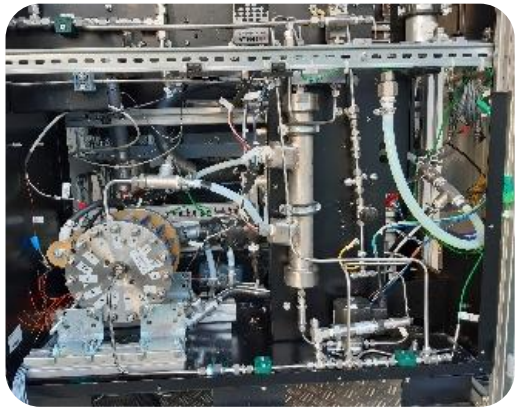
Projects Electrolysis & Power-to-X

HyCentA HYDROGEN CENTER AUSTRIA

One-stop-shop Electrolyser Development at HyCentA Research

Catalyst ink preparation

PEM Single Cell Test Bench



PEM Stack Test Bench

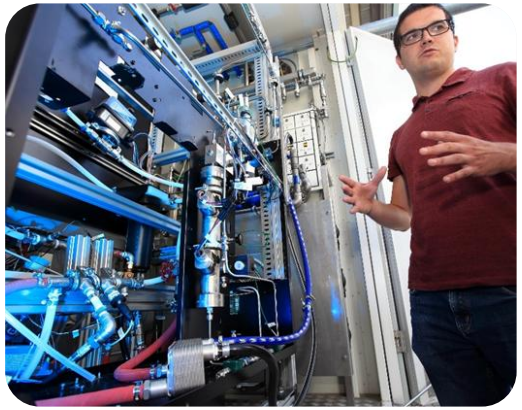
System Test Bench

Component Manufacturing → Single Cell Testing → Stack Testing → System Testing

Electrode Manufacturing

AEM Single Cell Test Bench

AEM Stack Test Bench



Gas Analysis

COMET H2 Safety & Detection

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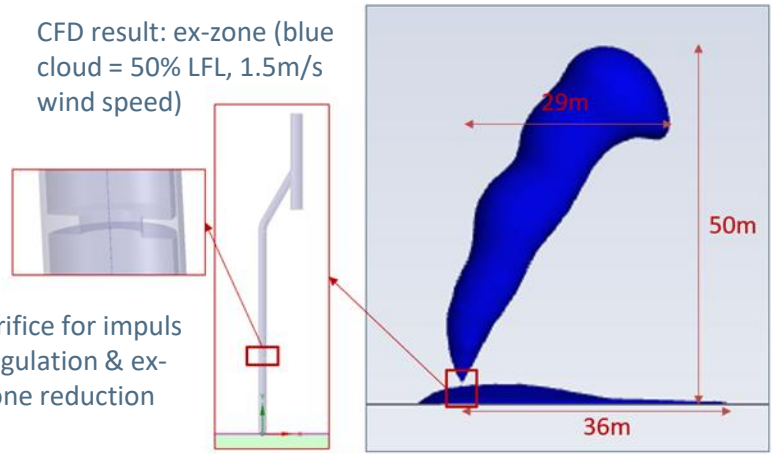
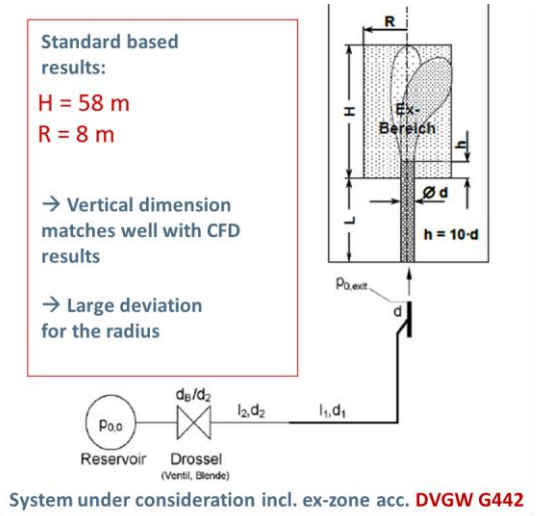
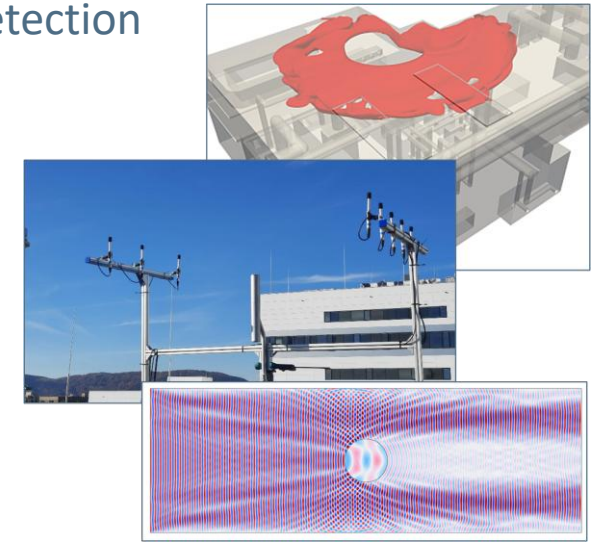
- Hazardous zones **simulation methods development & validation** by atmospheric measurements
- **H2 release behaviour**: leaks, cracks & diffusion
- **H2 flares** – effective, safe & low cost
- **H2 dispersion monitoring sensors** – new concepts
- **Smart Safety Concepts** – integrated method & tool chain for deployable safety concepts

Pipeline blow-off: H2 ex-zone CFD simulation vs. standard (DVGW G442)





Acoustic tomography for atmospheric H2 detection



H2 Construction & Mining Machines

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Design & test of a fuel cell hybrid machine for construction & mining applications

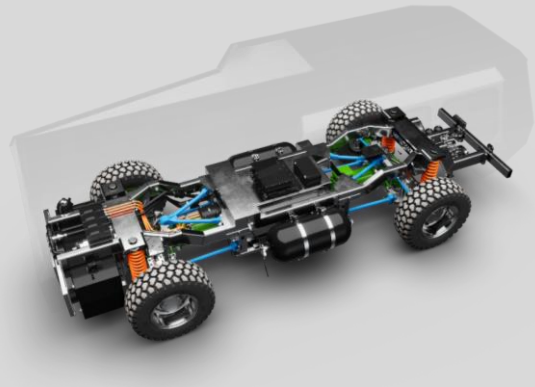
- Cathode poisoning
- Thermal management
- Water management
- Efficiency and lifetime optimized operation strategy

cet Partnership

Fraunhofer IVI | HyCentA | ICM Institut Chemnitzer Maschinen- und Anlagenbau e.V. | MUNIQ design

virtual vehicle | IMK engineering | car systems Scheil GmbH & Co. KG | TU Graz

Hy.CoMM



Vehicle Data

- 6t curb weight
- 2t payload
- 30% climbing ability
- >100km driving range

Powertrain

- 60kW fuel cell
- 34kWh battery
- 6.5kg H2 storage
- 2 x 90kW E-Motors

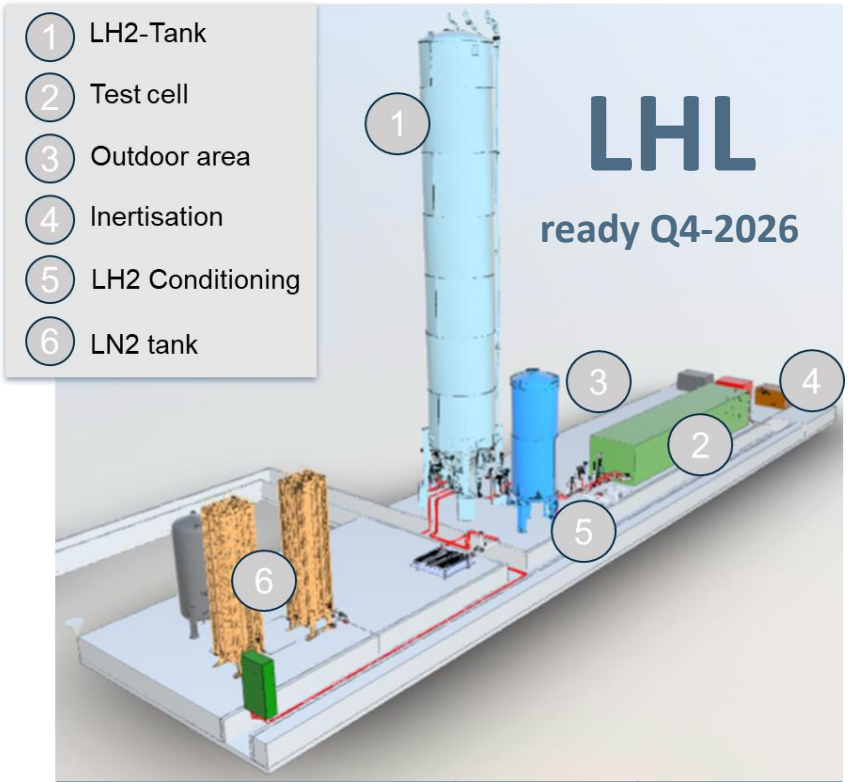
Liquid Hydrogen Lab - LHL

Source: 'MF Hydra': World's first liquid hydrogen-powered ferry gets operational (interestingengineering.com)


Source: Daimler Trucks, Mercedes-Benz Trucks provides outlook on hydrogen-based GenH2 Truck at IAA Transportation 2022 in Hanover

Source: Hydrogen-powered aviation A fact-based study of hydrogen technology, economics, and climate impact by 2050

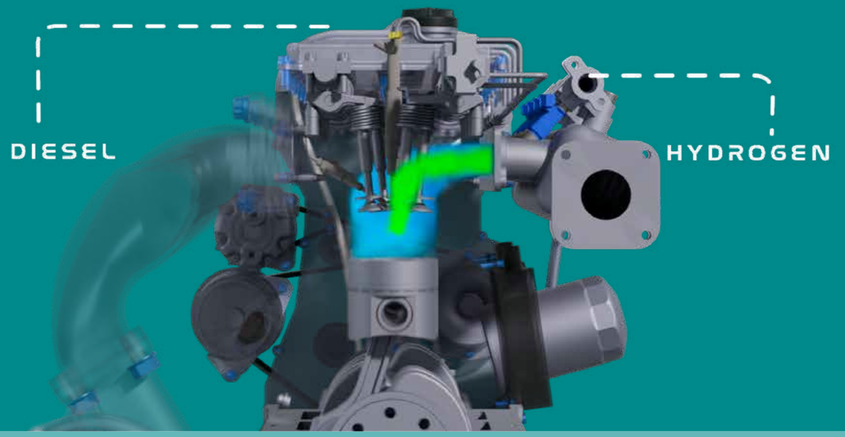
- LH2 needed for **aviation, heavy-duty, rail & shipping**
- LHL infrastructure for liquid hydrogen (LH2) **materials, component, and system testing**
- **High LH2 flow rates up to 860 kg/h**
- Modern, highly **flexible test environment** for data acquisition and manual as well as partially and fully automated process control and regulation
- **HiL, SiL, EoL & scientific test concepts**
- Climate-controlled **container test cells & large outdoor** test area



LH2 storage volume	**m³**	**76**
- **Pressure**	bar(g)	4 - 9
- **Max emptying rate**	kg/h	860 (5600)
LH2 supply system	kg	250
- **Pressure**	bar(g)	2 - 35
- **Max supply rate**	kg/h	860
LN2, He & special gases infrastructure		

BDN Powertrain

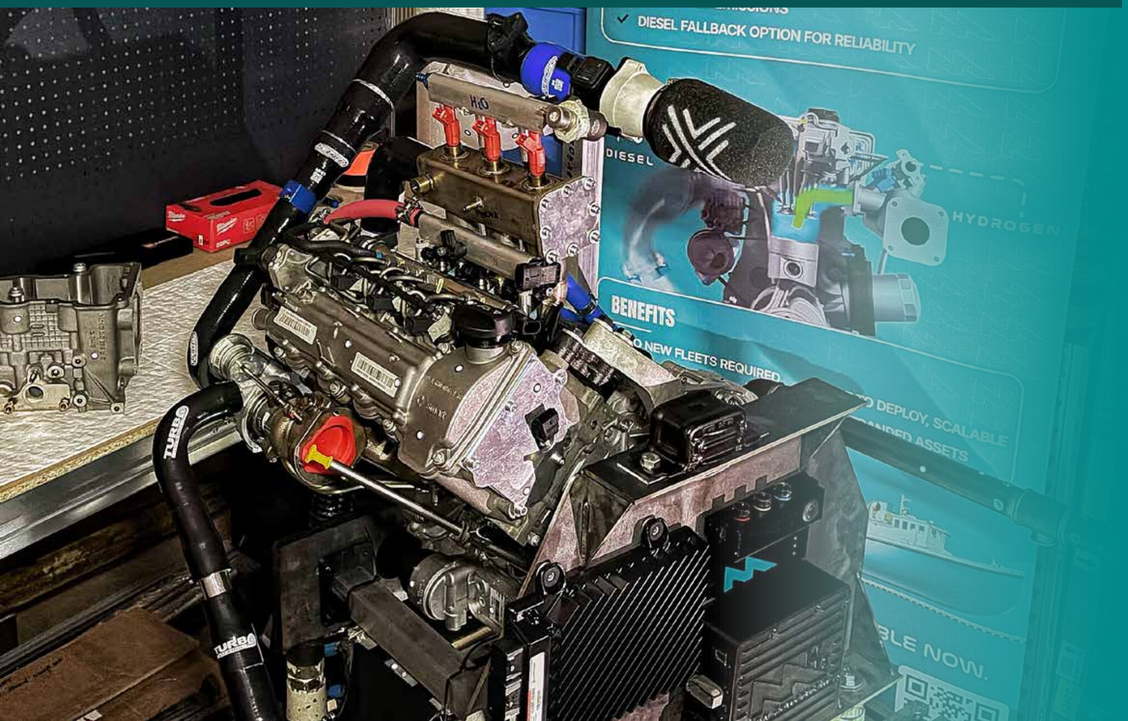
CLEAN POWER.
MADE TODAY.



The World Still Runs on Diesel today!

REPLACING THEM IS NOT JUST EXPENSIVE,

OFTEN IMPOSSIBLE!



Retrofit H_2 - Diesel dual-fuel hybrid system

- FOR EXISTING HEAVY-DUTY ENGINES
- 85% LOWER EMISSIONS
- DIESEL FALLBACK OPTION FOR RELIABILITY

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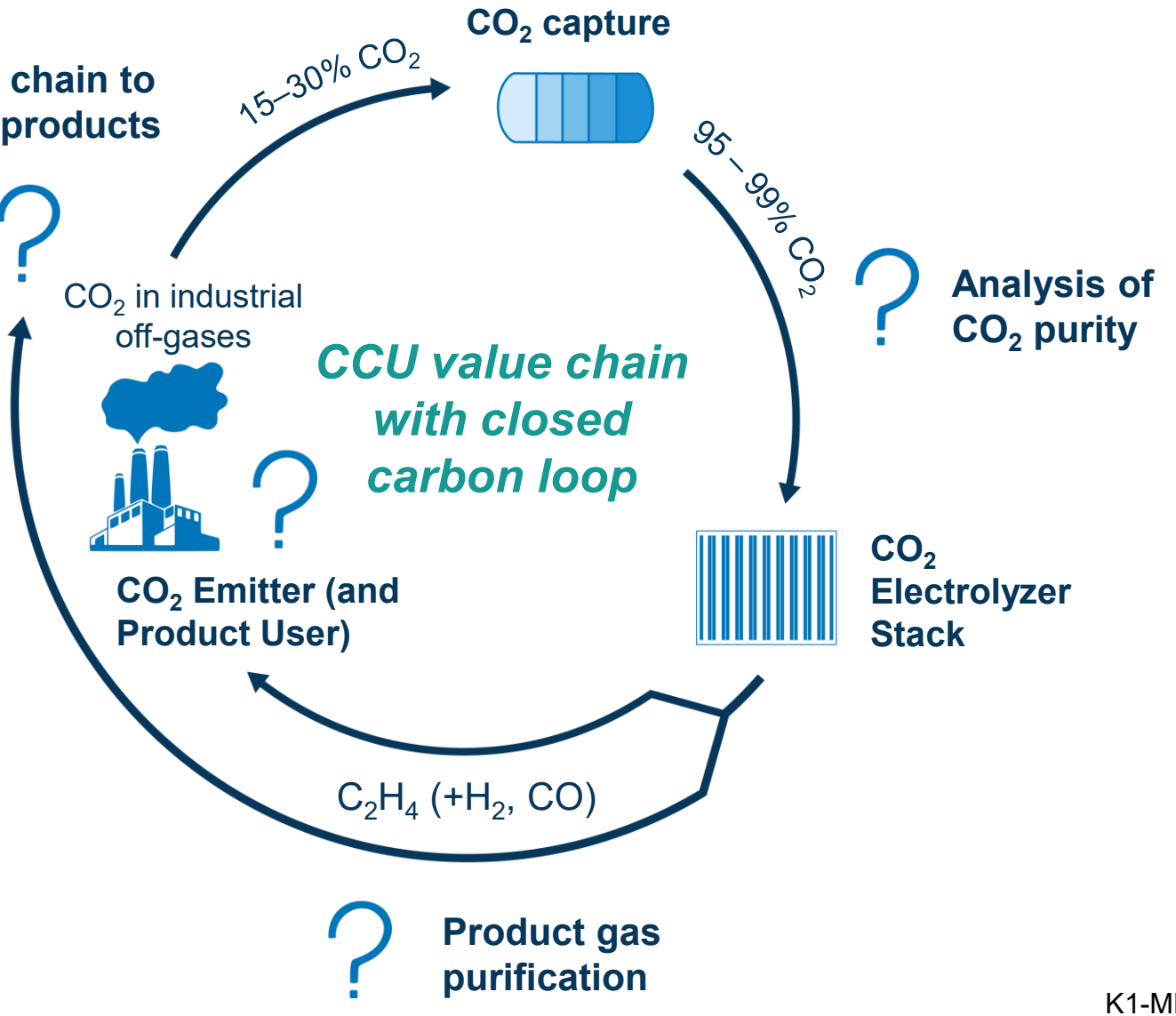
Chemical products from captured industrial CO_2

New CCU value chains with closed carbon loop



Partners needed

- Advanced gas analytics: purity captured CO_2
- Product gas purification
- CO_2 emitters from energy intensive industries
- Support utilization of C_2H_4 as chemical building block

Project timeline:
2027 – 2031

Funding:
FFG COMET

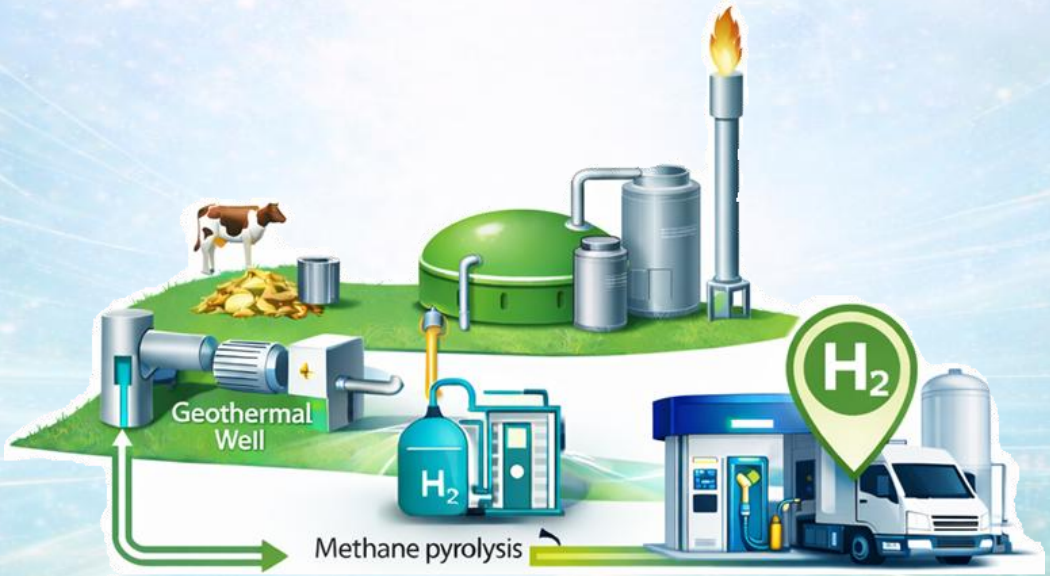
in-kind or cash contribution from industrial partners

Geo-B H_2 Station

Self-Sustaining Hydrogen from Geothermal Heat and Biogas

Challenges

- Hydrogen mobility needs reliable 24/7 supply
- Most renewable H_2 depends on intermittent electricity
- Geothermal wells and biogas plants underutilized



Local power + Local gas → Continuous hydrogen

Our Concept

- Geothermal ORC → baseload electricity
- Biomethane from biogas
- CO_2-free H_2 via methane pyrolysis
- Continuous local hydrogen production

Impact

- Continuous renewable hydrogen production
- No large batteries or hydrogen storage
- Utilization of existing energy assets.
  Scalable across Central Europe

Looking for

- **Funding partners**
- Further pilot sites
- ORC technology partners
- Methane pyrolysis providers

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Development of an efficient LOHC technology

HUN REN | ttk

HUN REN | Energiatudományi Kutatóközpont

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Overview

- **Goal:** Hydrogen storage technology by means of Liquid organic Hydrogen Carriers (LOHC)
- **RDI activities**
  - Novel durable catalysts: high fracture strength and wear resistance.
  - Novel loop reactor with advanced heat management
- **Partners needed** – industrial partners for
  - catalyst formulation and scaling up catalyst production
  - safety-related operational balance of plant components
  - Providing demonstration sites in EU for deployment of the technology

LOHC container

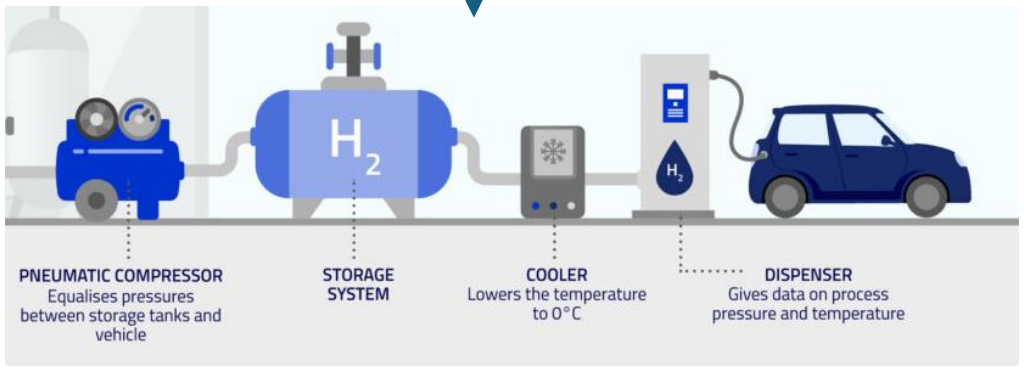
LOHC reactor

Smart-Inno
Energy, Concepts & Grants

HUN REN Energiatudományi Kutatóközpont

HUN REN ttk

Market opportunity: Connection to a hydrogen refuelling station



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Safe H_2 Pipeline Infrastructure for Europe

Two complementary project ideas for metallic and polymeric H_2 pipelines

Supporting cross-border hydrogen corridors, pipeline repurposing and new-build infrastructure

WHY THIS MATTERS

Europe needs **safe, durable and low-leakage H_2 pipelines** to scale cross-border hydrogen transport.
Critical gaps remain in **weld integrity**, **material qualification** and **lifetime prediction**.

Project 1 | H_2WELD-INTEGRITY

METAL PIPELINES

Goal: Safe repurposing of existing gas pipelines for H_2 and H_2-NG blends

Core development

- Weld degradation and H_2 embrittlement
- Advanced UT + CT-supported defect detection
- In-situ H_2 compatibility testing
- AI-based defect recognition and lifetime prediction
- Screening LCA / TEA for repurposing vs replacement

Expected results

- Validated inspection and qualification methods
- Datasets for weld integrity assessment
- Improved safety and lifetime of repurposed pipelines

TRL 3 → 5

Project 2 | H2SAFE-PIPE

POLYMER PIPELINES

Goal: Advanced recyclable polymeric materials for high-pressure H_2 transport

Core development

- Low-permeation thermoplastic pipe materials
- Material characterisation under pressurised H_2
- Near-service-condition assessment of damage initiation and crack propagation
- Multi-scale modelling with AI/ML support
- Sustainability and lifetime assessment

Expected results

- Validated H_2-compatible pipe materials
- Validated test methods for qualification
- Datasets and models for pipe lifetime prediction

TRL 3 → 5

JOINT VALUE PROPOSITION

Integrated metal + polymer solutions for safe, scalable H_2 pipeline infrastructure

From repurposing existing assets to next-generation dedicated H_2 systems

LOOKING FOR

TSO/DSO operators | Infrastructure & storage | Pilot/validation sites | Metal & polymer material suppliers| Certification / standards bodies

SCIOFLEX HYDROGEN

SCIOFLEX Hydrogen GmbH | SME | In-situ material characterization for hydrogen infrastructure

TECHNISCHE UNIVERSITÄT WIEN

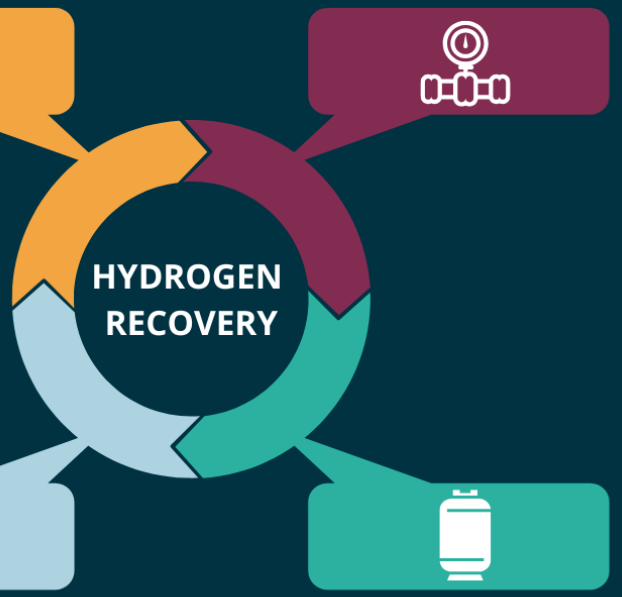
ELECTROCHEMICAL HYDROGEN PURIFICATION AND COMPRESSION: ENABLING FLEXIBLE ENERGY SYSTEMS

PRODUCTION

Hydrogen streams from reforming, electrolysis, or industrial off-gases

TRANSPORT

Hydrogen blending, chemical carriers, decentralized refueling stations



CONSUMPTION

Fuel cells, industrial processes, chemical synthesis, hydrogen deblending

STORAGE

Underground and pipeline-integrated storage, compressed gas and liquid hydrogen