

Biomass/biogas Development Potential

Scandinavian Expertise and Know-how Brought to the UK

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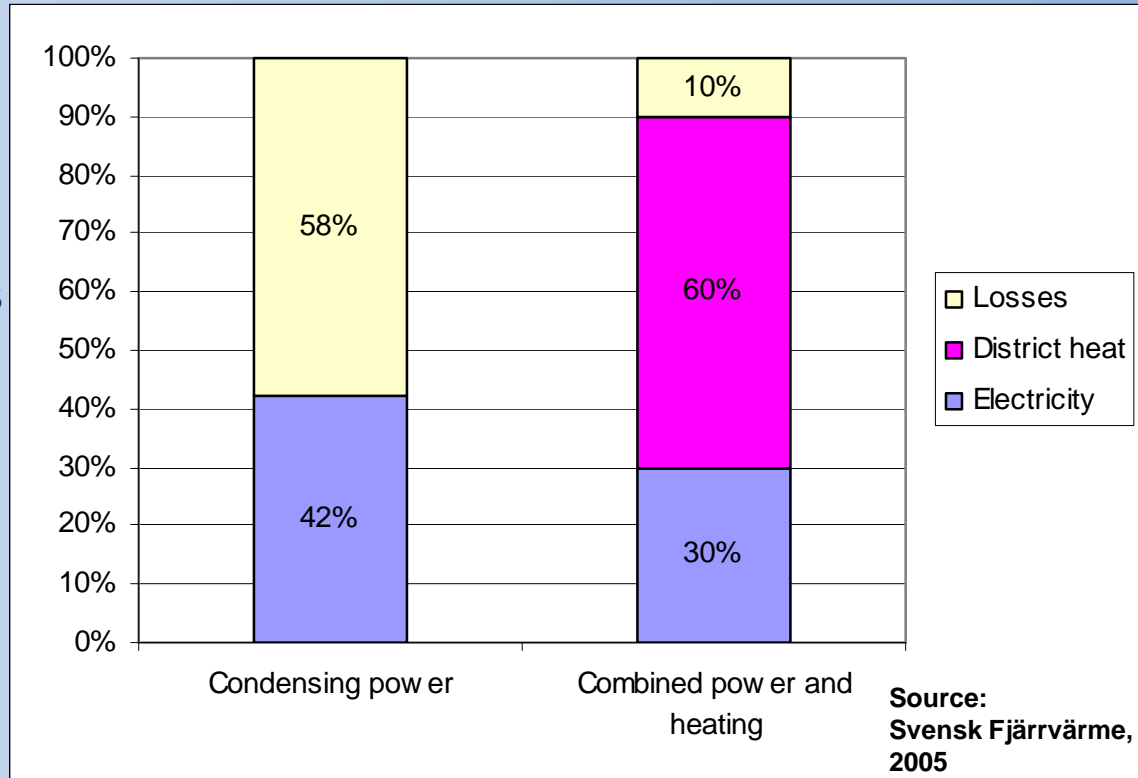
Key Facts that Explain the High Use of Biomass in Sweden / Scandinavia

- High total efficiency despite difficult fuels
- High degree of connection to the district heating system
- Near access to the biomass
- State founding
- Huge knowledge base



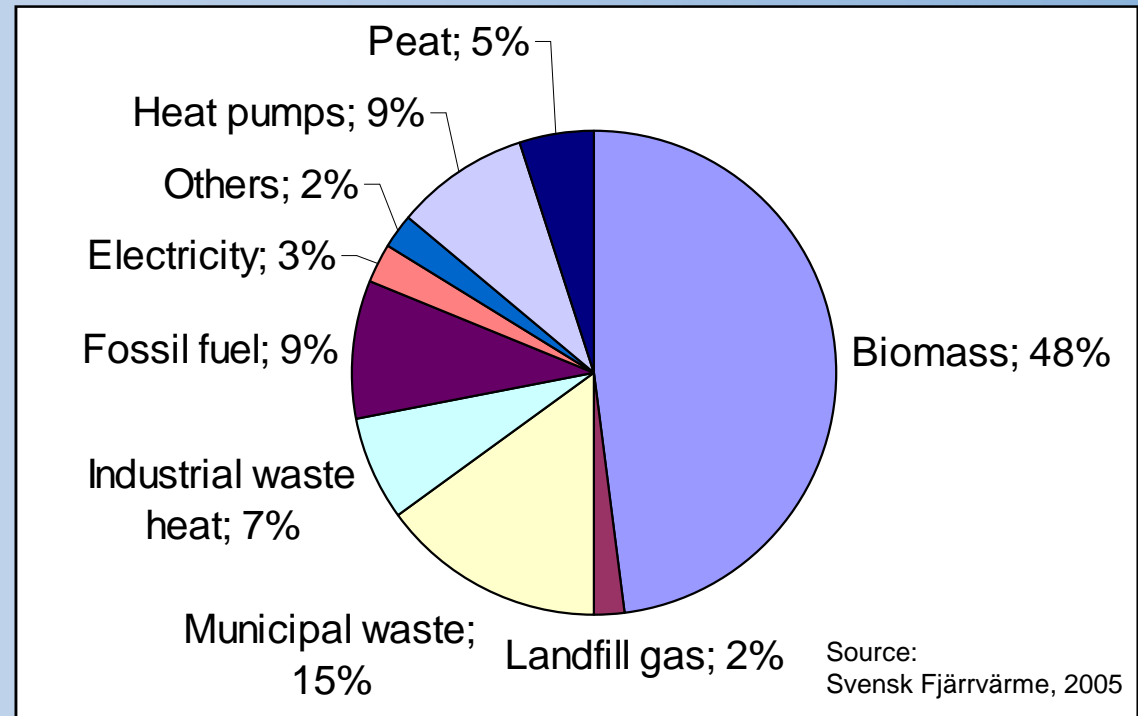
High Total Efficiency Despite Difficult Fuels

- High losses in condensing power
- The cooling water for combined power and heat is the district heating system
- The cooling water are used as heat source for buildings
- The total efficiency can be up to 90 %



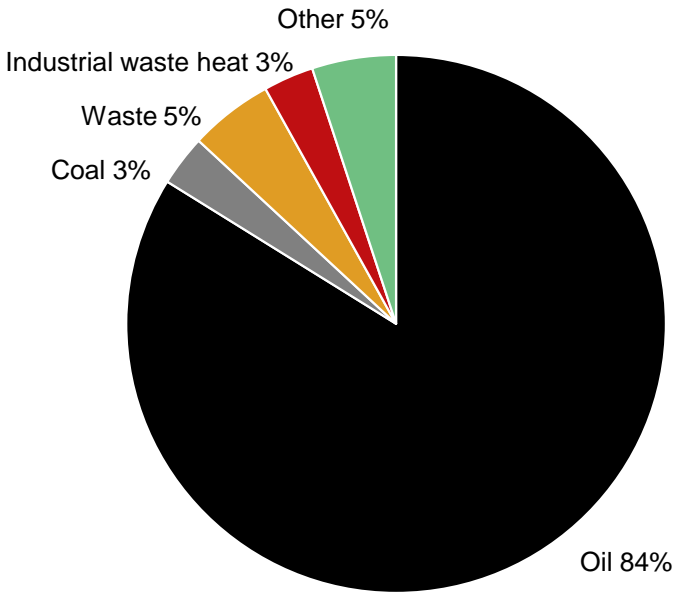
Fuel Sources for District Heating

- Biomass approx 5 times lower cost than oil.
- The revenues for district heating is lower the the production cost for heat produced with oil.



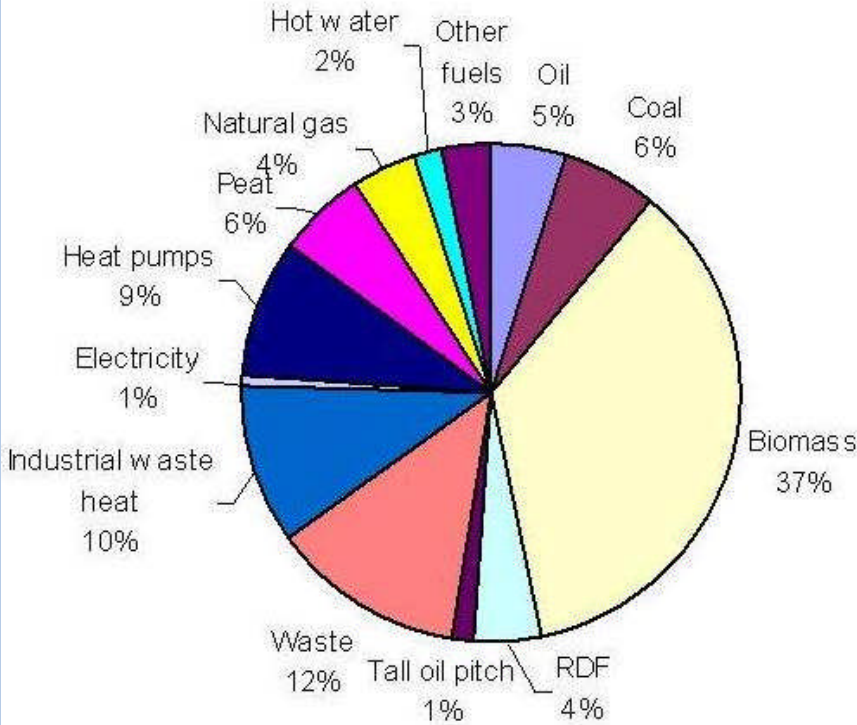
Unique Change of Climate Emissions

Fuel mix 1981 ~25 TWh



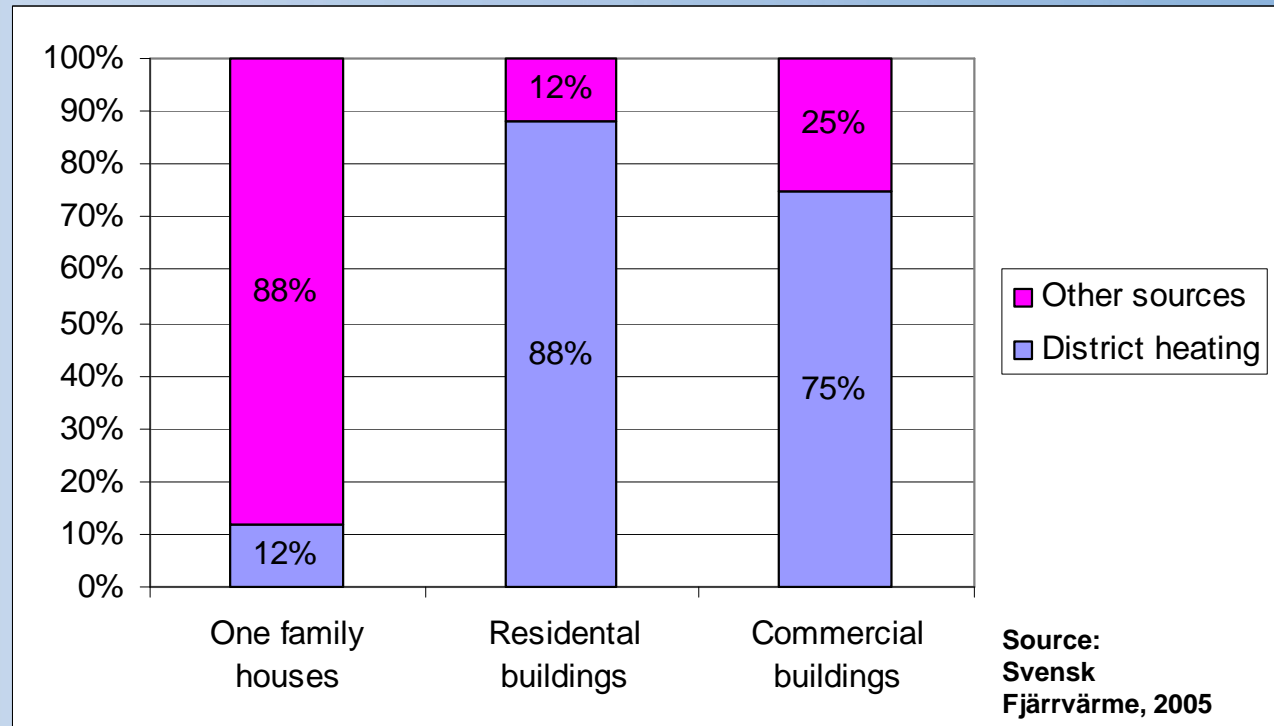
Source: Svensk Fjärrvärme

Fuel mix 2005 ~50 TWh



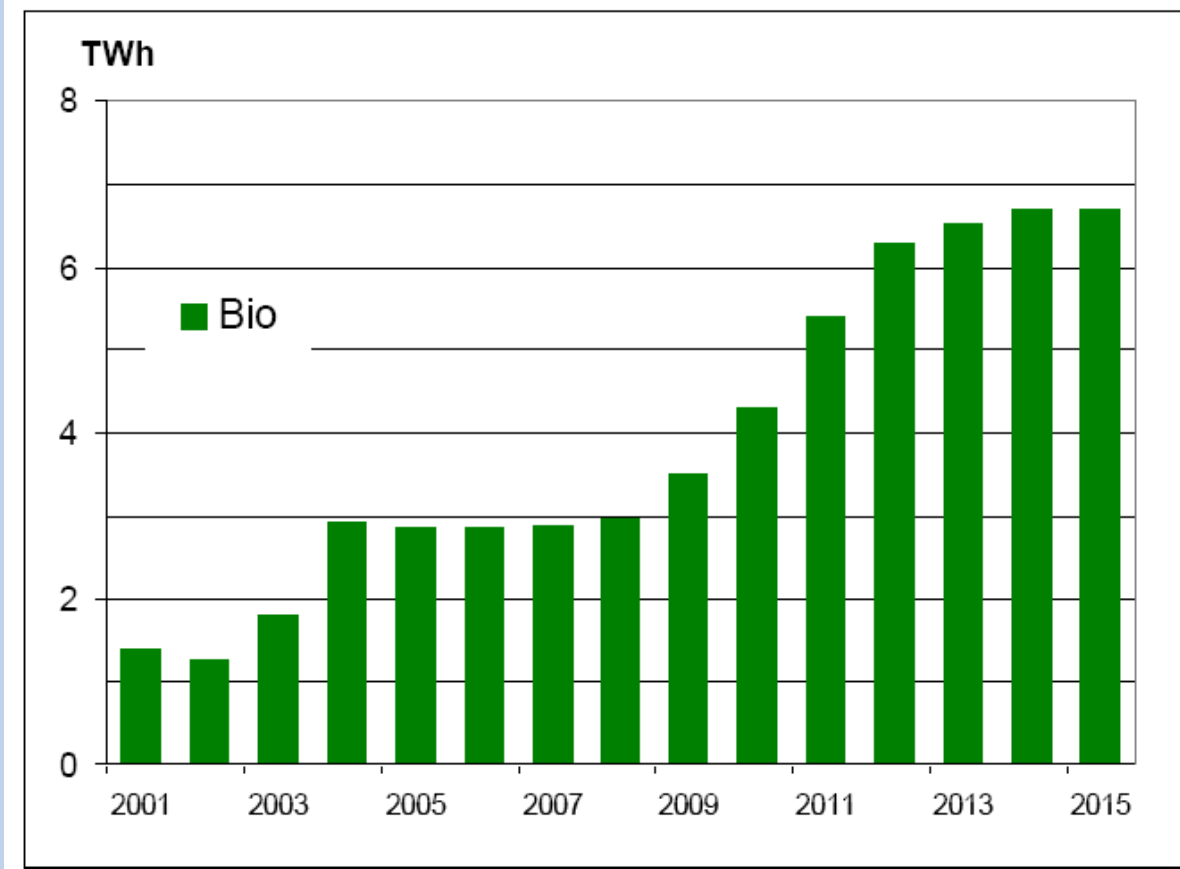
Market Share for District Heating

- It's more profitable to connect residential and commercial building due to higher energy use per connection point
- It's not possible to reach 100 %



Electrical Power from Biomass (Excluding Waste, Peat and Biogas)

- 50 TWh heat
- 4 TWh electricity is generated
- The commercial potential is ~7 TWh electricity



Source:
Kraftvärmeutbyggnad 2007-2015
Svensk Fjärrvärme, 2008

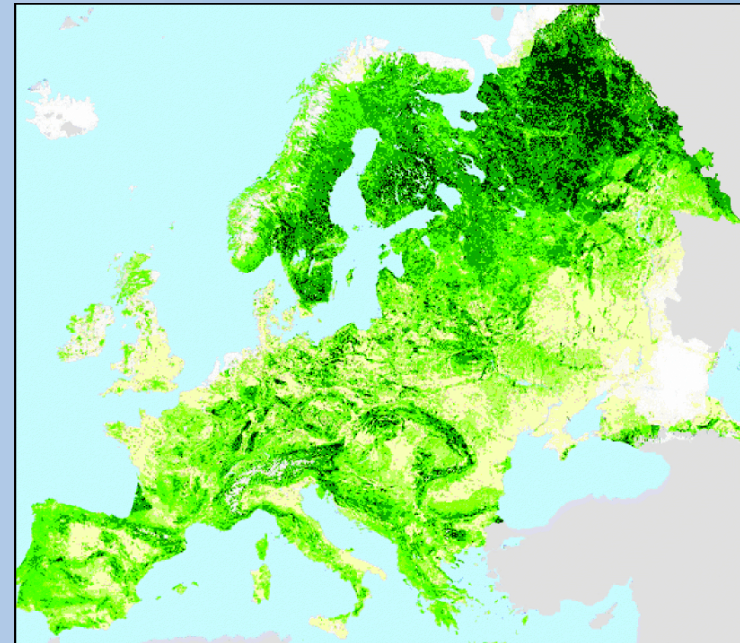
How did we get there?

- Strong economic policy instruments
 - Energy tax since 1950's; Increased rates during 1970's to reduce dependence of oil (oil crisis)
 - CO2-tax in 1991 – to reduce the use of fossil fuels
 - Green tax shift in 2001– strong focus on CO2-tax
 - Green certificate system (2003)
- Direct investment grants to renewable-production

Source:
Ministry of Enterprise, Energy and Communications
Division for Energy

Close Proximity to Biomass Fuel Sources

- Sweden (as well as Norway and Finland) has large area of forest
- The forest industry produce a lot of 'virgin' wood residue
- Just small amount of 'full log' fuel used
- Economical justifiable distance
~150 – 200km



Huge Knowledge Base

- Extensive experience of using biomass – 30 years of using biomass
- Trade associations sponsored by industry and authorities such as:
 - Värmeforsk
 - Svensk fjärrvärme
 - Elforsk
- University and university college research:
 - Almost all respected institutions have some biomass research

District Heating Today

- More than 50% of the heat market
- Exists in more than 570 districts in Sweden
- Approximately 50 TWh total production
- Turnover approximately €2.3 billion
- No subsidy

Source: Svensk Fjärrvärme, 2005

Challenges for the UK

- Fuel source – waste, peat, grown biomass or import biomass
- By expanding the district heating system more power can be produced
 - Combined power and heating makes it possible
- Subsidy might be a catalyst for increasing the power produced from renewable energy sources
- Trade association is important for experience exchange

Some Key Factors that Explain the High Use of Biogas in Sweden / Scandinavia

- High alternative cost for disposal of sewage sludge
- Biogas production as volume reduction for sludge
- Cities can (and do) increase demand by purchasing biogas fueled vehicle such as busses and cars
- State funding – investment subsidy



Production of biogas 2008

Type of production	Units	Amount of energy (GWh/year)
Wastewater treatment plant	140	605
Land fills	58	369
Industrial effluent	4	130
Co-digesting	17	240
Agriculture	8	15
Totally	227	1359

Source:
Svenska
Biogasföreningen

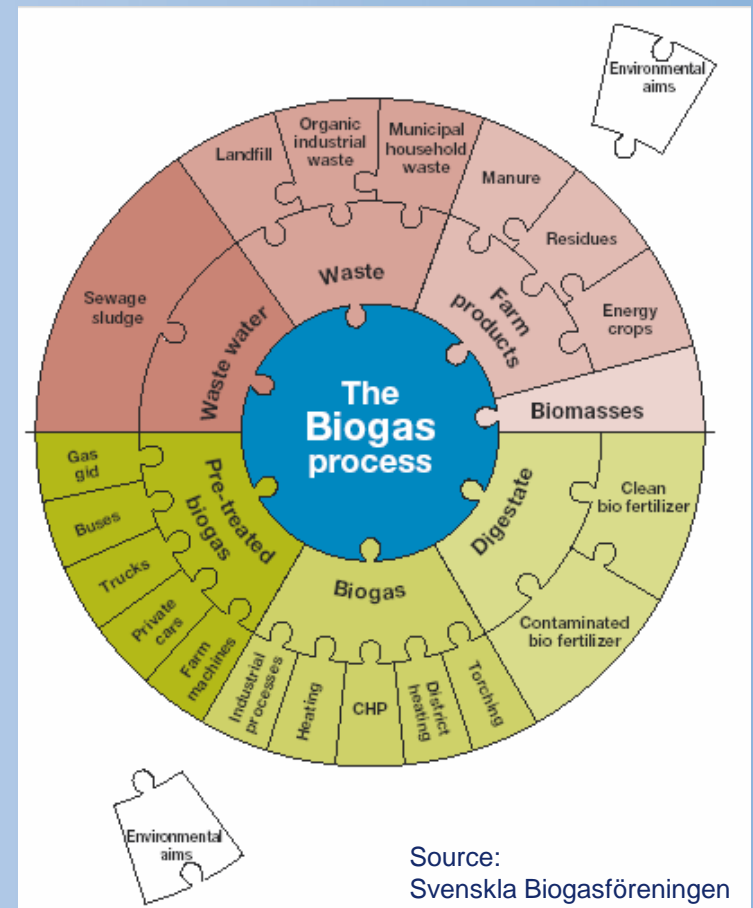
State Funding

- General investment subsidy for CO₂ reducing projects such as KLIMP and LIP
- Direct investment subsidy for manure biogas plants
- Lower tax on biogas for vehicles than fossil fuels
- Trade associations sponsored by both industry and authorities



How to make profit from biogas business

- Understand the puzzle of biogas
- Mix of long term contracts and spot prizes on substrate (raw materials)
- Contracts for bio-fertilizer
- Infrastructure for distribution of biogas
- A biogas market separated from the natural gas market
- The technology of biogas is the easiest challenge



Challenges for UK

- Climate debate drives the interest of increase biogas production
- Large amount of sewage sludge
- Large areas for distribution of bio-fertiliser
- The farming business can produce fuel for biogas such as manure and vegetables for co-digestive
- Market for biogas, higher customer value than natural gas



Thanks for listening



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