

Small Scale CHP from biomass – results from a demonstration project in Sweden

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The Energy Agency for Southeast Sweden (ESS)

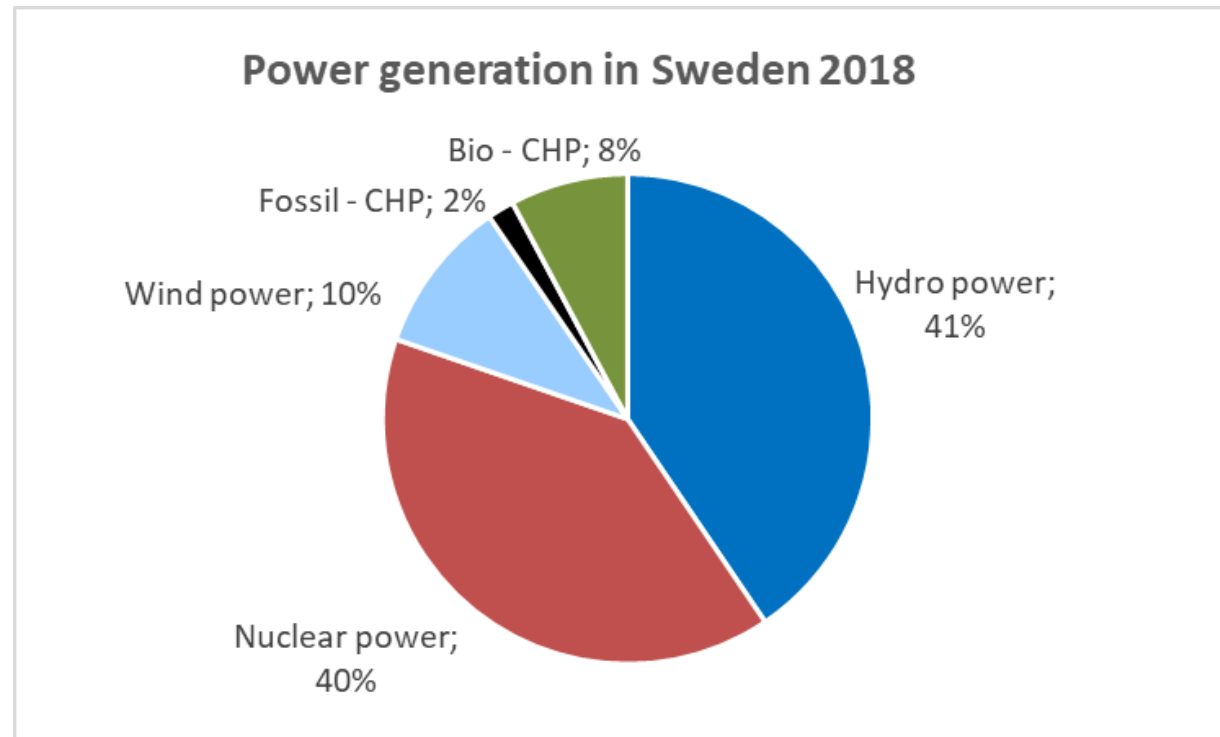


- 360 agencies for energy and environment in EU
- Of which 15 are located in Sweden



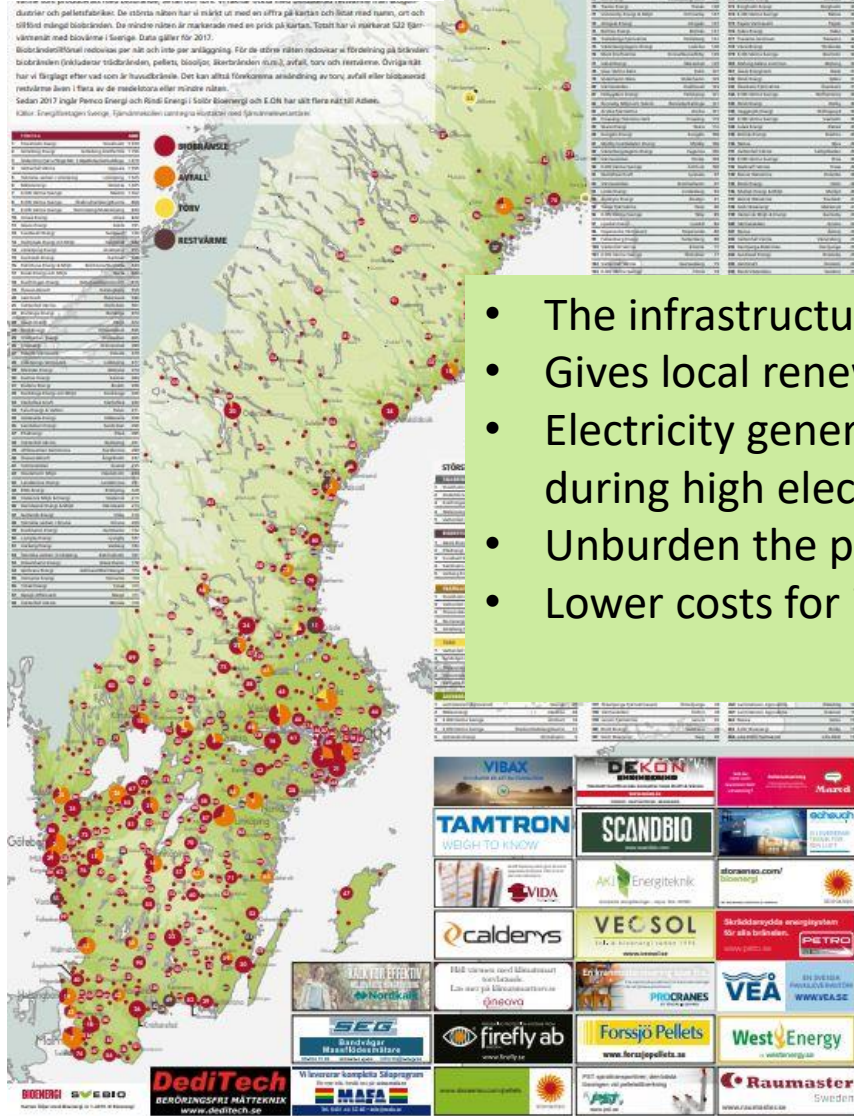
>50% of energy supply from biomass

Background: Power generation in Sweden

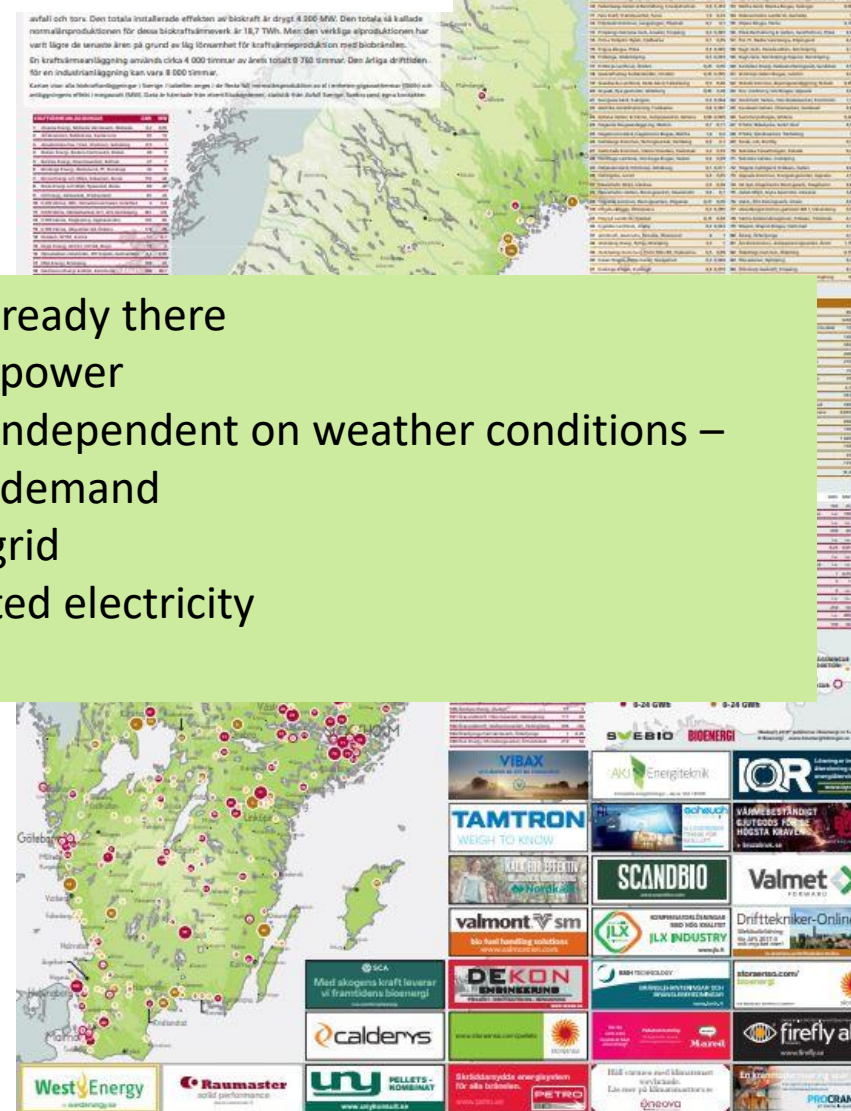


Source: Energikontor Sydost based on data from: Swedish Energy Agency

Bioheat 2019



Biopower 2019



- The infrastructure is already there
- Gives local renewable power
- Electricity generation independent on weather conditions – during high electricity demand
- Unburden the power grid
- Lower costs for imported electricity

Source:
Svebio

Ca. 520 district heating networks

ca. 100 CHP plants in operation

Small scale CHP

– a demonstration project in Southeast Sweden

- A project within the EU programme Life+ (2014-2020), Life13ENV/SE/000113
 - Energy Agency for southeast Sweden (*project manager*)
 - The Emå-dairy
 - The energy company, Ronneby Miljö & Teknik and Ronneby Miljöteknik Energi AB

Objective:

- To demonstrate different technologies for small scale CHP
 - Gasification to power
 - Wet steam turbine
 - Organic Rankine cycle
- Increase the use of small scale CHP
- Establish a platform for small-scale CHP showcases
 - Study visits at the plants
- Decrease emissions of CO₂ and contribute to the EU and national targets
- Increase renewable electricity by increasing local-bio based small-scale electricity production



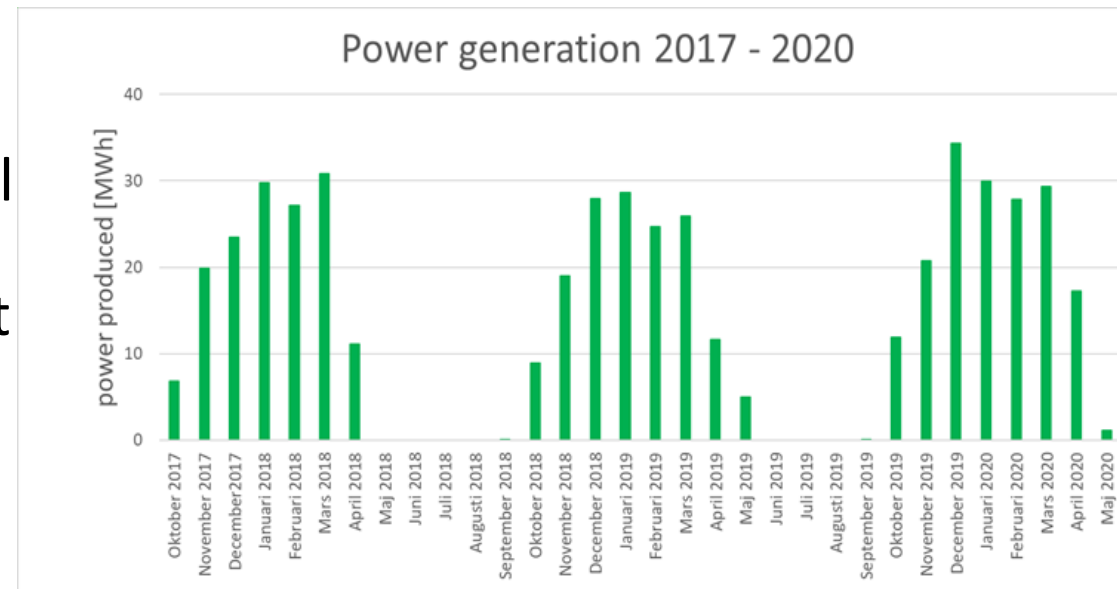
Three Demonstration Technologies: ORC

- 49 kW electricity
- Temperature from boiler= 108°C
- Temperature on return water < 50°C
- Biomass feedstock to boiler
- Connected with four pipes
- Organic medium in turbine cycle



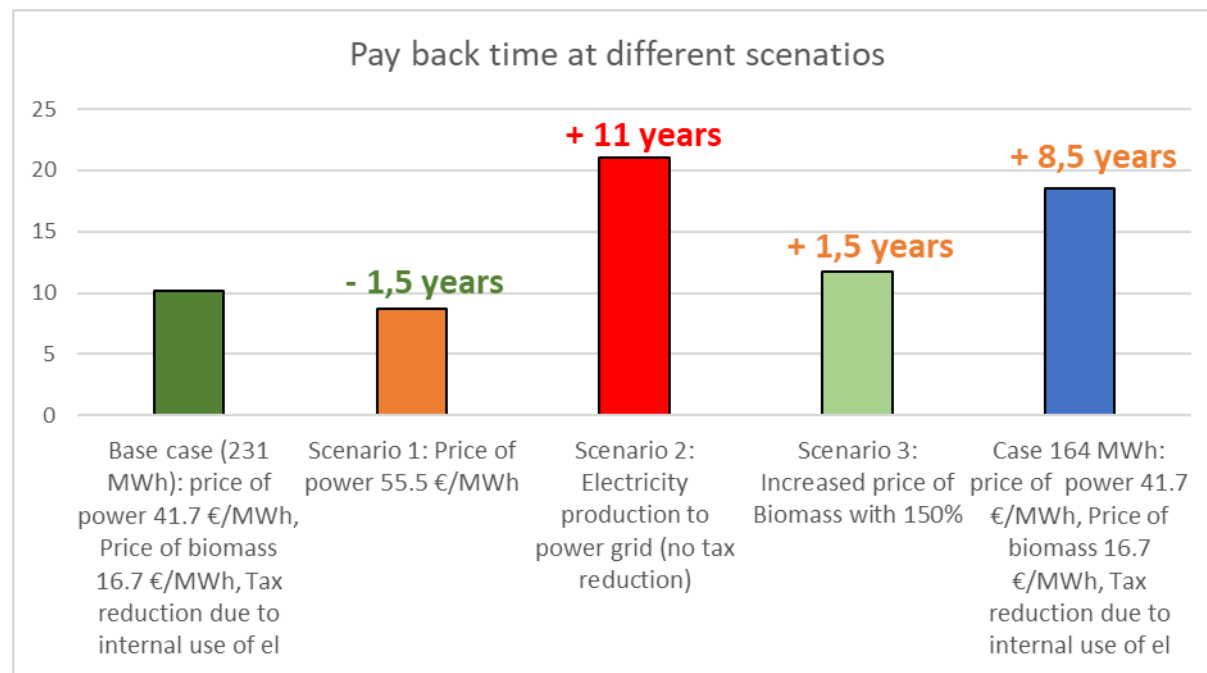
Experience from demonstration: ORC

- Between 155-173 MWh electricity (96-97% availability)
- Low electricity efficiency (2.3 %) but high total efficiency
- Installation needed some rebuilding of district heating pipes
 - Resulted in lower return temperature – more efficient combustion
 - Higher temperature to saw mill – less days for drying
- Competence improvement for employees
- Temperature difference very important for the electricity efficiency!



Pay back time – ORC (4600h – 231 MWh_{el})

- Based on the pilot plant and during right conditions, the payback time can be between 8 – 10 years
- Lower if the plant is running also during summer (May – September).

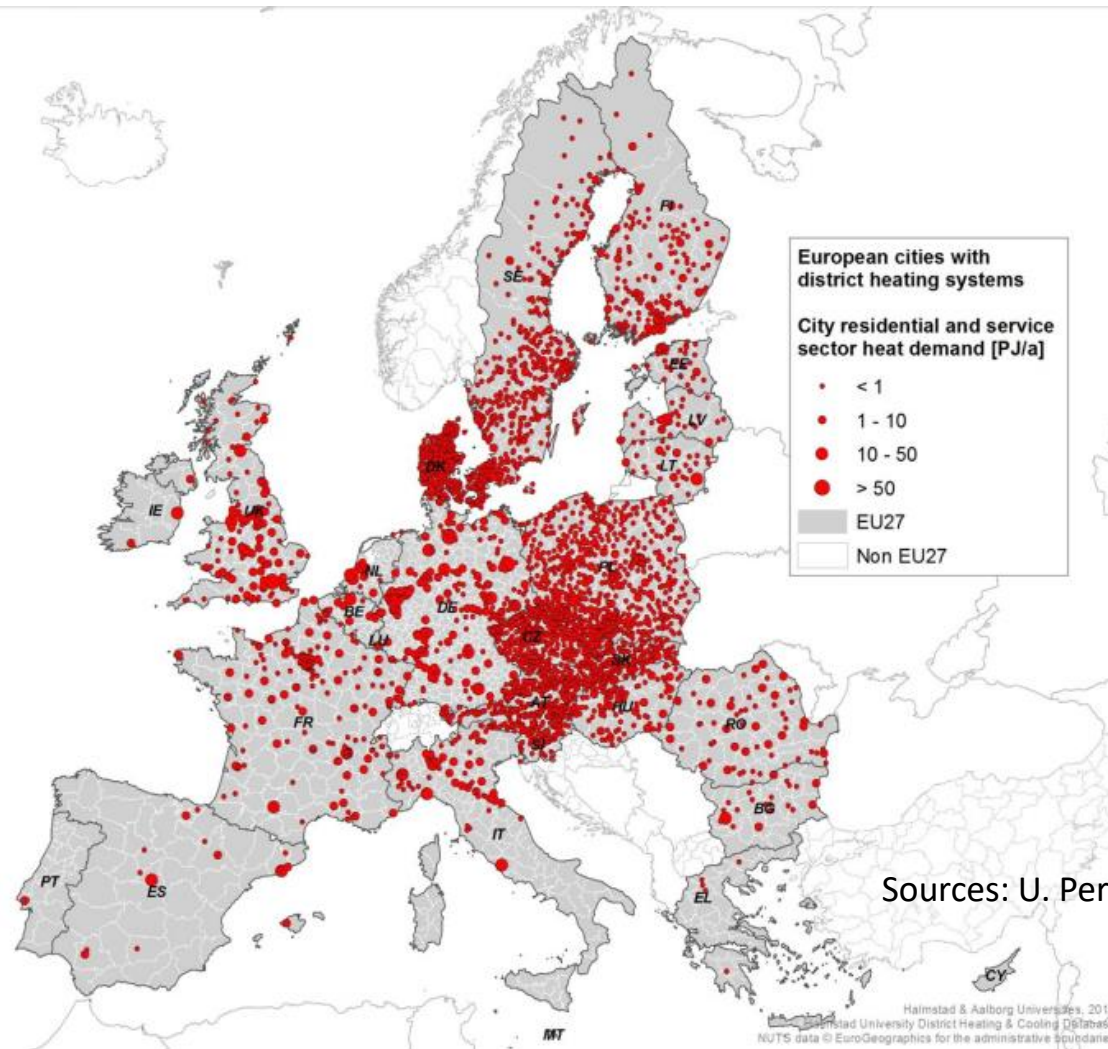


June 2020: 19 small scale CHP plants in operation in Sweden – from different suppliers



Sources: Google maps.

District heating systems in Europe-possibilities for Small Scale CHP!?



- Many micro gasifiers in mid-Europe
- Biomass use in district heating largest in Baltic and Nordic countries

Sources: U. Persson et al. / Energy Policy 74 (2014) 663–681

Final results, available during late 2020

- Final reports from the demonstration
 - Efficiency, performance and security
- Socioeconomic report
- Handbook

Thanks for listening!

Wellcome to visit the demonstrations!

Contact me or visit our home-page!

<http://www.energikontorsydost.se/smallscaleCHPLife>



Films on youtube:

<https://youtu.be/maUcnQSe0zQ>

https://youtu.be/d2zEjg6-D_I

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