IEA Bioenergy
Technology Collaboration Programme

Country report Sweden

IEA Bioenergy Task 33 – Gasification of biomass and waste

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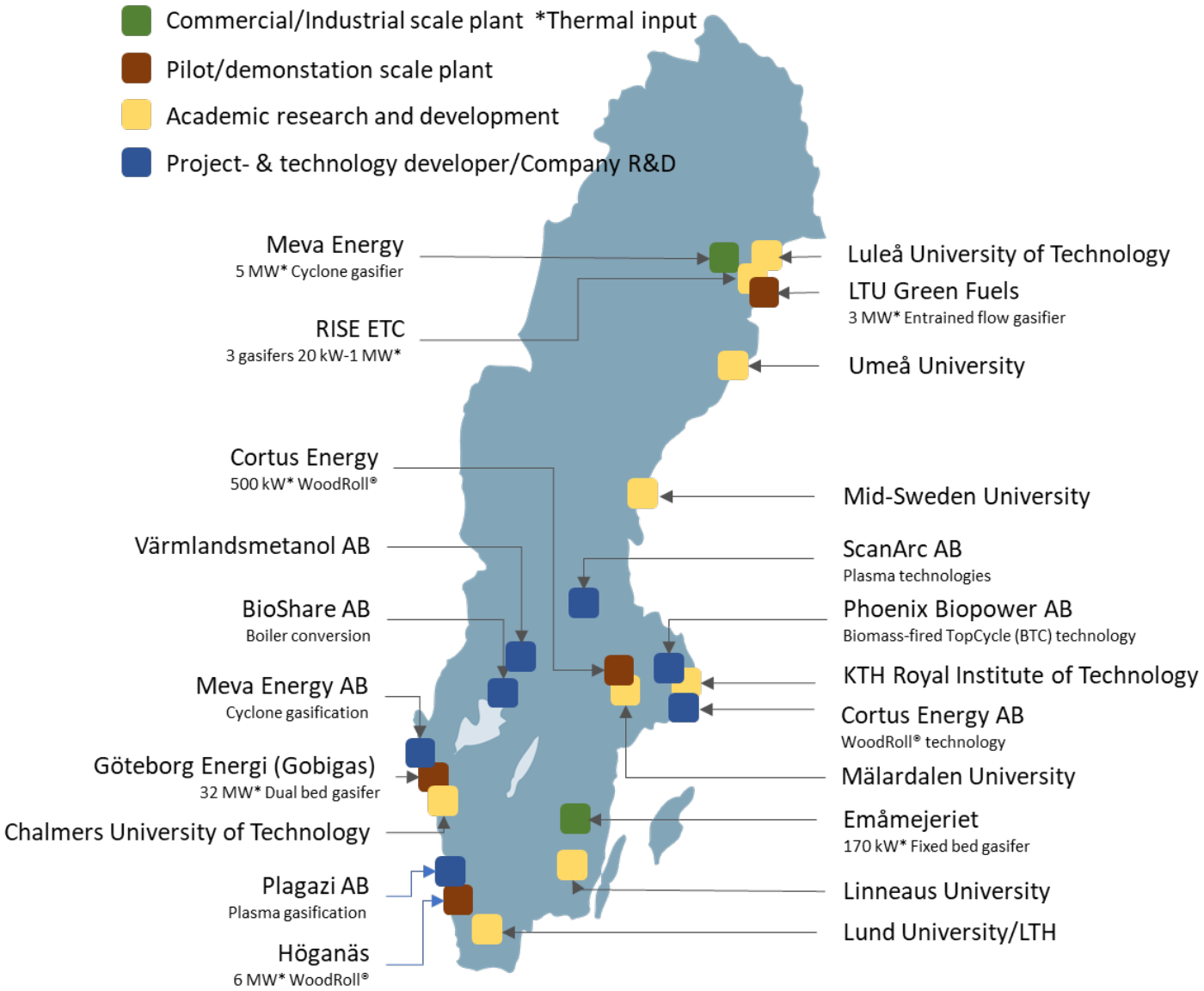
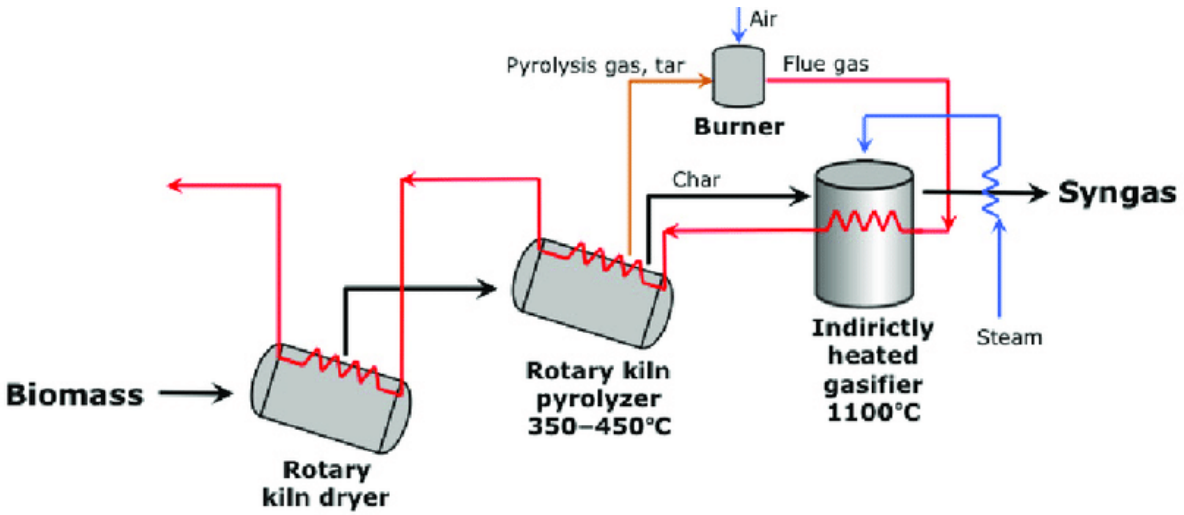
Online task meeting, December 2021


Commercial/Industrial scale plant *Thermal input
Pilot/demonstation scale plant
Academic research and development
Project- & technology developer/Company R&D
Meva Energy
5 MW* Cyclone gasifier
RISE ETC
3 gasifers 20 kW-1 MW*
Cortus Energy
500 kW* WoodRoll®
Värmlandsmetanol AB
BioShare AB
Boiler conversion
Meva Energy AB
Cyclone gasification
Göteborg Energi (Gobigas)
32 MW* Dual bed gasifer
Chalmers University of Technology
Plagazi AB
Plasma gasification
Höganäs
6 MW* WoodRoll®
Luleå University of Technology
LTU Green Fuels
3 MW* Entrained flow gasifier
Umeå University
Mid-Sweden University
ScanArc AB
Plasma technologies
Phoenix Biopower AB
Biomass-fired TopCycle (BTC) technology
KTH Royal Institute of Technology
Cortus Energy AB
WoodRoll® technology
Mälardalen University
Emåmejeriet
170 kW* Fixed bed gasifer
Linneaus University
Lund University/LTH

Cortus 6 MW WoodRoll® gasifier at the Höganäs steel plant



- Large efforts to reach Milestone 3 - pressurized syngas production during 168 h without interruptions.
- 24 h were reached, when the pyrolyser failed.
- Measures to increase the process stability are currently made before re-start.

Picture from and more info at http://cortus.se

Cortus WoodRoll® in Mariposa (US)

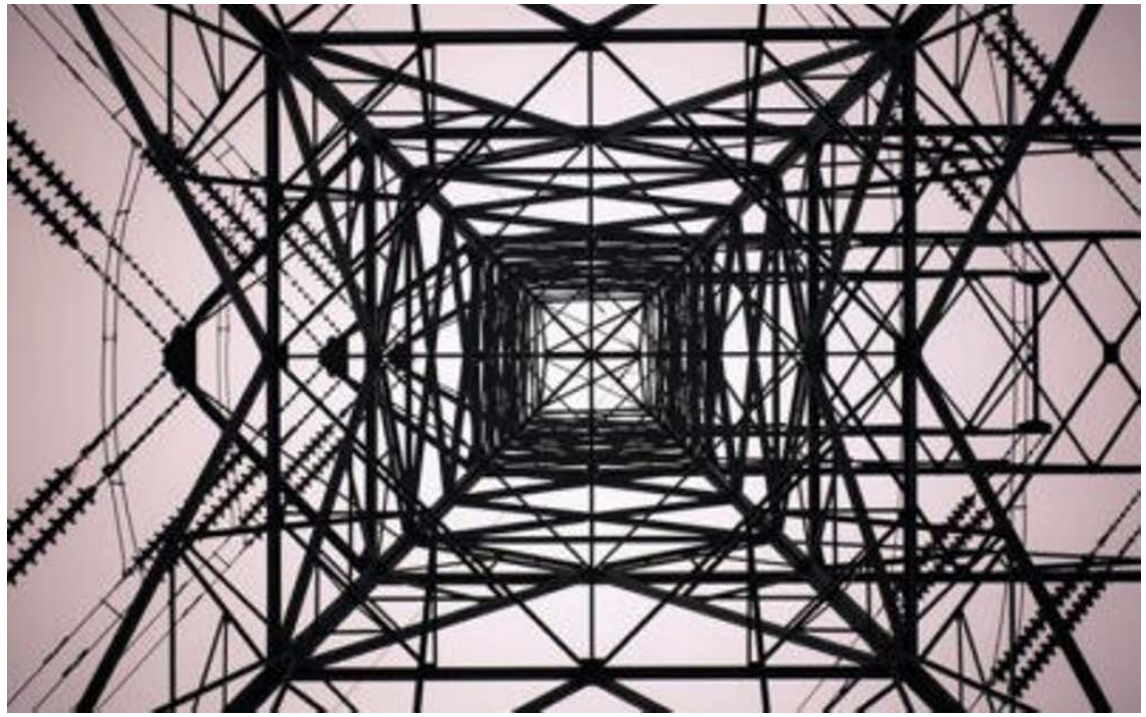


Photo from http://cortus.se

- Pacific Gas & Electric (PG&E) has approved Cortus and the Mariposa-project for delivery of 2,7 MW electricity.
- Cortus can now participate in forthcoming auctions within the BioMAT-program
- Cortus has **decided to await** the development of Covid-19 and the implementation of **Milestone 3** before starting any further activities.

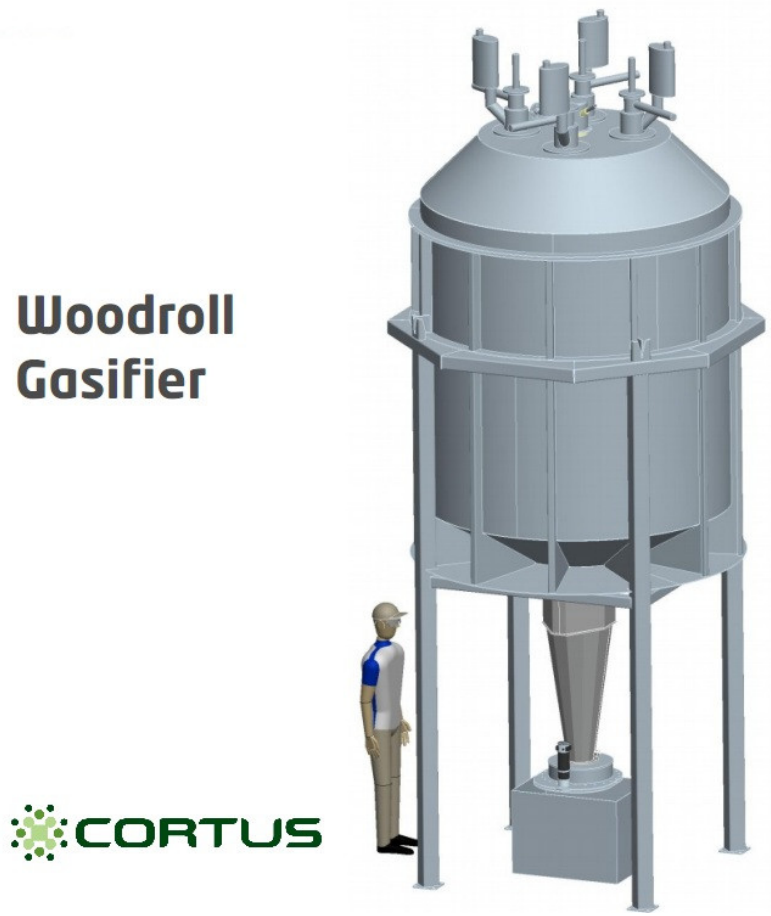
More info at http://cortus.se

* Bioenergy Feed-in Tariff Program, https://www.cpuc.ca.gov/SB_1122

Cortus WoodRoll® & ENGIE (Fr)

- Collaboration project (WoodHy) initiated 2019 on biomass-to-hydrogen project in Bordeaux, France
- An order from **Engie Cofely** worth 135 000 € to carry out an **Advanced Feasibility Study** of a plant for hydrogen and CO_2 production
- **No further activity until Milestone 3** in Höganäs is fulfilled.

More info at http://cortus.se



MEVA Energy

- Entrained flow cyclone gasifier emanated from research at Luleå University of Technology
- Energy outputs 1.2 MW_{el} and 2.4 MW_{th} - Small fraction fuels (sawdust, wood fibers and agricultural residues)
- Applications: CHP, fossil process gas replacements and industrial drying processes

More information at http://mevaenergy.com

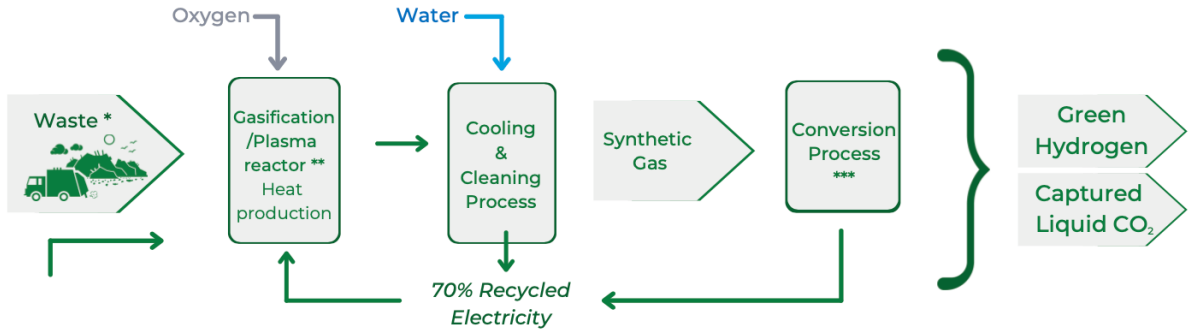
MEVA Energy

- Low value wood residue to renewable gas and power (2.4 MW) at IKEA Industry production unit in Zbaszynek, Poland
- Renewable gas (4.2 MW) for tissue drying at Sofidel mill in Kisa, Sweden

More information at http://mevaenergy.com

Plagazi AB

- Plagazi AB has a concept for transforming waste into hydrogen through plasma gasification. Several new projects are announced:
  - Neue Energien Premnitz and Plagazi to build the first Plagazi plant in Europe. Planned start Q2, 2023. No updates announced
  - New pre-study on plastics to H_2 (unknown customer)
  - New Basic Engineering study on several Plagazi plants for waste-to-industrial gas for fossil-free steel making (unknown customer)
  - Feasibility study on Automotive Shredder Residue (ASR) to H_2 in Switzerland
  - Successful tests regarding conversion of wind turbine blades



* Any type of waste: Auto Shredder Residue, Car Tires, Plastic, Household-, Industrial-, Hazardous- or Medical Waste.
** Exposed to Temperatures > 3000°C in a Plasma Reactor, where the waste is broken down to atomic level.
*** The Product is then rebuilt to form ***Green Hydrogen and CO2,*** which the latter is captured directly.

More info at http://www.plagazi.com

Ongoing Swedish gasification-related R&D programs

- **Swedish Gasification Centre (SFC): 2011-2021, total budget 54 M€ , see www.sfc-sweden.se**
  - Coordinates Swedish gasification R&D
  - 20 companies, 8 universities and one research institute

56
Projects 2013-21

Courses and workshops
23

10
Academic partners 2013-21

10
Years of research

34
Company partners 2013-21

38
PhD examina
13 Female
25 Male

More than
4 800
Journal article citations

446
Scientific publications, of which 274 journal papers, 2013-21

Planned SFC continuation

SFC RECAP - Radically Reduced CO_2-Emissions via advanced thermochemical Conversion processes in innovative industrial APplications

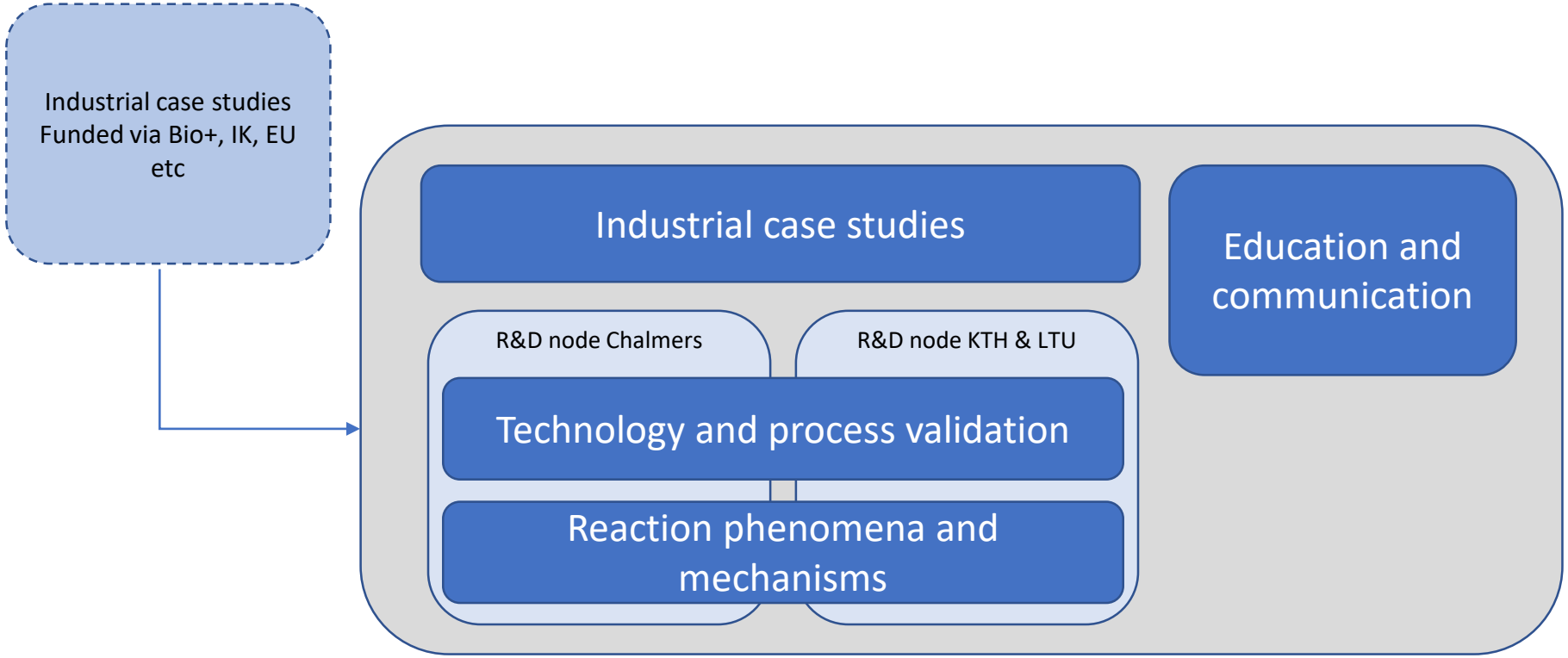
Partners SFC RECAP

Academia:

Companies:

Supporters:

SFC RECAP structure



Total budget: 9 MEuro, 2022-2028
Expected decision in February 2022

Large industrial transformation in Norrbotten – the epicentre for the hydrogen revolution

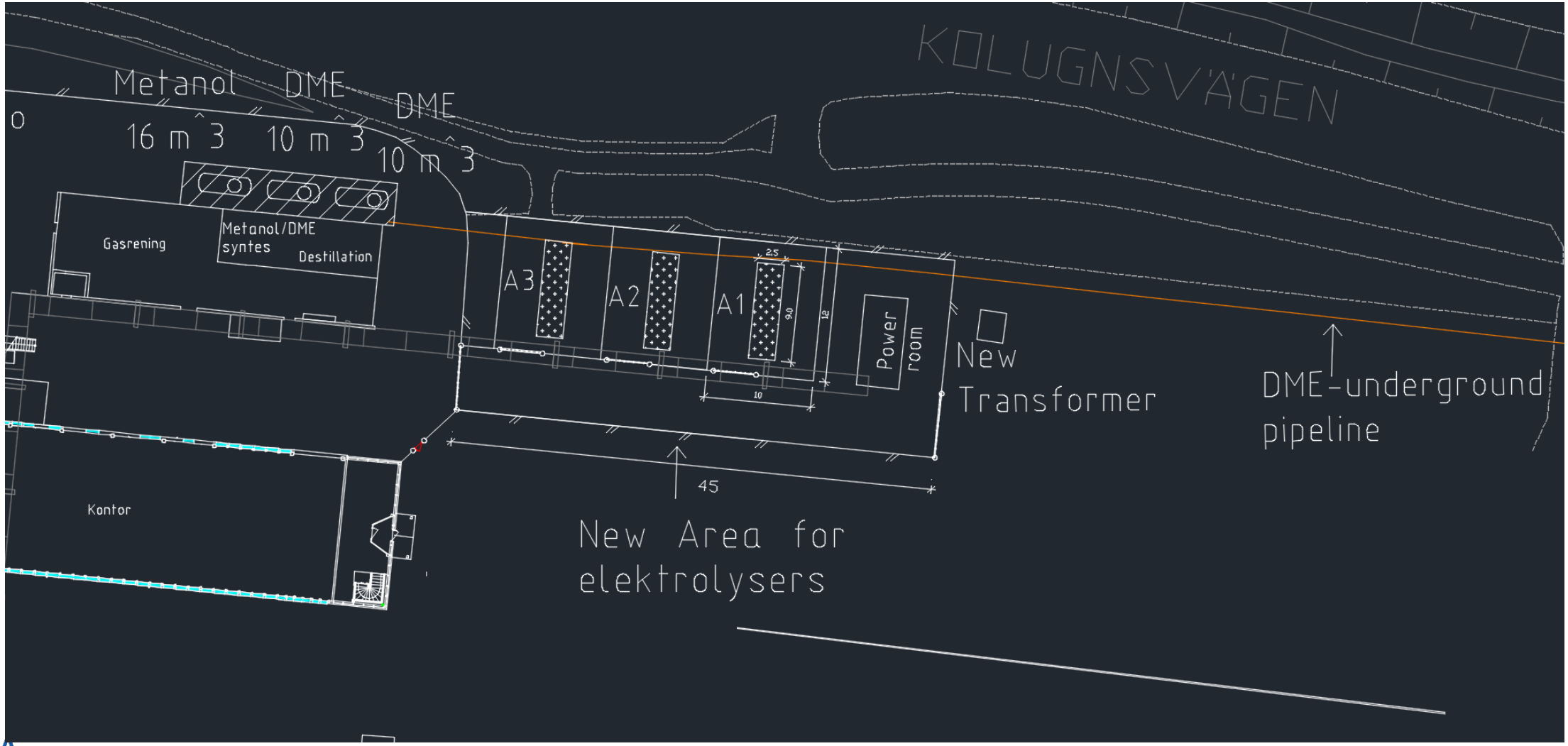
- **LKAB** – shift from iron ore pellets to CO_2-free sponge iron, need 1000 kton H_2 per year
- **SSAB** – green steel making, need 100 kton H_2 per year
- **H_2 Green Steel** – green steel making, need 250 kton H_2 per year
- **Grupo Fertiberia** – green ammonia and fertilizers, need 80 kton H_2 per year
- Renewable power is needed for **electrolysis and electric arc furnaces** – approx. 65 TWh per year corresponding to 40% of Sweden's current power production

Current total electricity Production 2020: 160 TWh

CH_2ESS - Centre for Hydrogen use in industry and the Energy System Sweden

- An extensive research and education investment in close collaboration with leading basic industries and energy companies.
- The focus is on hydrogen in industrial processes and energy systems.
- The core is LTU Green Fuels – great opportunities for combining electrolysis and biomass gasification

CH_2ESS - LTU Green Fuels plant



CH_2ESS research program

- Aim to cover the whole value chain, including the power system
- 10 new PhD projects will start in January 2022
- Large scale experiments in the LTU Green Fuels plant
- New courses in undergraduate programs – inclusion of H_2–related topics also in existing courses
- Network of Young Scientists

Thanks!

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www.ieabioenergy.com