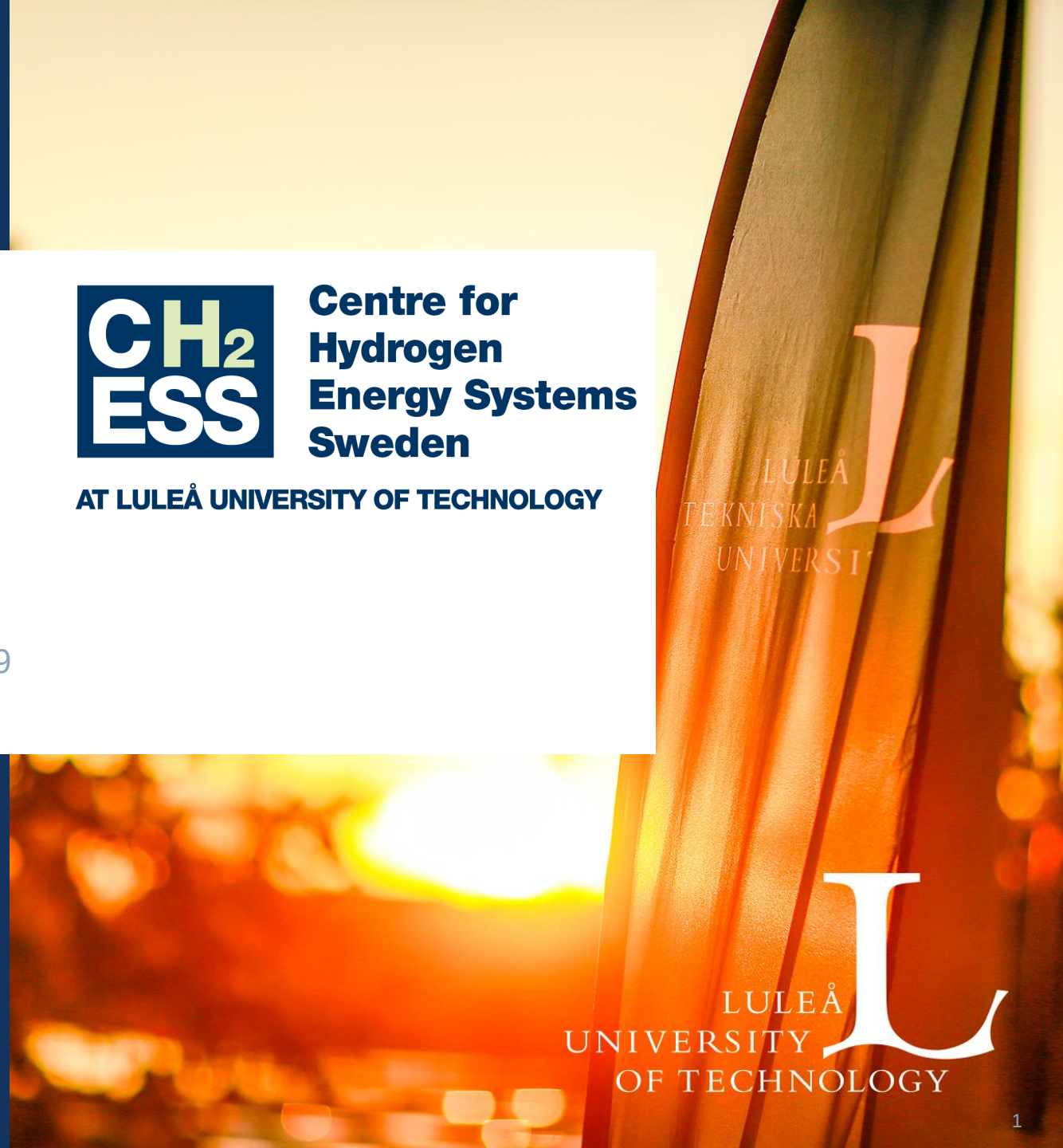
Welcome to us!

Centre for Hydrogen Energy Systems Sweden

AT LULEÅ UNIVERSITY OF TECHNOLOGY

Dr. Cecilia Wallmark
Director of CH2ESS

Within the hydrogen area since 1999



National and European perspectives

- FCH JU, 2008
- The EU 2050 climate targets

  Driving demand.
- The EU Hydrogen Strategy 2020

  EU support to RnD, mass production and incentives.
  Hydrogen Valleys.

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- 1990’s - Large R&D programs on fuel cells
- 2004 – Limiting national R&D funds for hydrogen and fuel cells
- 2016 – The industry project Hybrit
- The Swedish strategy proposal 2021

  Including targets as international frontrunners and global use.

Sweden as a frontrunner in hydrogen

[Vätgaskonferensen 2023, CH2ESS @ LTU]

Green power, biomass, distr heating, green CO_2, H_2O, capital

Active stakeholders along the full value chain, geografical spread, applications and systems

Major component suppliers
- ABB
- Hitachi
- SKF
- Alfa Laval
- …

Early network of HRS
>60 stations accepted for public financial support

High quality heavy-duty FCV
- Volvo
- Scania

Front runners in fossil-free green iron and steel etc
- SSAB
- LKAB
- H2 Green Steel
- Ovako
- Power2Earth

Hydrogen based fuel production
- Liquid Wind
- St1
- Vattenfall
- Uniper
- …

World class fuel cell material, components, stacks and systems
- PowerCell
- Alleima
- Cellimpact
- Permascand…

Energy system innovations and research with multiple stakeholders and sector coupling

Marine applications
- Gotland
- …

Strong innovation, SME

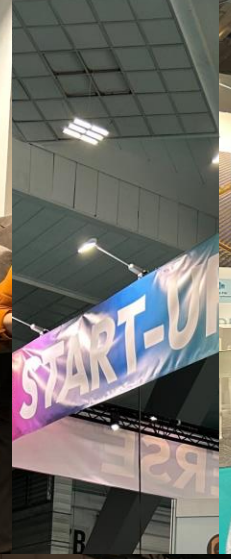
E.g for flights with FC, GT, hydrogen storage

First movers

World class hydrogen research
- KTH
- Umeå
- Chalmers
- Lund
- Uppsala
- LTU
- RISE

World leading steel and metallurgy research
- LTU
- KTH
- Swerim

Stakeholders active in hydrogen and fuel cell research and development, all TRL



EU Hydrogen Week 2022-2024

Centre for Hydrogen Energy Systems Sweden

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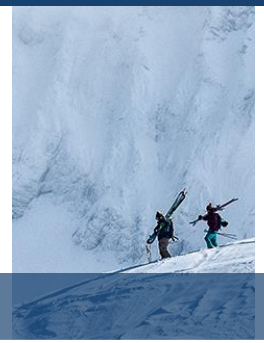
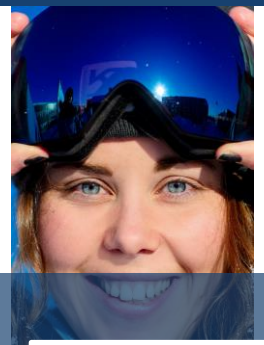
1) Education

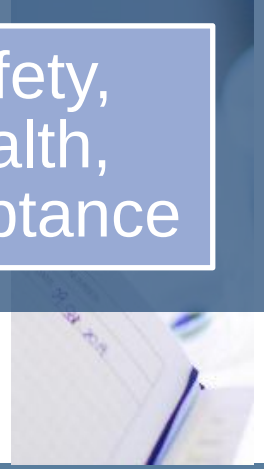
2) Excellent, demand driven research

3) Accelerating hydrogen:

Regional, national & Nordic events





Production

Distribution

Storage

Use

Safety, health, acceptance

LTU - excellence

- Electric power technology – grid issues and smart power grid;
- Energy system analysis – Scenario analysis; Climate; Energy efficiency
- Sustainable energy technology – Advanced biofuels, combustion, district heating, CCS, …
- Building design and fire – Safety against fire and explosion
- Production development – Laser welding; Manufacturing
- Rock mechanics – Storage in lined rock caverns
- Geological and environmental science – CO_2 storage
- Applied physics – Control technology
- Machine design – Hydrogen distribution
- Cyber-physical systems – Hydrogen storage and distribution
- Fluid mechanics – Hydrogen distribution/safety
- Quality technology and logistics
- Rights of indigenous people
- Human work sciences – Safety
- National economy
- Environmental law
- History, city planning…

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CH_2ESS Steering Group – Accelerating hydrogen

VATTENFALL

Skellefteå Kraft

Stegra

Luleå Energi

REGION NORRBOTTEN

region västerbotten

BODENS KOMMUN

Skellefteå kommun

TITAN KONSTRUKTION

Piteå kommun

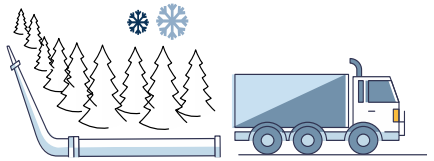
GÄLLIVARE NÄRINGSLIV

LULEÅ KOMMUN

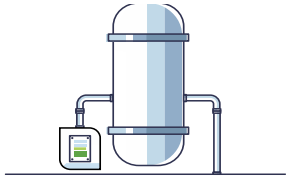
LULEÅ TEKNISKA UNIVERSITET

The CH2ESS growing research portfolio (2022-2023 funding)

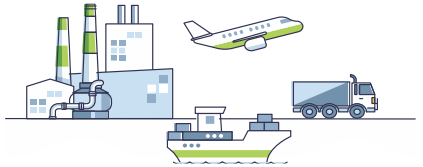
Production



Distribution



Storage



Usage

Energy & Fluid mechanics

Electrocatalytic production of liquid organic hydrogen carriers (LOHC) and chemicals from lignin

Power grid connections

Hydrogen from biomass

1 MW electrolyser (H2LABS)

Formic acid as hydrogen carrier

Pipeline flows x2

Methanol as a storage

Oxygen in iron oxide process

Carbon capture, storage and use

Green Fuels

Material & Safety

Condition monitoring - pipelines

Polymer for H2 tanks

Lined rock caverns

Ammonia – storage materials

Laser welding for stationary storage

Safety, permits & acceptance (H2SIPP)

Industrial symbiosis, energy & storage in rock caverns (H2AMN)

Bearing performance

Fossil-free steel (FINAST)

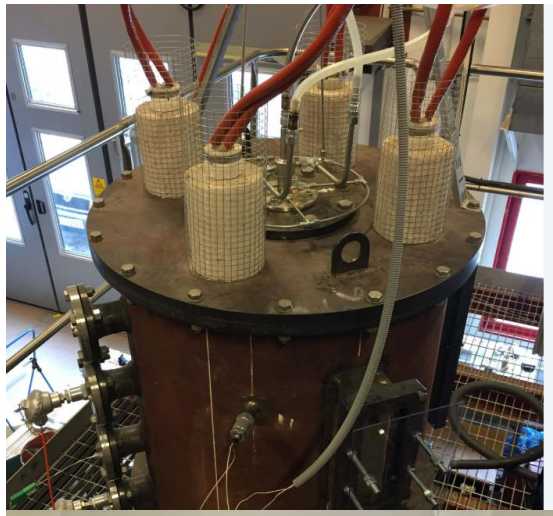
Law & Economics

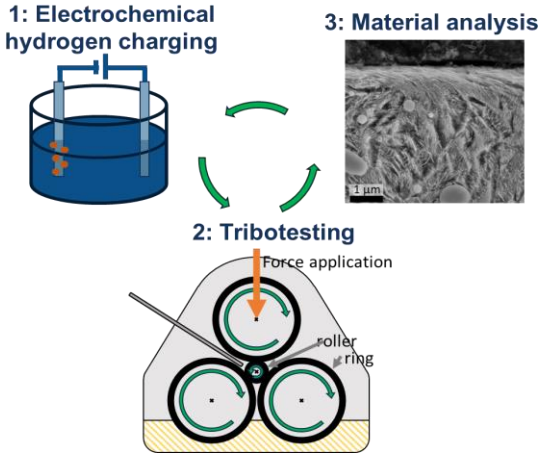
Heavy duty vehicles

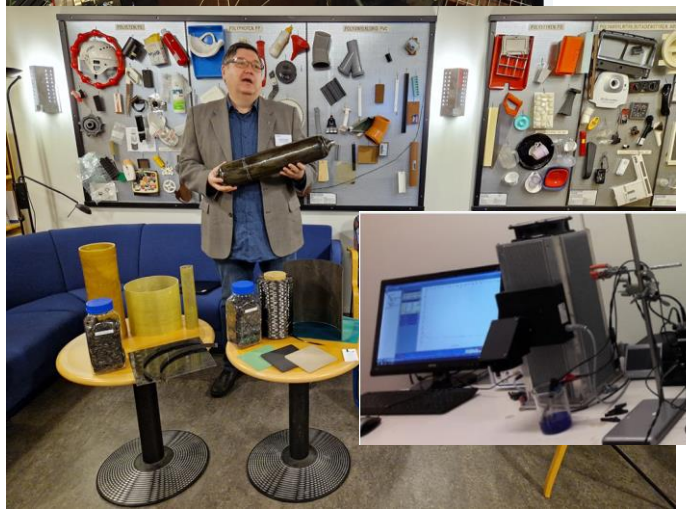
Socio-technical challenges, stakeholders

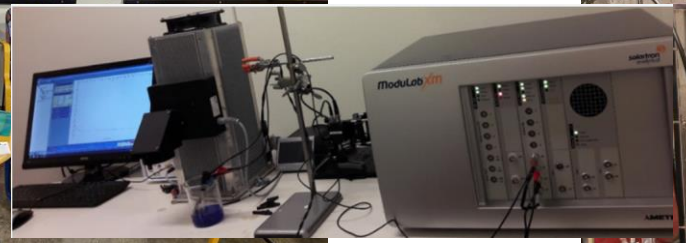
*CH2ESS seed project color

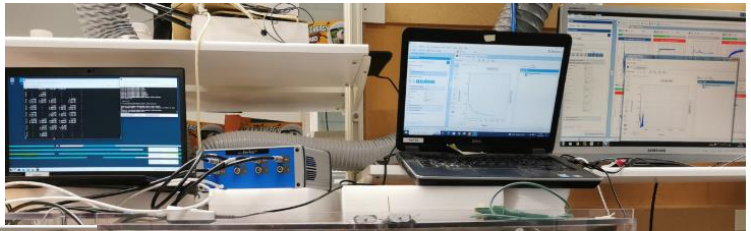
LTU initiative develops new lab test facilites for hydrogen – with 2022-2023 national & EU funding

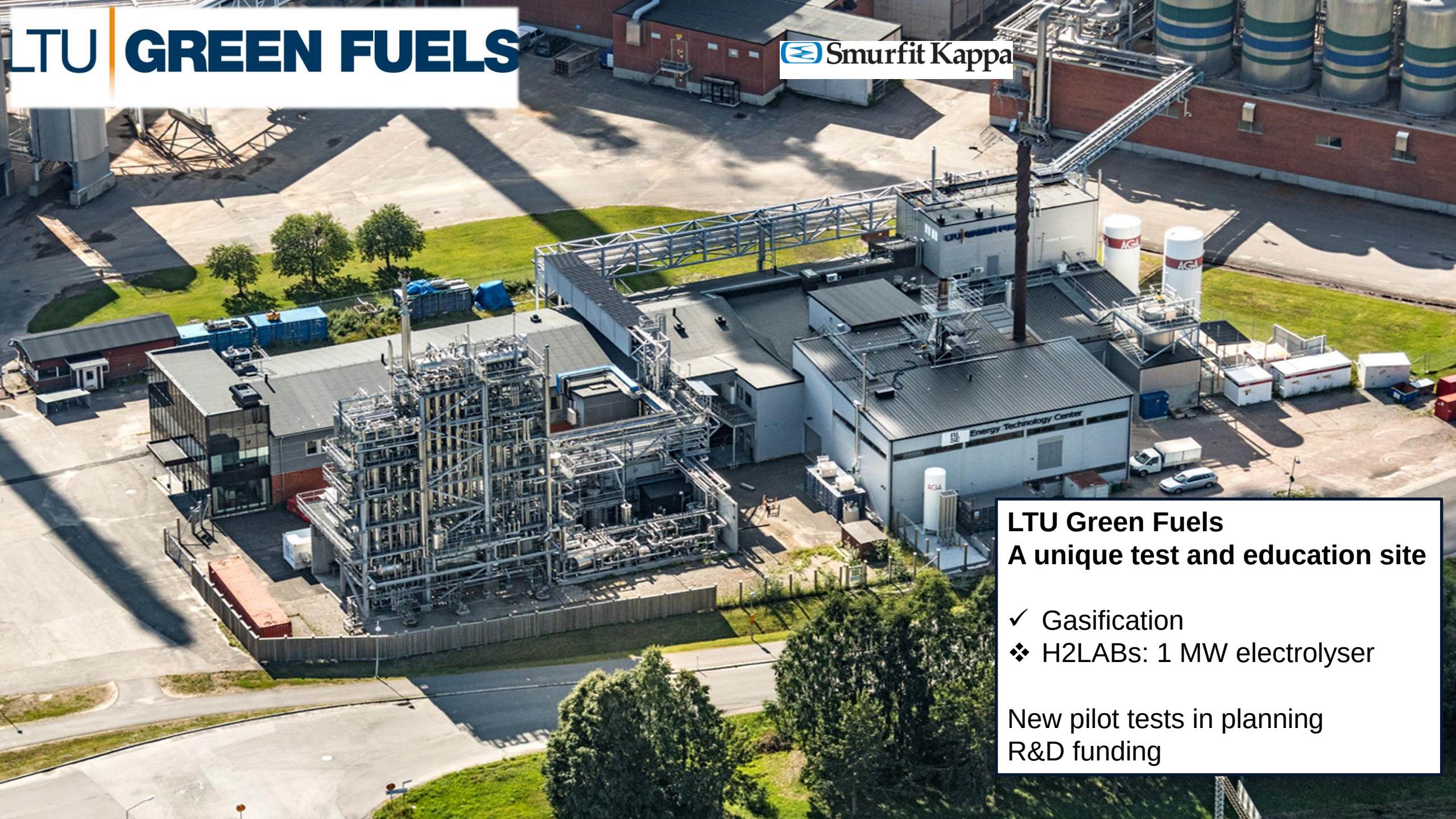








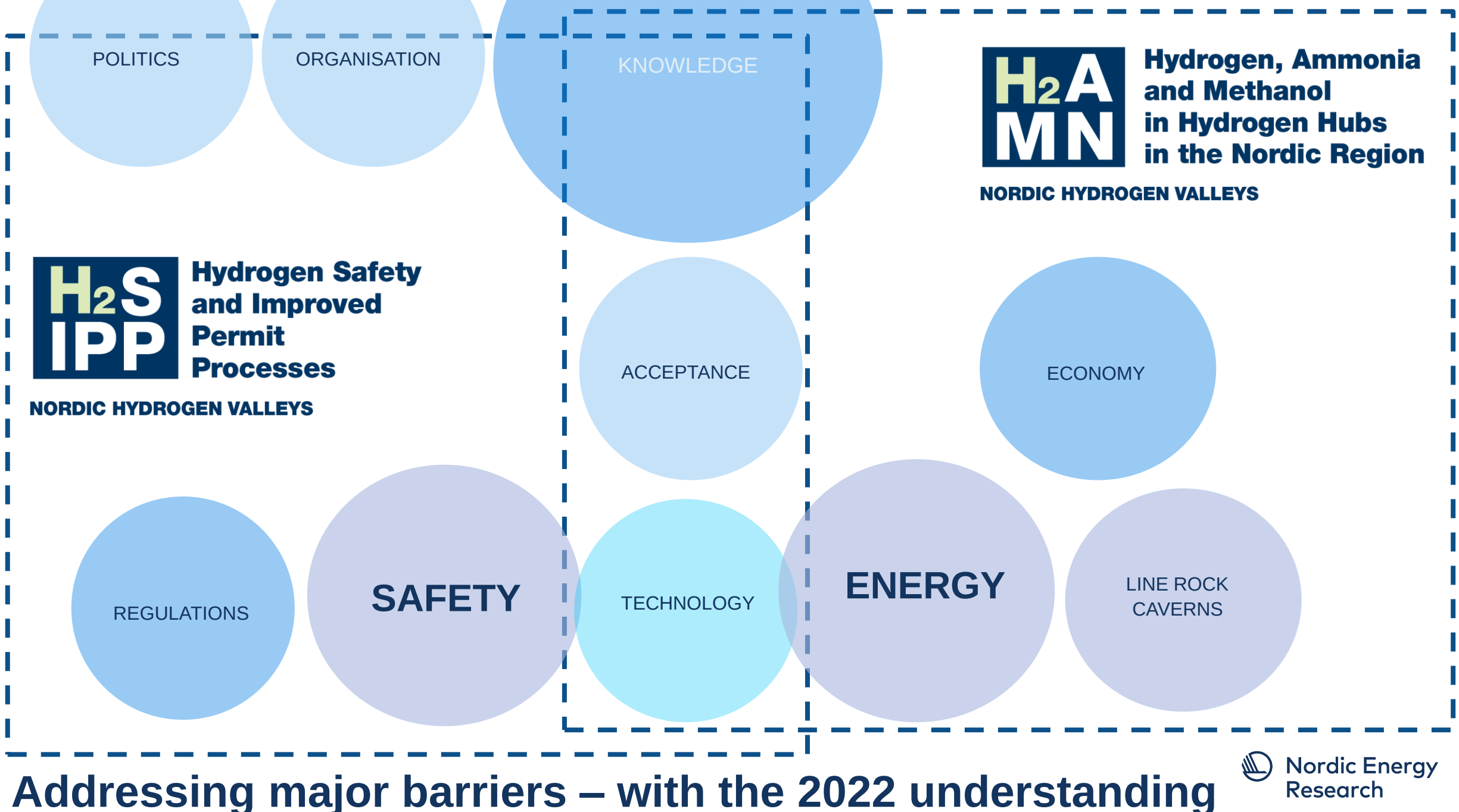




LTU Green Fuels
A unique test and education site

- ✓ Gasification
- ❖ H2LABs: 1 MW electrolyser

New pilot tests in planning
R&D funding



Addressing major barriers – with the 2022 understanding

Nordic Energy Research

Building the Nordic hydrogen economy, 24-25/1
Both2nia goes Luleå 2023

150 visitors from 10 countries, agreed:

- To coordinate education possibilities further between academy and companies

- To extend the regional value chains for the global hydrogen area

- To improve co-operation and inclusion of SME and pave the way for common Nordic offers

- To share how fun and important work we do within hydrogen in the region, to attract further companies and people to continue the innovative business and technology development.

- To expand the dialogue and to arrange further events to continue the development together.

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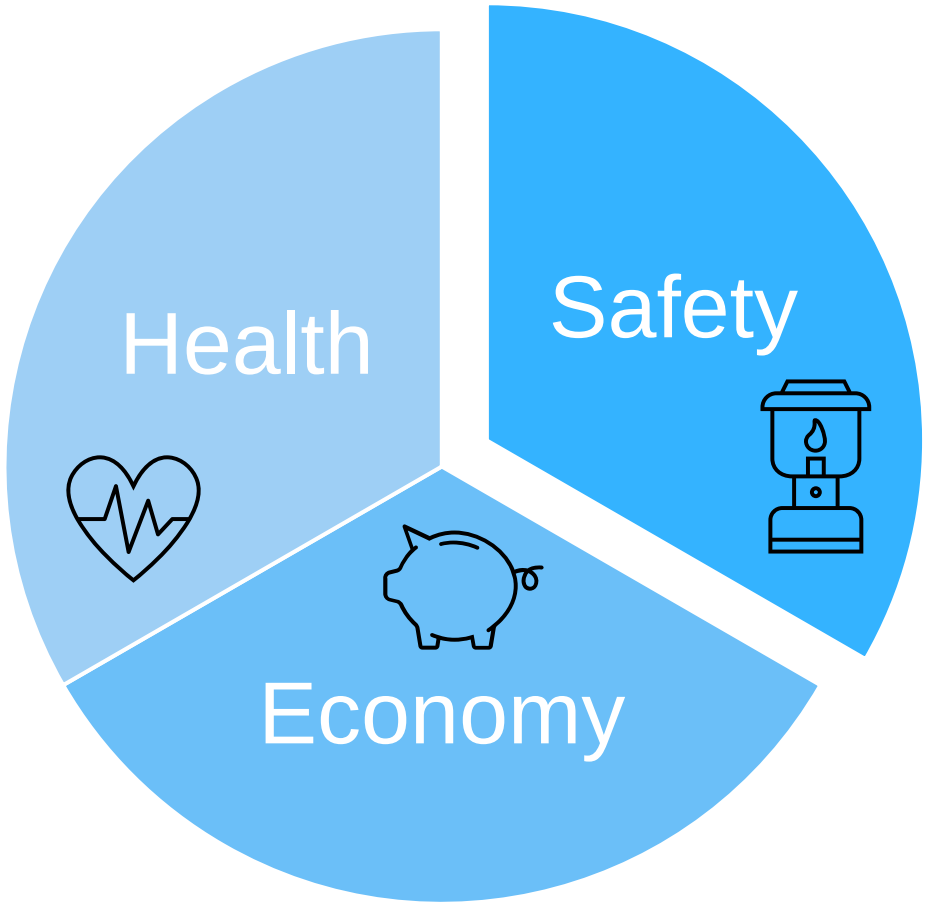
The 2025 status, the political trilemma – and the need for R&D support



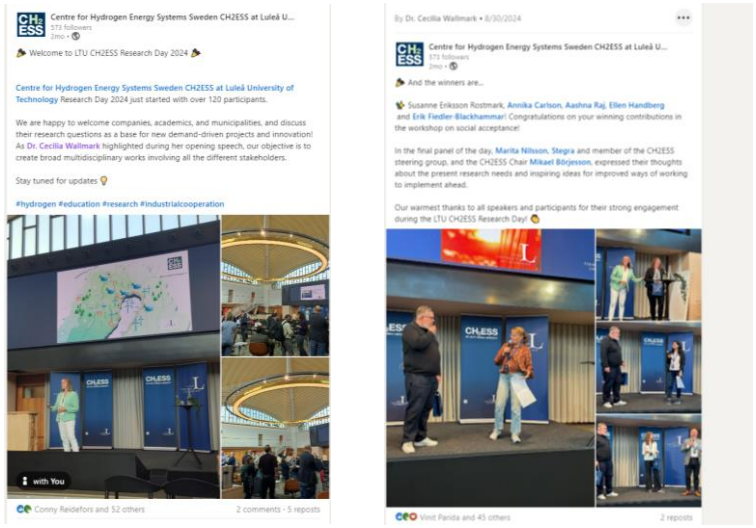
About CH2ESS

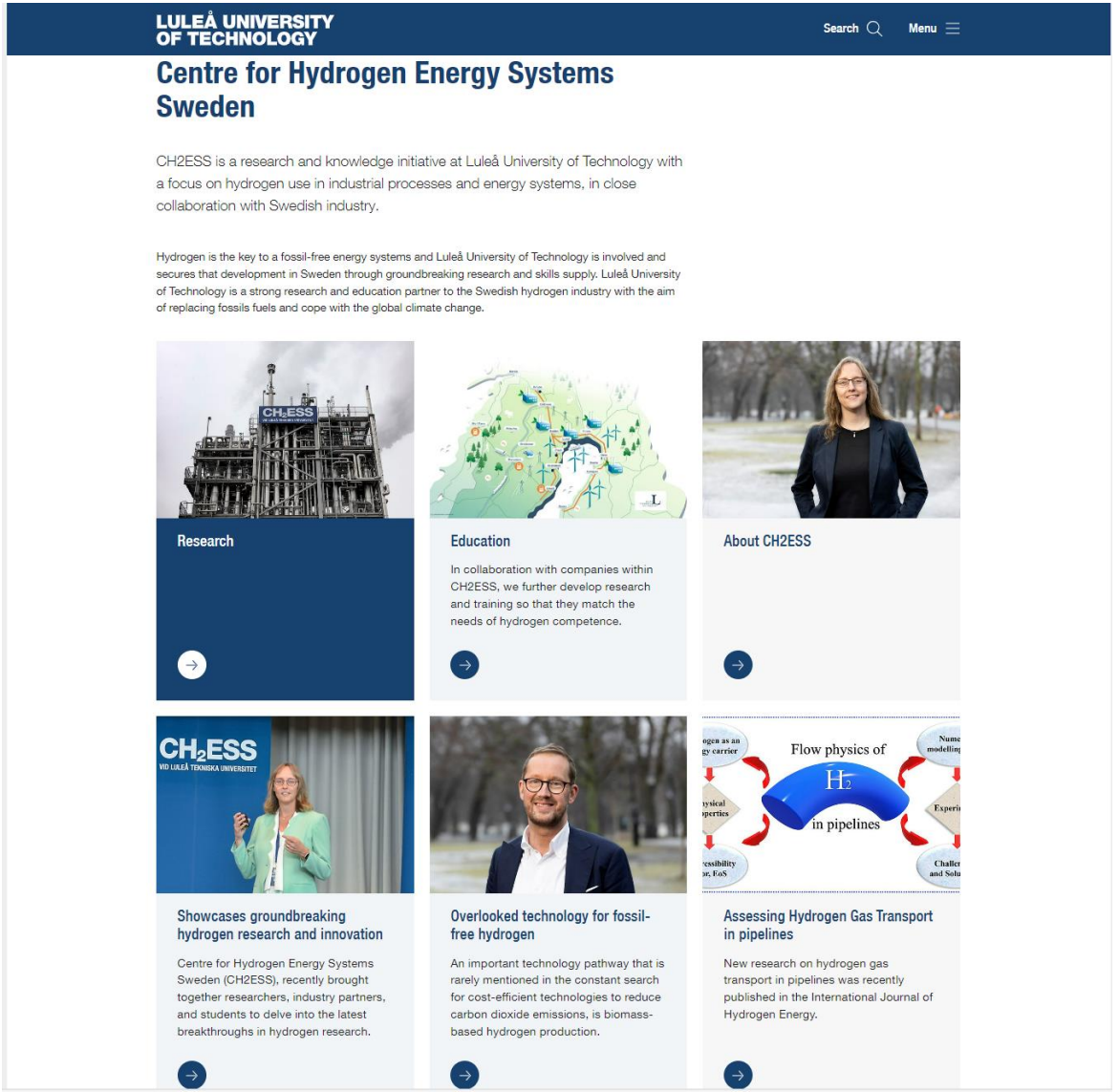
- Publications | Luleå tekniska universitet
  H2ESIN & around 60 peer review papers 2021-2024

- Research projects on Centre for Hydrogen Energy Systems Sweden | Luleå tekniska universitet (ltu.se)

- Education on Centre for Hydrogen Energy Systems Sweden | Luleå tekniska universitet (ltu.se)

CH2ESS on LinkedIN



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