

IEA Task 33 Meeting
Alkmaar, The Netherlands
2018-05-07

Country Update Sweden



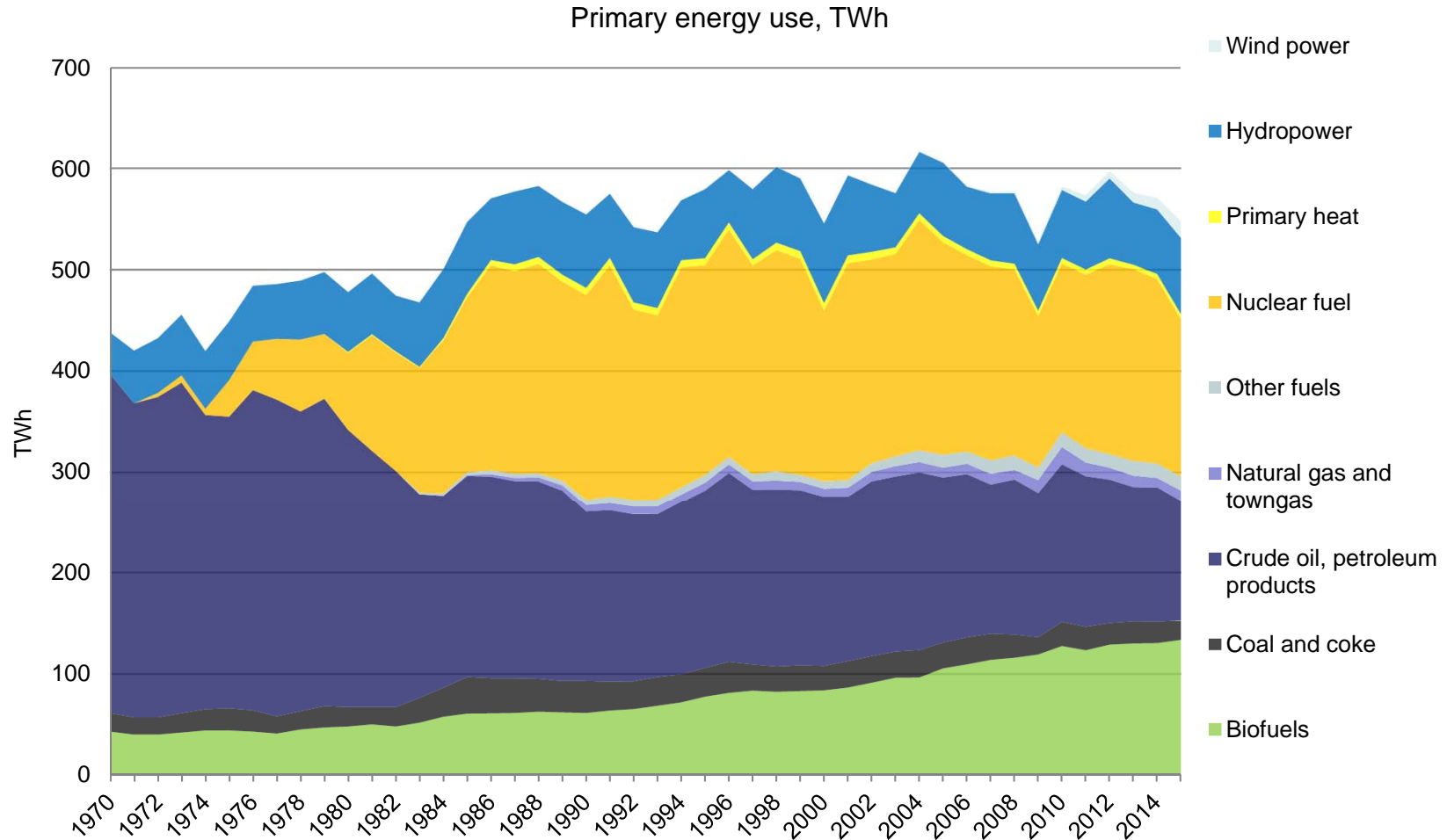
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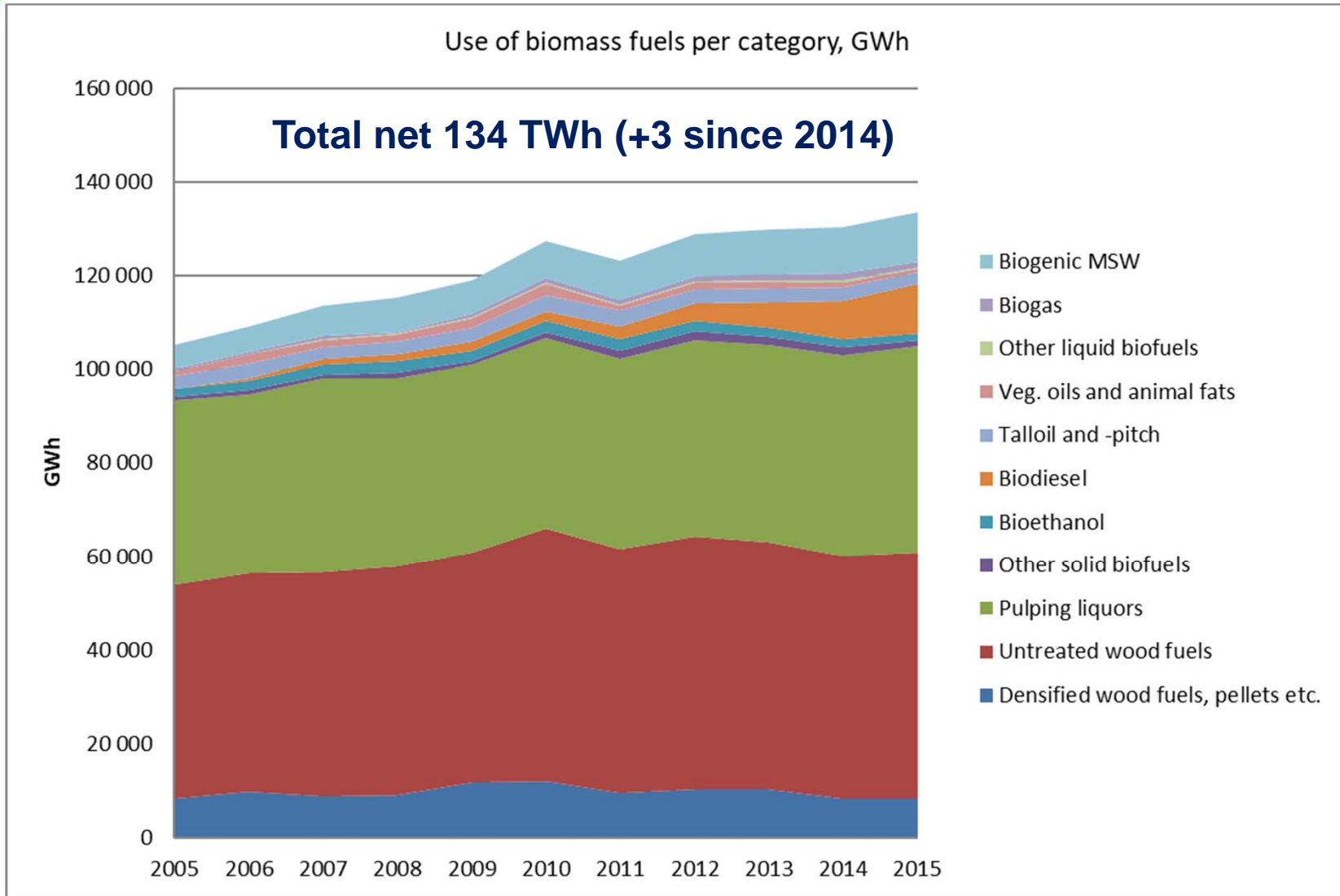
Primary Energy Supply 2015

Total net 525 TWh



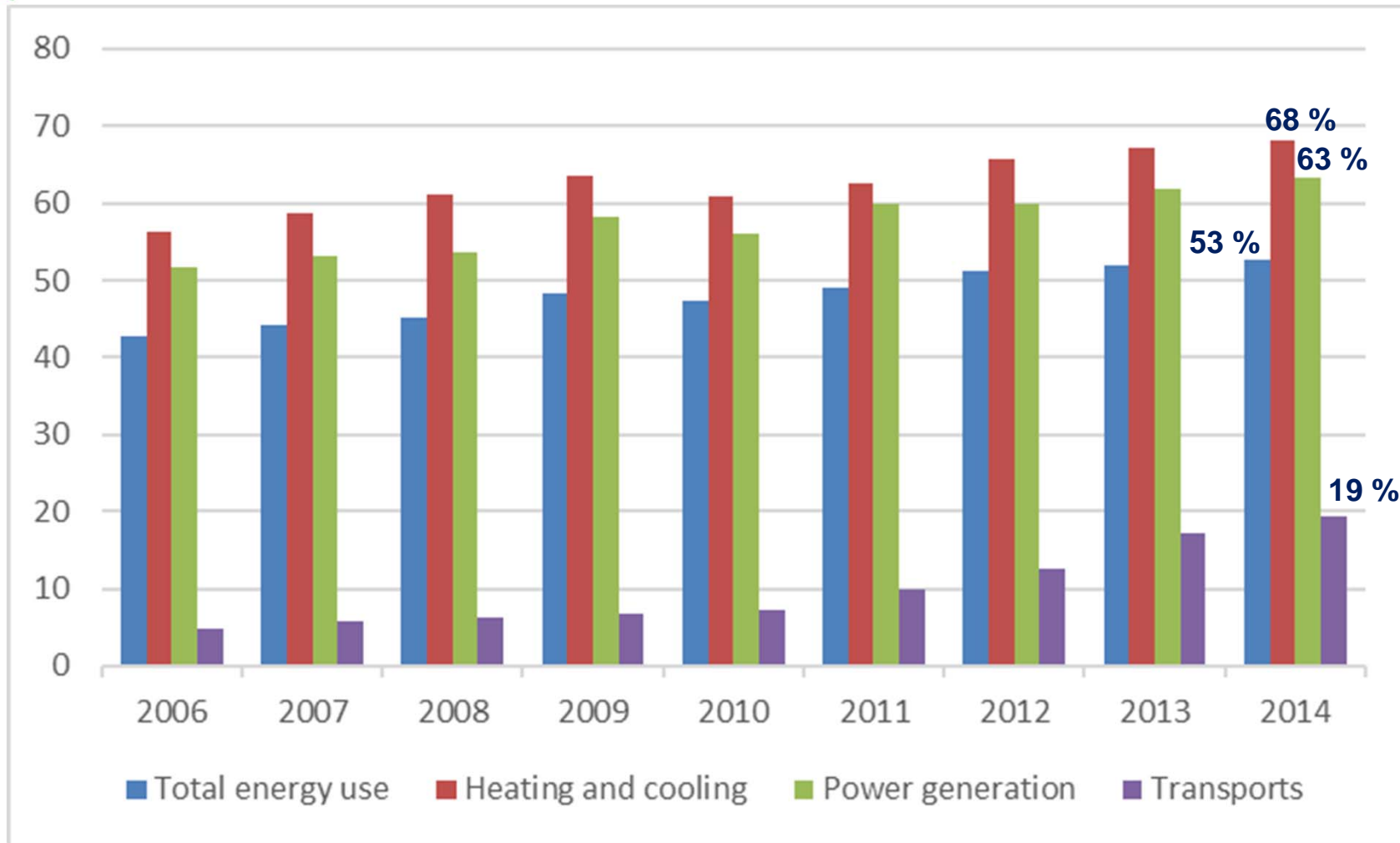


Biomass Energy Supply 2015





Use of RE energy 2014





Climate Proposition 2017

Climate law passed in 2018 requiring government to work towards goals set by the parliament and report back on these

Proposed Goals

- No net GHG emissions post-2045, negative emissions thereafter.
- Green certificates quota + 48 TWh 2030, rel. 2002.
- Sweden should have 100 % RE power after 2040
- 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

- Assumes increased ambitions in the EU ETS system
- Other measures, e.g. CCS, C capture in soil and forest, actions outside SE included.
- Does not include emissions and capture from (LULUCF)



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

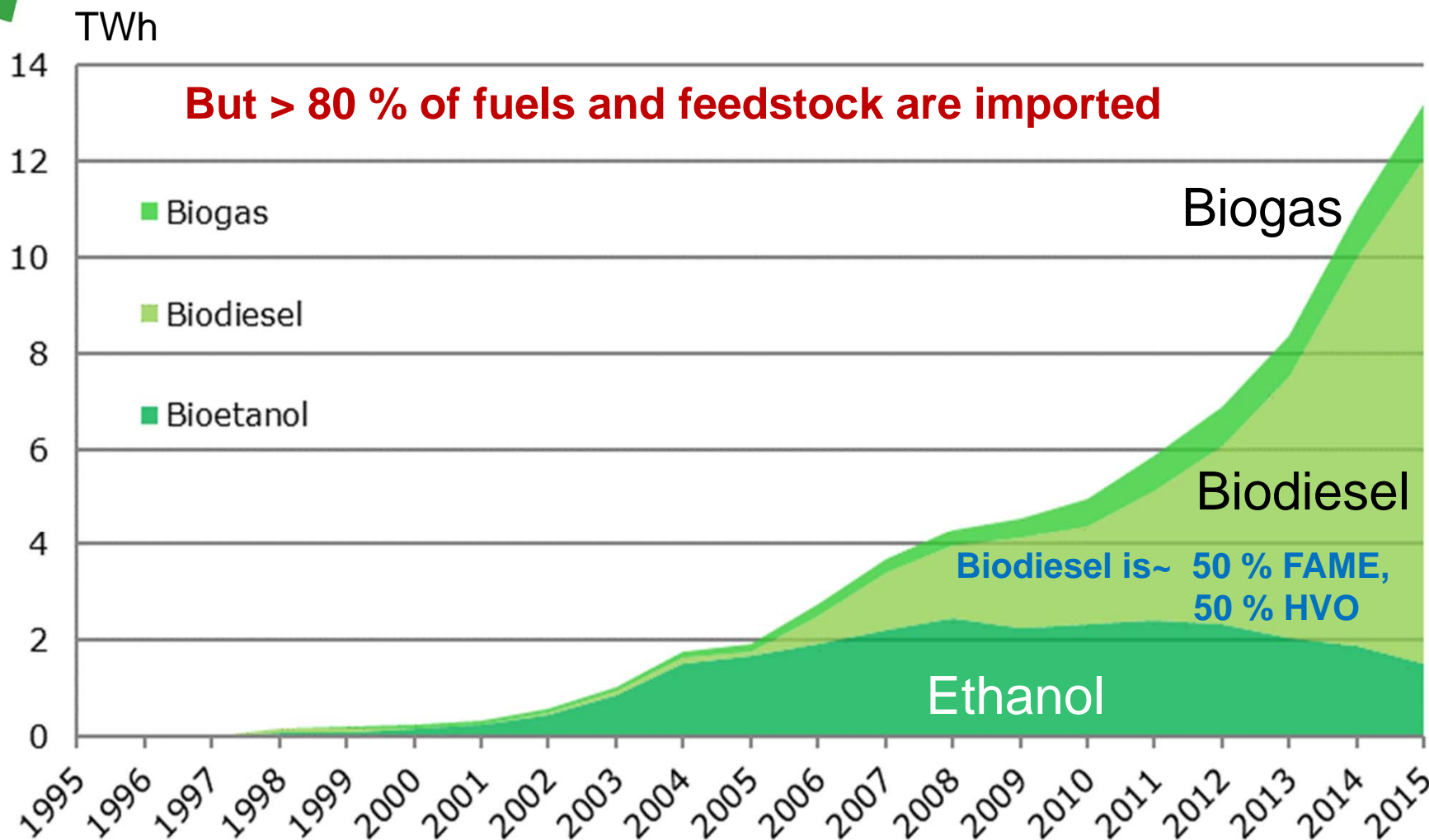
Other modalities in parallel actions

- 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
-



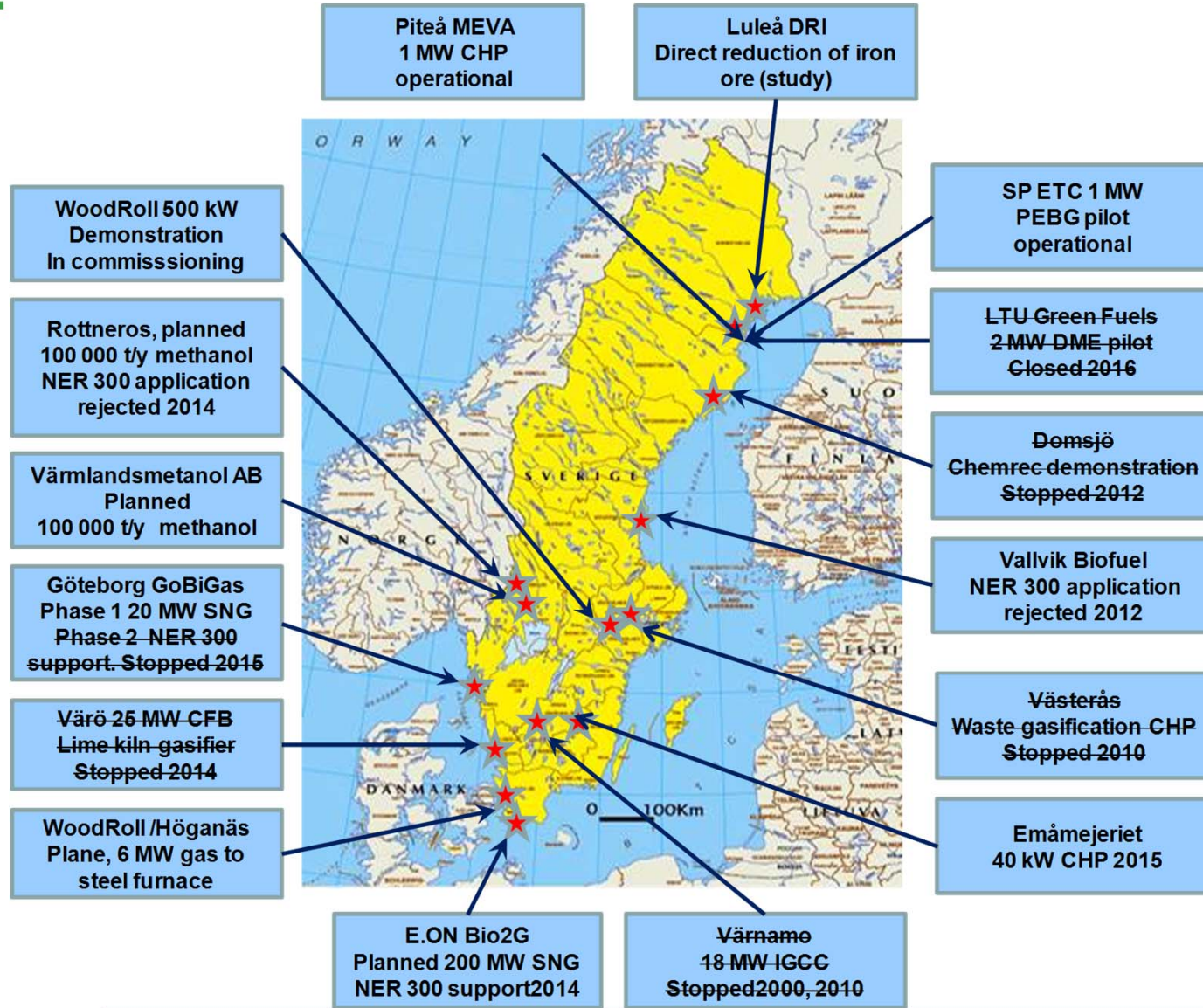
Renewables in the transport sector

21 % biofuels + REE 2015





Biomass Gasification Developments 2010-





Swedish Gasification-related R&D Programs

Swedish Energy Agency (alone) +various industries

SFC (Gasification)

On-going 2017-21, budget 24 M€

LTU-Biosyngas centre

Idling

F³ (system analysis)

New phase 2018-21, budget 3.3 M€

Biofuels program

On-going 2017-21. Both thermal and bio-chemical conversion, budget 18 M€

Swedish Energy Agency+Energiforsk

Energy gas program

Terminated 2016

SEBRA (CHP)

On-going 2016-19, budget 6 M€

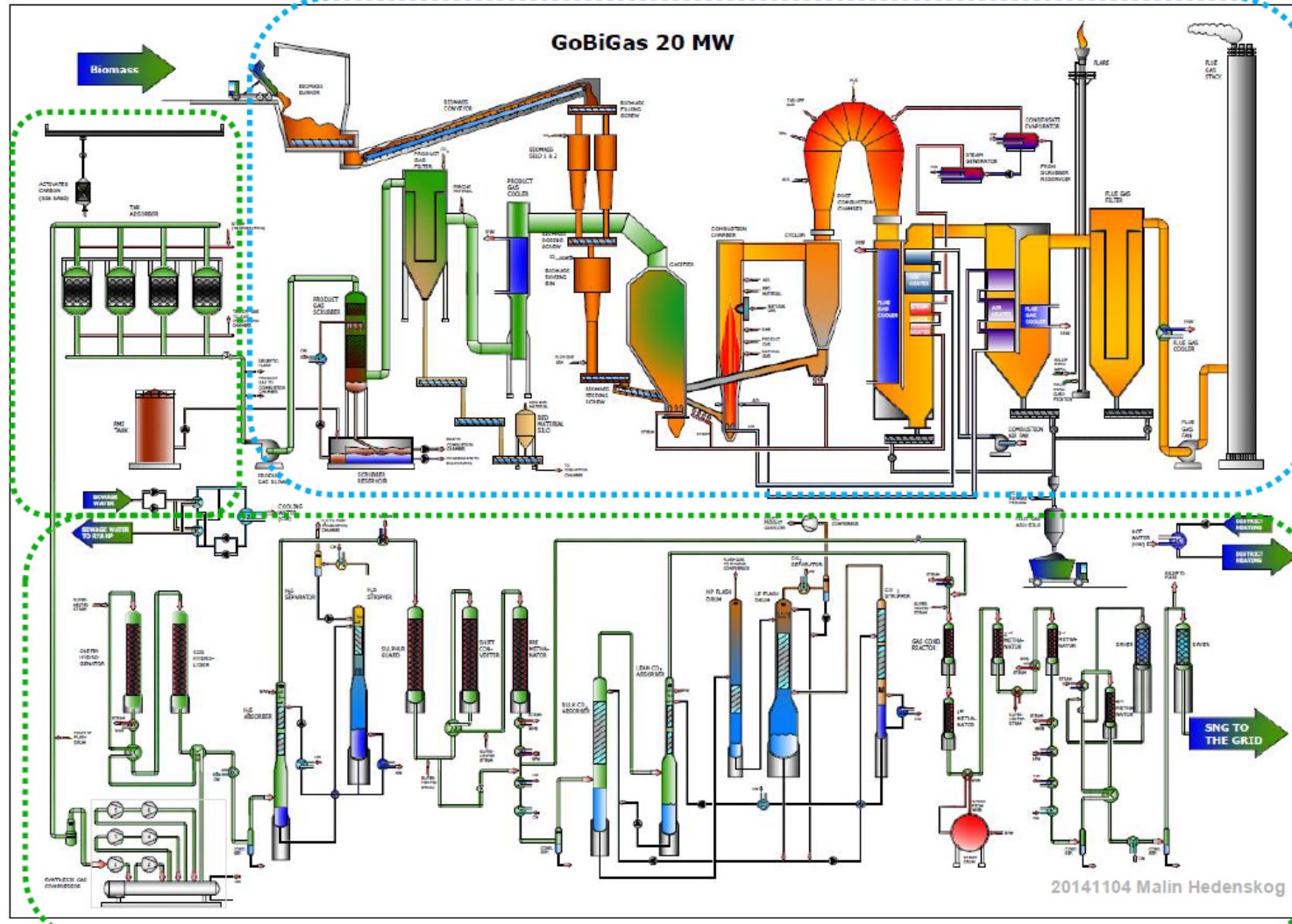
Biofuel for Sweden 2030

On-going 2017-20, budget 0.6 M€



Biomass to SNG: GOBIGAS

30 MW biomass feed, 20 MW SNG Output, operational 2014



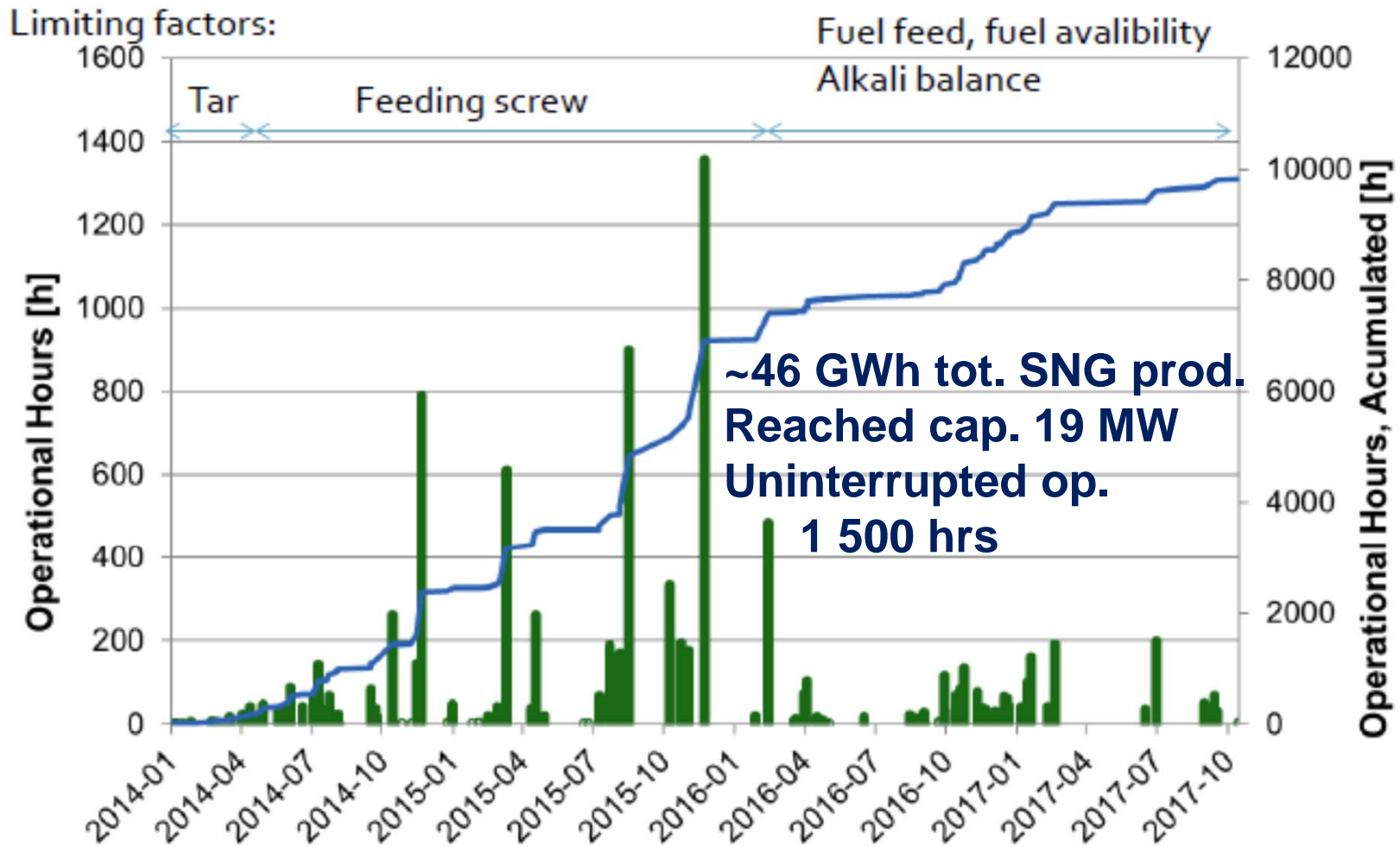


GOBIGAS

- Start of project installation project 2009
- Construction start end 2010
- NER300 application and grant for phase II 2011-12
- DK biogas, with DK subsidies from 2012, enters Swedish market via the grid, and gets SE tax benefits, distorting the Swedish, grid connected bio-methane market.
- Start-up end of 2013, operation on pellets
- The City Council discontinues plans for Phase II in December 2016.
- Lack of sufficiently dry forestry residue fuel forces operation on pellets in 2016-2017.
- End of April 2017, the board gave an assignment to the company to “speedily explore the possibility of finding new owners/financiers for the plant”.

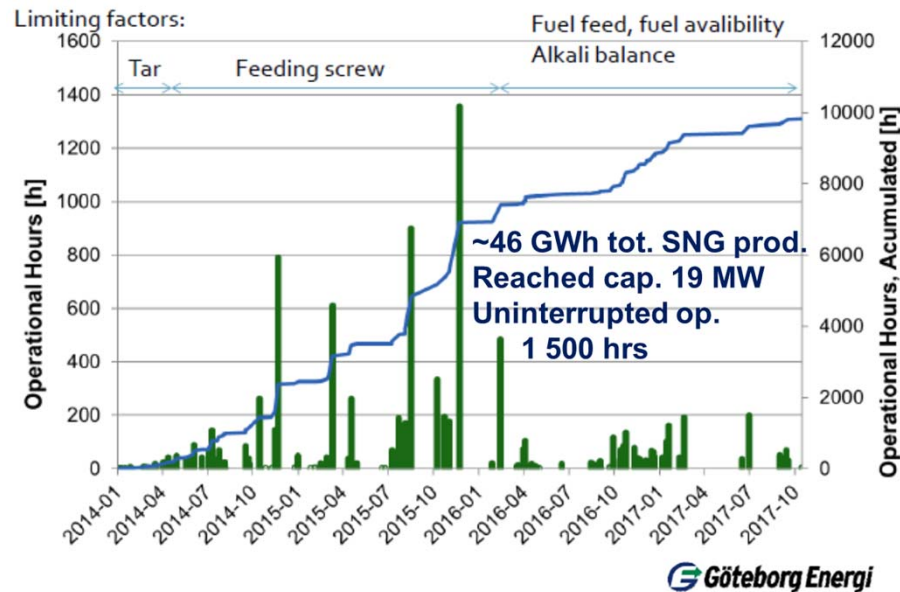


GOBIGAS Status in October 2017





GOBIGAS Status May 2018



Technical status at present:

- Nominal capacity 20 MW SNG reached
- New record of uninterrupted operation 1 800 hrs
- ~ 12 000 hr gasifier operation
- ~ 65 GWh SNG produced

However, despite improvements, Göteborg Energi has decided to mothball the plant due to economic reasons.



Cortus Energy Probiostål

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



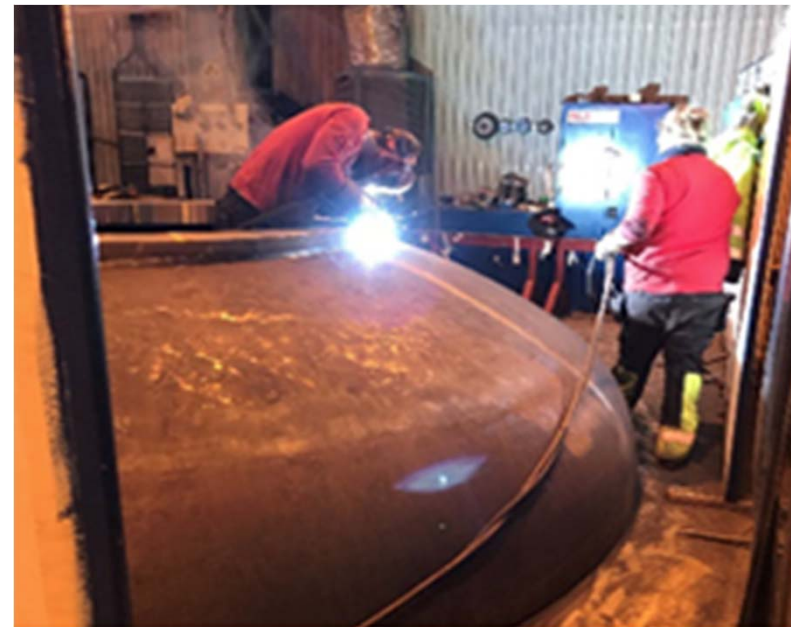


Cortus Energy



ProBioStål

Site erection on-going
Official inauguration in June 2018
Commissioning start H1 2018
Test program to 2018/2019
Commercial op. 2019-2038



ENGIE

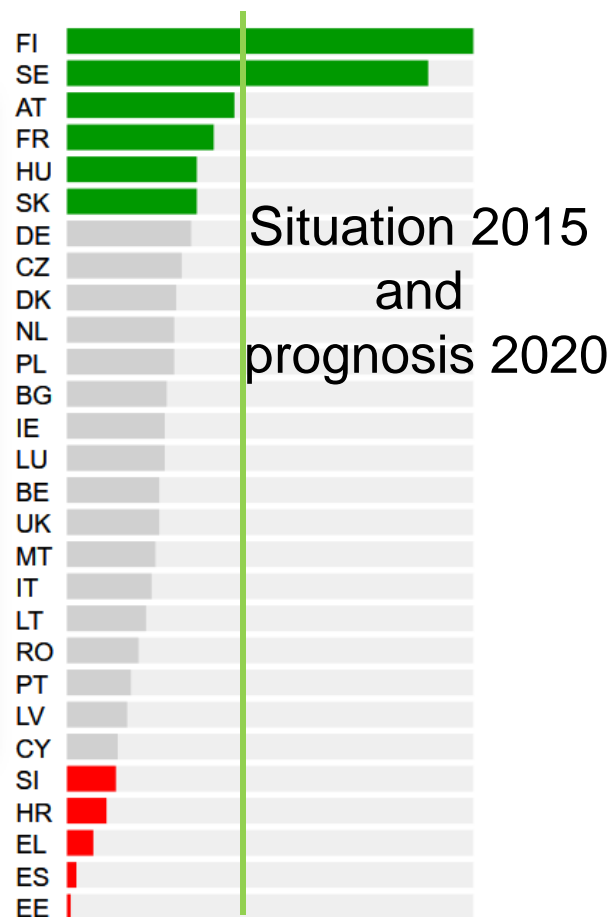
Hydrogen production unit at the same capacity as for ProbioStål
Pre-project study H1 2018
Project Study + pilot tests H2 2018
FID expected 2019



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.



Biomass to SNG: GOBIGAS

GoBiGas – step by step

- **Performance goals:**

- Biomass to biomethane 65 - 70%
- Energy efficiency > 90%

- **Phase 1:**

- Demonstration plant
- Evaluation, R&D programme
- 20 MW generating 160 GWh/year
- In operation early 2013
- Allothermal (in-direct) gasification

- **Phase 2:**

- 80-100 MW generating 640-800 GWh/year
- In operation after evaluation of Phase 1
- Technology not yet chosen



**Official start-up
October 28, 2013.**

