

IEA Task 33 Meeting

Skive, Denmark

2017-10-23

Country Update Sweden

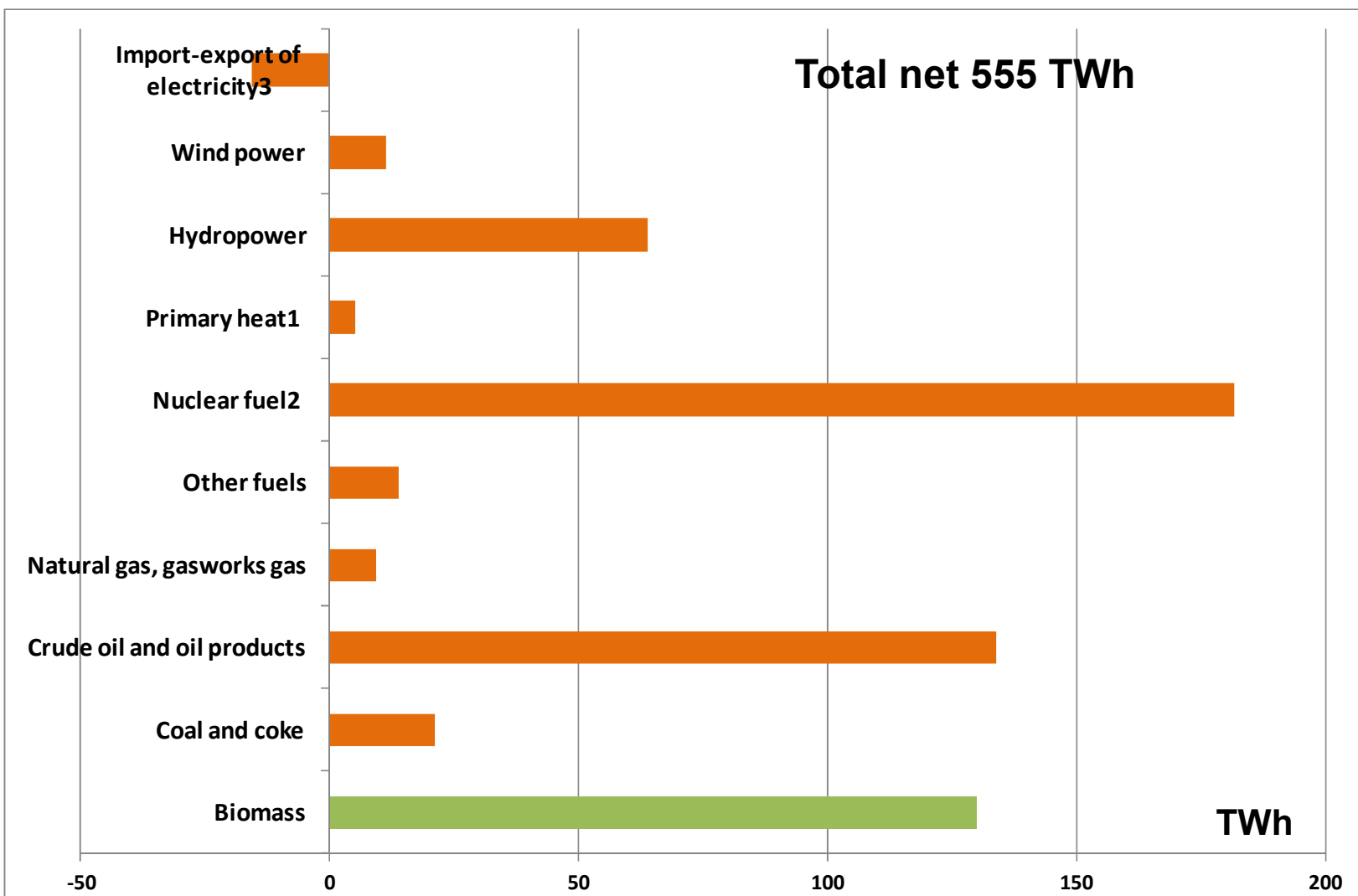


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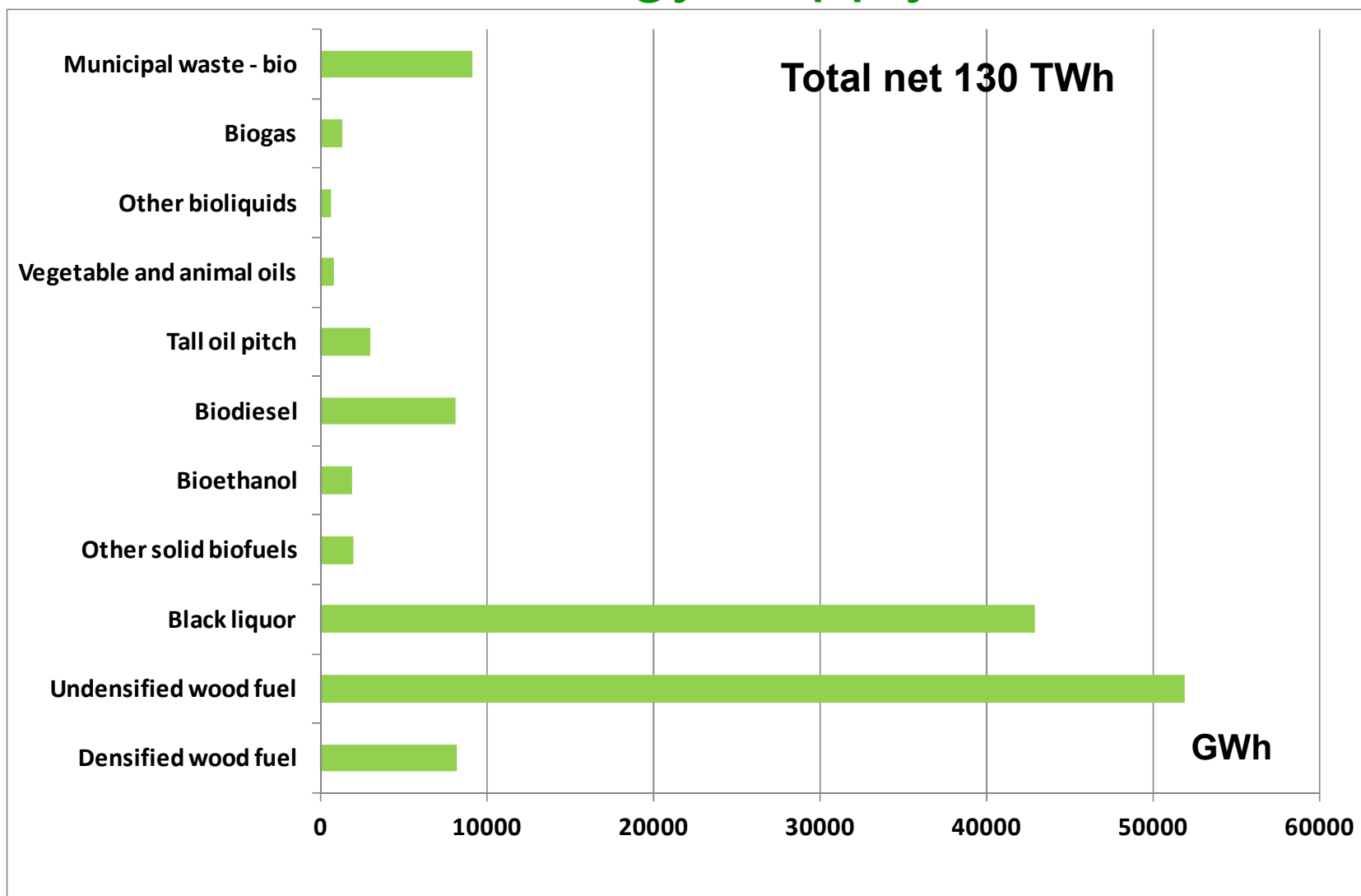


Primary Energy Supply 2014



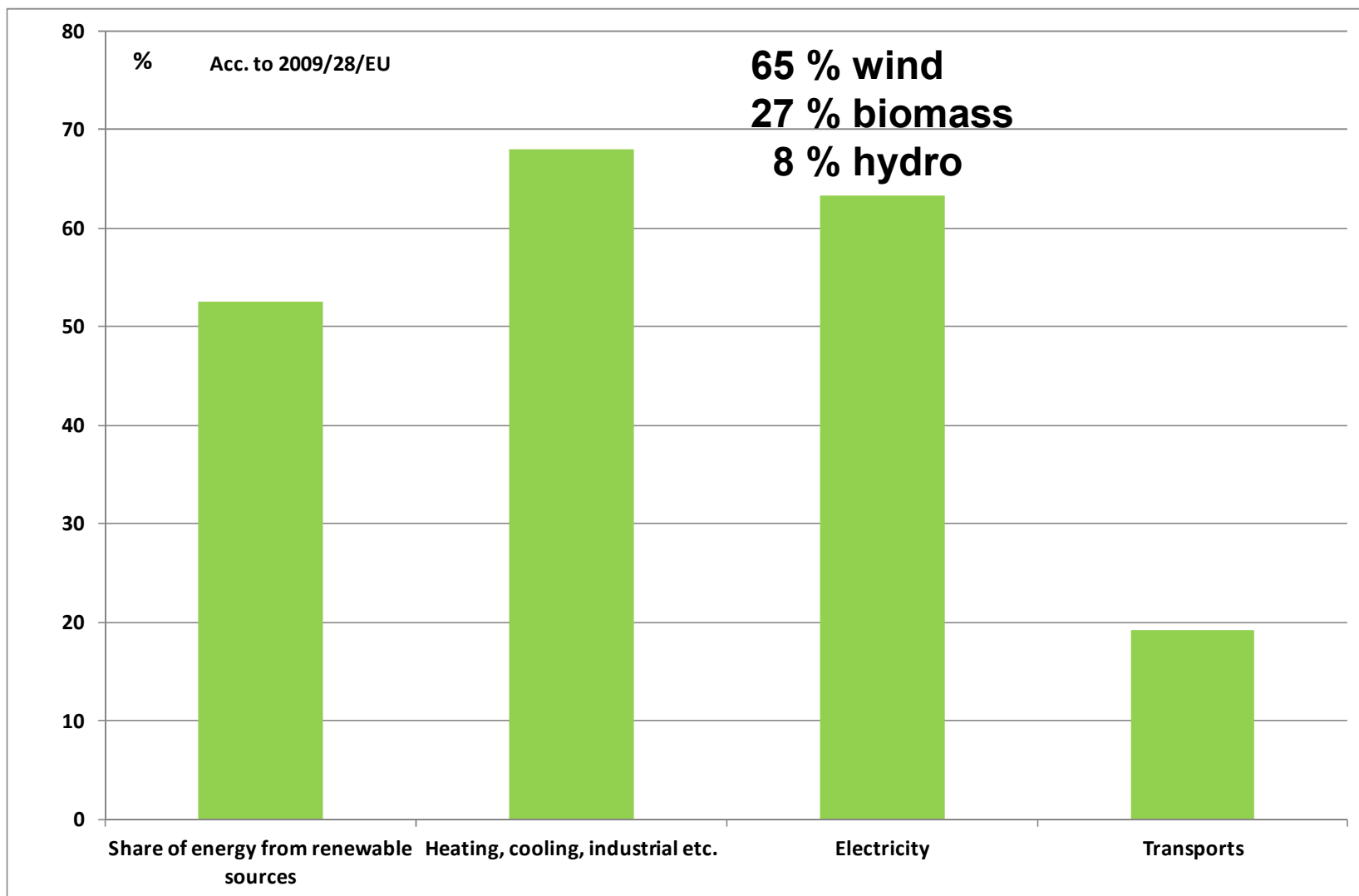


Biomass Energy Supply 2014





Use of RE energy 2014





Energy Agreement & Commission

Electric energy (today 120TWh) 116-162 TWh 2030, 107-195 TWh 2050

Structural changes, increasing variability in generation. Power sector economics not in favour of new investments

Goals

- Sweden should have no net GHG emissions by 2045, and achieve negative GHG emissions after this date.
- Sweden should have 100 % RE power after 2040. This is a goal and "not an ultimate stop date prohibiting nuclear power or implies a decommissioning of nuclear power by political decision"

Actions

- Decision to gradually phase out the "power tax" to 2017
- Expand the SE RE Certificate target by 18 TWh to 2030
- Sectorial energy savings strategies, in particular for energy-intensive industries
- Revision on re-permitting process for hydrogenerators



Climate Proposition 2017

”The global average temperature increase should be limited to well below 2 °C and efforts should be made to reach below 1.5 °C. Sweden shall engage internationally to direct global efforts towards this goal.”

Instrument

That parliament passes a law, to be in force as of 2018, to define the obligations of the government in the climate area

- To work against long-term goals set by the parliament
- That climate impacts should be considered and used as guidance in parallel to other goals in all policy areas
- Modalities for planning and follow-up
- Reporting to parliament



Climate Proposition 2017

* ESR= EU effort sharing mechanism,
i.e. non-ETS sector

Proposed Goals

- No net GHG emissions post-2045, negative emissions thereafter.
- GHG emissions on Swedish territory reduced by 85 %, rel. 1990.
- ESR* sector emission reduction 63 % by 2030, 75 % by 2040, rel. 1990
- Of which only 8 and 2 %, respectively, from complimentary actions
- Transport sector emission reduction 70 % by 2030, rel. 2010
- Goals are only intermediate and part of overall environmental goals

Conditions

- An increased ambition also in the EU ETS system is assumed and aslo basis for possible adjustments of goals for 2030 and later
- Also other reduction measures, e.g. fossil or bio-CCS, C captured in soil and forestry, actions outside Sweden can be included.
- Does not include emissions and capture from land-use, land-use change and in forestry (LULUCF) estimated as per international climate reporting methods.



RE Promotion Green Certificates

2002 datum **6.7 TWh**

2002 target **+ 10 TWh 2010**

2006 target **+ 17 TWh 2016**

2009 target **+ 25 TWh 2020**

2012 SE+NO common target

SE **+ 13.2 TWh 2020** to meet previous target

NO **+ 13.2 TWh 2020**

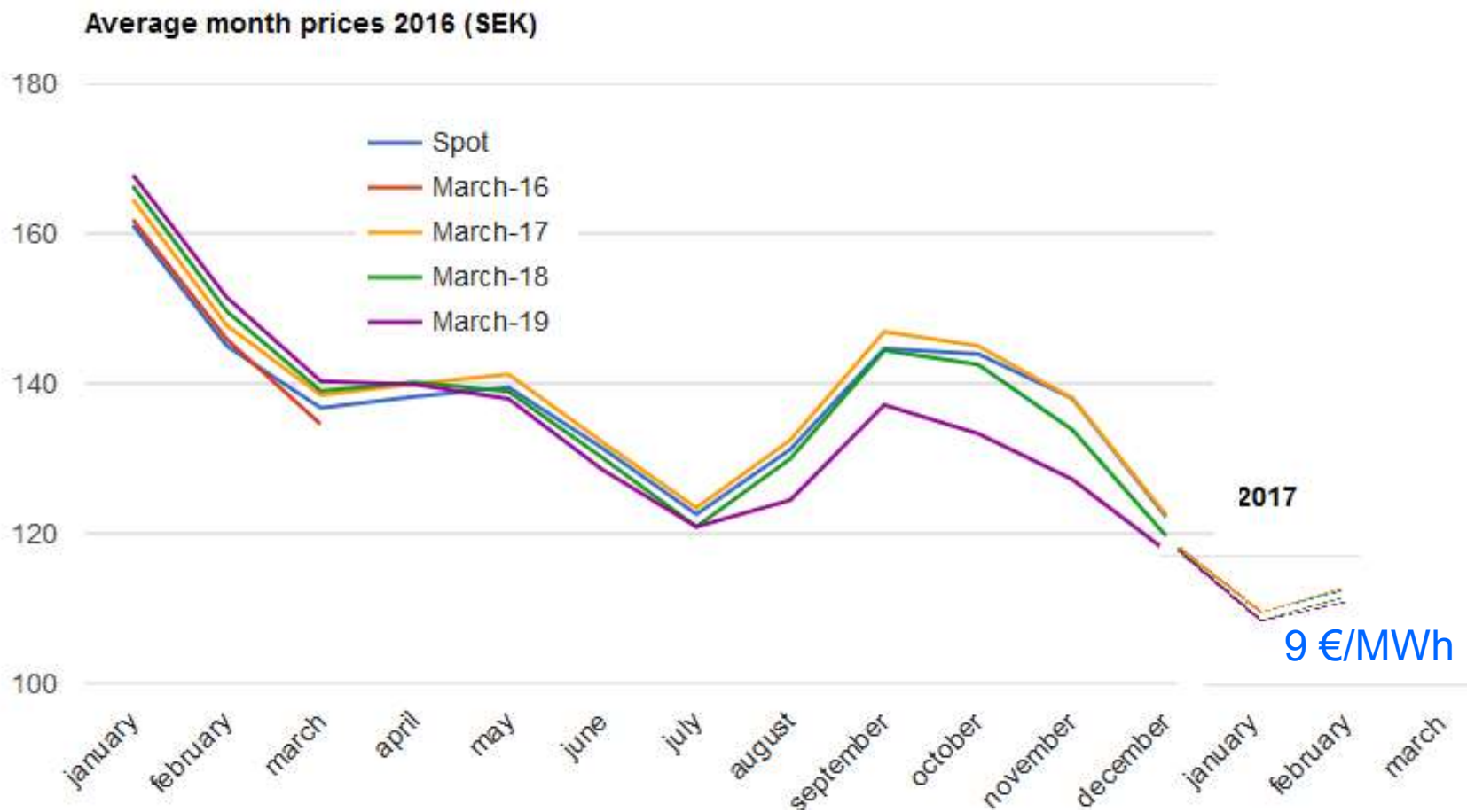
2015 SE target **Increase 5 TWh to + 30 TWh 2020**

June 2016 SE target **Increase 18 TWh to + 48 TWh 2030**

(total final power usage in 2014, 120TWh)



RE Certificates 2016



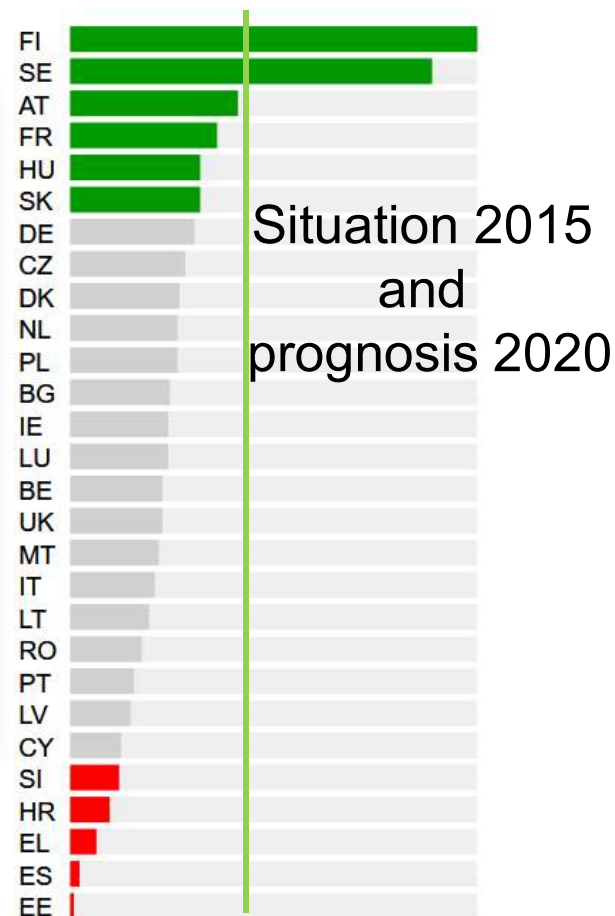
Source Svenska Kraftmäklarna



Renewable energy in transports

EU target 10 % 2020

Swedish ambitions

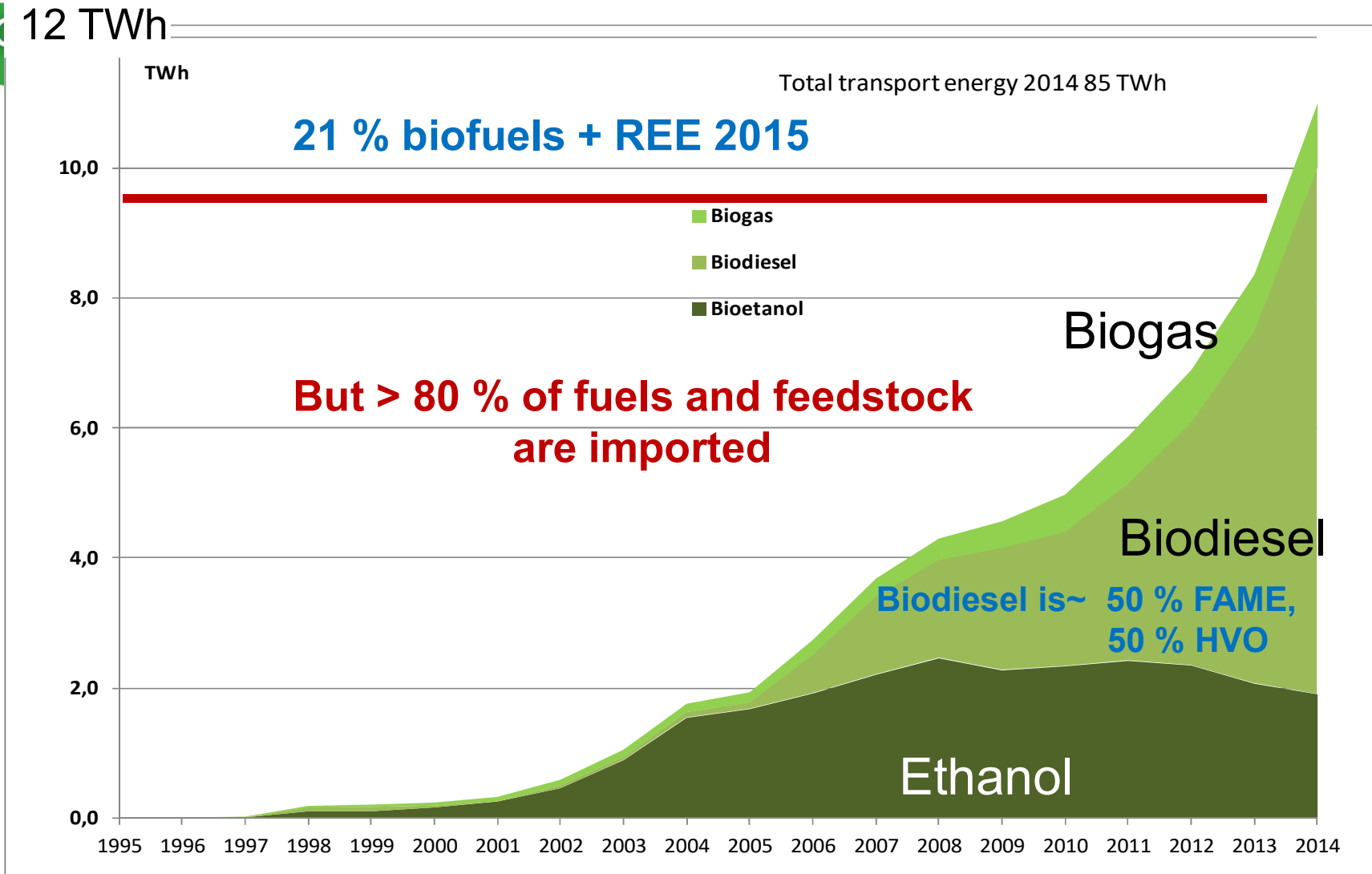


GHG emissions from transports, excl. aviation, should be reduced by at least 70 percent at 2030 latest, rel. 2010.

The Fuel Substitution includes a Reduction Duty that is the most ambitious yet worldwide. The aim is to reduce the GHG emissions from road traffic by 40 % by 2030, i.e. approximately half of the energy in petrol and diesel sold is renewable.



Renewables in the transport sector





Proposal: GHG reduction in Transport 2017

Proposed goal: Transport sector GHG reduction

70 % by 2030, rel. 2010, (excl. Aviation)

Instrument

- GHG reduction obligation for diesel and gasoline by biofuel blends (energy)

| 2018 | 2019 | 2020 | 2030 |
|----------------------|----------------|----------------|--------------|
| G 2.6%, D 19.3 % | G 2.6 % D 20 % | G 4.2%, D 21 % | Overall 40 % |
| (i.e. 50 % blending) | | | |

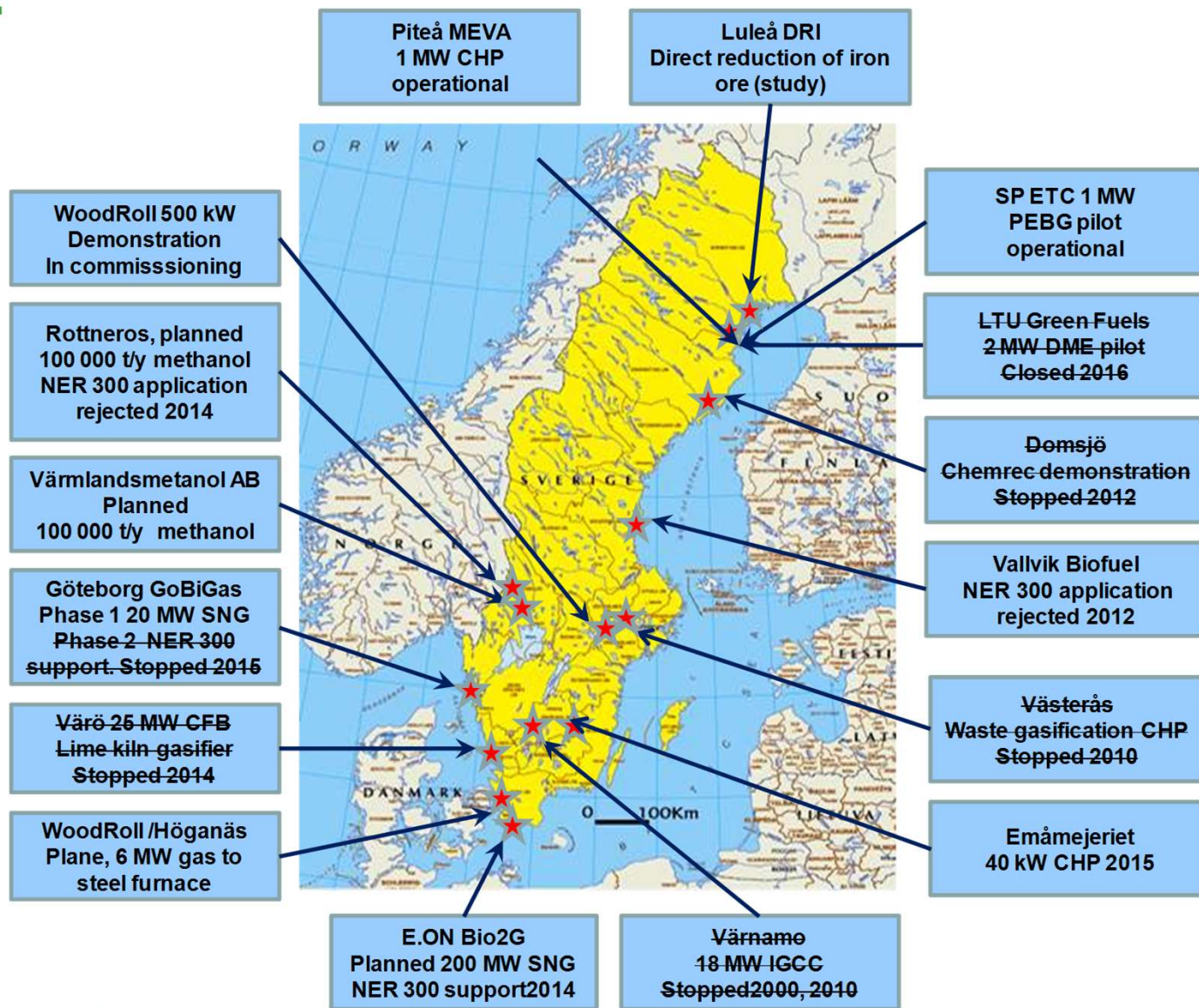
- Sanction for non-compliance **7 SEK/kg CO₂ (700 €/ton) or biofuel premium value cap ~1.5 €/l fossil eqv.**
- Uniform energy tax and CO₂ tax for gasoline and diesel products on the market, adjusted for of blending, i.e. decreases over time on a volume basis.
- Not applicable to neat or high-blends biogas, E85, ED 95, B100 etc., where 100 % CO₂ tax reduction and also 100 % energy tax reduction is proposed

Other modalities in parallel actions

- Bonus-malus system in vehicle taxation based on emissions per km
 - Promotion of e-mobility and low emission vehicles
 - Changes to the taxation of company cars
-



Biomass Gasification Developments 2010-





Swedish Research Program

SFC

Separate slide

LTU-

Biosyngas centre

Separate slide

Energy gas program

Terminated 2016, no new program

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65 million SEK, of which part is a joint program of 44 MSEK, “Renewable transport fuels” 50% co-funded by Energy Agency

Thermochemical

Conversion

Biomass including lignin, gasification, HTL, HTC, pyrolysis, hydrogenation, 80 MSEK 2015-19 (allocations 40 in 2015, 20 in 2016, 45 in 2017)

The main roles of SFC

- **Strengthen and coordinate** Swedish gasification R&D and foster a new generation of **gasification competence** in Swedish academy and industry
- Serve as a national network for **knowledge transfer** and **problem solving** within the field of gasification
- **Facilitate commercialization** of advanced gasification of renewables

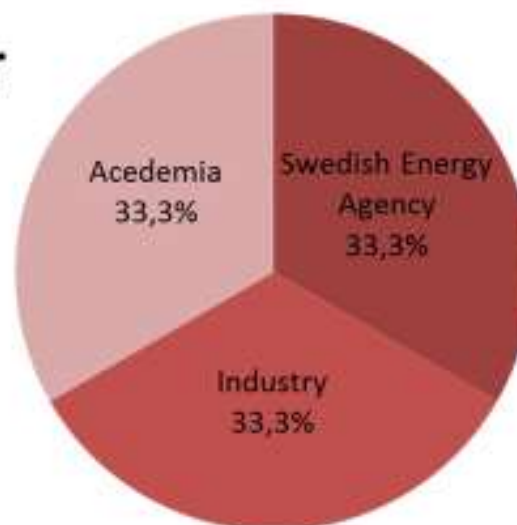




SFC

SFC- A Centre of Excellence

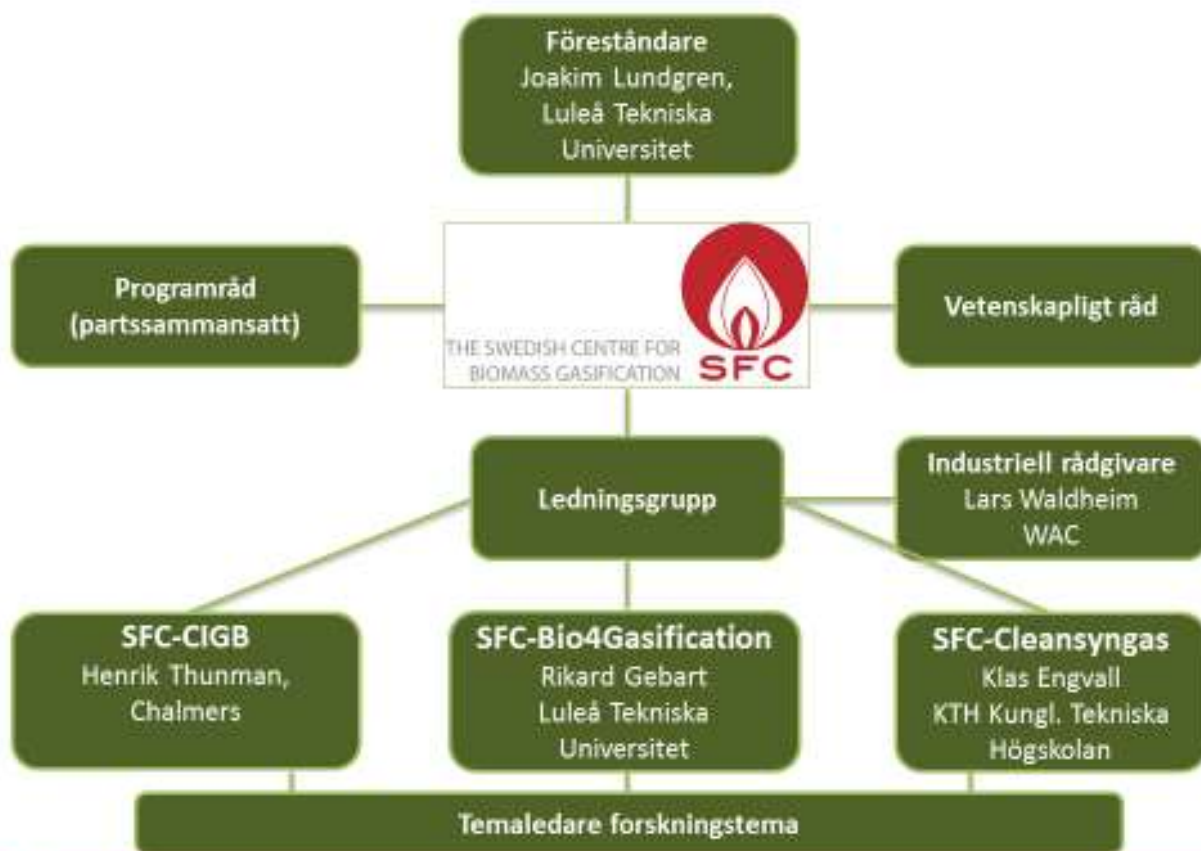
- Annual budget **6 million Euro per year in 10 years until 2021**
- In total, approx. **20 companies, 8 universities** and **one institute**
- **25-30 senior researchers** and **30-35 PhD students** (>20% funding from SFC)





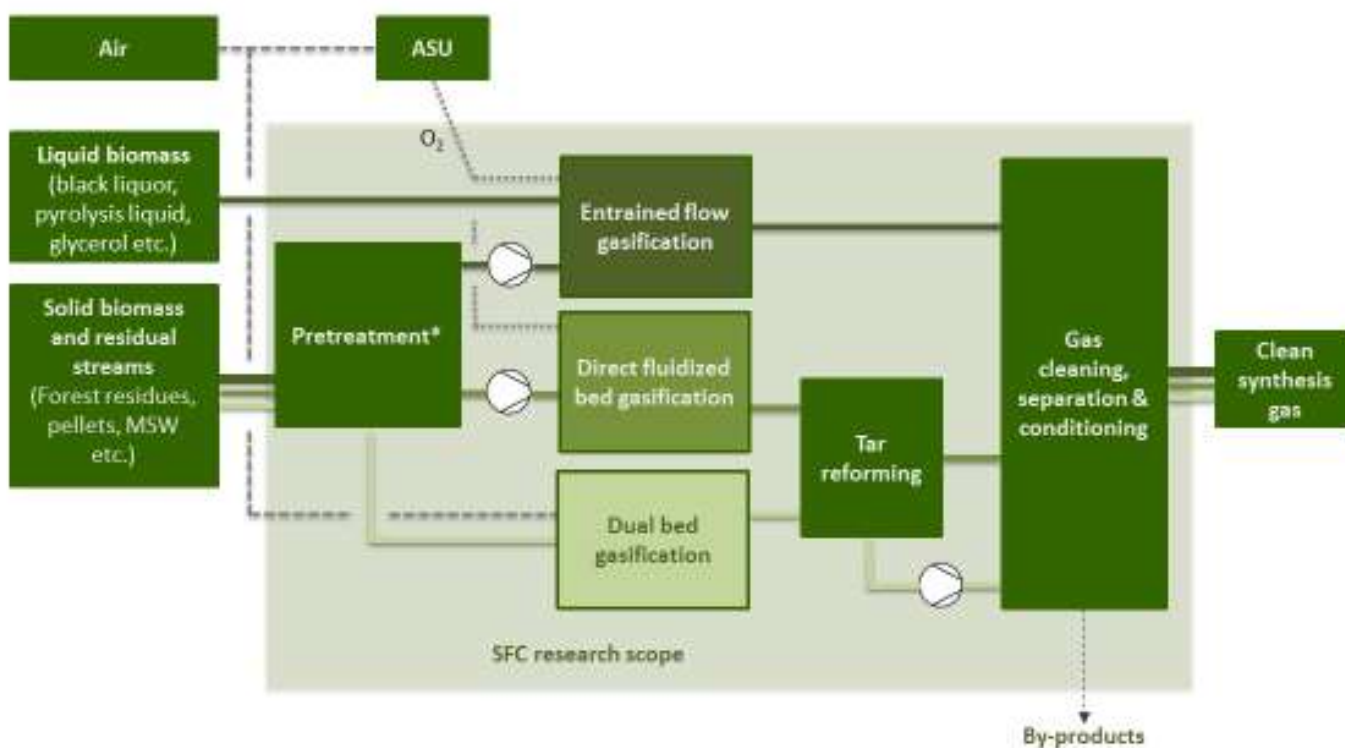
SFC

SFC Organisation



SFC

Scope of research within SFC



*Only pretreatment research with strong connection to biomass gasification (i.e fuel impregnation, integrated pyrolysis, etc)





SFC

Company partners





SFC

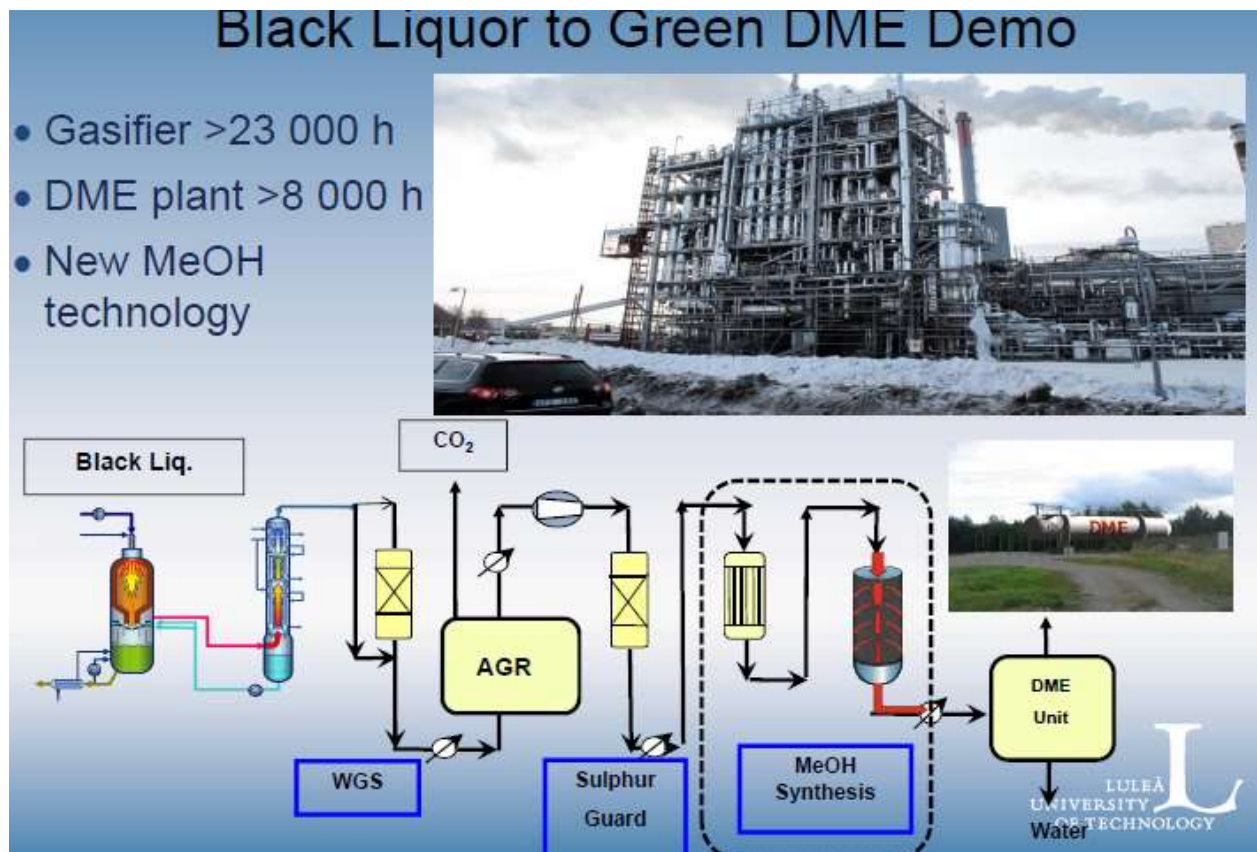
Academic and governmental partners



CHALMERS



LTU Biosyngas program



Previously Chemrec BL pilot, bio-DME pilot
 LTU Biosyngas program, approx. 160 MSEK, 2014-2016
 Program ended in May 2016 and no additional funding secured
Mothballing for a period has been decided.



Other Projects

Other projects, no known development

- Bio2G, EON 300 MW SNG, S. Sweden
- Värmlandsmetanol, 100 000 tpa methanol, Värmland (New IPO on-going, 1.5 Million €)
- Rottneros biorefinery, 150- 200 000 tpa methanol, Värmland
- MEVA Hortlax



Cortus Energy Probiostål

6 MW MCV gas + biocharcoal to a steel furnace at Höganäs Steel.

