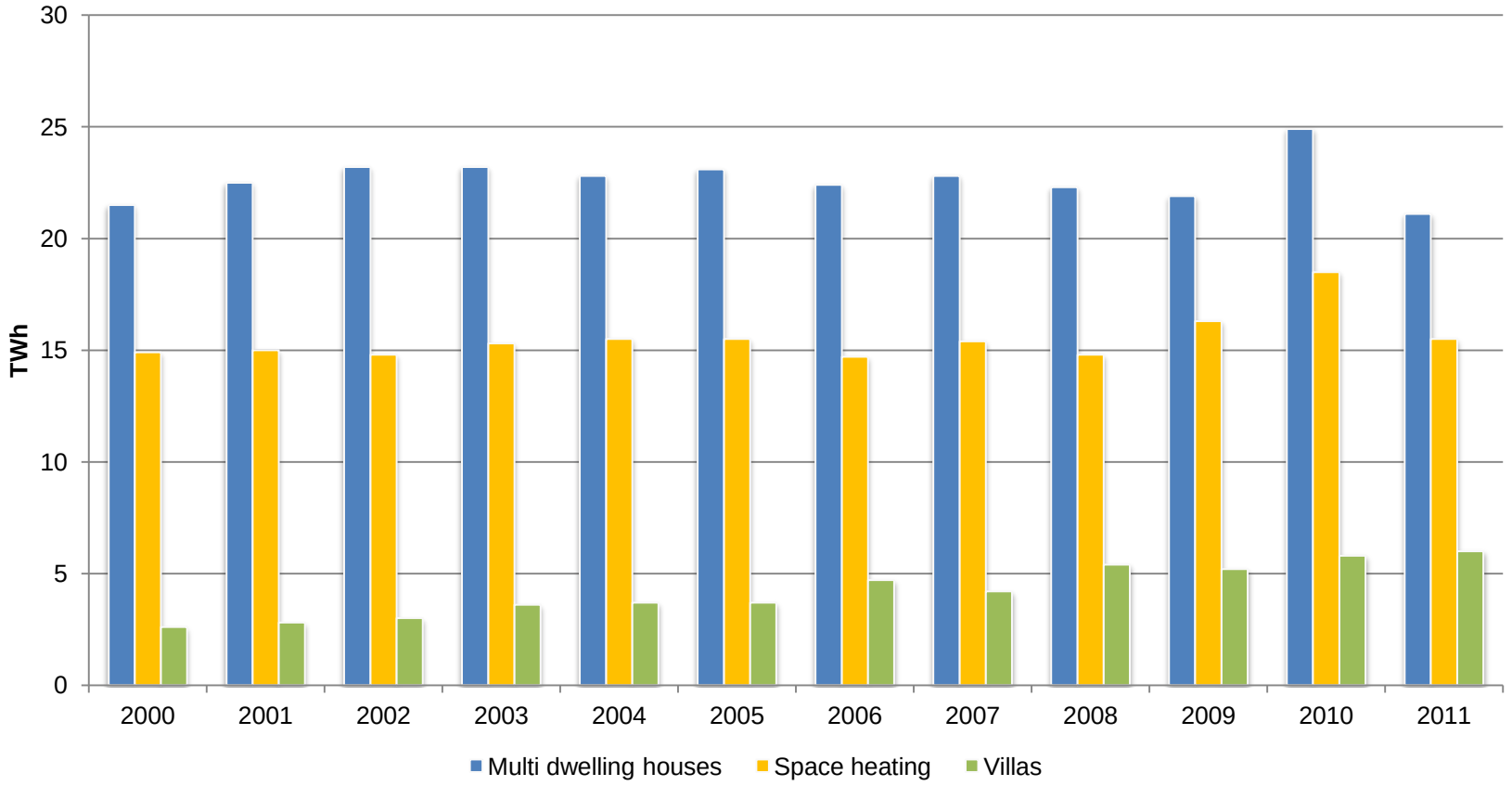
Source: Svensk Fjärrvärme

District heating is primarily used in multidwelling houses



- Ca. 50 % of all DH goes to multi dwelling houses
- Ca 90 % of all multi dwelling houses use DH
- Usage in villas has increased over the years

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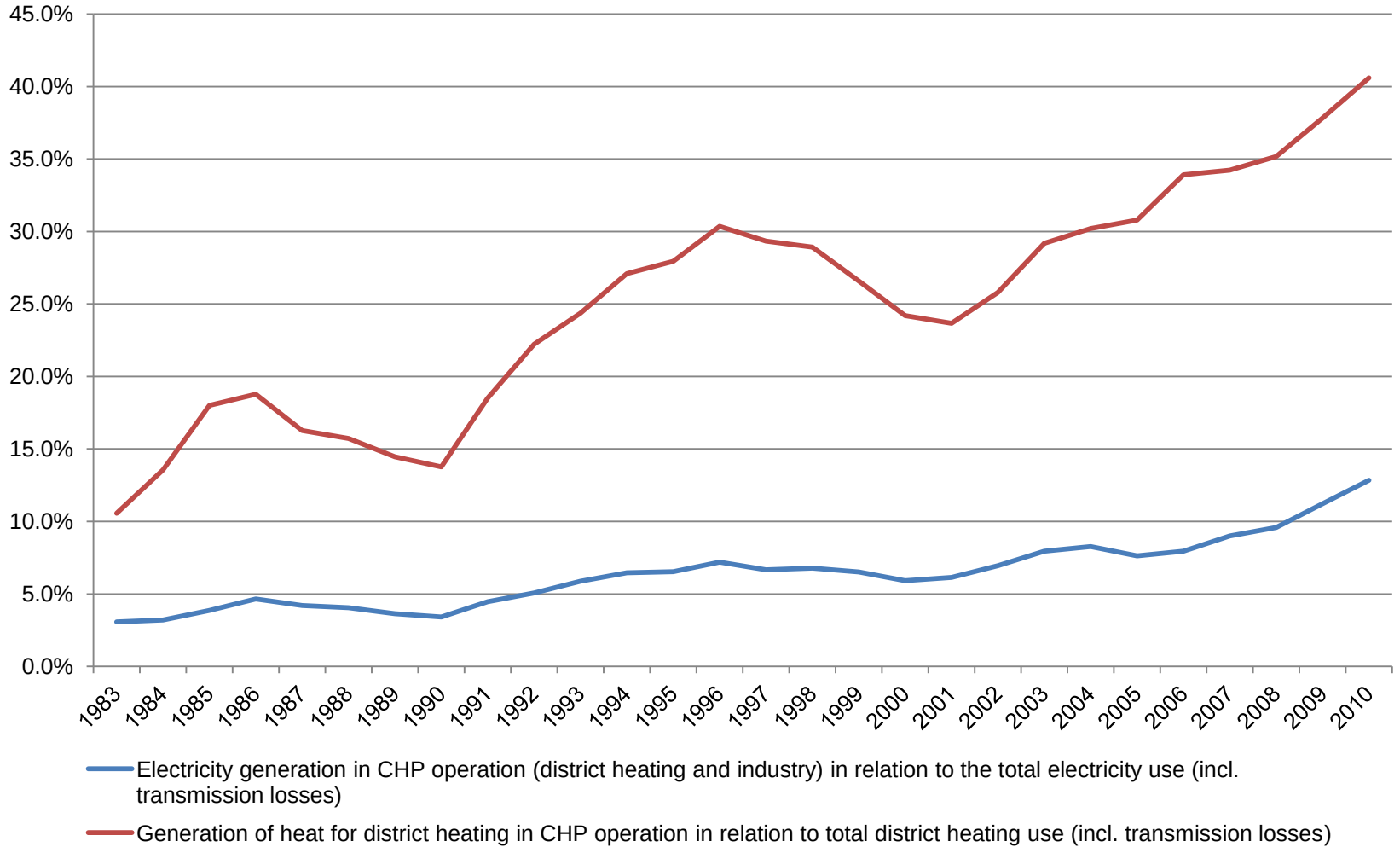
Source: SCB and Swedish Energy Agency

Share of CHP in heat and electricity production is increasing



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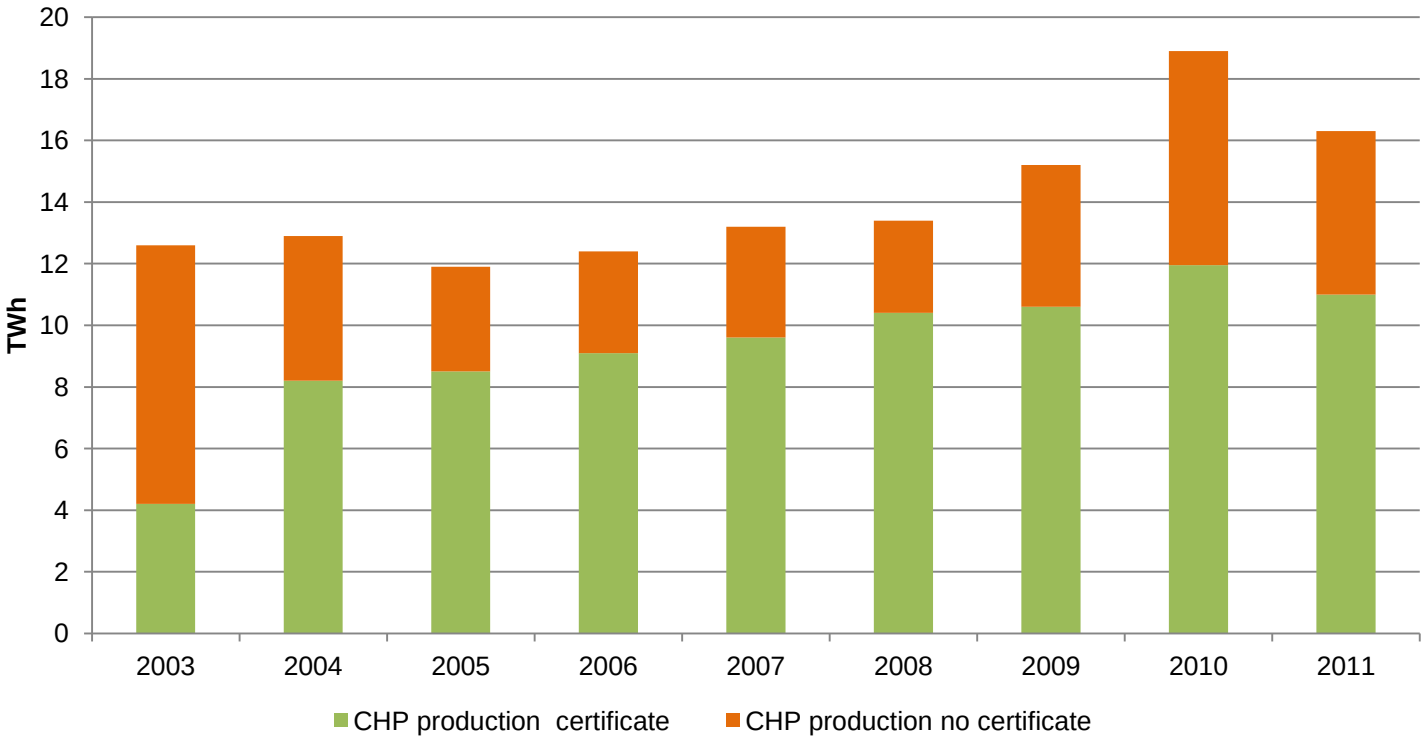
Source: Energiindikatorer 2011

Electricity certificates production in CHP, TWh



- 1 Certificate = 1 MWh
- Between 2003-2010: Ca. 72,5 million electric certificates have been issued to CHP producers and sold to trading companies.
- Total value ca. 1,8 billion euro

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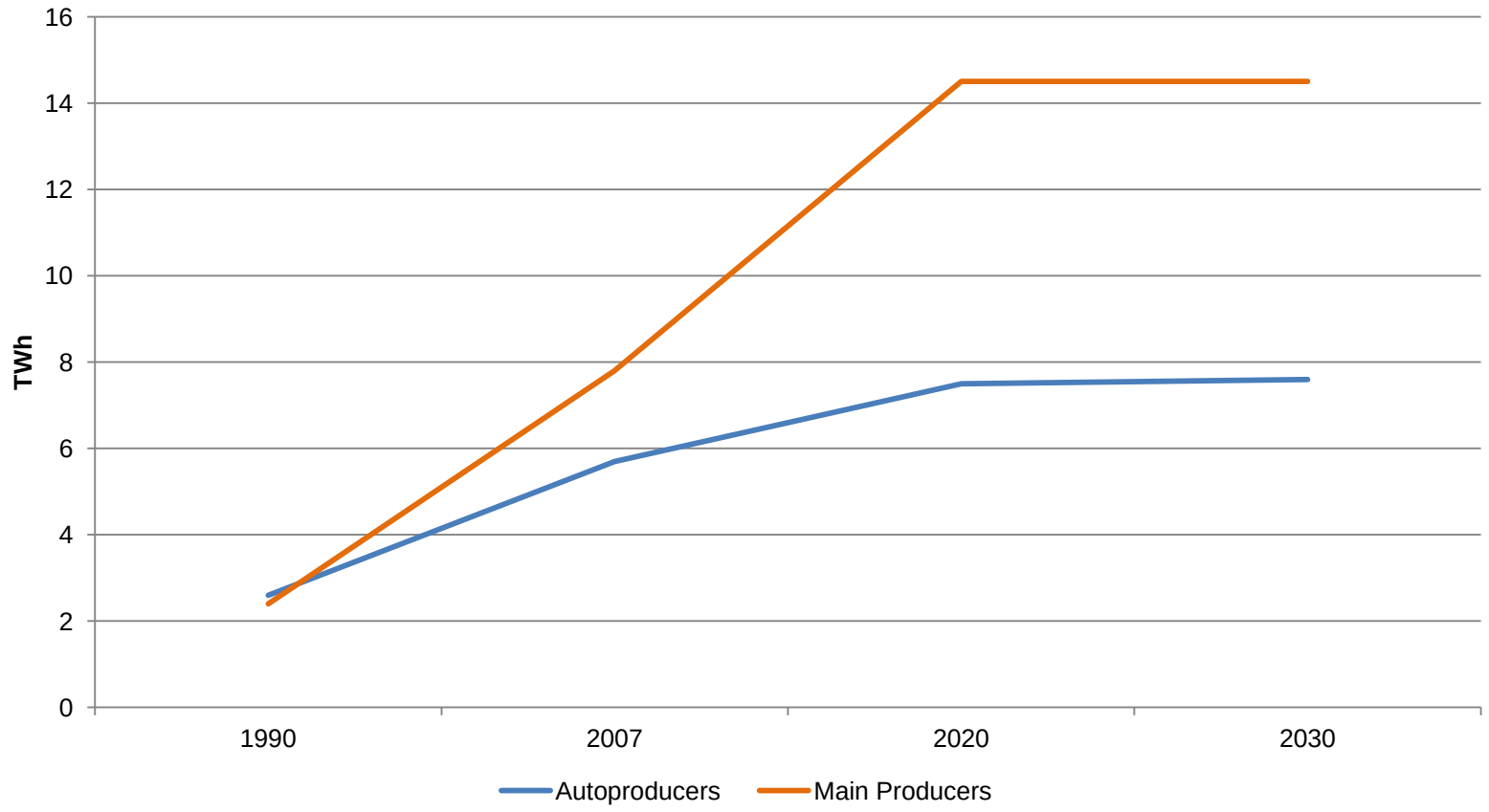
Source: SCB and Swedish Energy Agency

Prognosis CHP-electricity (main scenario), TWh



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Source Långsiktsprognosen 2010; Energimyndigheten

Policy instruments and incentives

Taxation and subsidies have promoted renewables and CHP-development

Introduction of CO_2 tax in 1991

- Major tax increases on fossil fuels (heating, motor fuels)
  - high for households and service (ca. 100 € in 2011)
  - low for industry, forestry and CHP

Introduction of investment subsidies to biomass and cogeneration plants in 1991

- Investment subsidy of 1 BSEK to cogeneration (1991) (ca. 116 Million EUR)
- Prerequesite: CHP plant had to use 70 % bio during 5 years.
- Investment subsidy of 625 MSEK for R&D concerning biomass usage.

⟹ Resulted in ca. 20 biomass fueled CHP plants

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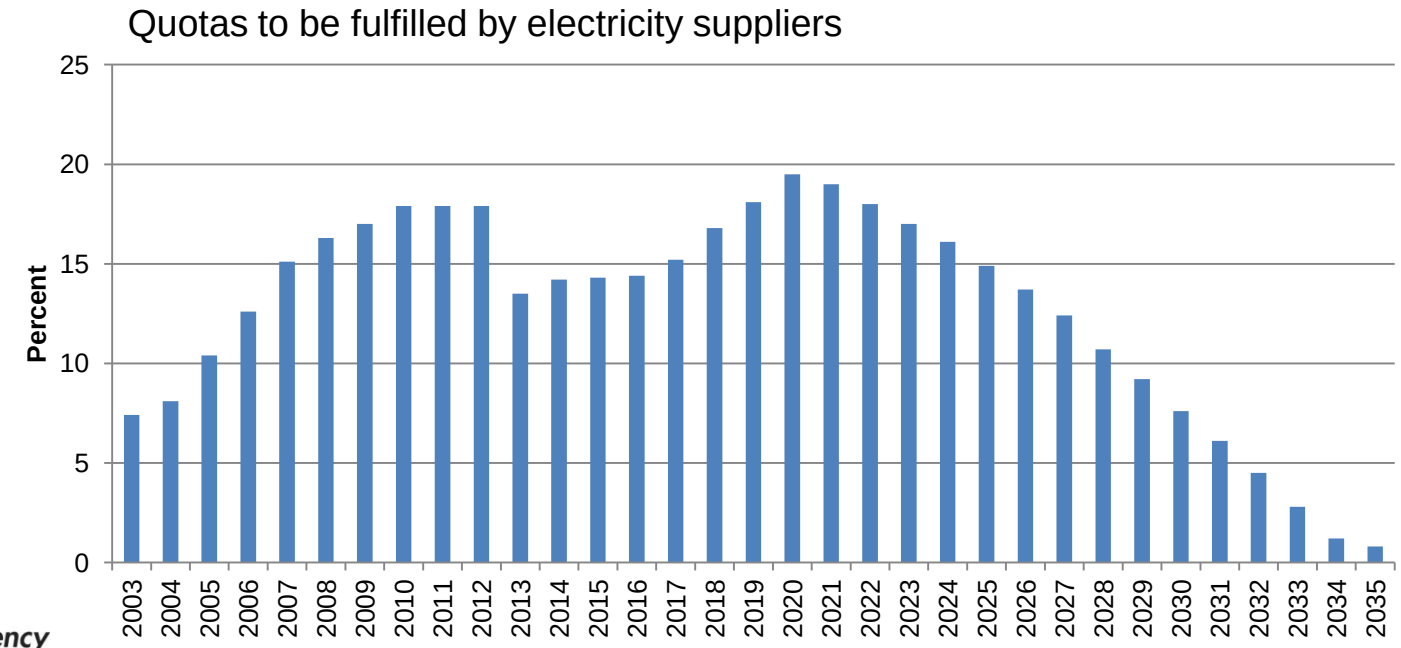
The Electric Certificate System 2003-2035

- *a market-based system to support the expansion of electricity production in Sweden from renewable energy sources and peat.*
- *Increase by 25 TWh "green" electricity by 2020 (relative to 6,5 TWh 2002)*
- *Current level (2010)18TWh*
- *Entitled: Wind, Solar, Geothermal, Wave, Bio, Peat, small scale hydro*



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Source: Swedish Energy Agency

CHP is guaranteed access to the grid

- All electricity producers are guaranteed access to the grid.
- No type of electricity is discrimminated or prioritized.
- There is no ”trade off” or ”crowding out” between renewable and CHP electricity production concerning access to the grid.

Structure

- The Swedish TSO (*Swedish national grid*) is responsible for transmitting electricity from the major power stations to the regional electrical grids, via the national electrical grid.
- Regional/Local net owner is obliged to provide grid connection ensuring sufficient capacity. The cost is charged to the new plant/actor.
- Sufficient net capacity must also be ensured by the Swedish national grid (Svenska Kraftnät).

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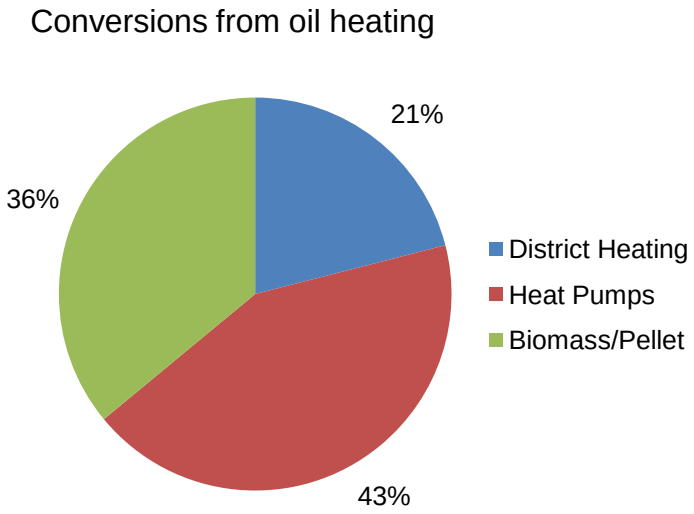
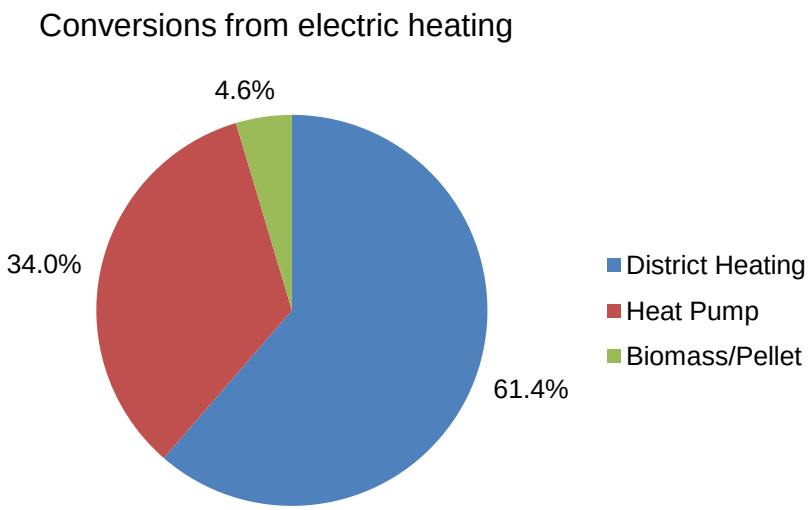
Source: Svenska kraftnät

Subsidies for conversion from oil and direct electricity for heating 2006-2010





- Subsidies to convert from oil and direct electric heating has indirectly helped CHP.
- Ca 47 million euro was paid to conversion from oil whereof 21 % went to DH.
- Ca 47 million euro was paid to conversion from electricity whereof 75 % went to DH
- Total subsidy to DH amounted to slightly less than 47 million euro

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Source: EI R2011:06

Investment programmes for improved environmental conditions and reduced climate change

- **LIP** – Local Investment Programme
- **KLIMP** – Climate Investment Programme
- Total grants ca 6 billion SEK (ca 650 million euro) covering ca 23 billion SEK worth of projects (ca 2,4 billion euro).
- In total, almost 3000 projects have been or are being carried out by municipalities, companies and other organisations.
- Ca. 260 projects involving district heating have received grants.

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Source: Naturvårdverket och *Incitament för ökad kraftvärmeproduktion,* Rapport 2009:9

The development of Swedish DH and CHP

- Historically DH companies, owned by municipalities, connected municipal buildings/houses which helped expansion. Today DH is functioning on a competitive heating market and expands on commercial grounds.

- Very few municipalities use detailed planning favouring DH.

- DH is the most cost efficient alternative in more than half of Sweden's municipalities. It is usually not cost effective to convert from preinstalled DH.

- Sweden invests the biggest amount on DH- R&D in Europe.

- Investments in CHP is estimated to 3,1 billion EUR for the period 2012-2017.

- The net new CHP-capacity is ca.1,6 TWh new electricity 2012-2017 in biomass-CHP.

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Source: Survey, Svensk fjärrvärme

Overview and summing up of the Swedish Policy for CHP/DH

Incentives for Combined Heat and Power production (CHP)

- the Electric Certificate system
- High electricity prices
- Favourable taxation

35 new plants planned 2009-2015

Source: Fjärrvärmen 2015, branschprognos

Availability of district heating networks

- Prerequisite for CHP
- District heating is highly versatile in using different fuels

Support systems and investment schemes

- LIP and KLIMP – Local Investment- and Climate Investment Programmes
- Subsidies to conversion from oil- and electric heating

Large Forest Industry

- Continuous supply of domestic biofuels, logistical benefits etc. (forest residues)

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Challenges and opportunities

District heating market

- A market with low profitability and increasing prices
- Decreasing demand prognosis by ca 10-13 TWh 2007-2025 in houses with DH 2007 (*Energy Performance of Buildings Directive*, building regulations, heat pumps, climate). (Svensk fjärrvärme Rapport 2009:21)

EU- legislation

- New directive on energy taxation – 0 CO_2 taxation within EU-ETS (CHP and "heat-only" on equal footing).
- Sustainability criteria for solid biofuels? Increased admin costs for DH producers.

Regulated access to the DH-net

- Waste heat producers can force entry into a net provided there is a "mutual benefit" to be made

Article 14 EED

- DH and industries must conduct CBA to ensure waste heat usage and primary energy savings.

Biofuels

- Wood vs. Refuse/Waste
- Increased wood energy prices due to increased bio fuel demand

District Cooling

- Increasing market

Thanks for Your Attention!

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