# CH2ESS

## Kunskapshöjning inom vätgasområdet

Vätgaskonferensen 2023-12-06

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# Centre for Hydrogen Energy Systems Sweden

## AT LULEÅ UNIVERSITY OF TECHNOLOGY

1) Education

2) Excellent, demand driven research

3) Accelerating hydrogen

# What is hydrogen and why is it important?

*MOOC = Massive Open Online Course (Swedish and English)*

1. Hydrogen production, distribution, storage and use
   - Approx. 12 h
   - 5-min movies
   - Self studies and questions
   - Swedish and English

2. Education for students, PhD students, reskilling

LTU.se/centres/CH2ESS/Utbildning

# Hydrogen – an energy carrier

## Advantages with hydrogen in the energy system


**An energy carrier**

For use anywhere energy is needed and no better option exists


**Support an emission free value chain**

Water as emission

Various sources

Local production


**Flexible**

Many options for production, distribution, storage and use

Grid support services

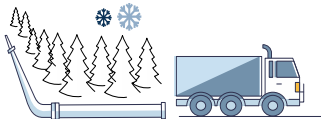

**So much more to discover**

# FAQ Hydrogen

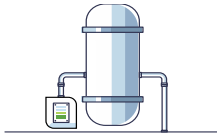
1) Safety
2) Stakeholders
3) Conversion losses
4) Technical readiness
5) Manufacturing readiness
6) Limited natural resources
7) Competition
8) Incentives
9) Certification scheme
10) Cost of renewable hydrogen
11) How does it work?

# The CH2ESS growing research portfolio

Production



Distribution



Storage

Usage

Energy & Fluid mechanics

EPOCH

Power grid, system

Aurora & IEA

H2LABS

Formic acid as hydrogen carrier

Pipeline flows x2

Methanol as a storage

Oxygen in iron oxide process

Material & Safety

H2SIPP

Safety & permits

Condition monitoring - pipelines

Polymer for H2 tanks

LRC – rock design

Ammonia – storage materials

Laser welding for stationary storage

H2AMN

Industrial symbiosis storage

Bearing performance

FINAST

JTF – steel industry

Law & Economics

Heavy vehicles

CCUS

Green Fuels

Socio-technical challenges, stakeholders

# H2LABS - Test bed for MW-scale electrolysis systems at LTU Green Fuels

**Budget:**~93 MSEK
**Timeline:** Oct 2023 – Sep 2026.
**Project owner:** Lulea university of technology
**Partners:** LTU Green Fuels + H2 Green Steel + PiteEnergi + SmurfitKappa

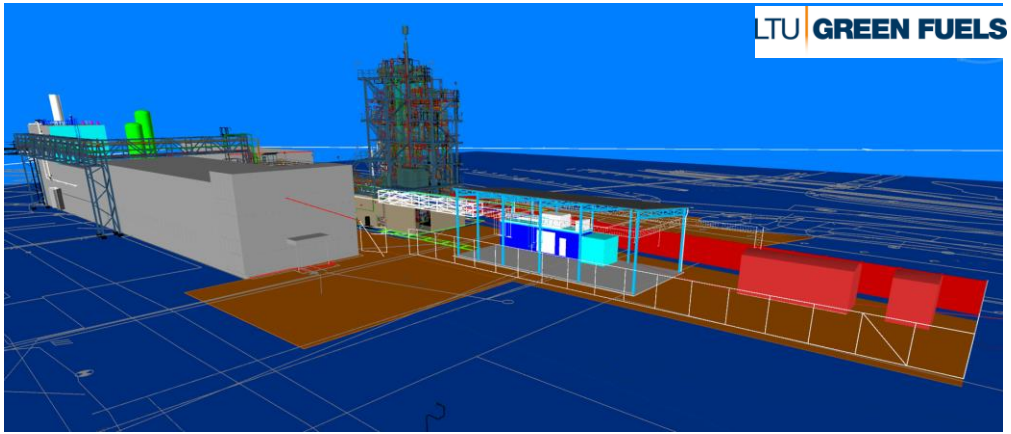
Partners:

With support from:

Stiftelsen Energitekniskt Centrum i Piteå

## Goals:

- ✓ Increase knowledge on critical parameters, SAFETY
- ✓ Research on process optimization
- ✓ Explore operability
- ✓ Identify important research questions

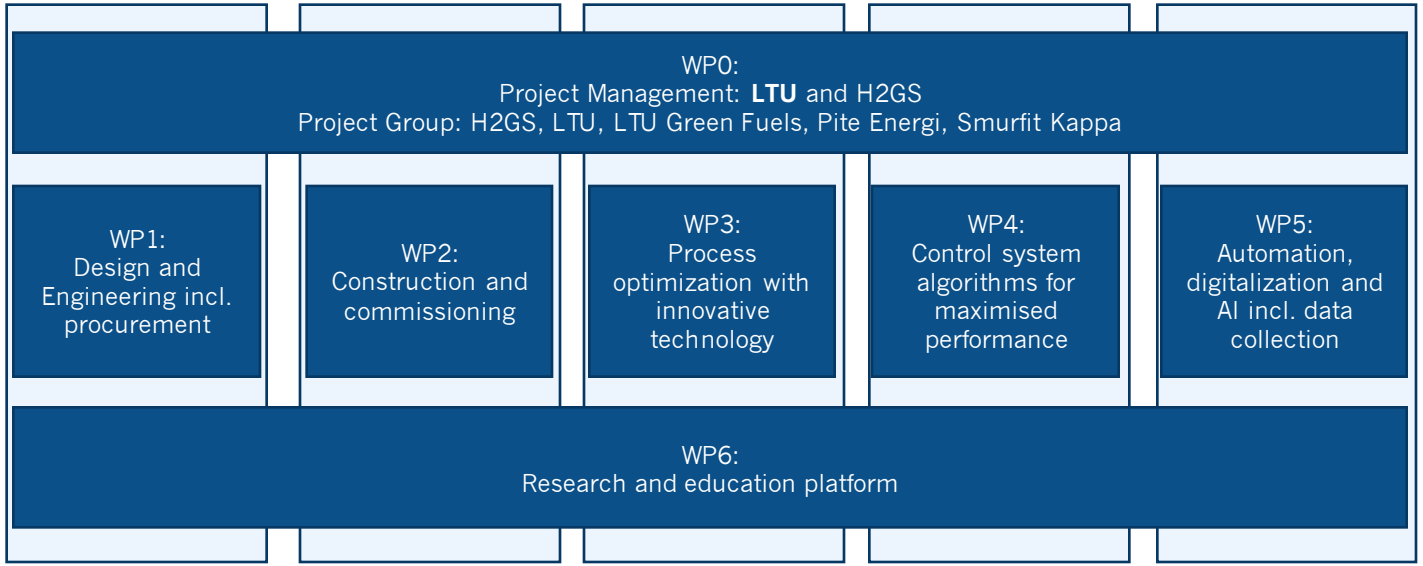



tillväxtverket

Medfinansieras av Europeiska unionen

# Project Work Packages

## H2LABS




tillväxtverket

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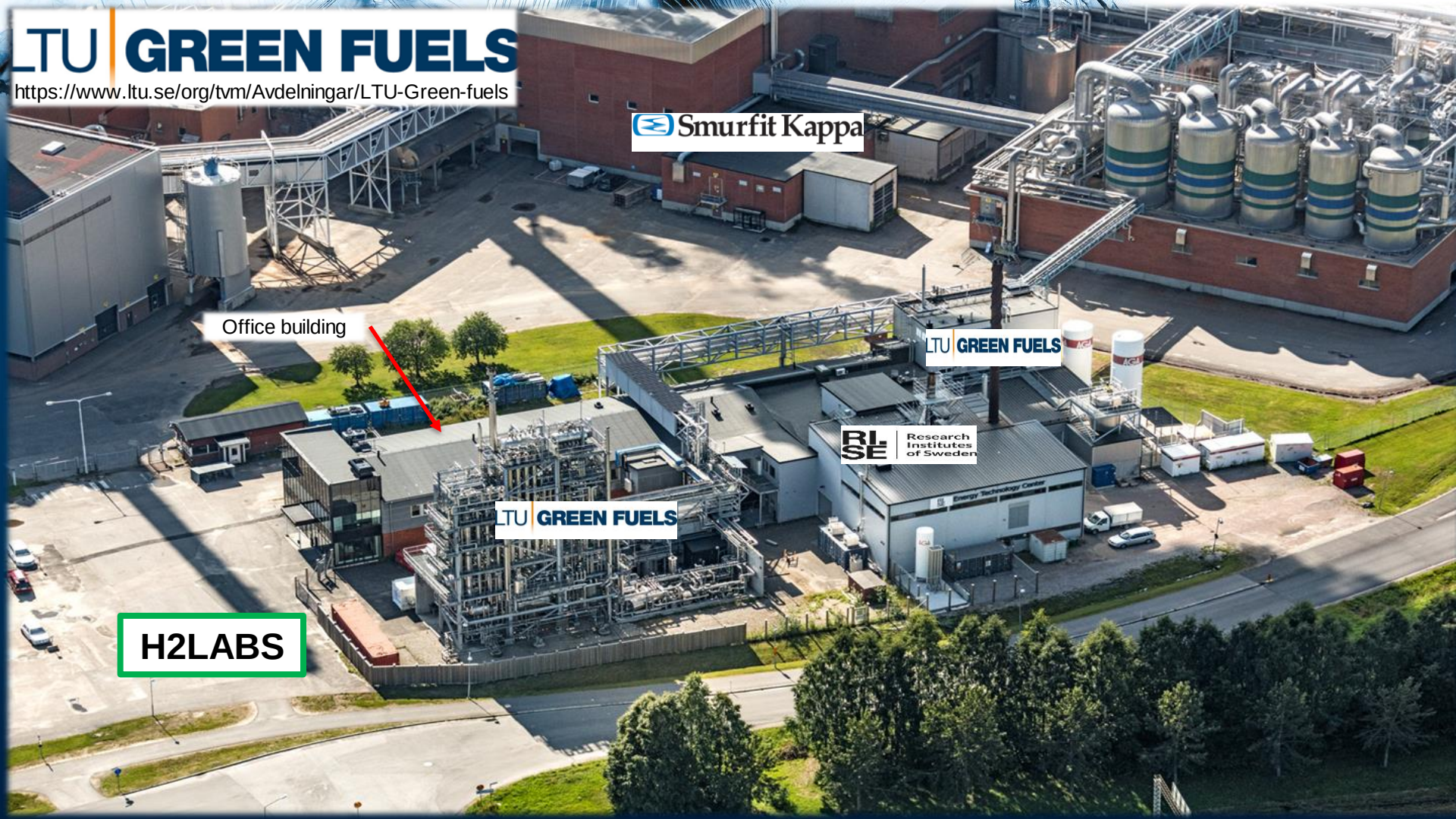
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https://www.ltu.se/org/tvm/Avdelningar/LTU-Green-fuels
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Office building
LTU GREEN FUELS
RI.SE Research Institutes of Sweden
Energy Technology Center
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H2LABS

# H2LABS

Medfinansieras av Europeiska unionen

**Excellent consortia:** steel, pulp & paper, energy company and academia

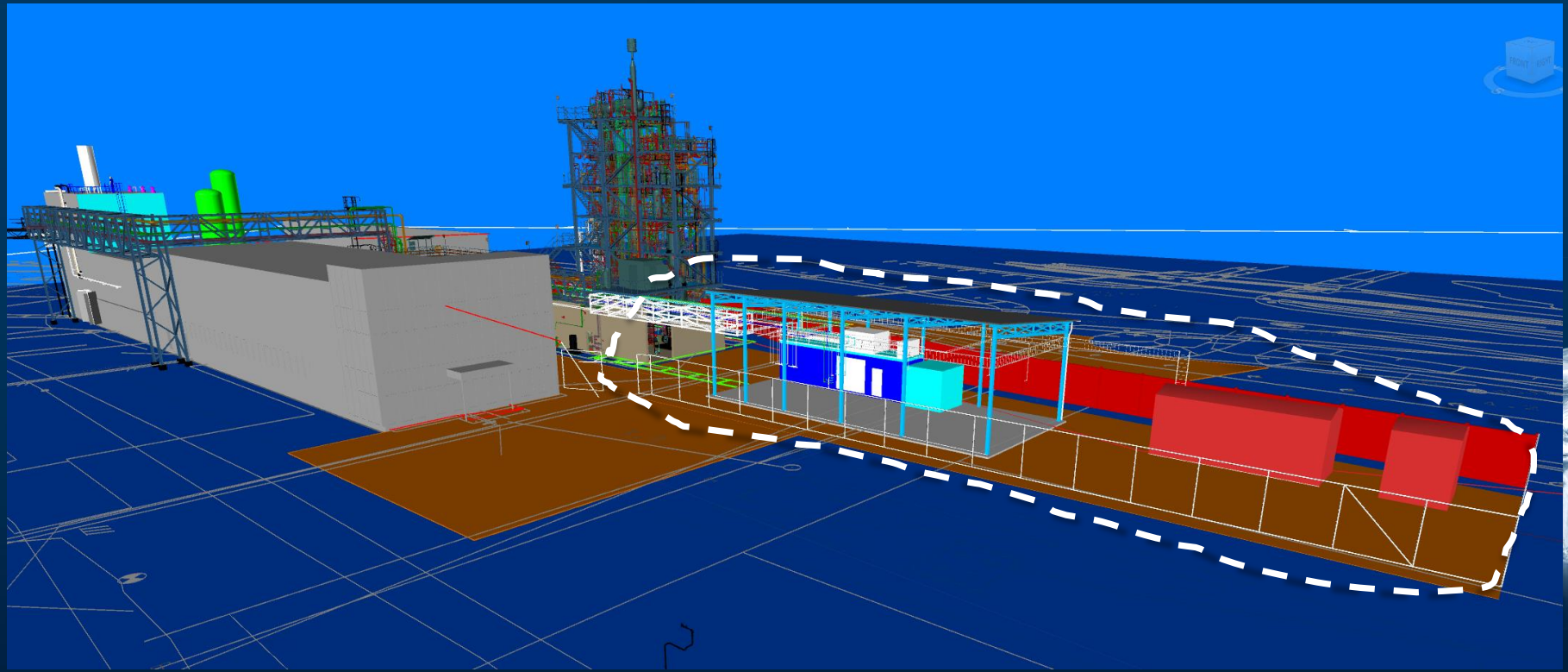
- ✓ Exploring sector couplings between steel-, forest-, and energy industry.

## Future possibilities

- ✓ Research on hydrogen and/or oxygen demanding processes.
- ✓ Electrofuels and Bio-electrofuels, etc. to replace non renewables for heating, logistics *(maritime, aviation, road, rail)*
- ✓ Related in depth research on material, electrochemistry, SAFETY, AI, modeling, TEA, etc.
- ✓ Education

# H2LABS

## EXAMPLE LAYOUT



# Benefit from research in an industry-relevant environment

- Rapid knowledge building around operation of electrolyser systems in cold climate
- Nursery for key people in the industry
- Realistic environment that can be used for training professionals and aspiring engineers
- Optimization of facilities of the type that the region's industry needs
- Independent basis for assessment of maintenance needs, operating strategies and safe operation
- Permit issues, chemical legislation, etc.

# THANK YOU

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