



# Gasification of Biomass & Waste

## Country Report Denmark

IEA Bioenergy Task 33  
Task meeting – 23 October 2017  
Skive – Denmark

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# What do we discuss in Denmark?

Government has been warming up for upcoming energy negotiations

- New energy agreement is to replace current one from 2012

Energy commission report

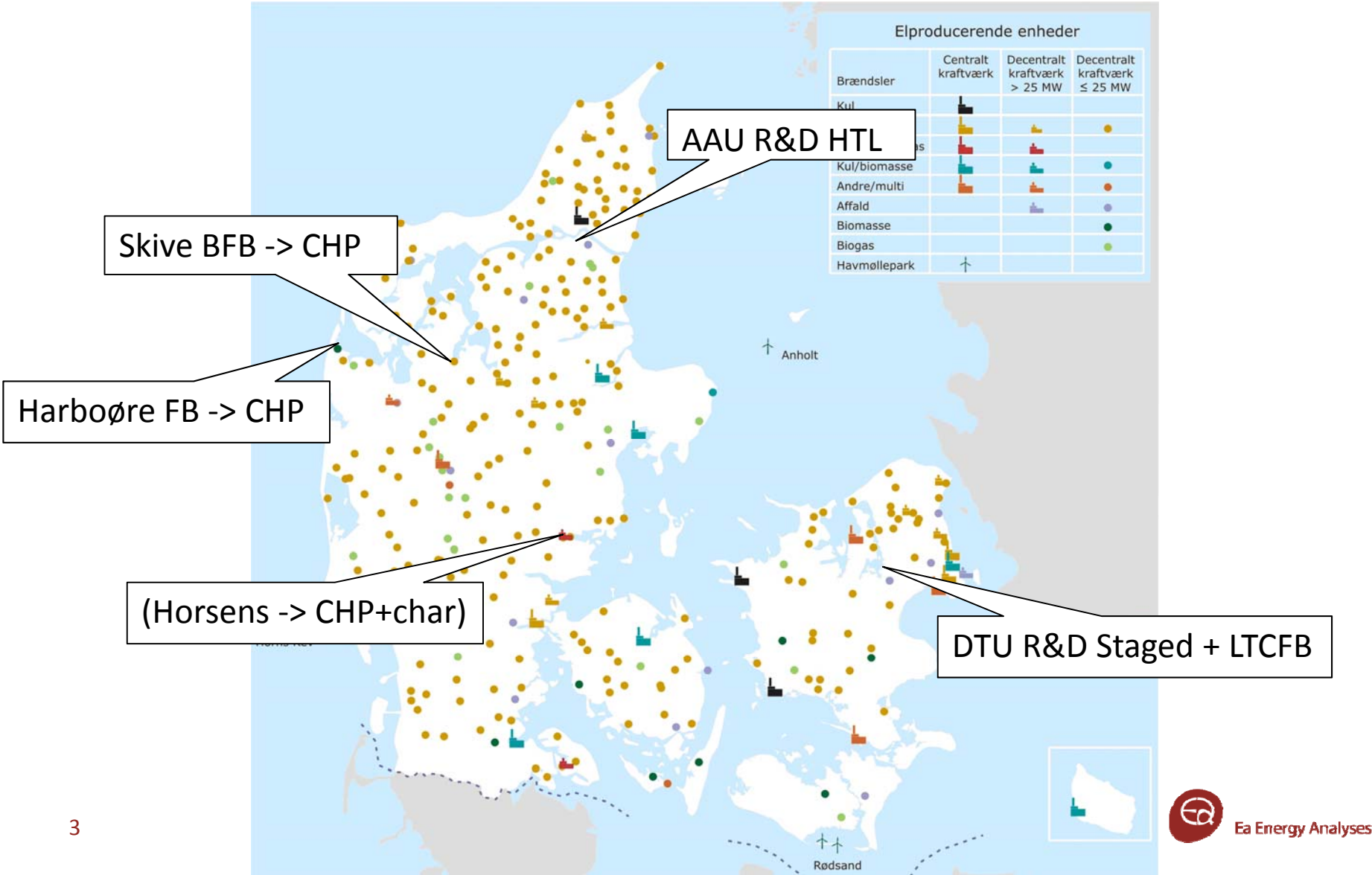
- Remove subsidy for RE + market to govern green energy future
- Non-ETS reduction goals require investments of €3-6 billion - to take place nationally?

District heating news

- Prices still decreasing, yet, Danish prices are higher than Swedish ones, a study from Ea shows
- Large heat pumps and electricity tax reduction
  - Taxation analysis pending
- Utilisation of surplus heat from data centres discussed

DONG Energy has changed name -> 

# Biomass gasification plants



# Choice of recent R&D projects

- [Oxy-fired Biomass Gasification for Flexible Power](#)
  - Integrating oxygen membranes (DTU)
- [Synergy by Integration of Biogas and bio-SNG](#)
  - Feeding producer gas into biogas reactor (DGC)
- [Regenerative Sulfur Removal from Biomass Gasifiers](#)
  - High temperature H<sub>2</sub>S removal (DTI)
- [Catalytic removal of tar from biomass gasifiers](#) (DTI + HTAS)
  - Optimizing Skive CHP plant
- [PolyGas - POLYgeneration by thermal GASification](#)
  - Producing bio oil/char or gas for CHP on low value fuels in 100 kW LTCFB (DTU)
- [SYNFUEL - Sustainable synthetic fuels from biomass gasification and electrolysis](#) (DTU)
- Sewage sludge gasification in Viking staged gasifier at laboratory (DTU)
- Bio oil generation via pyrolysis in pressurized H<sub>2</sub> atmosphere with catalyst in bed (DTU)

# Partnership for Thermal Gasification

- Study on framework conditions now and in 2030 is now public
  - How do framework conditions in Denmark influence implementation of gasification
  - How will framework conditions develop towards 2030
  - How does thermal gasification compare with alternatives

# Conditions today and in the future

|                                   | Current framework   | Possible framework in 2030   |
|-----------------------------------|---|--|
| CHP                               | <p>Electricity:</p> <ul style="list-style-type: none"> <li>FIT at around 18 €/kWh</li> </ul> <p>Heat:</p> <ul style="list-style-type: none"> <li>Indirect advantage due to tax exemption</li> </ul> | <p>Electricity:</p> <ul style="list-style-type: none"> <li>Subsidy for solar and wind energy will set the level</li> </ul> <p>Heat:</p> <ul style="list-style-type: none"> <li>No tax advantage – other heating technologies expected to be primarily RES</li> </ul> |
| Bio-SNG                           | Not equal with biogas, that is today obtaining high subsidies for production og upgrading   | <p>Equalisation between bio-SNG and biogas:</p> <ul style="list-style-type: none"> <li>Base subsidy</li> <li>Subsidy dependent on natural gas price</li> <li>Green certifikates</li> </ul>   |
| Liquid biofuels (Fischer Tropsch) | No specific support   | <p>Mandates for renewable fuels:</p> <ul style="list-style-type: none"> <li>By 2030 6,8% of energy consumption for transport must be renewable fuels</li> <li>Fischer Tropsch syndiesel to compete with 2G bioethanol, biogas and electricity etc.</li> </ul>        |
| Waste based bio-SNG               | <p>Exempted from taxes:</p> <ul style="list-style-type: none"> <li>Waste heating tax</li> <li>CO<sub>2</sub>-tax</li> <li>Additional tax</li> </ul>   | Like today   |

# LCOE comparison -> possible openings

- **Bio-SNG based on biomass will be competitive with biogas and natural gas**, if bio-SNG obtains the same subsidies as biogas and a substantial technology development takes place
- **Bio-SNG based on waste gasification** is competitive with waste incineration in 2030
- A subsidy of 5€/GJ to make **Fischer Tropsch syndiesel competitive with diesel** is a reasonable level when compared with other means of green transition in the transport sector
- **Gasification based CHP is not expected to become competitive** with alternative CHP technologies such as biomass combustion
  - However, co-firing gasified straw or waste into biomass combustion CHP plants (wood pellets) seems be viable.





Thank you!

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