2nd Generation Biogas: bioSNG

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ECN

Energy research Centre of the Netherlands

2nd generation biogas: bioSNG

Robin Zwart

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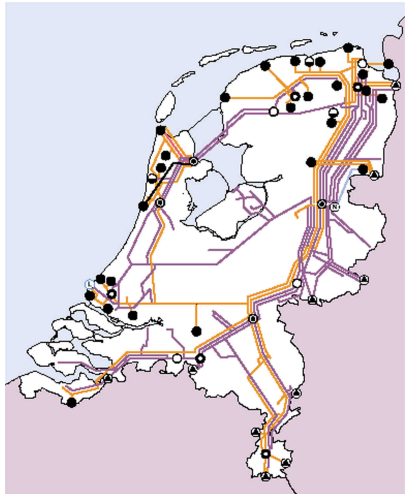
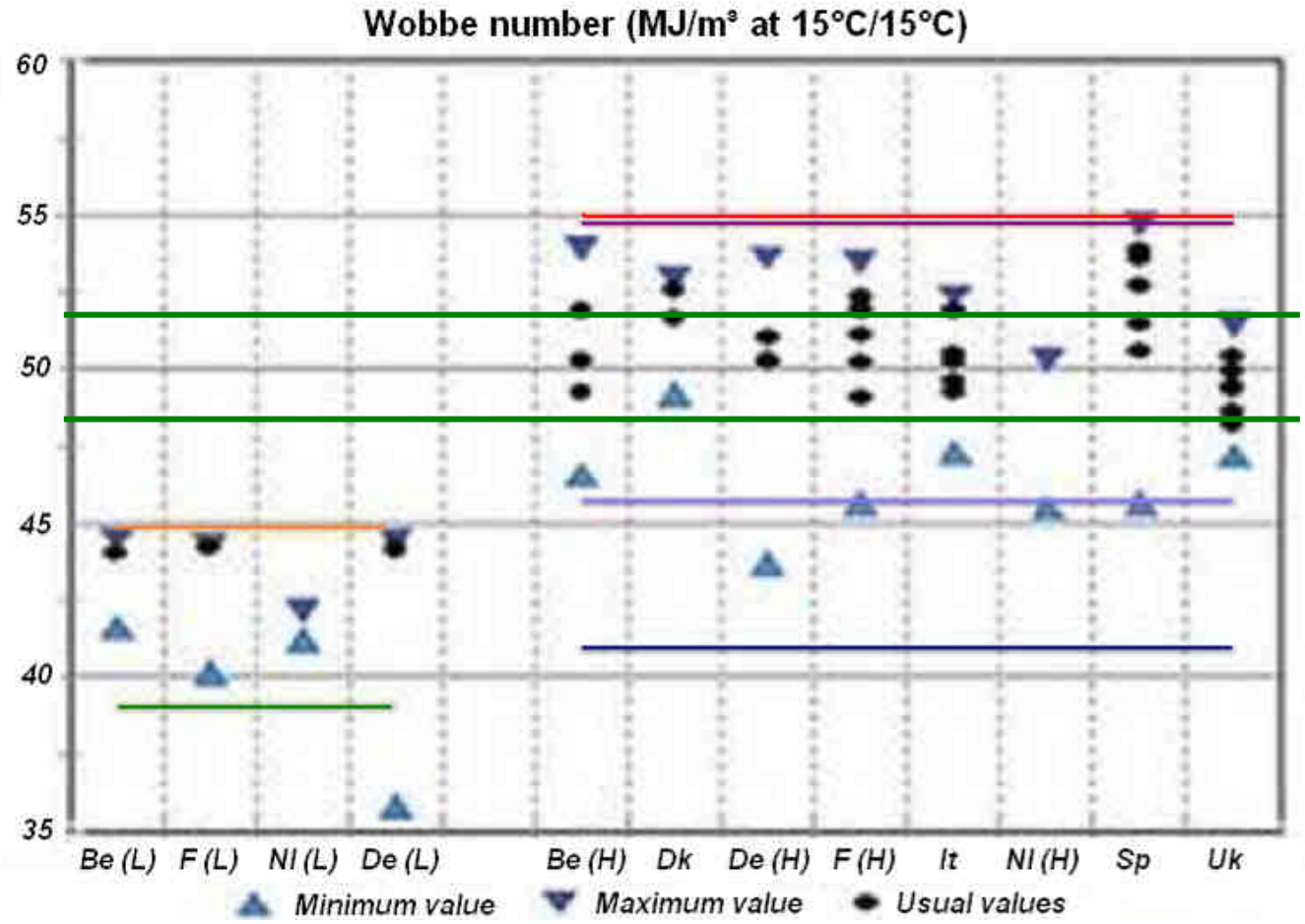



Differences

bioSNG and biogas



Differences

bioSNG and biogas

bioSNG

biogas

Differences

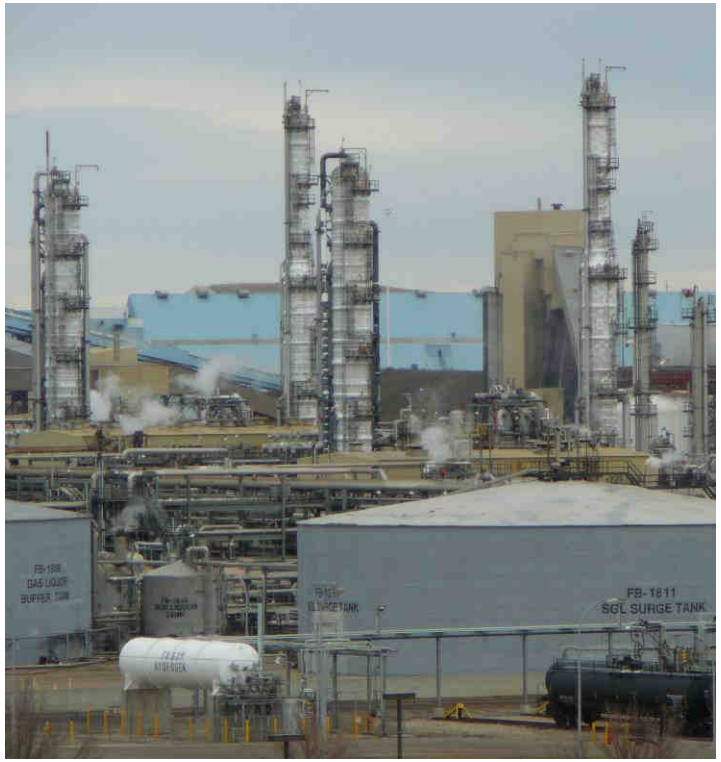
bioSNG and biogas

bioSNG

biogas

Differences

bioSNG and biogas



bioSNG

biogas

Coal based SNG

Why not?

It is...

… commercial technology installed 25 years ago and still in operation

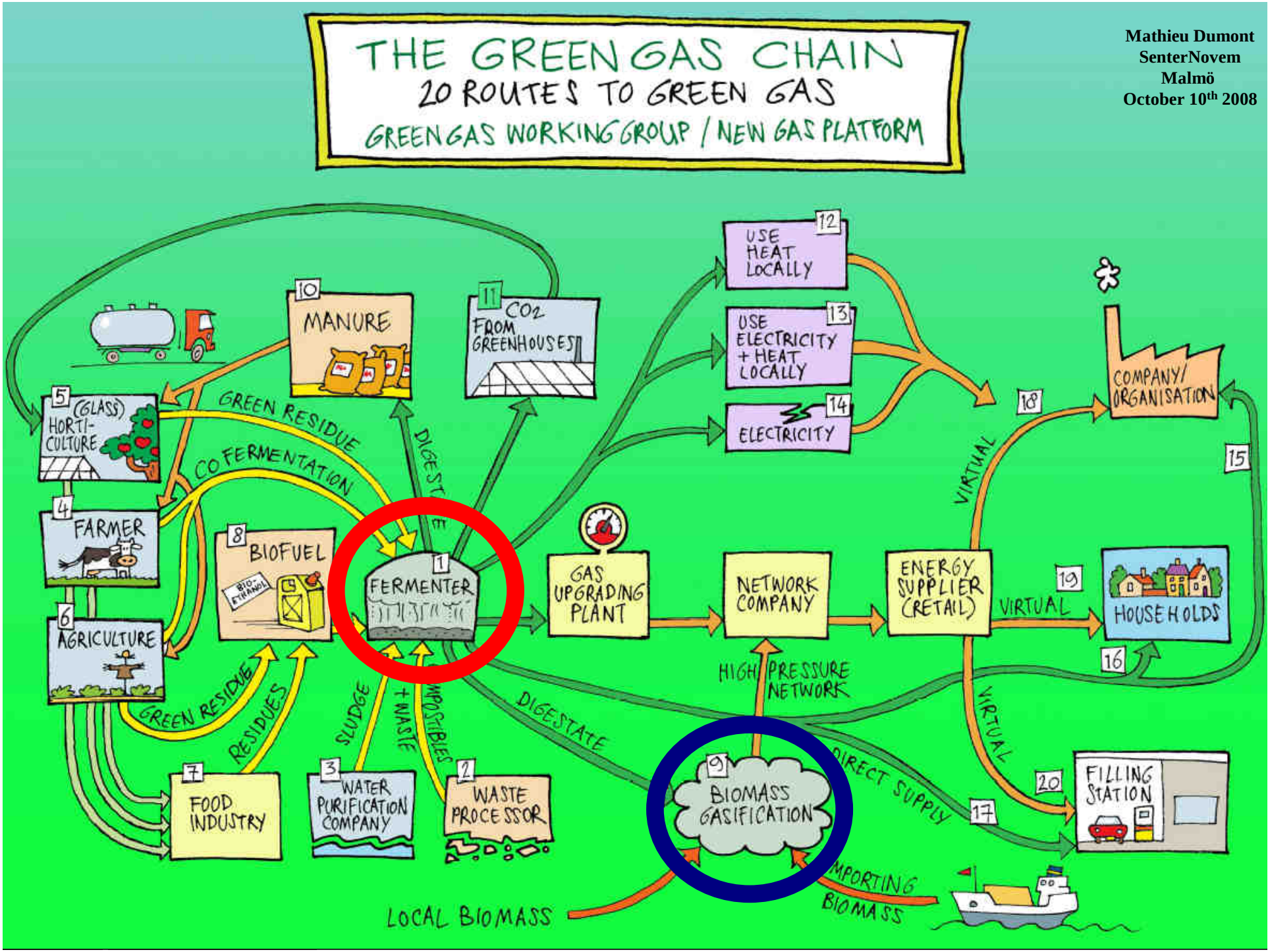
… inherently removing CO_2 within the process

… using CO_2 for enhanced oil recovery, can however be used for carbon sequestration in for example empty natural gas fields

… common practice to building coal fired power plants in the EU

… common practice to co-fire biomass in coal fired power plants

Mathieu Dumont
SenterNovem
Malmö
October 10th 2008



CTU

Allothermal gasification

- 1 MW slipstream production
- Commissioning started August ’08 (AT)
- First gas production expected
  in November 2008

www.ctu.ch

Göteborg Energi

Allothermal gasification

- Approximately 100 MW gas
- Distribution in the existing gas grid, however also as fuel in CHP-plant
- Situated in the harbor of Gothenburg (SE)

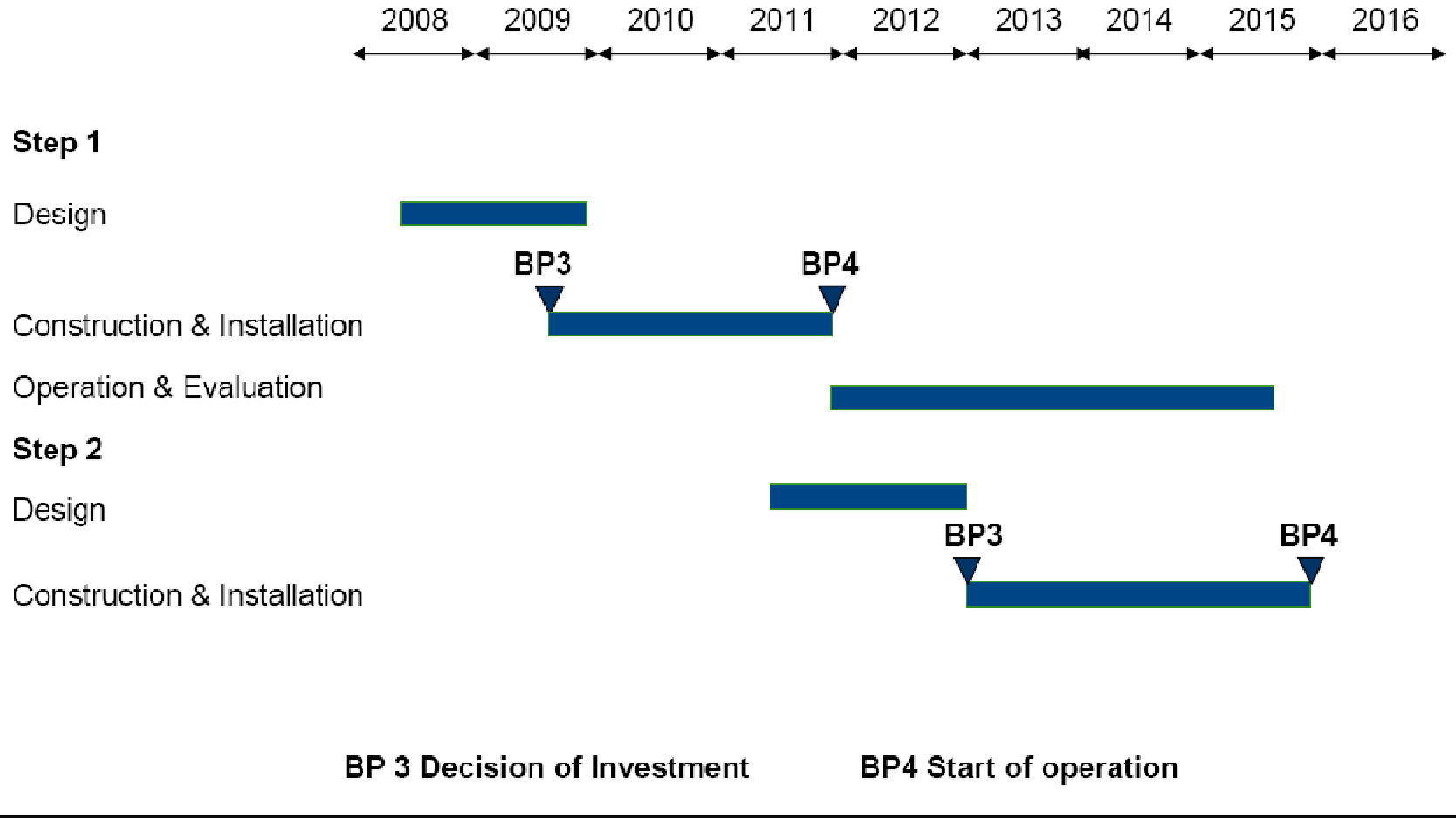
Ingemar Gunnarsson
Göteborg Energi AB
Malmö
October 9th 2008

Cooperation with
e.on
(20% share)

www.goteborgenergi.se

Göteborg Energi

Main time schedule

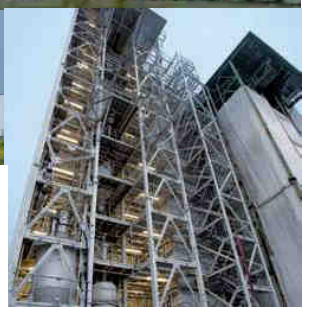


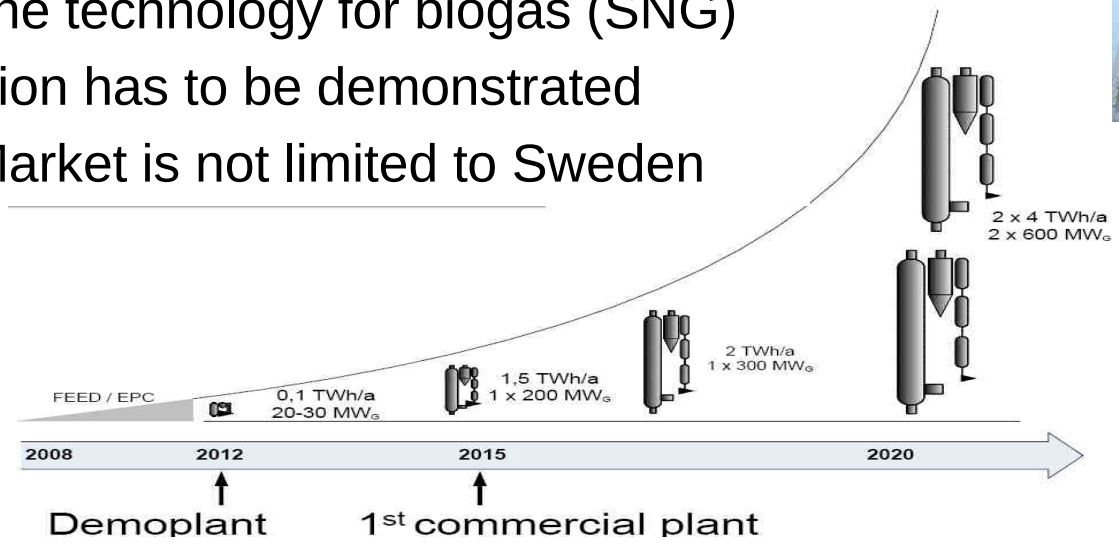
BP 3 Decision of Investment **BP4 Start of operation**

E.ON

IGCC vs SNG / Coal vs Biomass

- Feasibility study: potential for gasification plants (both IGCC and SNG) in Sweden of ~20 plants for the period up to 2025
- IGCC already demonstrated in Värnamo, but … the technology for biogas (SNG) production has to be demonstrated
- E.ON Market is not limited to Sweden



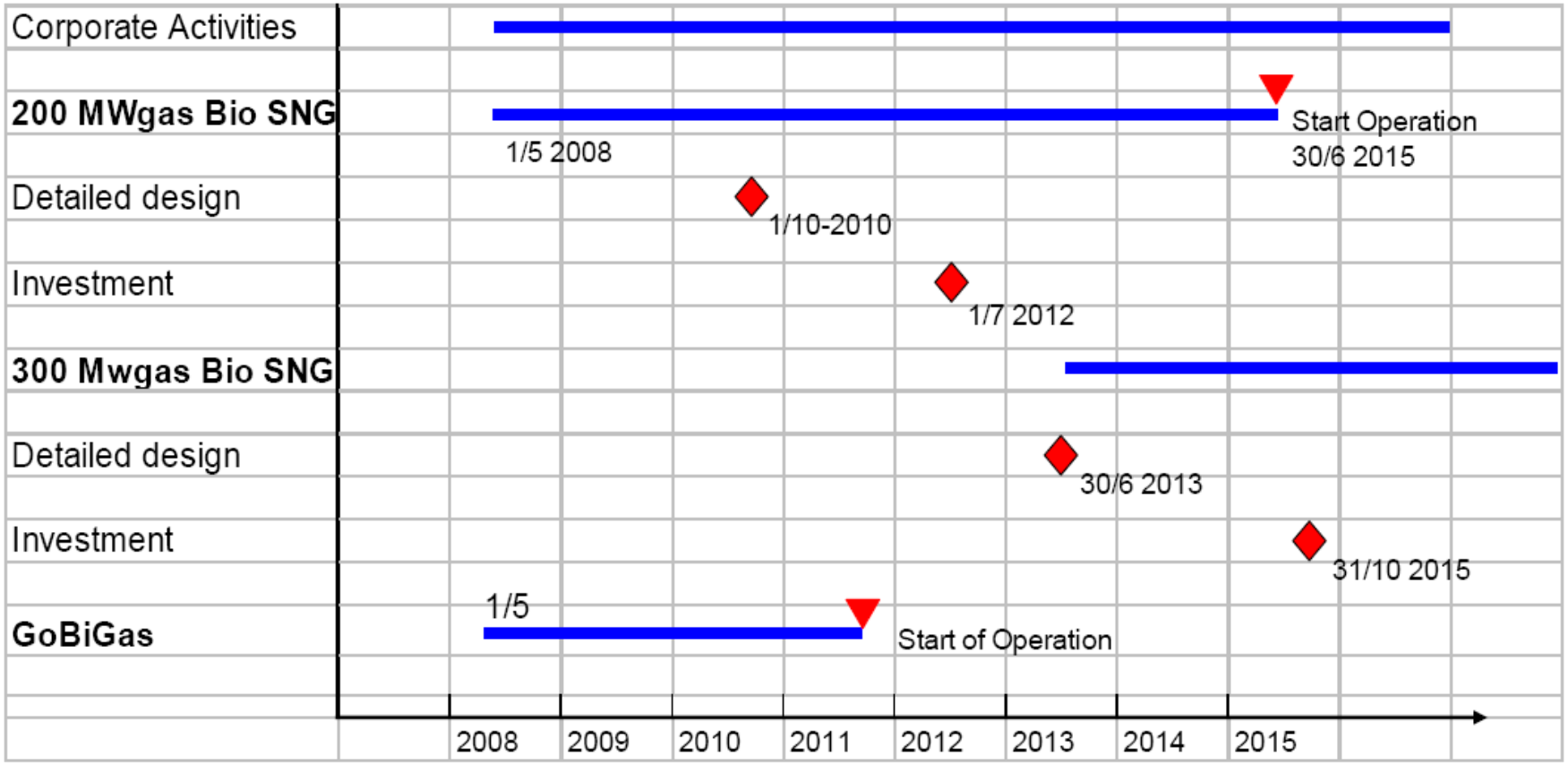


Goran Tillberg
E.ON Sweden
Malmö
October 9th 2008

www.eon.se

E.ON

Main time schedule



GTI

Biomass to SNG Process Simulation

- O_2-blown, 10 bara fluidized bed gasifier
- Hydrocarbon (tar) reforming (incl. CH_4)
- Sour WGS and compression
- ~ ***68%*** conversion efficiency

www.gastechnology.org

ECN

Biomass to SNG Process Simulation

SNG composition		Air-blown indirect	O_2-blown CFB	O_2-blown EF
CH4	vol%	94	95	94
N2 + Ar	vol%	3	1	1
CO2	vol%	1	2	3
CO	vol%	0	0	0
H2	vol%	2	2	2
Wobbe Index (LHV)	MJ/Nm3	46	46	46
Wobbe index (HHV)	MJ/Nm3	50	51	50
Heating value (LHV)	MJ/Nm3	34	35	34
Density	kg/Nm3	0.73	0.73	0.75

Production efficiency					
SNG	%	71,6%	67,5%	57,5%	
SNG and heat	%	93,0%	82,4%	81,8%	(1)
SNG and electricity	%	72,0%	66,4%	57,7%	

(1) not including own power consumption, otherwise similar efficiency as for production of SNG and electricity

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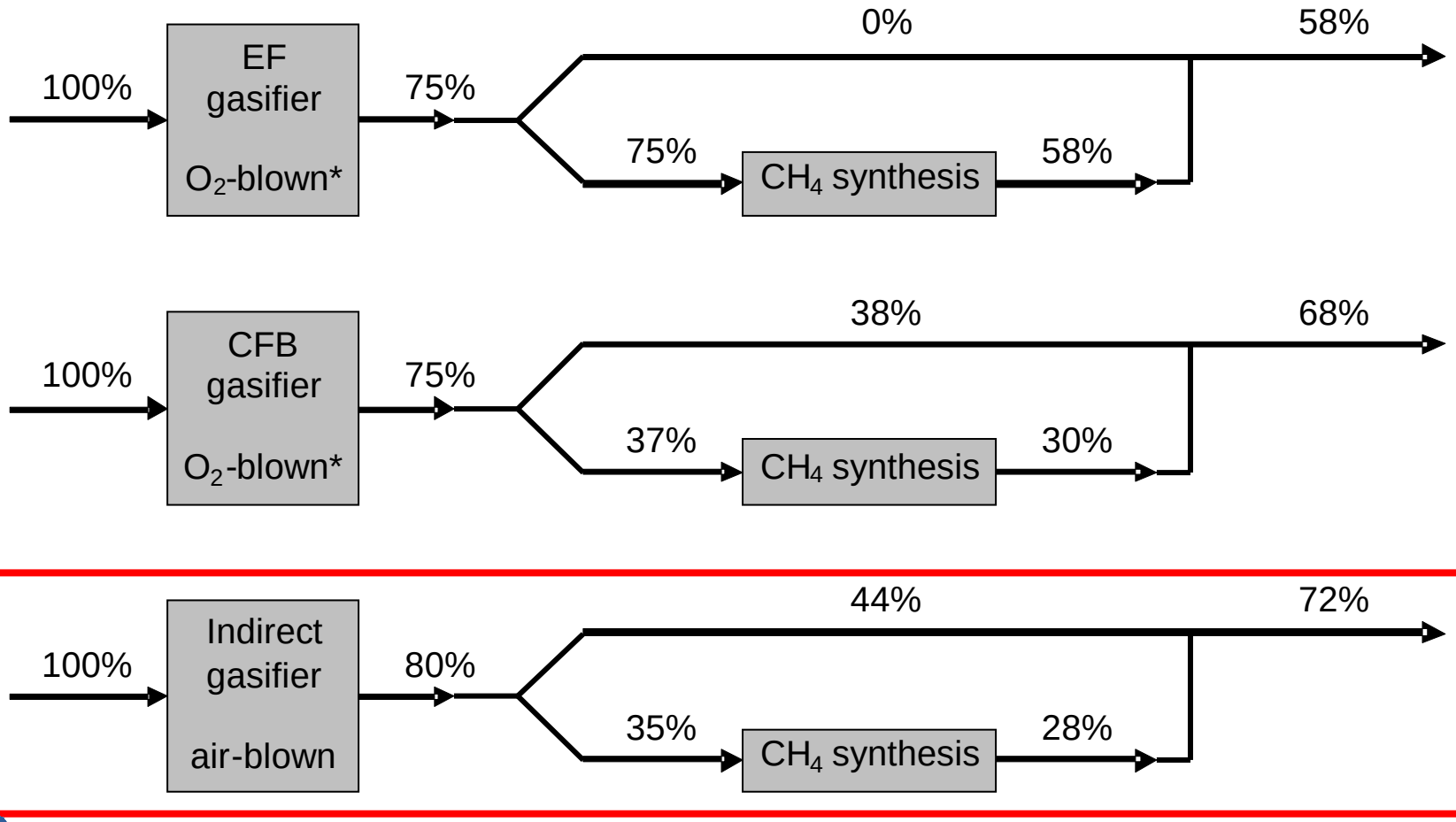
Biomass to SNG Process Simulation



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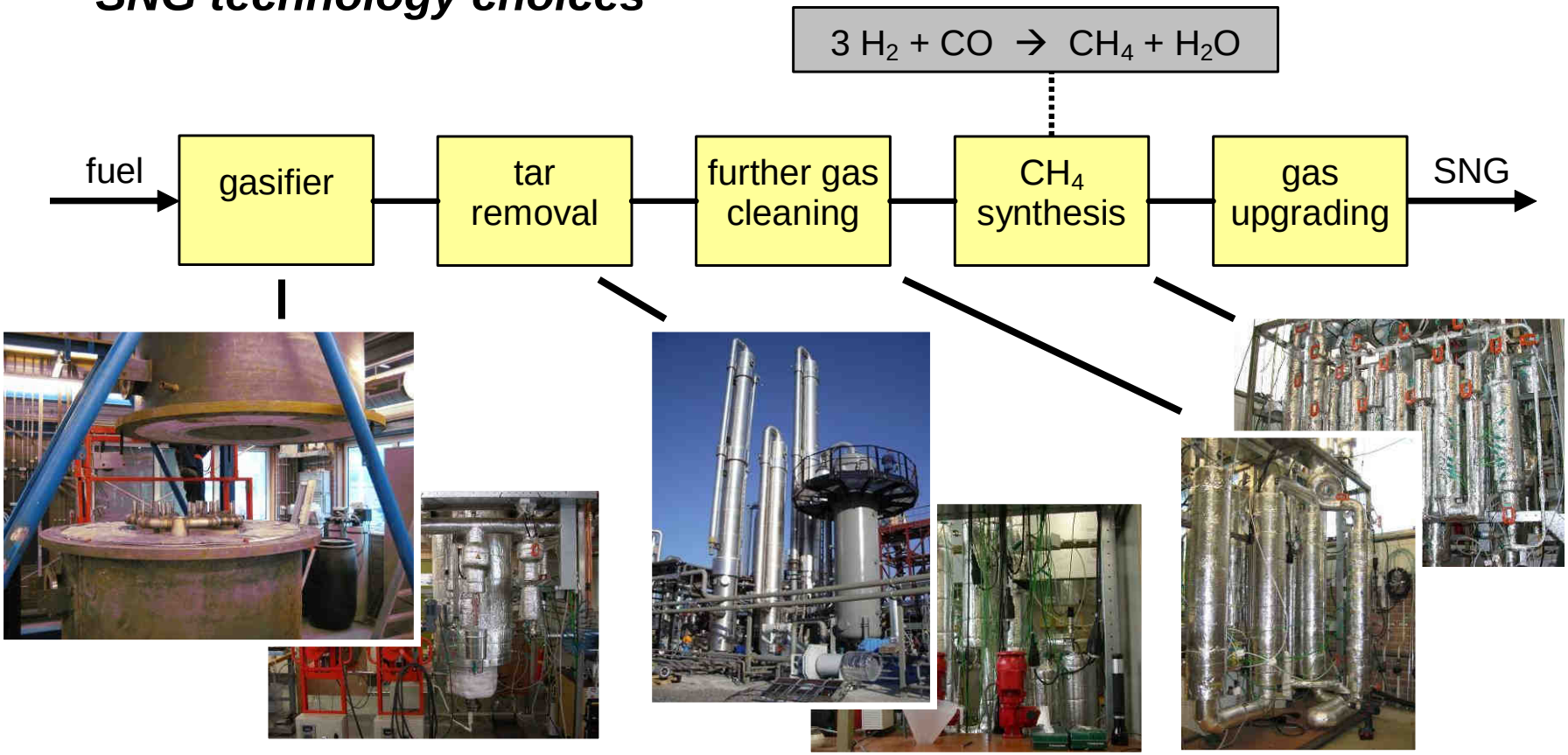
SNG technology choices



MILENA indirect gasification

OLGA tar removal

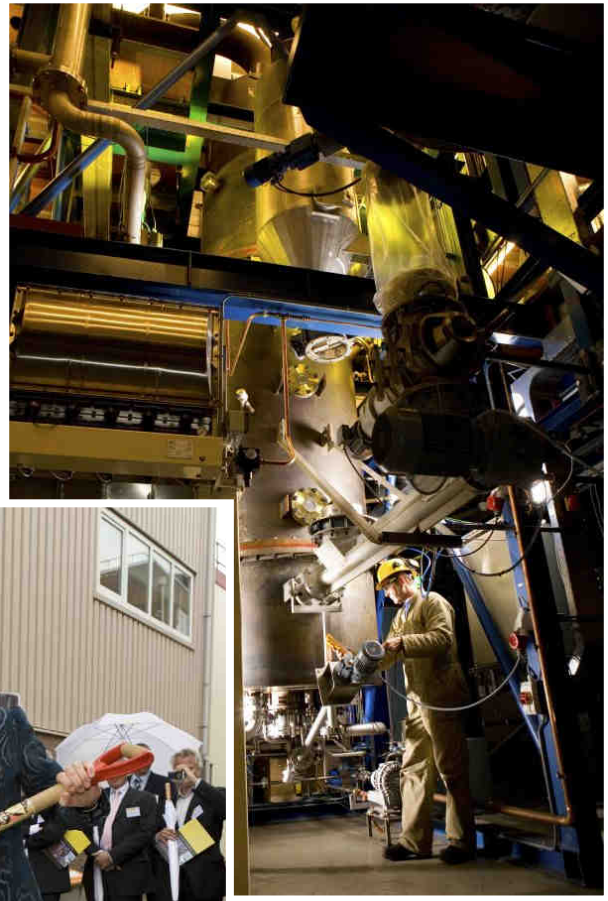
many options…

www.bioSNG.com / www.bioCNG.com

ECN

MILENA Indirect gasification

- Pilot (160 kg/h) installed late 2007
- Officially opened by minister on 4th September 2008
- First tests performed



www.MILENAtechnology.com

ECN

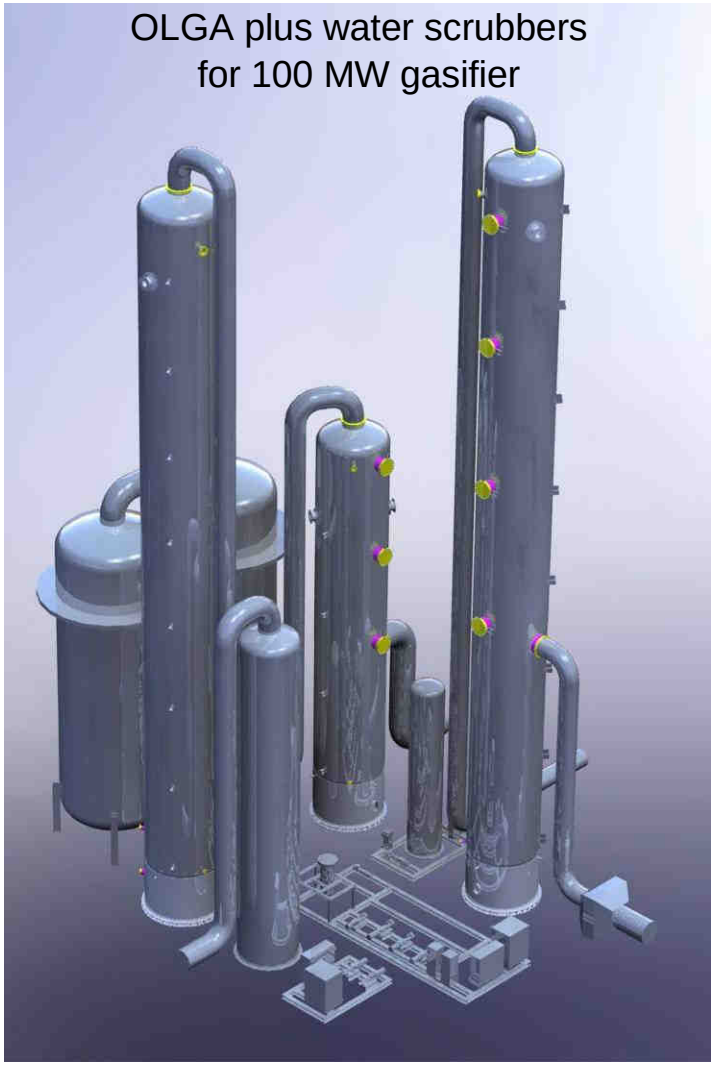
OLGA Tar removal

- Interest from all over the world
- Supplier Dahlman: 3 fte on OLGA

- Crucial role in biomass-to-SNG development at ECN
- Adapted successfully to high concentrations from MILENA indirect gasifier
- Work started to adapt OLGA for low-temperature gasifiers

DAHLMAN
FILTER TECHNOLOGY

OLGA plus water scrubbers
for 100 MW gasifier



www.OLGAtechnology.com

ECN

SNG time schedule and cooperation

- 10 MW CHP demonstration plant (MILENA, OLGA, engine) ready 2012
- 50 MW SNG demonstration plant (MILENA, OLGA, etc.) ready 2015

- HVC will team up with ECN in development
- HVC will be the owner of the demo plants

HVC is known as the owner of a waste incineration plant and a demolition wood combustion plant HVC intends to play a major role in realizing renewable energy goals of their share holders

Thank you for your attention

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Publications can be found on:
www.ecn.nl/en/bkm

Visit also:

"Phyllis" – *internet database for biomass, coal, and residues:* *www.phyllis.nl*

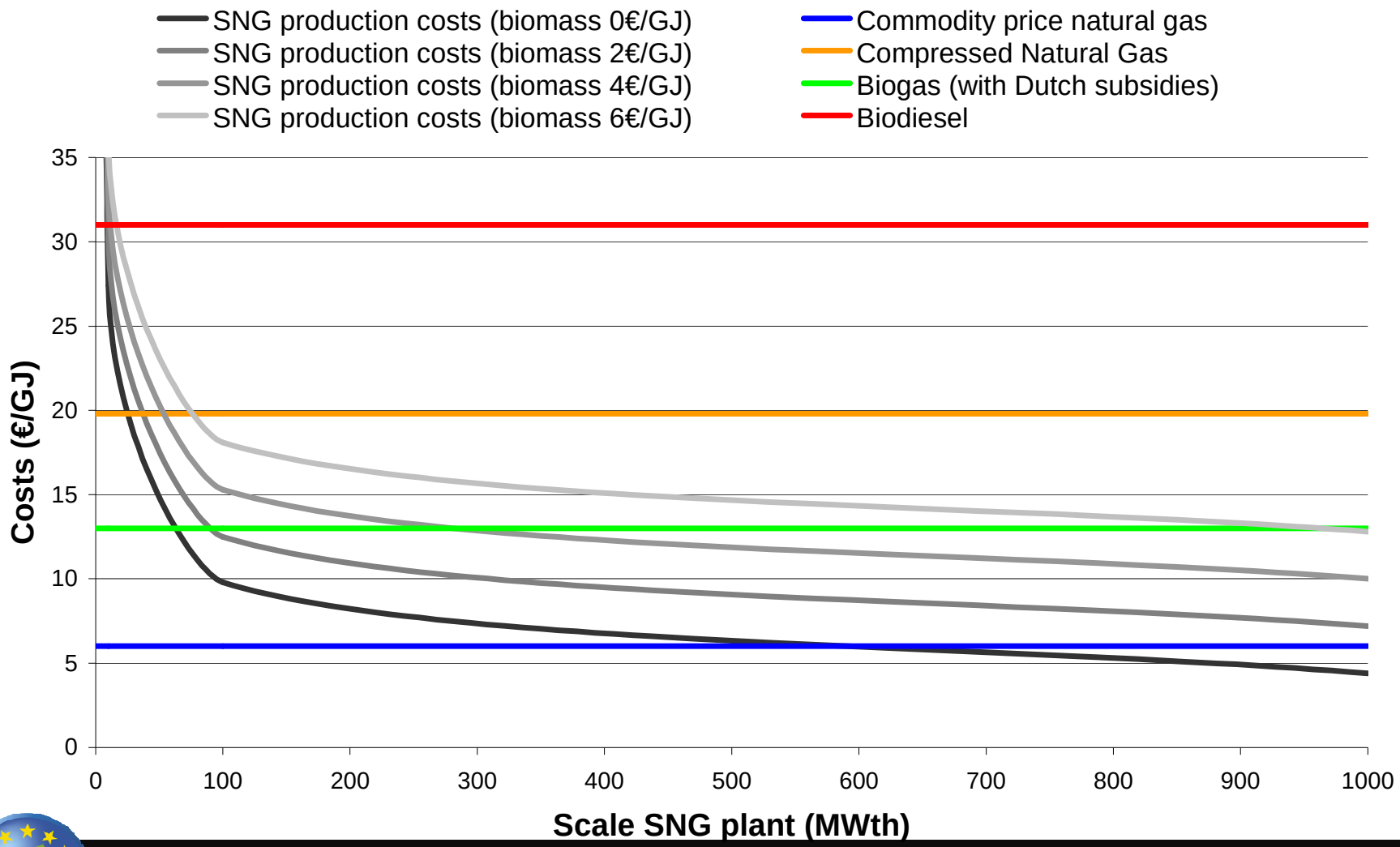
"Thersites" – *internet model for tar dewpoint calculations:* *www.thersites.nl*

"MilenaTechnology" – *high efficient gasifier under development:* *www.milenatechnology.com*

"OLGA Technology" – commercialised tar removal technology: *www.olgatechnology.com*

"bioSNG" – concept for synthetic natural gas from biomass: *www.biosng.com*

ECN


SNG production costs (biomass 0€/GJ)
SNG production costs (biomass 2€/GJ)
SNG production costs (biomass 4€/GJ)
SNG production costs (biomass 6€/GJ)
Commodity price natural gas
Compressed Natural Gas
Biogas (with Dutch subsidies)
Biodiesel
Costs (€/GJ)
0
5
10
15
20
25
30
35
0
100
200
300
400
500
600
700
800
900
1000
Scale SNG plant (MWth)