

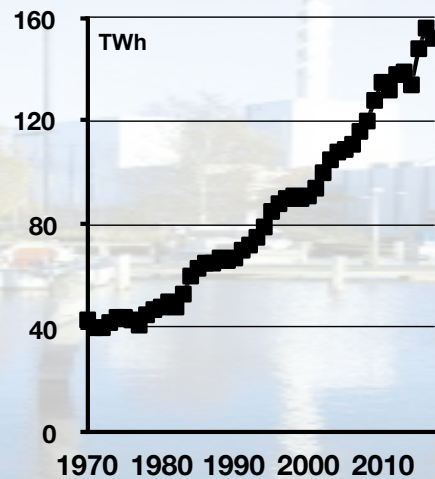
Future perspectives of Swedish bioenergy development

Tomas Kåberger

*Professor Chalmers University of Technology &
Executive Board Chair of Renewable Energy Institute, Tokyo
Member of the Royal Swedish Academy of Engineering Sciences
and the Swedish Association of Energy Economists, SEEF*



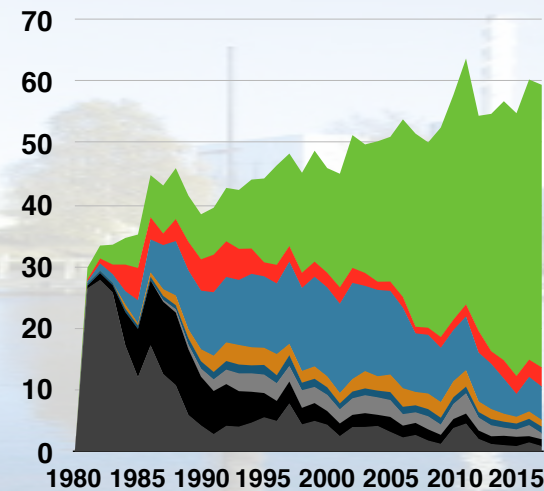
Bioenergy use in Sweden 1970-2017



- $\approx 1/3$ of total energy use
- 525 PJ
- 52 GJ/capita
- 1,7 kW/capita
- Largest source of domestic energy used

Data: Energimyndigheten
kortsiktsprogno

TWh Swedish District Heating 1980-2017



- Biomass and waste
- Electricity
- Waste heat
- Peat
- Other fossil fuels
- Fossil gas (NG)
- Coal
- Oil

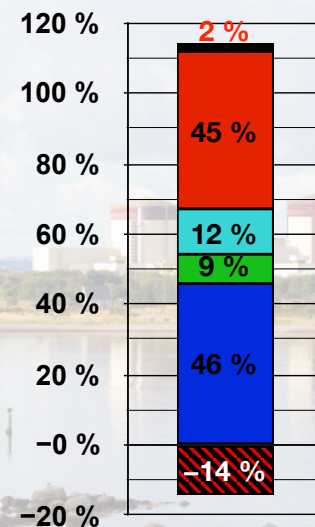
Data: Energimyndigheten
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Värtaverket Co-gen plant in central Stockholm 375 MW steam power, annually 750 GWh el and 1700 GWh heat, 12 000 m3 wood-chips/day

60% by ship



40% by train

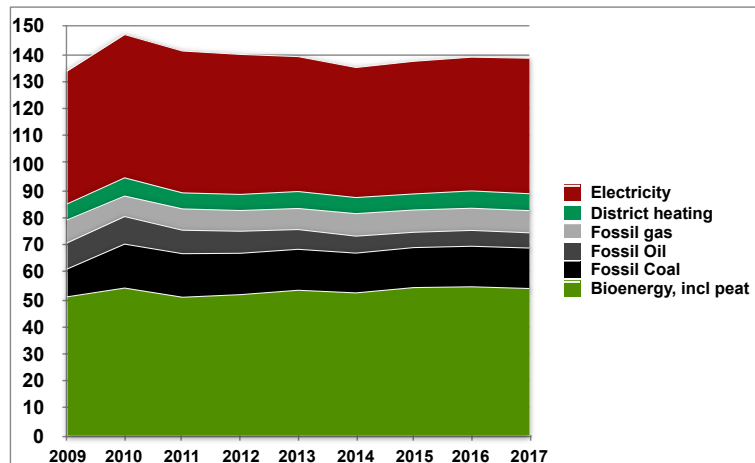


Swedens electricity generation 2017

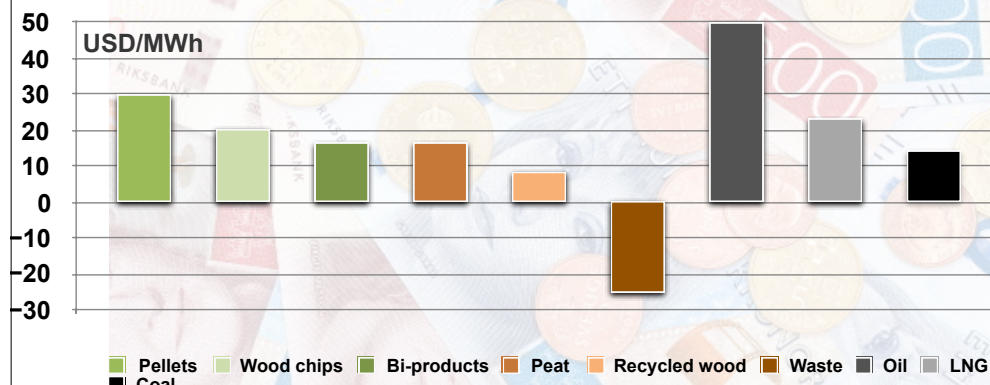
■ Fossil, including fossil waste
 ■ Nuclear
 ■ Wind
 ■ Biopower
 ■ Hydropower
 ■ Import

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Industrial energy use in Sweden, Twh



Un-subsidised, un-taxed price of fuels in Sweden

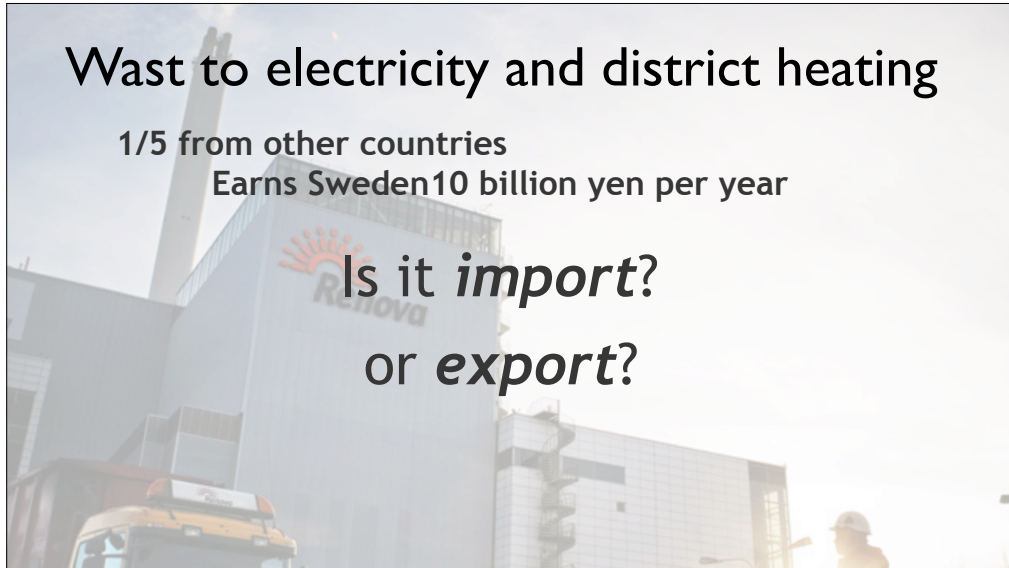


Wast to electricity and district heating

1/5 from other countries

Earns Sweden 10 billion yen per year

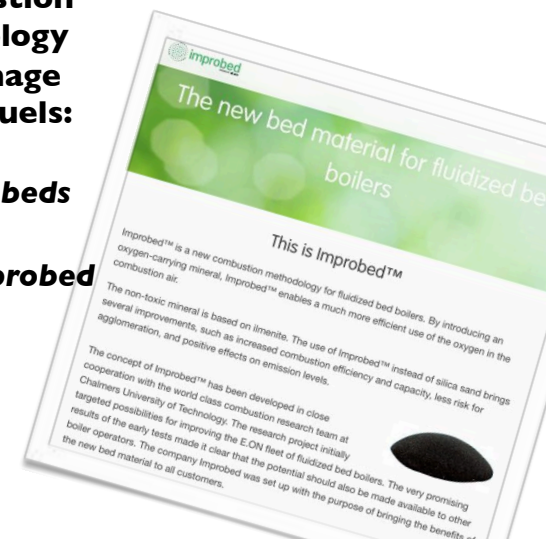
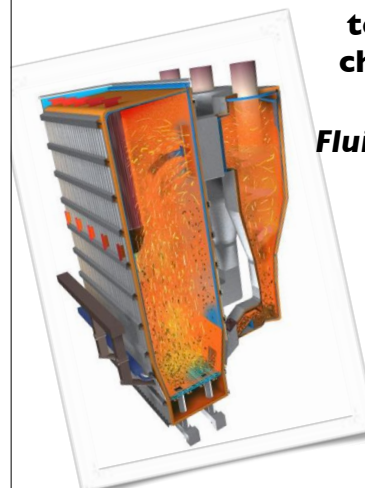
Is it *import?*
or *export?*



**Combustion
Technology
to manage
cheap fuels:**

Fluidised beds

Improbed



Good research!

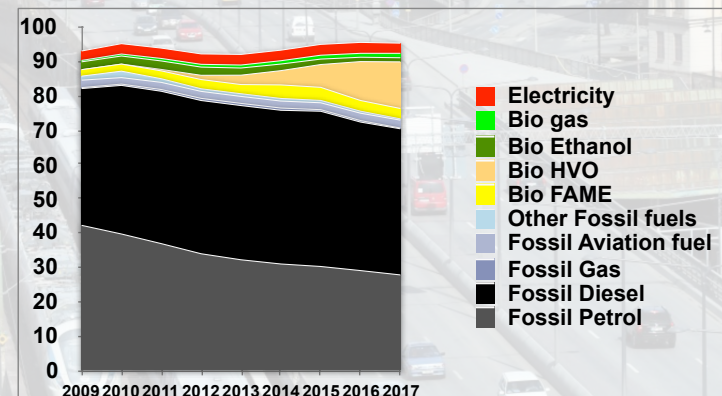


- 1 M€ improved economic result per FB boiler
- There are approx 1000
- Net present value 10 G€

The rest of us don't have to do anything!

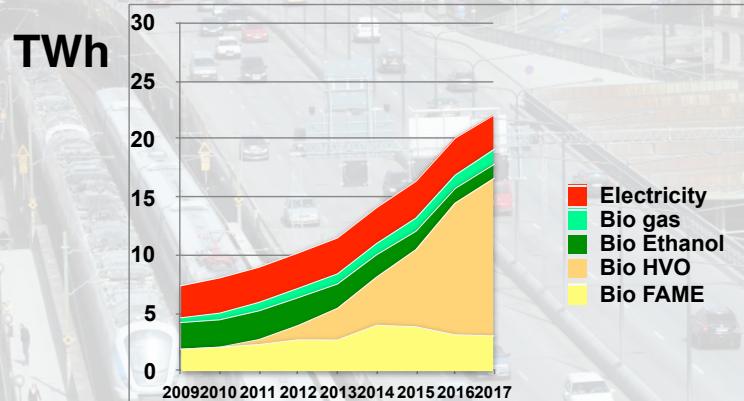
Energy use for domestic transport in Sweden

TWh



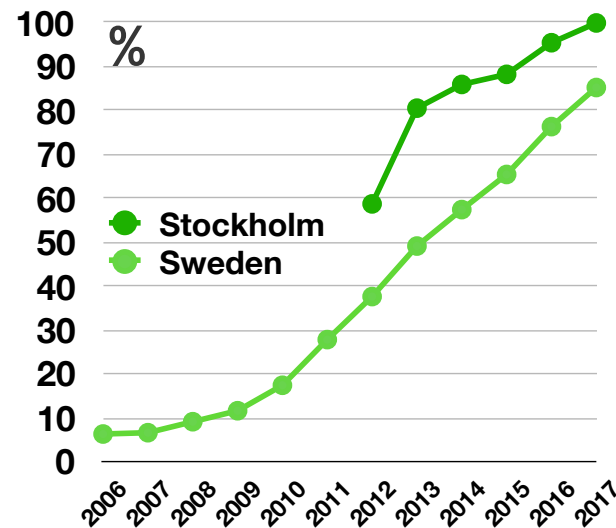
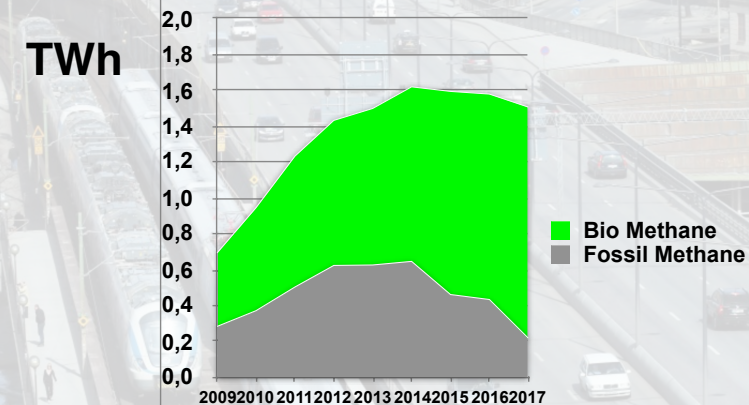
Data: Energimyndigheten
kortsiktsprognos

Renewable energy for domestic transport in Sweden



Data: Energimyndigheten
kortsiktsprognos

Vehicle methane fuel used in Sweden 2009-2017



Share of renewable fuels used in Stockholm's and Sweden's public transport 2006-2017

Data from the "FRIDA"-database

Future opportunities:

- Refined bioenergy to substitute residual fossil fuels in district heating and power sectors
- Refined bioenergy to substitute residual fossil fuels in industrial heating
- Electrification of transport, cars, trucks, busses, ferries and, later, in aviation
- CO₂-reduction obligation for remaining standard transport fuels
 - Diesel - 21.0% by 2020
 - Petrol - 4.2% by 2020
- Already Talloil as diesel feedstock for conventional refineries
- Pyrolysis oil and lignin considered for conventional refineries

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