Development of the Danish power and district heating systems from 2020 to 2035

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Peter Meibom, Head of the Analysis Group, Professor

DANSK ENERGI

The energy policy milestones of the Danish government (Vores Energi 2012)

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2020	2030	2035	2050
Wind power covers 50% of electricity consumption	No coal in Danish power plants No individual oil heating boilers	Power and heat supply covered by renewable energy	Power, heat, industry and transport covered by renewable energy

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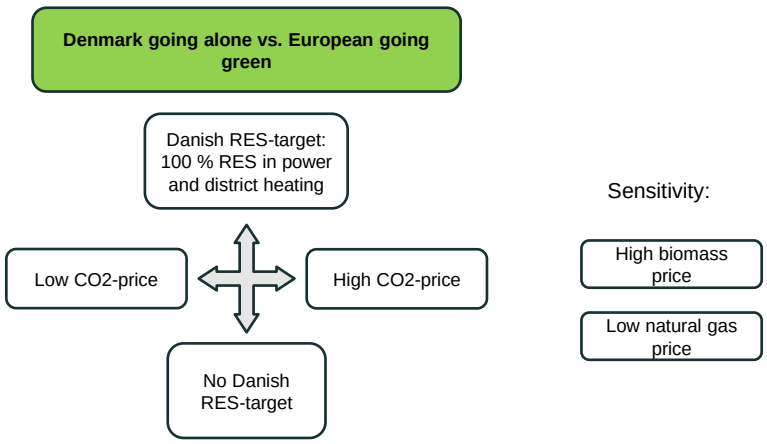

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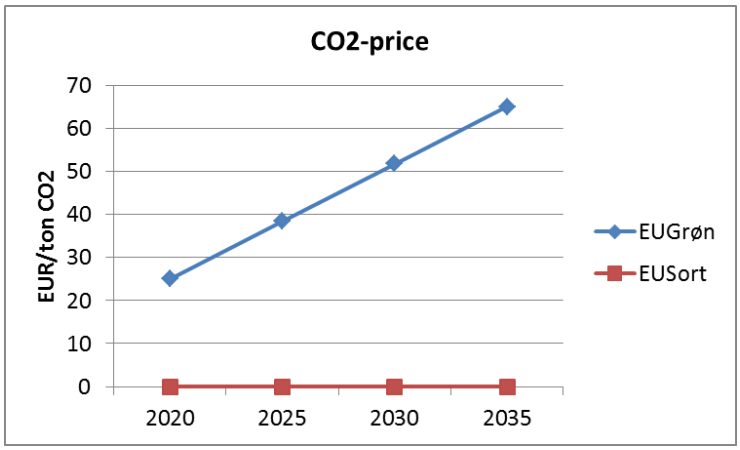

EUGrøn taken as an average over the decarbonisation scenarios in EU Energy Roadmap 2050

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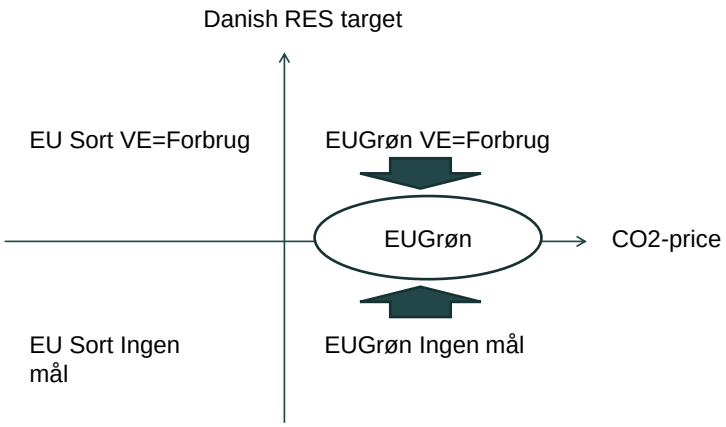
Four basic scenarios



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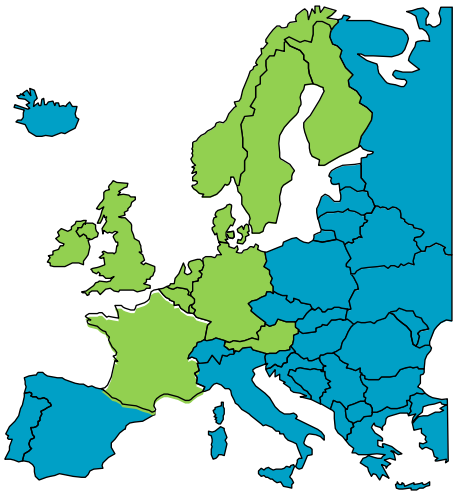
Method – Modelling of the power and district heating systems in Northwestern Europe

Balmorel runs 2020-2035

- Results 2020-2035
  - Investments
  - Power prices
  - Power production
  - District heating production
  - Fuel consumption
  - CO2 emissions
  - Power exchange
  - Costs
  - Support levels



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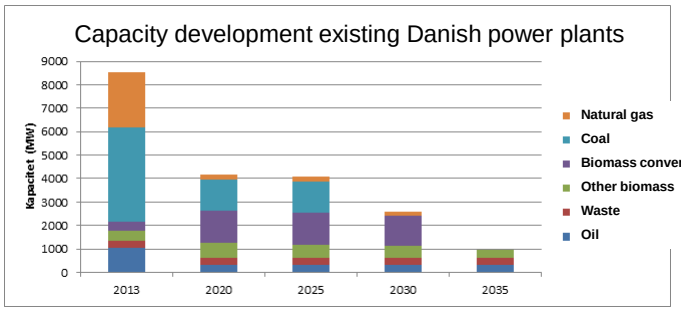
Two open windows

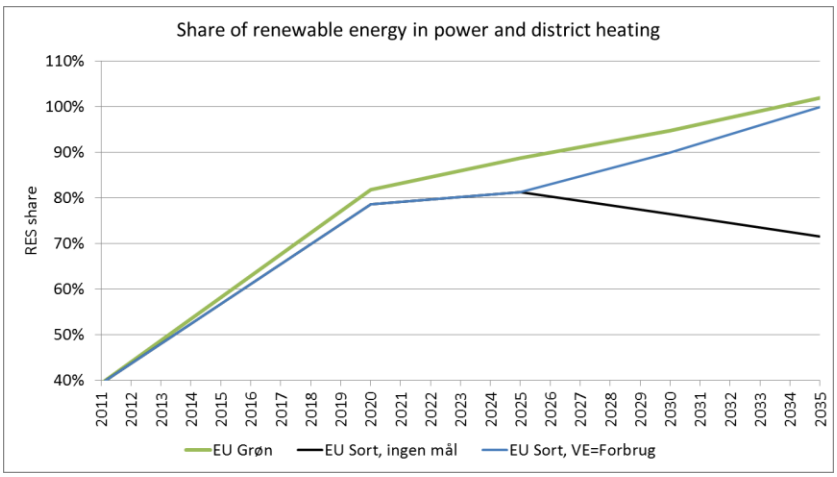
2018 "grundbeløb" stops. Life time extension of gas motors?
How will the heat be produced in decentral district heating areas?

2030 Stop for usage of coal in Danish power plants.
Decision on new capacity in several bigger cities e.g. Aalborg and Esbjerg

2035 Biomass converted power plants decommissioned.
How will the heat in Copenhagen, Aarhus, etc. be produced?



Already decided taxes and support schemes ensure a high share of renewables in 2020

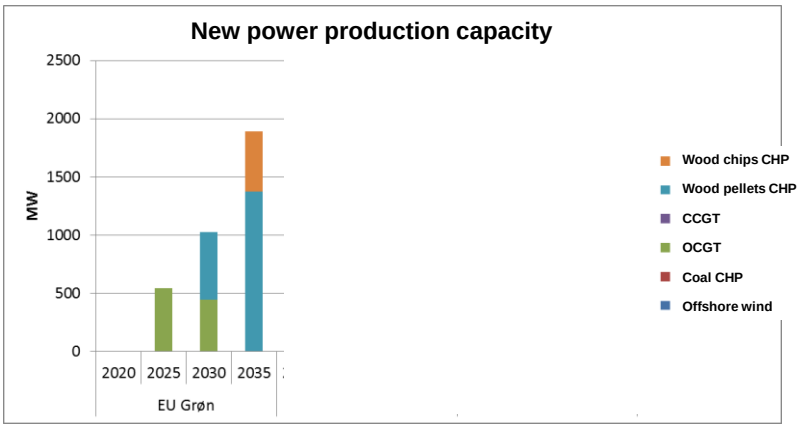


First open window – heat supply in decentral district heating areas

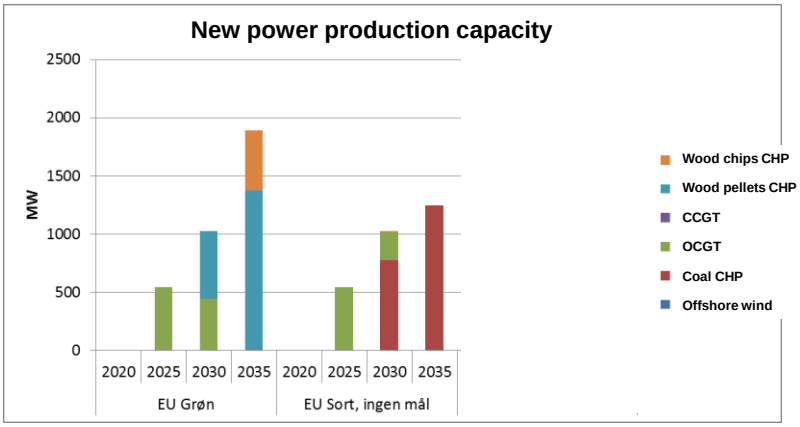
- Decentral natural gas fired CHP plants are not producing
- If usage of biomass in heat boilers allowed:
  - Investment in wood chip boilers
- If not allowed to use biomass heat boilers:
  - Investment in heat pumps
- If present taxes and support is removed:
  - Natural gas boilers later replaced by wood chip boilers

- If capacity payment exists in 2020:
  - Lifetime extension of decentral natural gas CHP
    - Used as peak power

Three different roads towards 2035



Three different roads towards 2035



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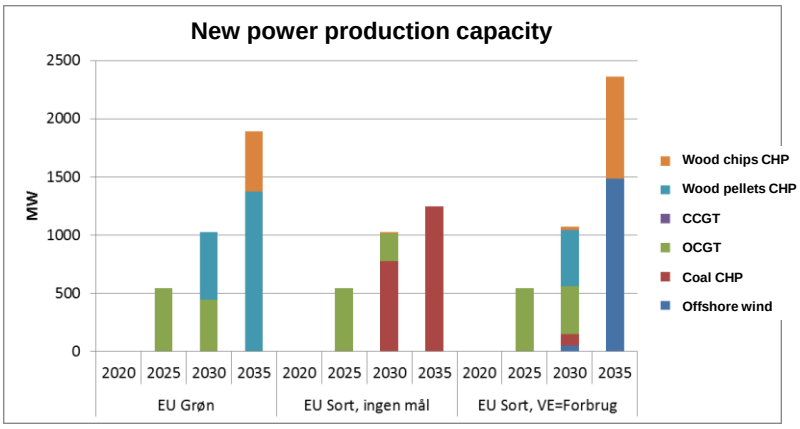
Three different roads towards 2035



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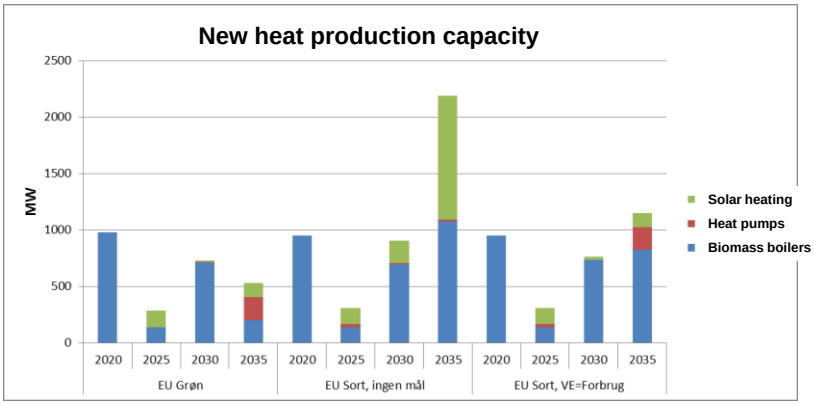
Taxes favours wood chip boilers



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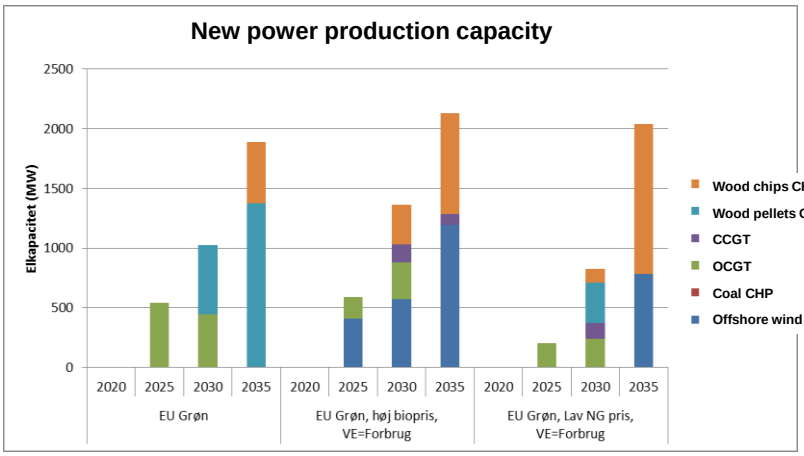
The road of biomass sensitive to fuel prices



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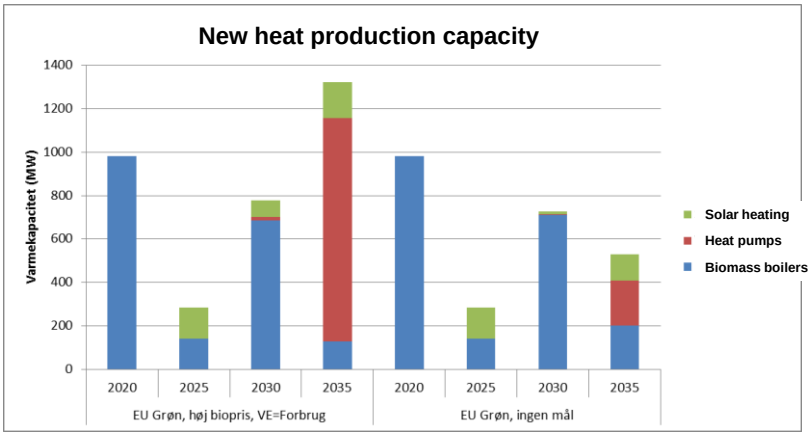
Offshore wind power leads to more heat pumps



Conclusions

- A continuation of the present energy tax and support system is crucial for the choice of technologies and ensures in itself a high RES share
- The choices between building new wood pellet CHP or offshore wind power after 2030 are sensitive towards changes in fuel prices of wood pellets and natural gas
- Decentral natural gas fired CHP plants require a capacity payment to stay operational