



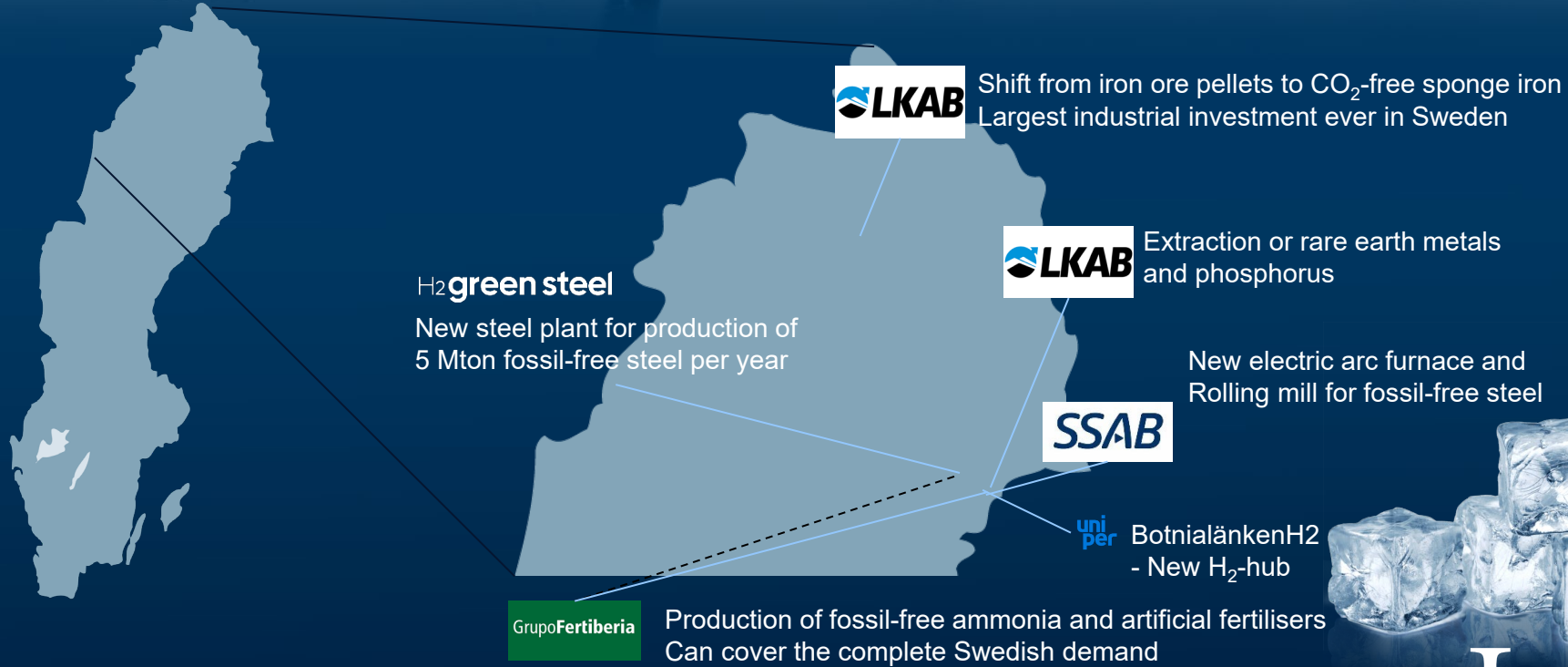
# PRODUCTION OF BIO-ELECTROFUELS AT LTU GREEN FUELS

IEA TASK 33 WORKSHOP, EDMONTON  
DATE 2023-04-19

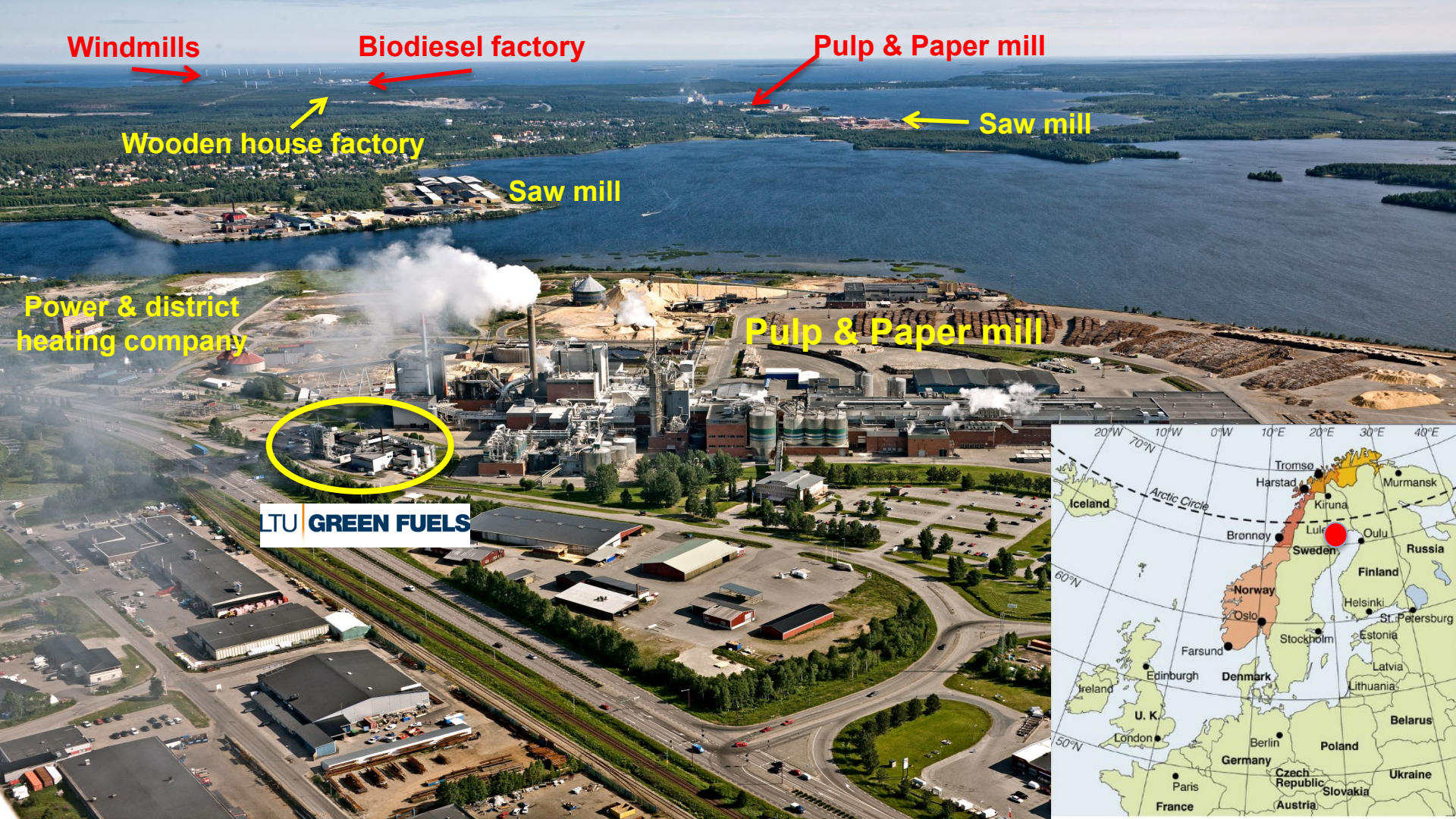
*Fredrik Granberg, MSc. chem eng.  
Project Manager, Luleå University of Technology  
CEO, LTU Green Fuels*



# INVESTMENTS OF MORE THAN 100 BILLION €



Ref. LKAB, SSAB, H2GS, Grupo Fertiberia, Uniper, 2022



Windmills

Biodiesel factory

Pulp & Paper mill

Wooden house factory

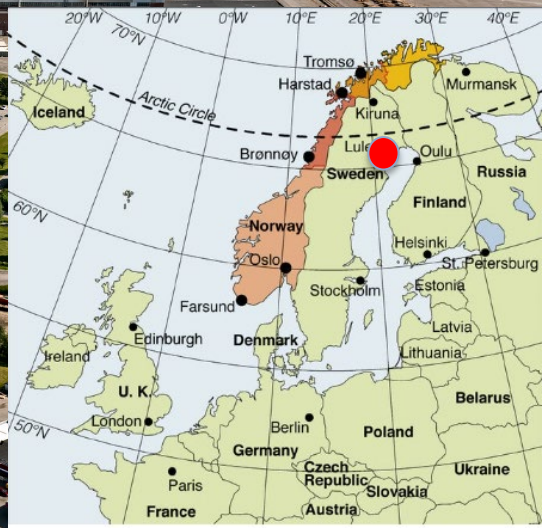
Saw mill

Saw mill

Power & district heating company

Pulp & Paper mill

LTU GREEN FUELS



R&D center with globally recognized track record

Office building

Synthesis gas

Black liquor

Green liquor

Biomass Gasification  
30 bar, 1050° C

LTU GREEN FUELS

RI SE Research Institutes of Sweden

LTU GREEN FUELS

Distillation

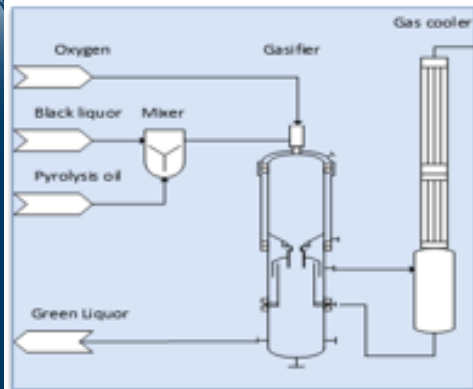
Synthesis  
MeOH ~130 bar  
DME ~15 bar

Gas Conditioning

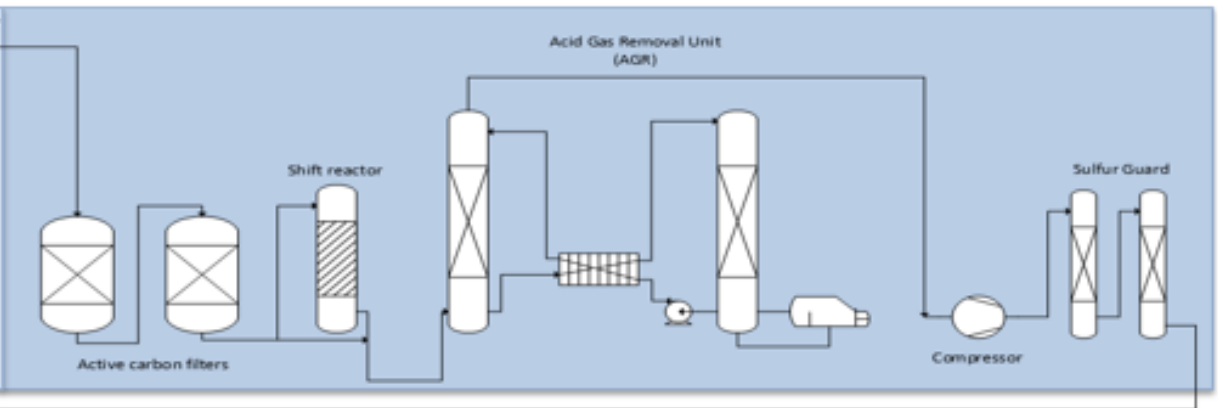
To Storage & Distribution

Gasification, (Pressurized, oxygen-blown Chemrec technology )	Gasification + Synthesis
3 MW, 20 t DS/day of black liquor (biomass)	6 t/d methanol or 4 t/d DME
>28 000 h op. since 2005	>12 000 h op. since 2011
Recovery of cooking chemicals without difficulties	> 1 500 ton Bio-methanol produced
Co-gasification with pyrolysis oil (150 ton) tested >1000 h	> 1 000 ton Bio- DME produced

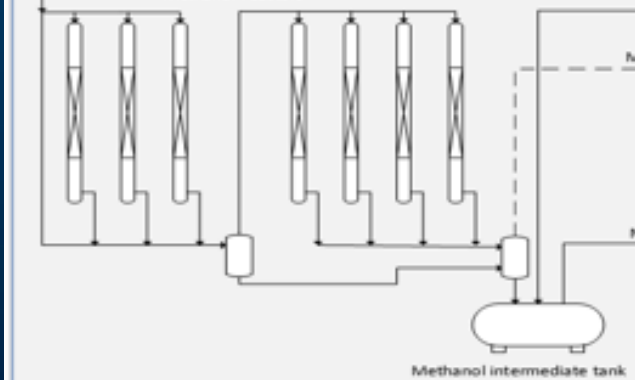
## Gasification



## Conditioning

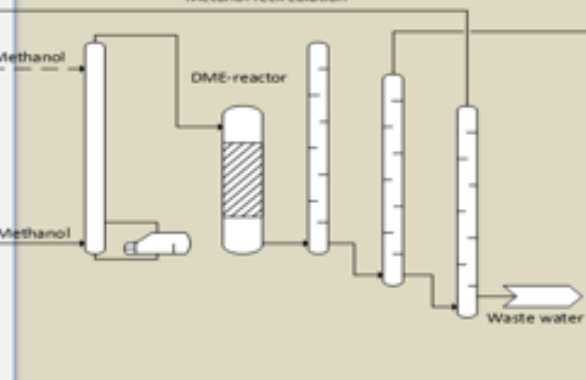


## Methanol-reactors

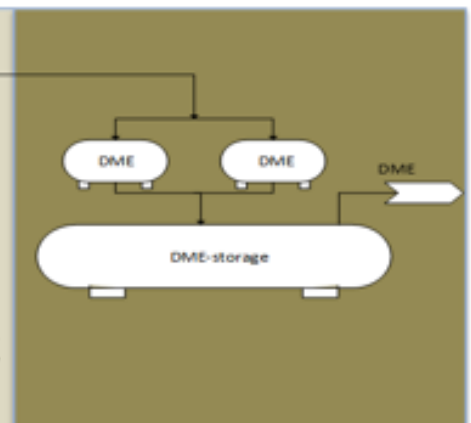


MeOH- synthesis

## Methanol recirculation

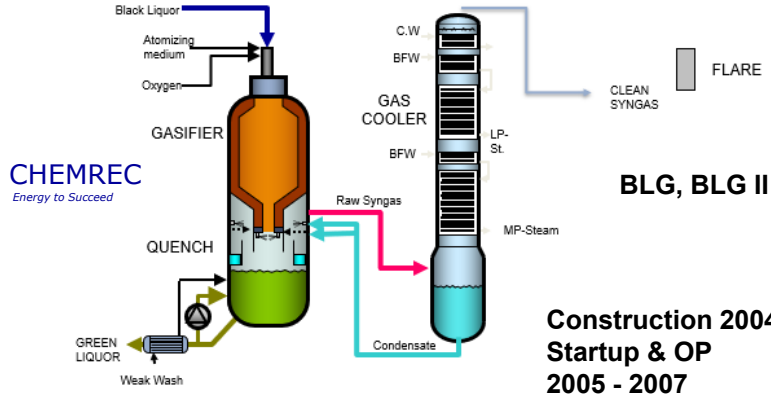


DME synthesis

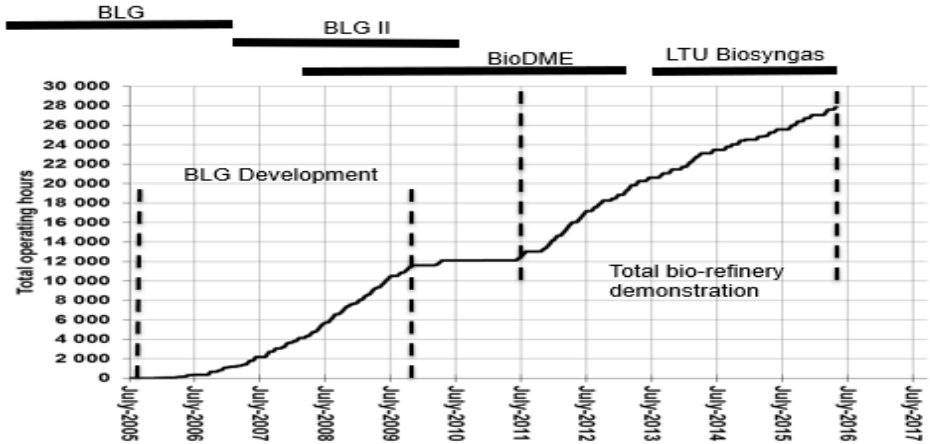


Storage

# BLACK LIQUOR GASIFICATION SYSTEM

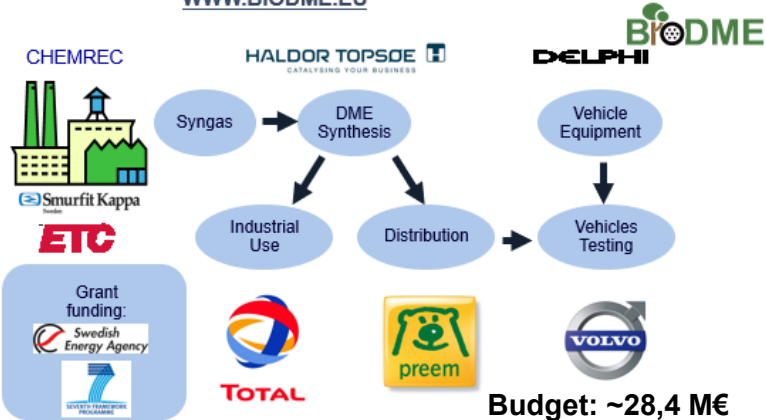


# PILOT PLANT ACCUMULATED OPERATING HOURS

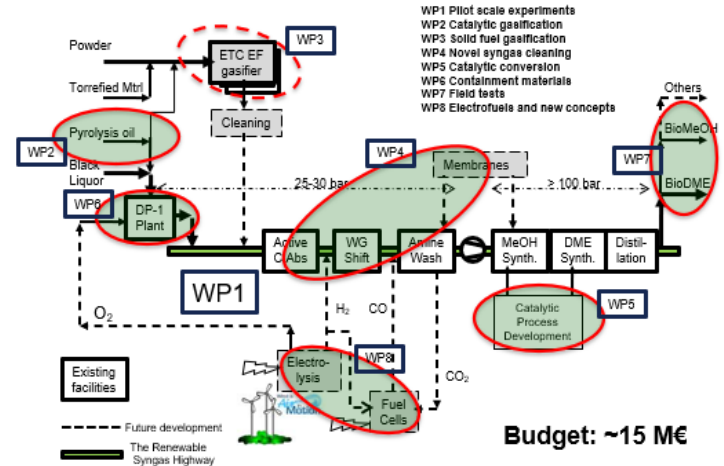


# THE BIODME PROJECT 2008-2012

DEMONSTRATION OF BIODME PRODUCTION AND ITS USE AS FUEL IN HEAVY DUTY TRUCKS  
[WWW.BIODME.EU](http://WWW.BIODME.EU)

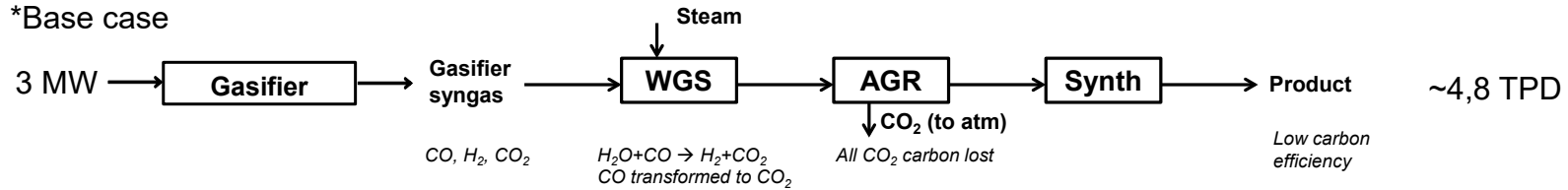


# LTU BIOSYNGAS PROGRAM: 2013-2016

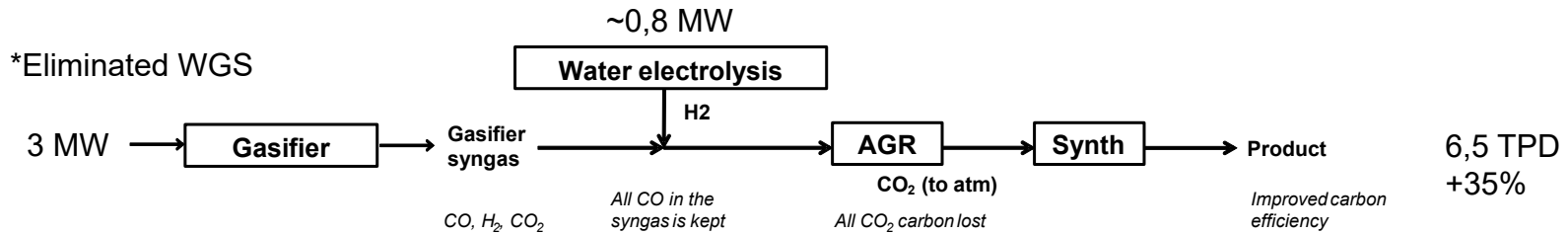


# Hydrogen boosted MeOH production

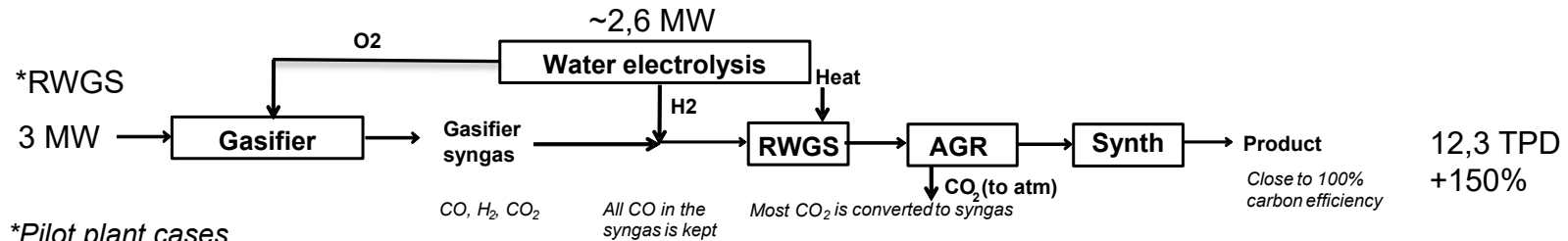
\*Base case



\*Eliminated WGS



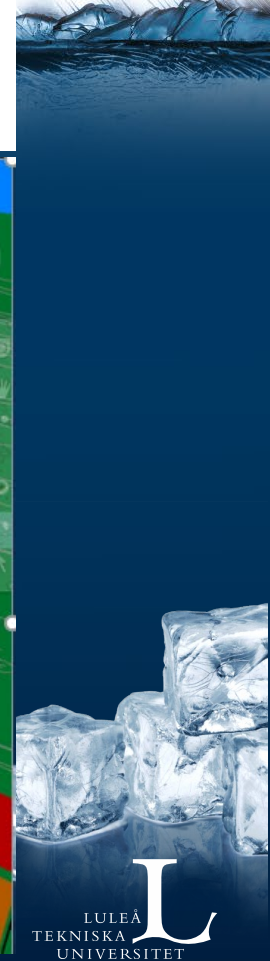
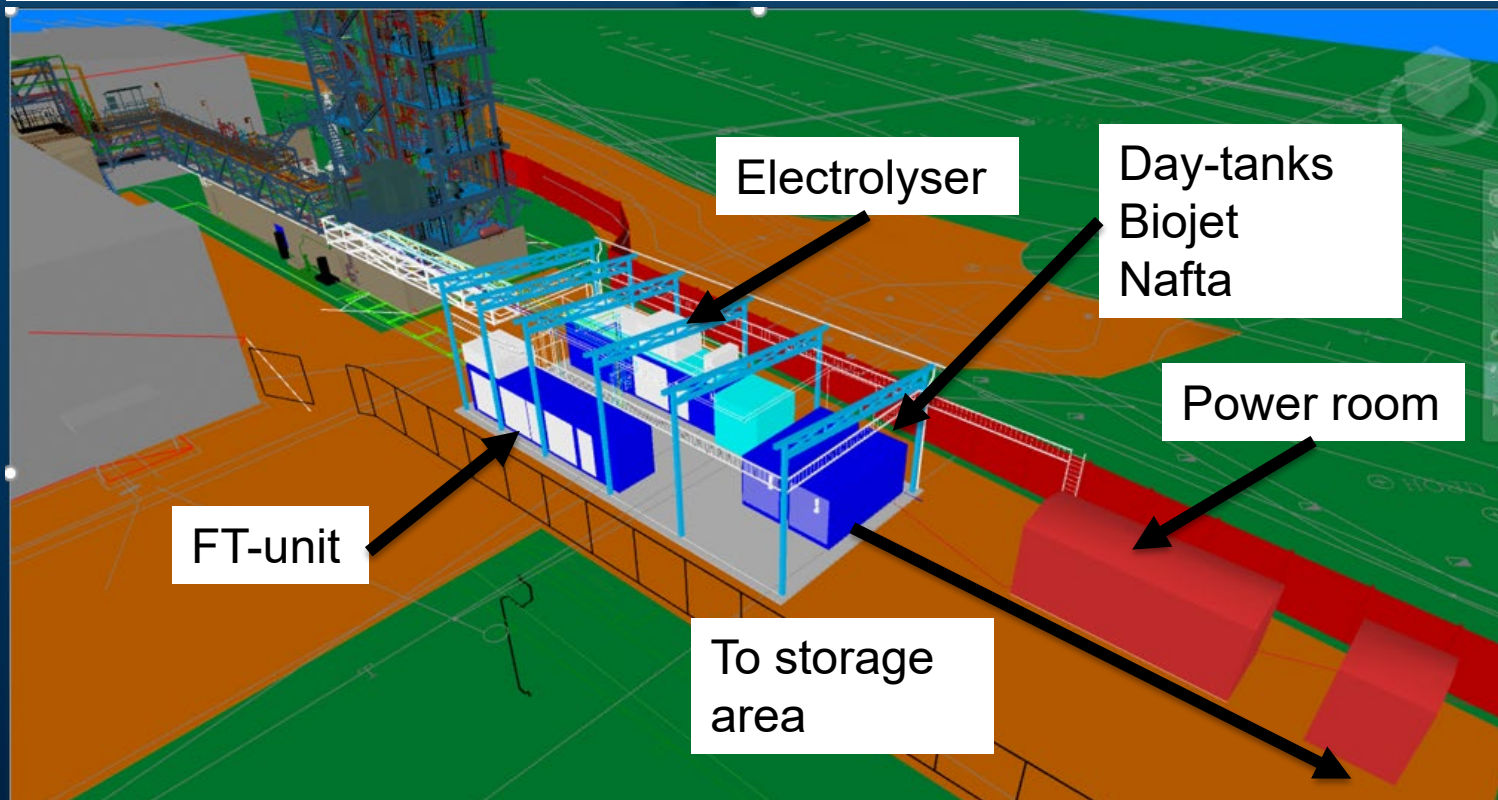
\*RWGS



\*Pilot plant cases

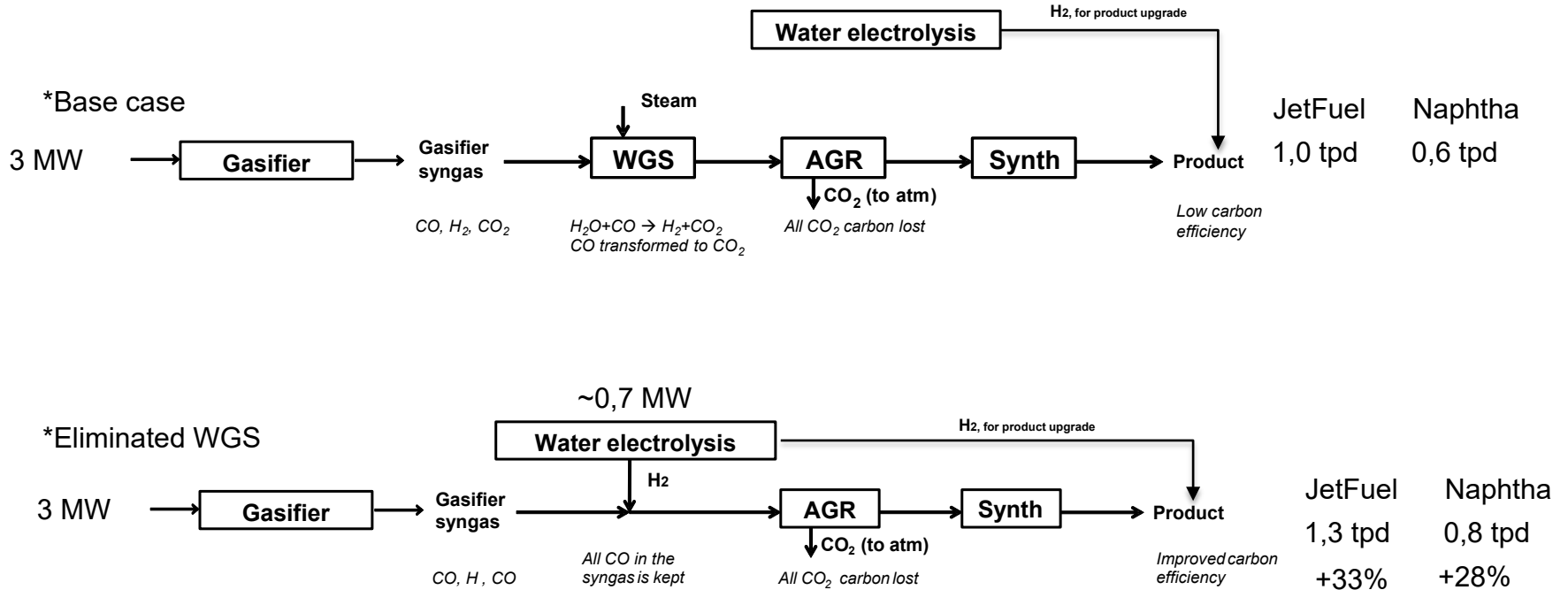
# PRE-STUDY 2018- 2020

## 1 TON / DAY SAF PILOT PLANT





# Pre-study: Hydrogen boosted FT production



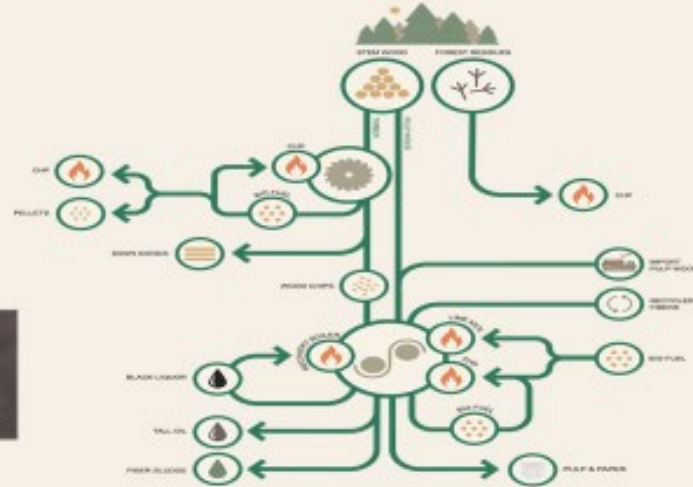
\*Pilot plant cases

# TREEPOWER, Sustainable aviation fuel

Time: 2020 – 2023

Concept / Pre-Feasibility study for SAF in Northern Sweden

VAST FOREST RESIDUES AND INDUSTRIAL SIDE-STREAMS AVAILABLE IN THE REGION



# TREEPOWER, Sustainable aviation fuel



1. Biomass: ~160 000 t DS /year (~100 MW)

2. Hydrogen boosted production, electrolysis  
Option 1: ~40 MW power  
Option 2: up to ~150 MW power

3. PTL, large potential from bio CO<sub>2</sub> sources

Product: ~35 000 – ~70 000 ton/year FT-crude

# The Concept study has identified two high-potential site options



## IDENTIFIED SITE OPTIONS

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### Option 1:

Brownfield development and system integration

- Billerud pulp and paper mill, Karlsborg, Kalix Municipality

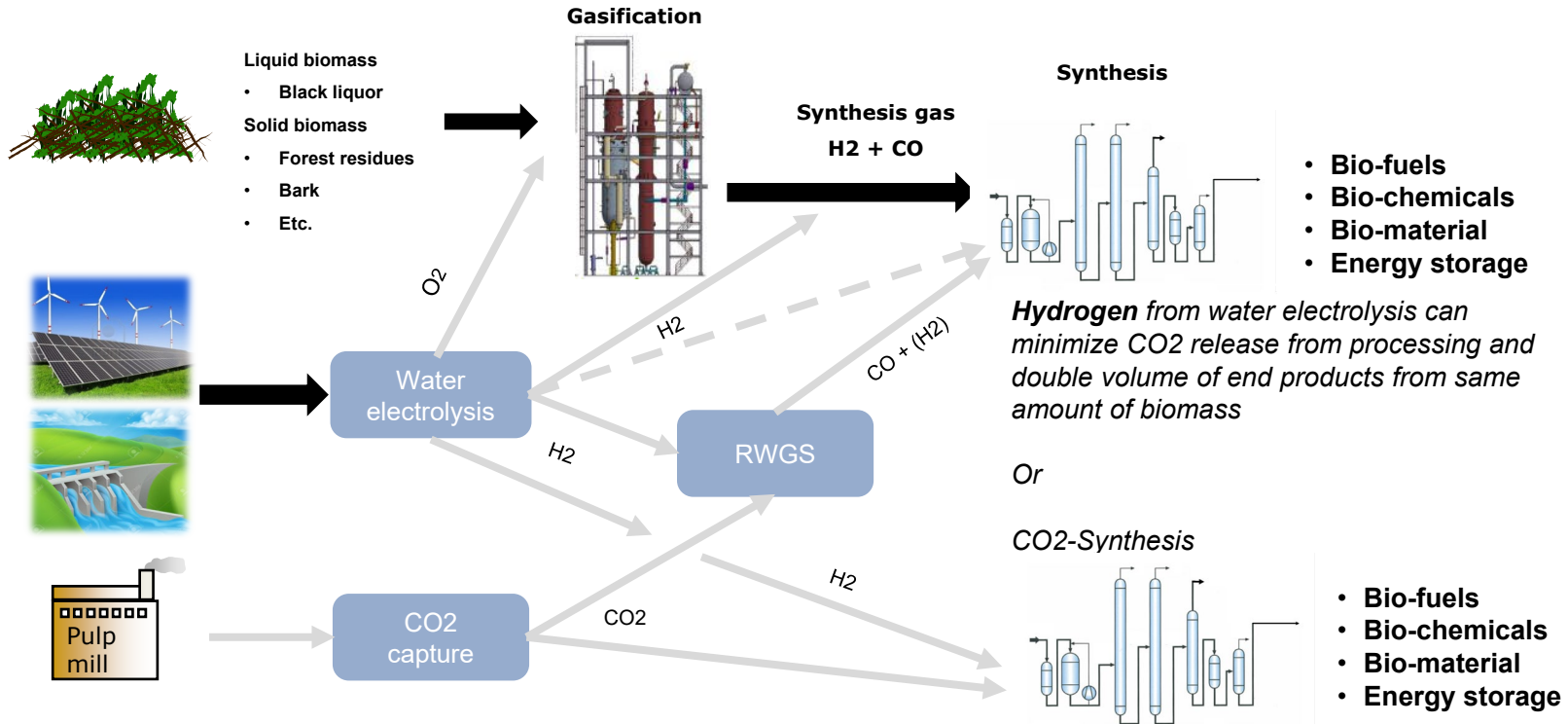
### Option 2:

Greenfield development

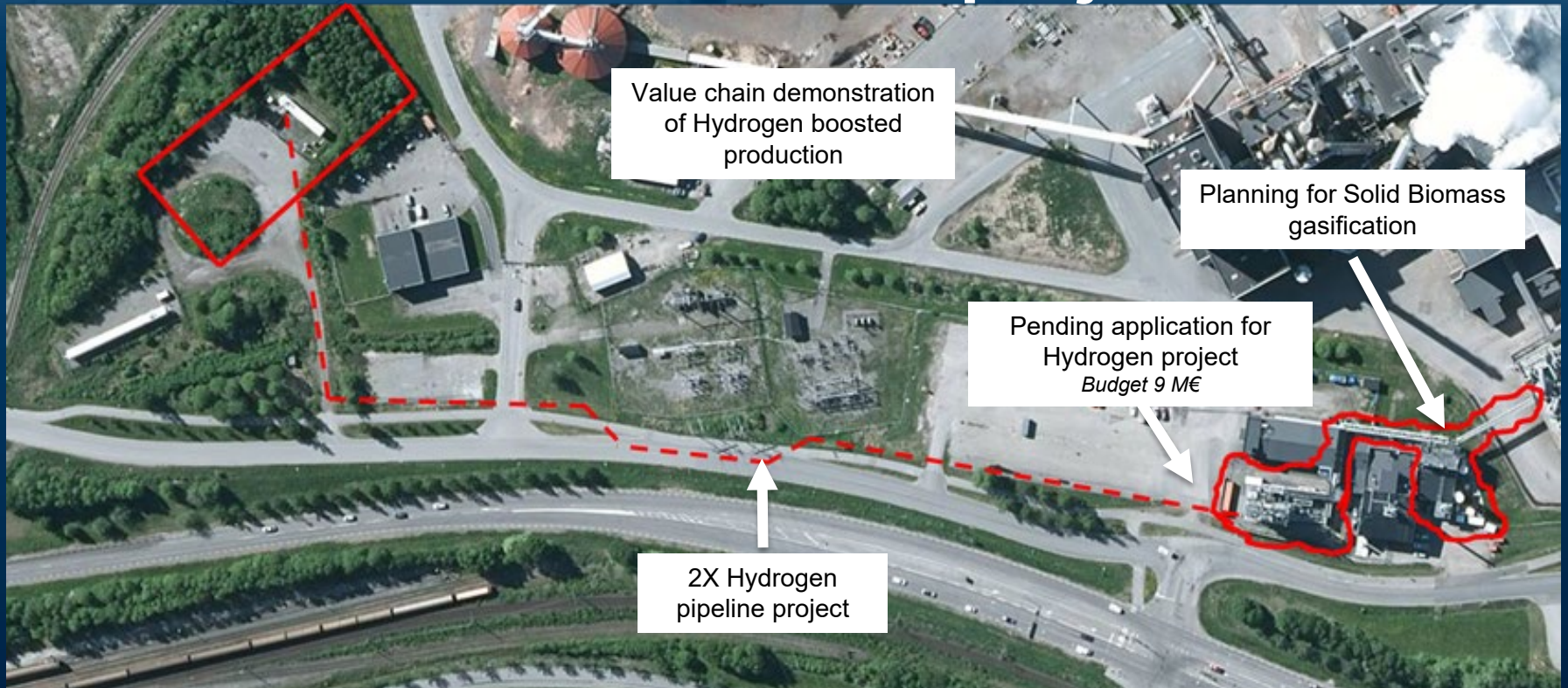
- Haraholmen industrial park, Piteå Municipality



# Example of new concepts



# Present and future projects



# THANK YOU

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