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GoBiGas:
An Industry Relevant State-of-The-Art Reference for Advanced Biofuel Production via Gasification

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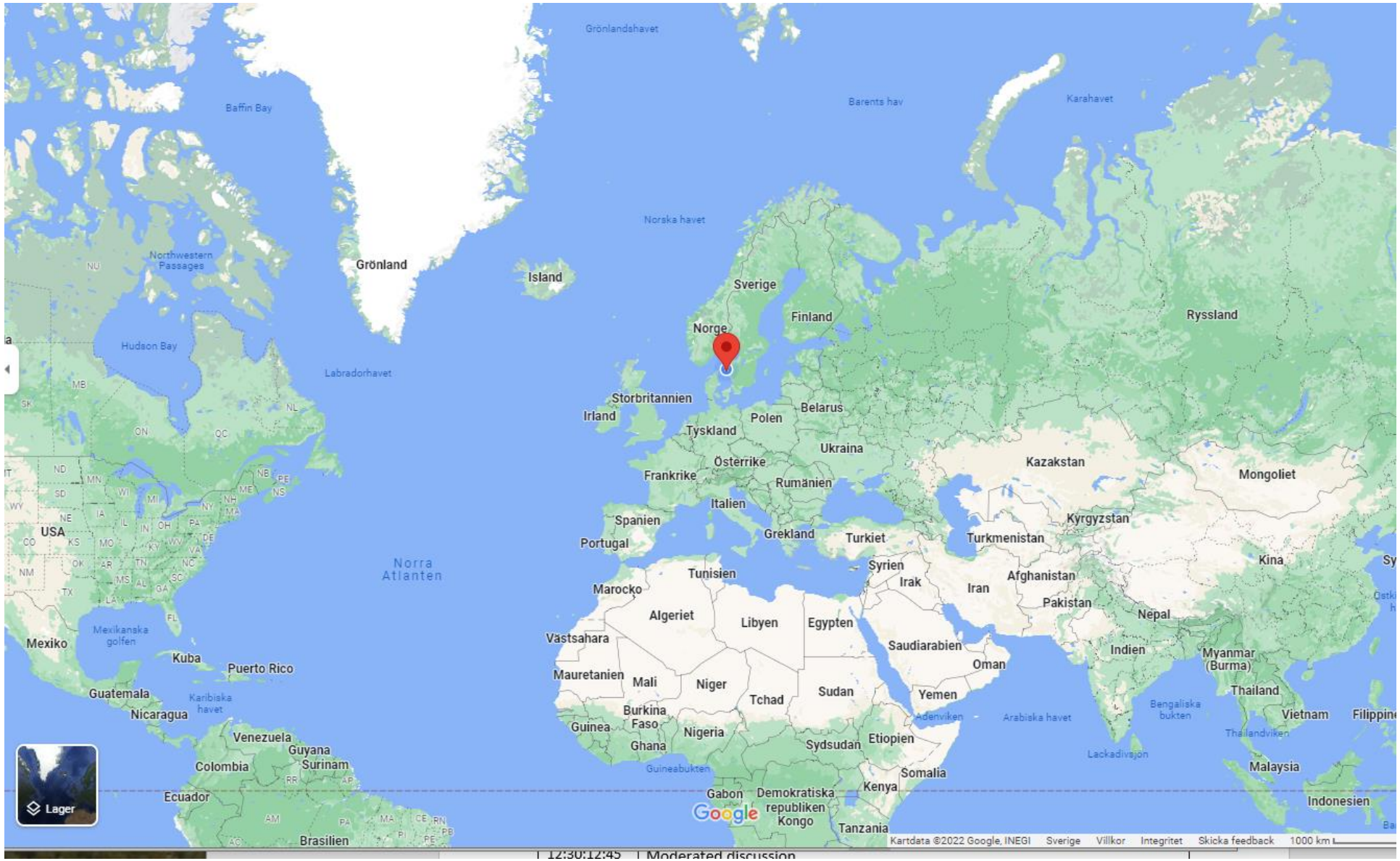
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Villkor
Integritet
Skicka feedback
1000 km

Background of the project

- To reduce air pollution from busses, natural gas busses were introduced in the 1990s
- A new natural gas combined cycle plant was built around 2000 and a condition for this was that they come with a plan for how to switch from natural gas to biogas
- Sweden goal of a fossil free transport sector by 2030 was set around 2005
- Large incentives for biofuel production from forest residues 2005 to 2012, of which GoBiGas was one, that got national and EU support
- A national competence center (2011-2021) was created to match these incentives with a budget of more than 55 million US dollar

GoBiGas

Gothenburg **Bi**omass **Ga**sification Project
Initial aim of project 0.8 TWh/year SNG production in Gothenburg, Sweden by 2020

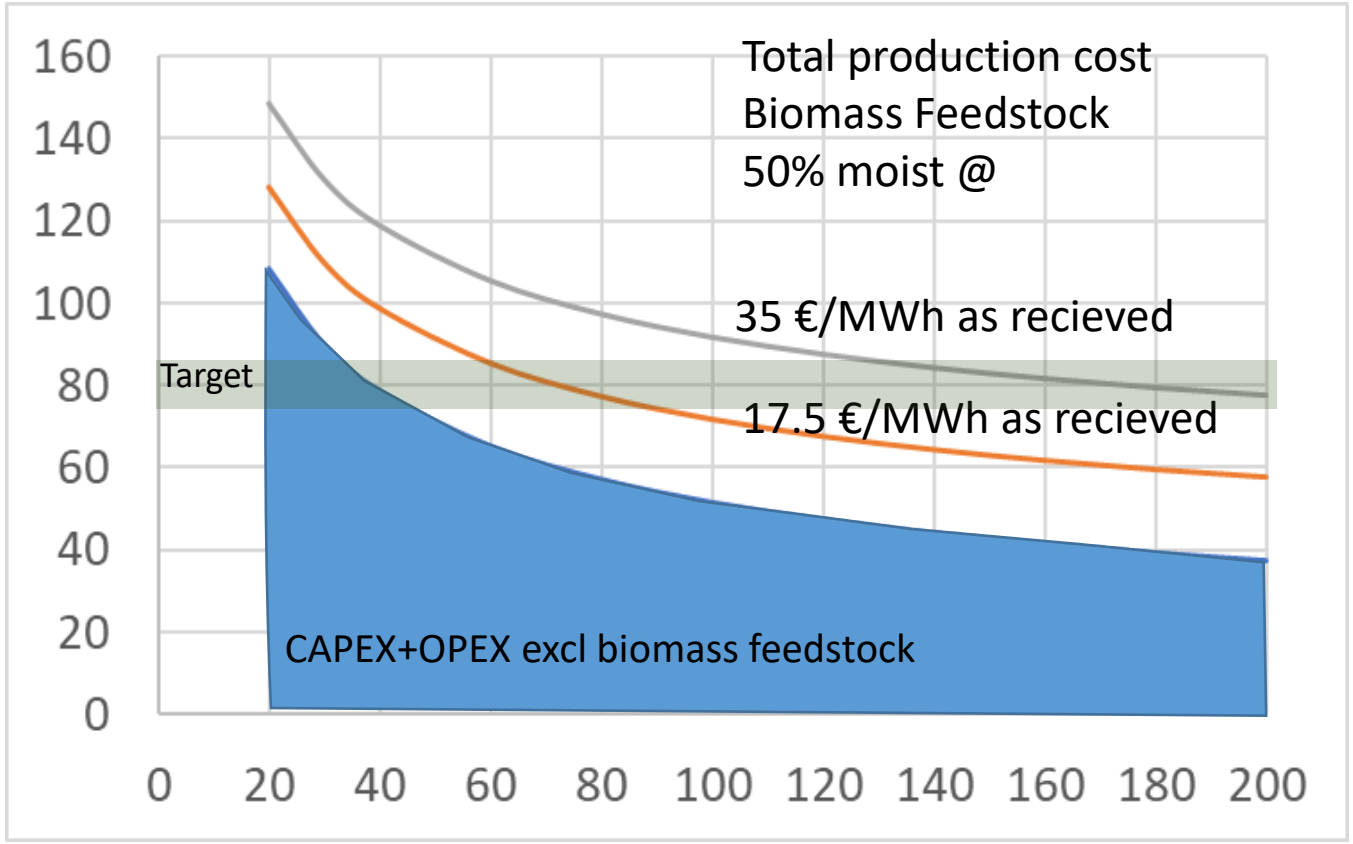
Planned to be implemented in two phases:

1. Demonstration/Commercial (together with phase 2)
   20 MW Biomethane (160 M€ investment)
   (32 MW fuel, 6 dry ton biomass/h)
   Performance goal of demonstration
   - Biomass to Biomethane ≥65 %
   - Biomass to Energy ≥90 %
   - 8,000 hours continuous operation per year

   Produced SNG to grid 2014 – 2018

2. Commercial (Canceled 2015)
   80 – 100 MW Biomethane
   (125-150 MW fuel 25-30 dry ton biomass/h)

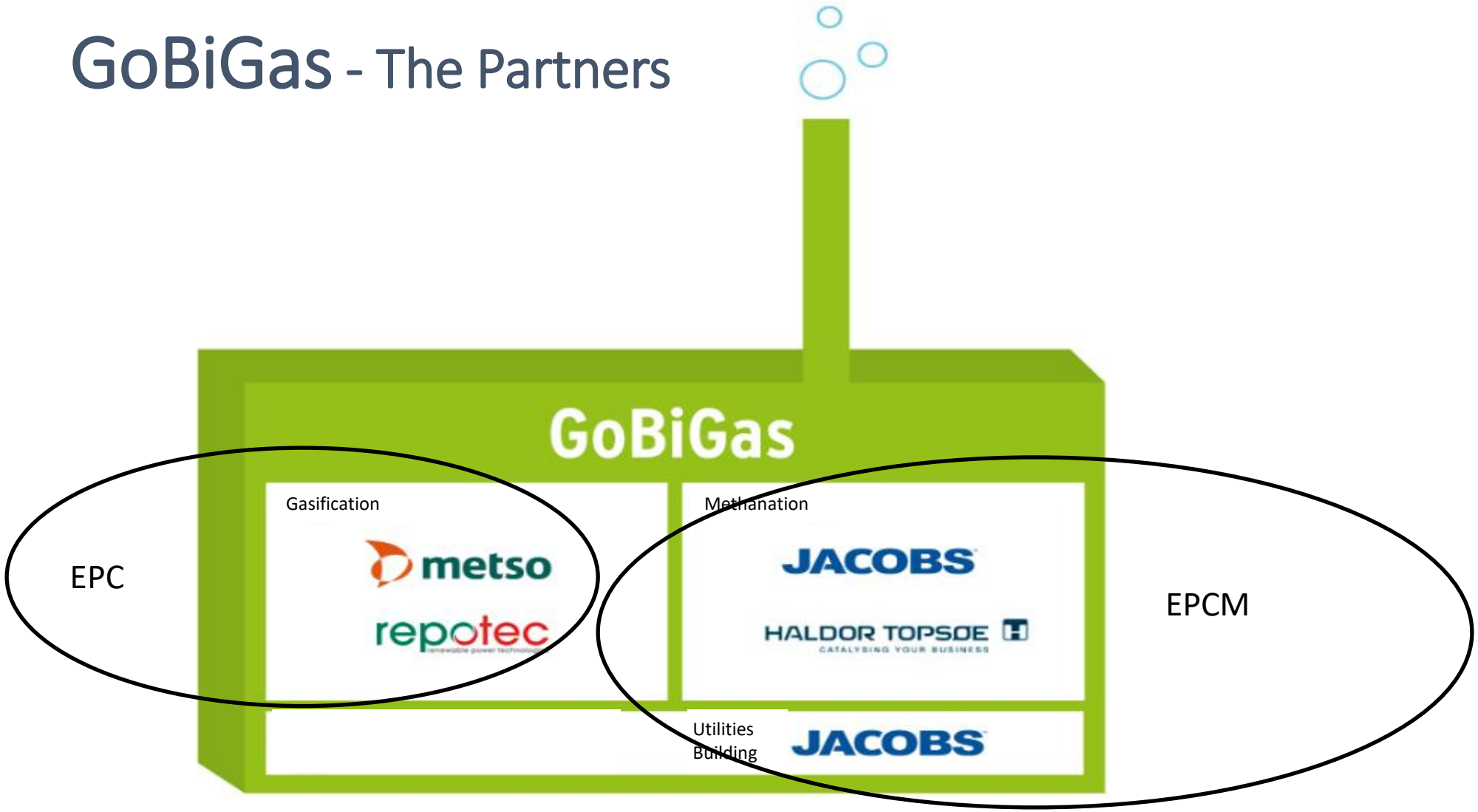
Economics motivated the project



~ 3 US$/gallon

Plant size MW SNG
100 MW correspond to around 60 000 ton SNG/year
25 fully loaded trucks with biomass a day

GoBiGas - The Partners



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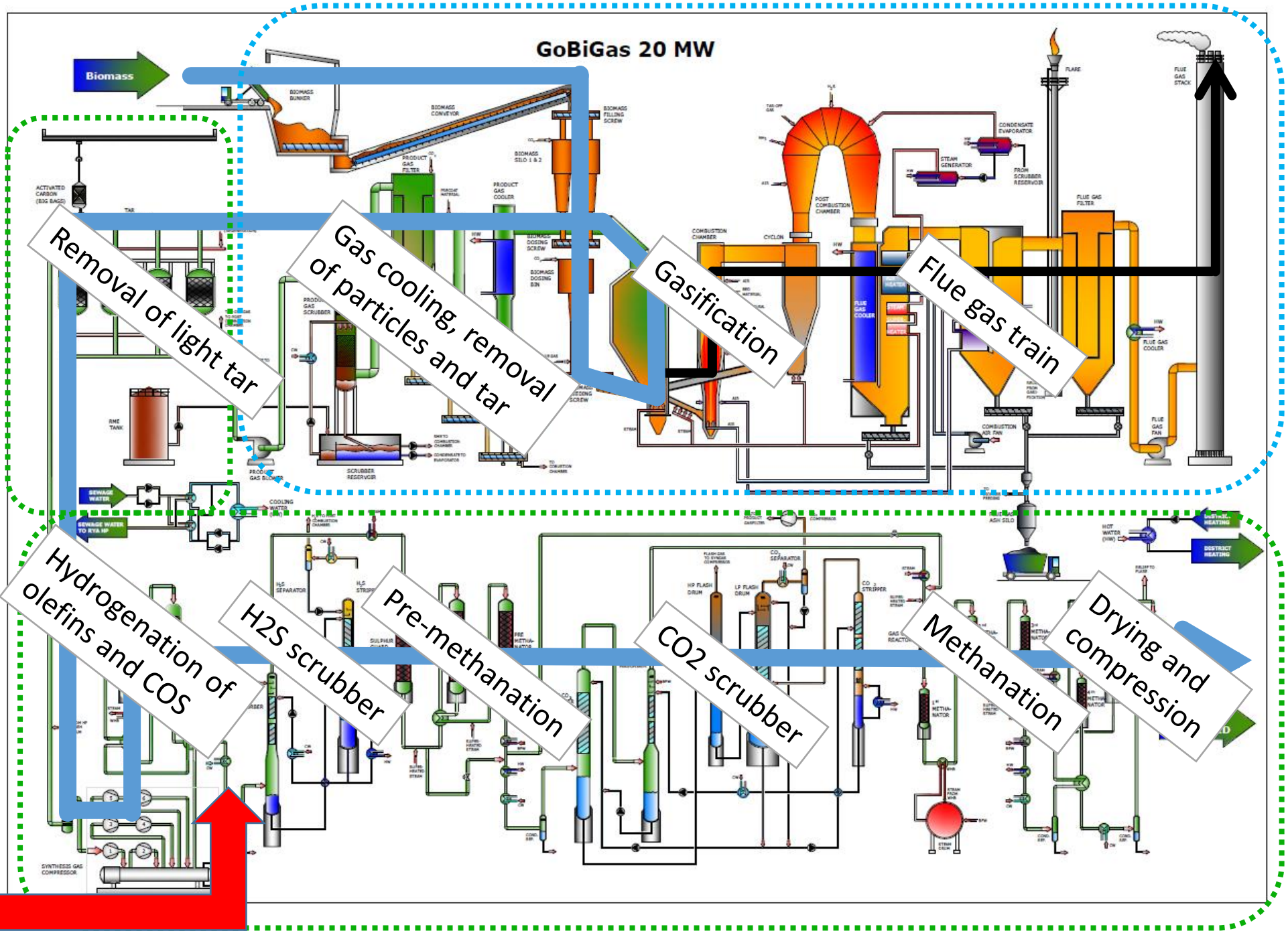

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Development of Dual Fluidized Bed Gasification technology

Retrofit of commercial designs of fluidized boilers

2-4 MW
Gothenburg

2 MW
Yokohama

15 MW
Kujan Indonesia

Target
Production of Fuels, Materials, Chemicals
>100 MW

Upscaling of dedicated gasification design

32 MW
Gothenburg

8 MW
Güssing

FIRST GENERATION

8.5 MW
Oberwart

SECOND GENERATION

15 MW
HGA Senden

THIRD GENERATION

Target
Decentralized Heat and Power Production
<50 MW

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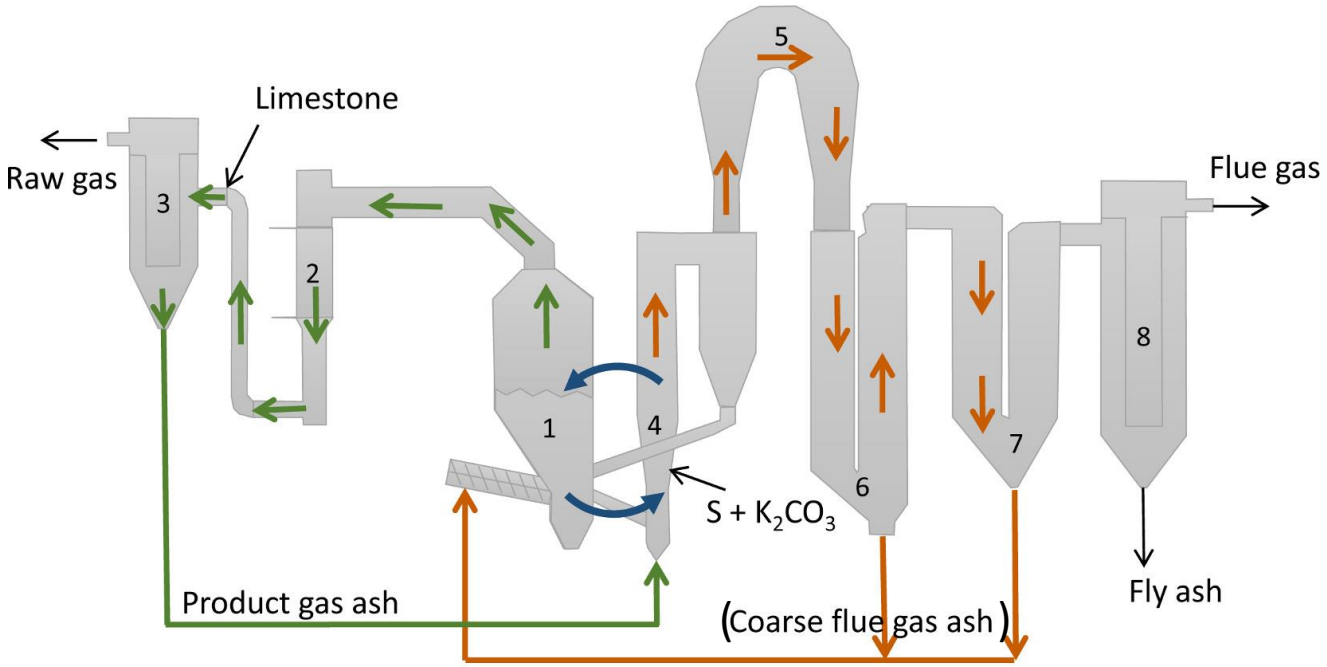
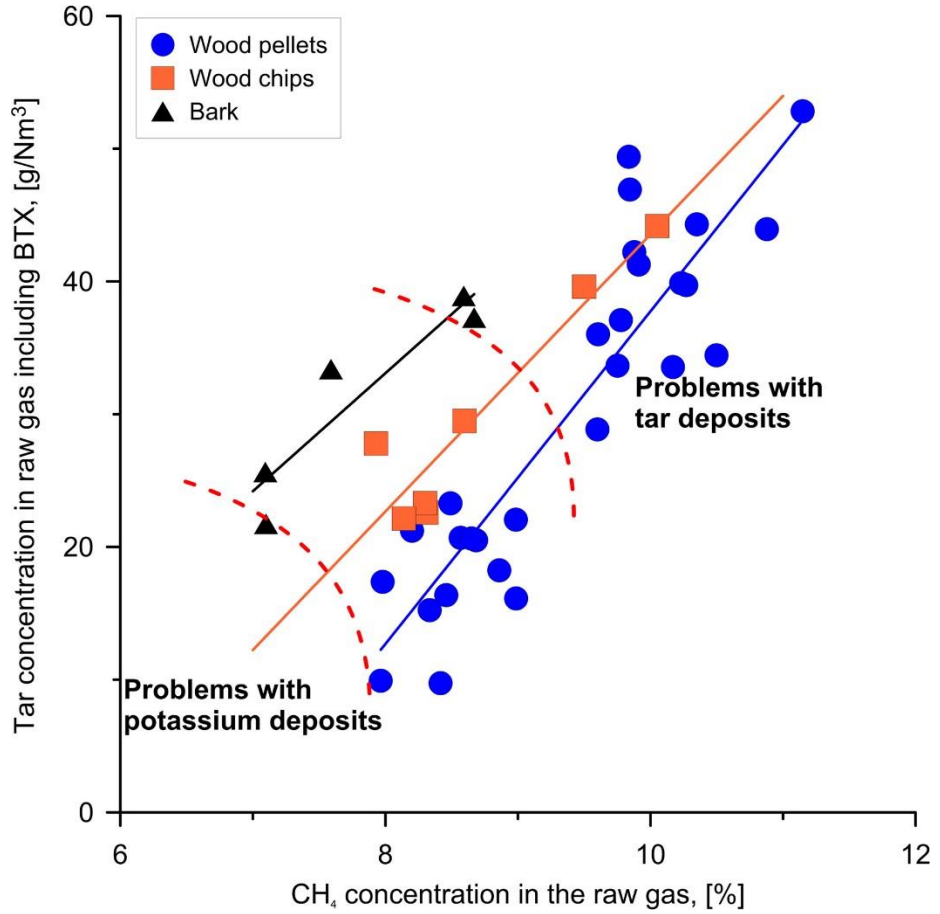
Control of the Gasification Process



1 Gasifier
2 Product gas cooler
3 Product gas filter
4 Combustion chamber
5 Post combustion chamber
6 Convection path and flow reversal space
7 Convection path and flow reversal space
8 Flue gas filter



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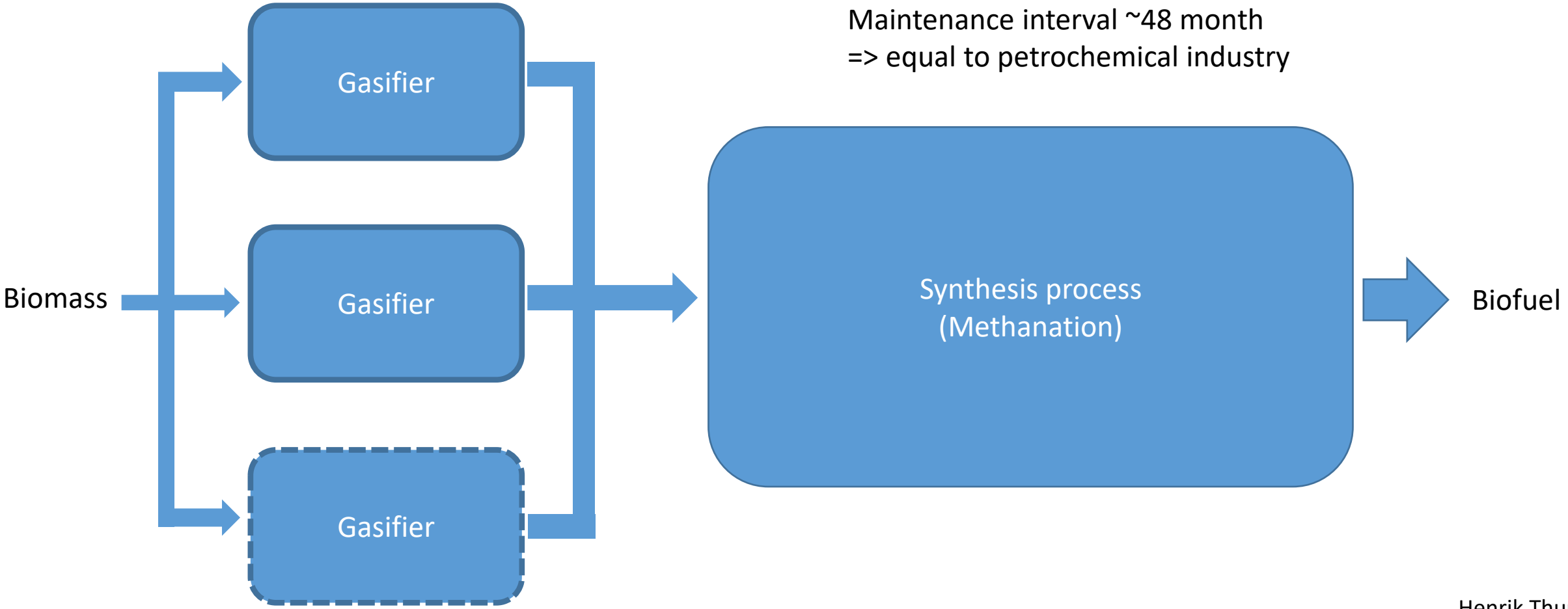
Commercial plant

Maintenance interval 12-18 month
=> equal to forest industry

Maintenance interval ~48 month
=> equal to petrochemical industry



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Why didn´t the project fly?

- Regulation intended to support the development of domestic biofuel production from forest residue in Sweden triggered cherry picking of global small streams of used cooking oil and animal fats, as well as trade opportunities that allowed taking advantage of multiple support systems for biogas from anaerobic digestion across EU countries
  - Here, global flows of animal fats and used cooking oil has been directed to Sweden and Finland (mainly from southeast Asia) to be used to produce HVO. Very marginal global potential to produce biofuels from this feedstock, but significant for a region of 15 million inhabitants. HVO demand in comparison very small investments and the payback time has been in the order of 3 to 9 month.
  - This has resulted in a cost for Swedish taxpayers during last 10 years 15-20 billion US dollar, without contributing to a significant biofuel production from domestic feedstock
- Development towards electrical cars — gas for personal cars went out of fashion.

Experiences and Lessons Learned

- Contract connected to licenses of the gasifier hindered the use of state-of-the art rector design
  - Parts designed and delivered by the large technology providers, meet requirements. The part from the small technology provider was more directed towards protecting license than function.
- Important to build the reactors large enough so each process can be optimized like in petrochemical plants
- The reactors where the solid material is converted should be built in parallel to obtain sufficient reliability and uptime for the whole system
- Don't optimize the first system to its extreme, as it will complicate start-up and operation
- Technical problems will be solved if enough space is provided to allow reconstructions
- Have, a plan on various possible products that can be produced from the plant if the market for the primary intended product change
- Regulatory frameworks need to be designed so the targeted feedstocks is used as feedstock for the biofuel production and not create costly international logistic solutions that meet near term targets, but related long-term goals will be of marginal importance

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Relevant references from the project (open access)

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