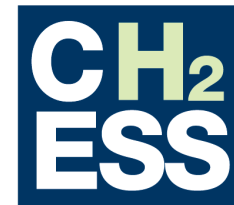


Overview - Sweden

Dr. Cecilia Wallmark
Director of CH2ESS
Within the hydrogen area since 1999



**Centre for
Hydrogen
Energy Systems
Sweden**

AT LULEÅ UNIVERSITY OF TECHNOLOGY

LULEÅ
TEKNISKA
UNIVERSIT

LULEÅ
UNIVERSITY
OF TECHNOLOGY

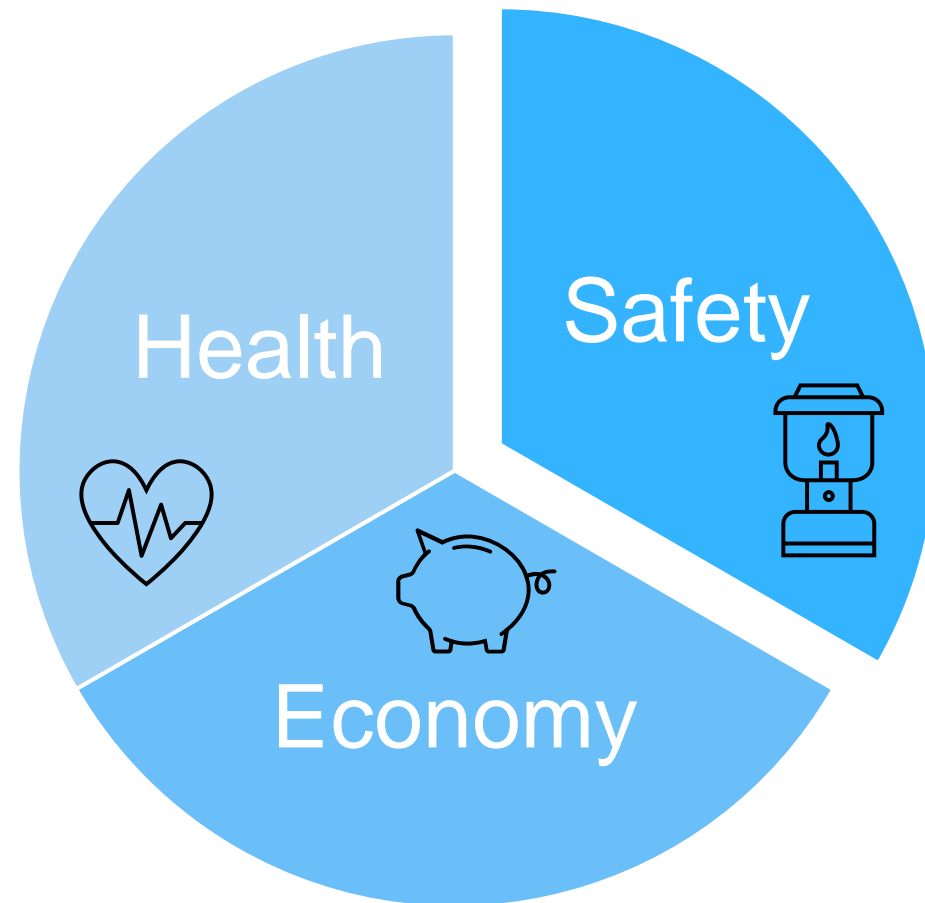
The Hydrogen Conference Sweden, December 2024

- ✓ Theme of the year: Solutions that creates the change
 - ✓ Eight years with Hybrit
 - ✓ Collaborations
- ✓ Approximately 430 visitors from many stakeholder groups
- ✓ Exhibition, research pitches

Third edition by the end of 2025, tbd



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



The Swedish Governments' (2023/24:10) long-term direction of energy policy:

1

The use of hydrogen should contribute to the transition to fossil-free energy systems

2

Focus on hydrogen applications where other resource- and cost-effective alternatives are lacking

3

Hydrogen should be efficiently integrated with electricity and heating systems and contribute to increased security of supply in Sweden

4

Hydrogen infrastructure should be expanded in a way that facilitates the transition and safeguards Sweden's competitive energy prices

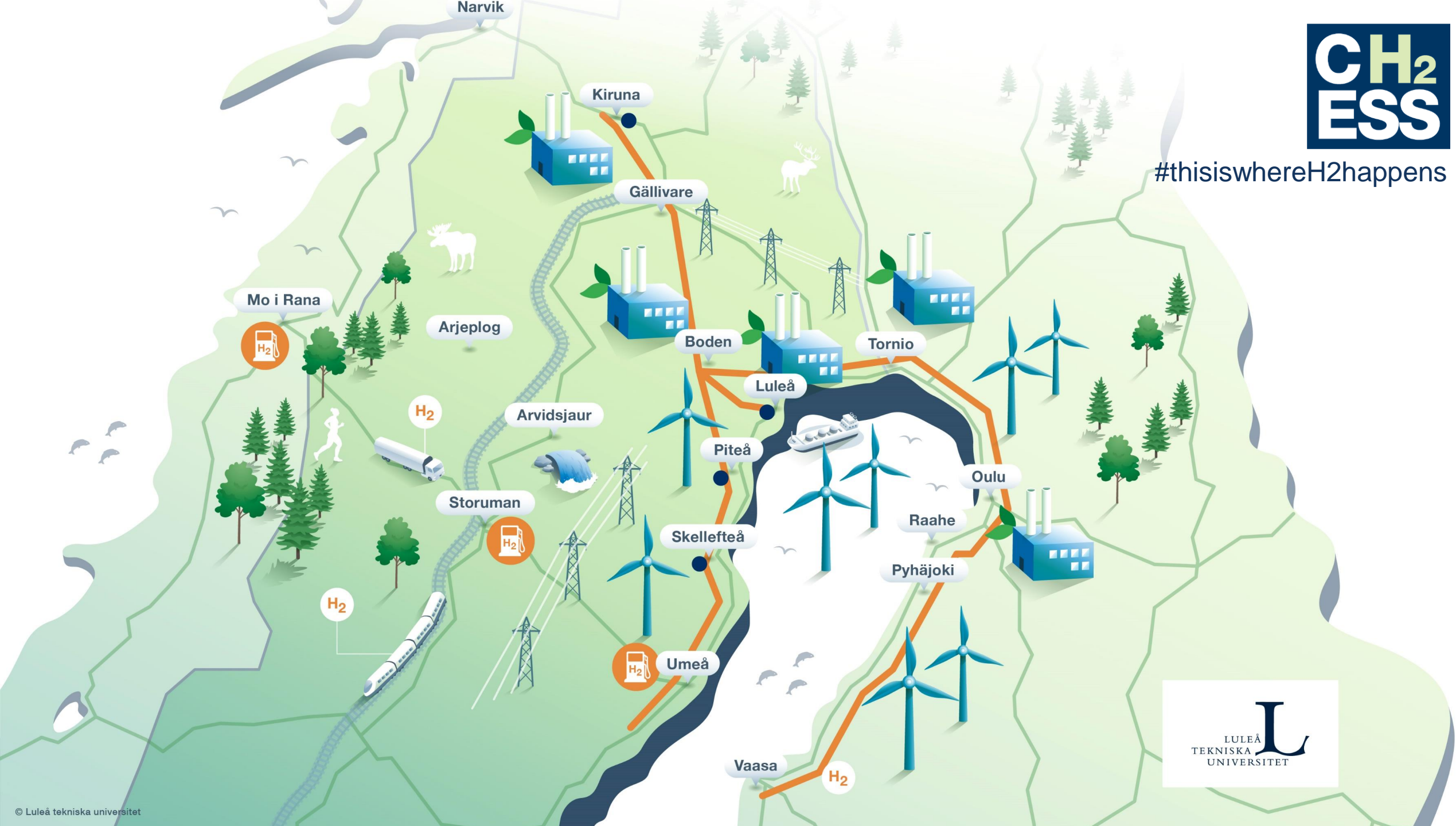
Hybrit in Luleå



Stegra in Boden



#thisiswhereH2happens



Green power, biomass, distr heating, green CO₂, H₂O, capital

Sweden as a frontrunner in hydrogen

[Vätgaskonferensen 2023, CH2ESS @ LTU]

Active stakeholders along the full value chain, geographical 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

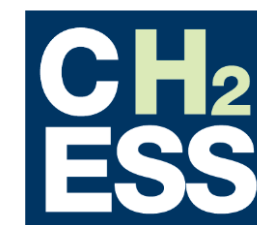


The Hydrogen Map

Investments and products

Activities all over Sweden along the entire value chain from production, distribution, storage and use in industry, energy and transport.

Collaborations with Finland on hydrogen pipelines, business development, research etc.



Demands; Top priorities, and examples

1. Political support to be a pioneer, resolve goal conflicts such as land issues, and build regional security of supply
2. The energy demand is HUGE. Coordination of electricity and hydrogen vs industrial plans
3. Adapt permit processes and regulations taking into account a multitude of aspects



Industry and market

An active policy that provides the necessary support, with knowledge of other countries' levels of support.

Transport

Introduction of hydrogen-fueled vehicles.
Technology development and cost reduction.

Infrastructure

Long-term planning, export strategies, and regulations.

Technology and production

Cost reductions, higher reliability and longer service life. Mass production.

Education

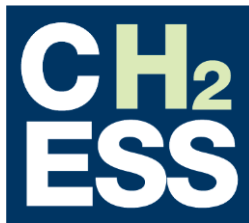
A lot of people need to know what hydrogen is and what it can mean for them, not least decision-makers.

Communication and coordination

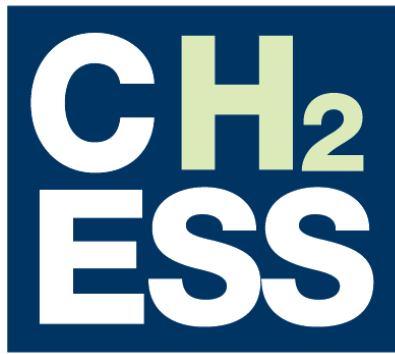
Input from Sweden and the Nordics to the EU's strategic plans. The NORDIC OFFER.

Research

Research and development in many disciplines.



[Source CH2ESS @ LTU]



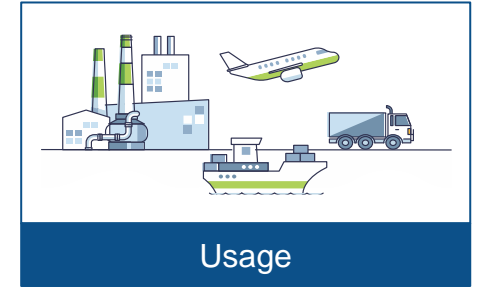
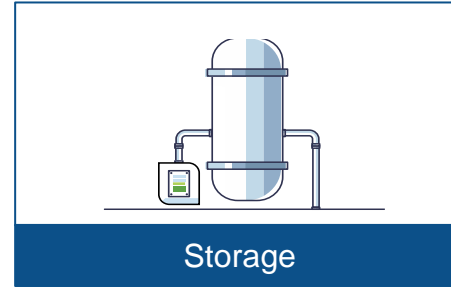
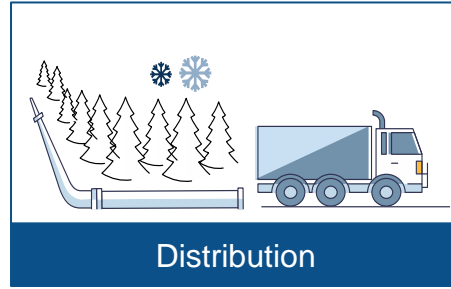
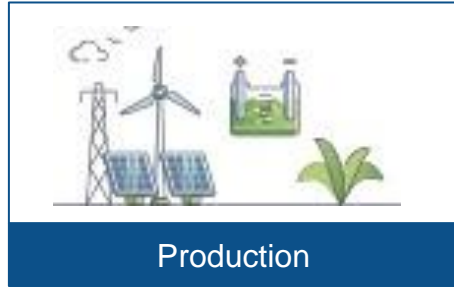
Centre for Hydrogen Energy Systems Sweden

AT LULEÅ UNIVERSITY OF TECHNOLOGY

- 1) Education**
- 2) Excellent, demand driven research**
- 3) Accelerating hydrogen:
Regional, national & Nordic events**



The CH₂ESS growing research portfolio - Addressing the barriers



Energy & Fluid mechanics

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

Methanol as a storage

Oxygen in iron oxide process

Carbon capture, storage and use

Green Fuels

Power grid connections

Formic acid as hydrogen carrier

Hydrogen from biomass

Pipeline flows x2

1 MW electrolyser (H2LABS)

Material & Safety

Condition monitoring - pipelines

Polymer for H₂ tanks

Lined rock caverns

Ammonia – storage materials

Laser welding for stationary storage

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

Bearing performance

Fossil-free steel (FINAST)

Safety, permits & acceptance (H2SIPP)

Law & Economics

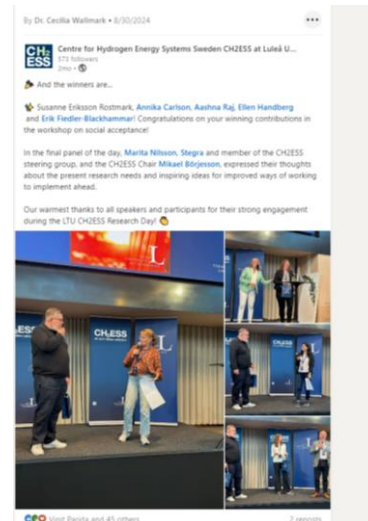
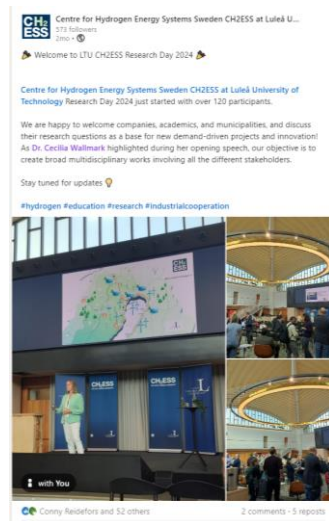
Heavy duty vehicles

Socio-technical challenges, stakeholders

CH2ESS - Links

- [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](#)




LULEÅ UNIVERSITY OF TECHNOLOGY
Search Menu

Centre for Hydrogen Energy Systems Sweden


CH2ESS is a research and knowledge initiative at Luleå University of Technology with a focus on hydrogen use in industrial processes and energy systems, in close collaboration with Swedish industry.

Hydrogen is the key to a fossil-free energy systems and Luleå University of Technology is involved and secures that development in Sweden through groundbreaking research and skills supply. Luleå University of Technology is a strong research and education partner to the Swedish hydrogen industry with the aim of replacing fossils fuels and cope with the global climate change.



Research


→



Education


In collaboration with companies within CH2ESS, we further develop research and training so that they match the needs of hydrogen competence.

→



About CH2ESS


→



Showcases groundbreaking hydrogen research and innovation

Centre for Hydrogen Energy Systems Sweden (CH2ESS), recently brought together researchers, industry partners, and students to delve into the latest breakthroughs in hydrogen research.

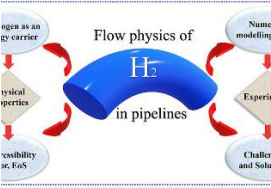
→



Overlooked technology for fossil-free hydrogen

An important technology pathway that is rarely mentioned in the constant search for cost-efficient technologies to reduce carbon dioxide emissions, is biomass-based hydrogen production.

→



Assessing Hydrogen Gas Transport in pipelines

New research on hydrogen gas transport in pipelines was recently published in the International Journal of Hydrogen Energy.

→



LULEÅ

UNIVERSITY

OF TECHNOLOGY