**AIMPLAS, Plastics Technology Centre, Valencia (Spain),** is a private, non-profit association. Funded by a public-private initiative, + 800 associated companies. +240 highly skilled professionals, 12,000 $m^2$ of facilities and +30 years expertise.

AIMPLAS has a broad expertise in plastic materials recycling, reactive extrusion, synthesis and processing of polymers, special assisted processing technologies (MW, SCF & US), gases capture & conversion, catalyzers, plastronics, additive manufacturing, high performance composites & coatings, polymer nanocomposites, functionalization and synthesis of nanoparticles, materials for hydrogen production & storage, multilayer structures and development of plastic products. Full value chain of plastic materials.

AIMPLAS has participated in >150 projects in FP5, FP6, FP7, LIFE+, H2020, HEU… EU Programmes, coordinating 35% of them.


**Interest to coordinate: *HORIZON*-JTI-CLEANH2-2024-05-02: Development of non-fluorinated components for fuel cells & electrolysers ( RIA, TRL2 to 4).** New green routes to obtain non-fluorinated ionomers for membranes and catalyst layers and reinforcement membranes. Looking for partners with different capacities.

***Interest to participate: HORIZON-JTI-CLEANH2-2024-03-03: Next generation on-board storage solutions for hydrogen-powered maritime applications (RIA) and/or***

***HORIZON-JTI-CLEANH2-2024-03-04: Demonstration of hydrogen fuel cell-powered inland or short sea shipping (IA).*** Experience in composites for the ship sector, integration of sensors in composites & $H_2$ storage (gas & liquid),

AIMPLAS Ferran Marti Director of R&D ✉ fmarti@amplas.es ☎ +34 639 139 516

# Extreme Microbiology meets Patented Innovation

- Extreme microbes
- Extreme habitats

- Gas storage operators
- Europe

- MIC mitigation
- Hydrogen conversion

- Patented equipment
- Anaerobic sampling

- High-pressure engineering
- Certified team

- Porous storage experience
- European network

## Partners | Network

Gas storage operators
High-pressure infrastructure service providers

microbify

UKE

Clean Hydrogen Partnership

Clean Hydrogen Partnership Info Day | 26th January 2024

**Linda Dengler**

General Manager
linda.dengler@microbify.com
+49 9421 8676-801

www.microbify.com

# SUPERCRITICAL ELECTROLYSER

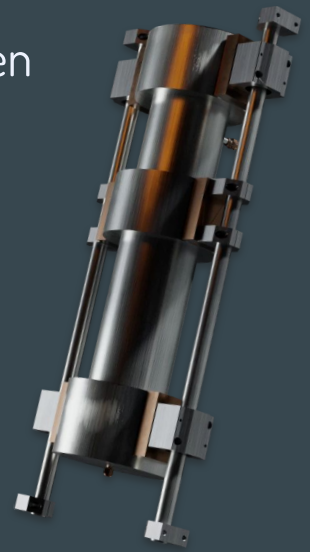
Supercritical has solved the biggest inherent problem of membraneless electrolysers, gas separation, achieving over **99% purity** in both the oxygen and hydrogen outlets, with the system running at as low as **42 kWh/kg of $H_2$** and delivering **220 bar of pressurised gases**, without gas compressors.

220 Bar High Pressure separated oxygen and hydrogen

>50% emission reduction vs PEM

Planet first - no iridium, no PFAS (Forever) chemicals

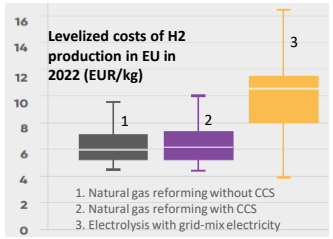
<€2 /kg of hydrogen, this decade



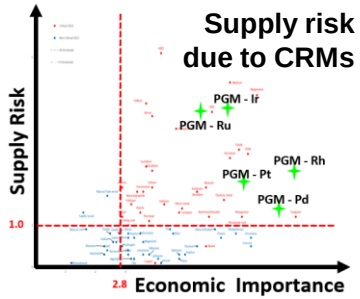
# Accelerated Green $H_2$ production through Sustainable Recycling

## Motivation

**High cost**




**Supply risk due to CRMs**




**PFAS regulation**

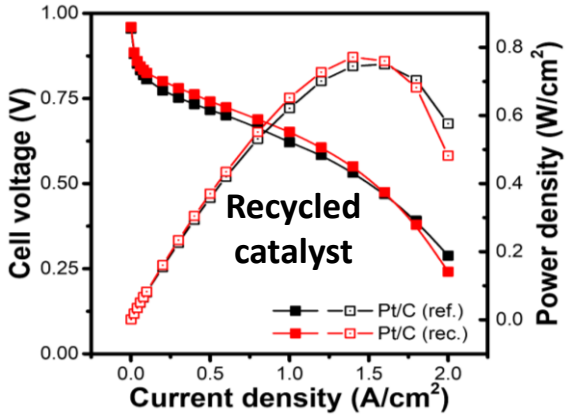


## Our experience

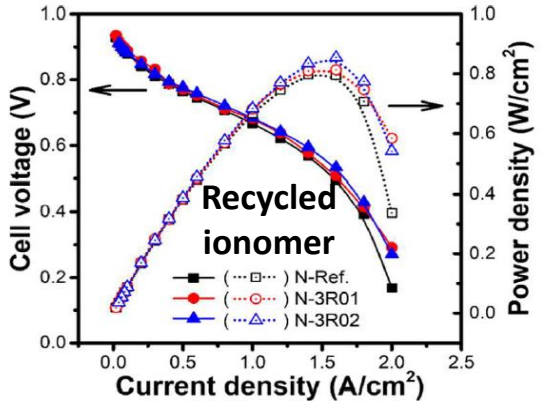
- >10 years experience on the topic, especially PEM fuel cells & electrolyzers materials
- >20 peer-reviewed publications, 3 IPRs/app., 15 news / interviews, etc.
- Several national funding programs >5 million EURO.
- Well-established analytical, screening and processing infrastructure
- High quality researchers, engineers & administrators experienced for the tasks
- Network with relevant players on the value chain
- Operation of materials on stack level (kg MEAs)
- Portfolio covers Ir, Pt, Ru, Pd, non-PGM and **PEM**
- TRL up to 6


PI, Asso. Prof.: Shuang Ma Andersen, University of Southern Denmark, mashu@igt.sdu.dk


## Validation



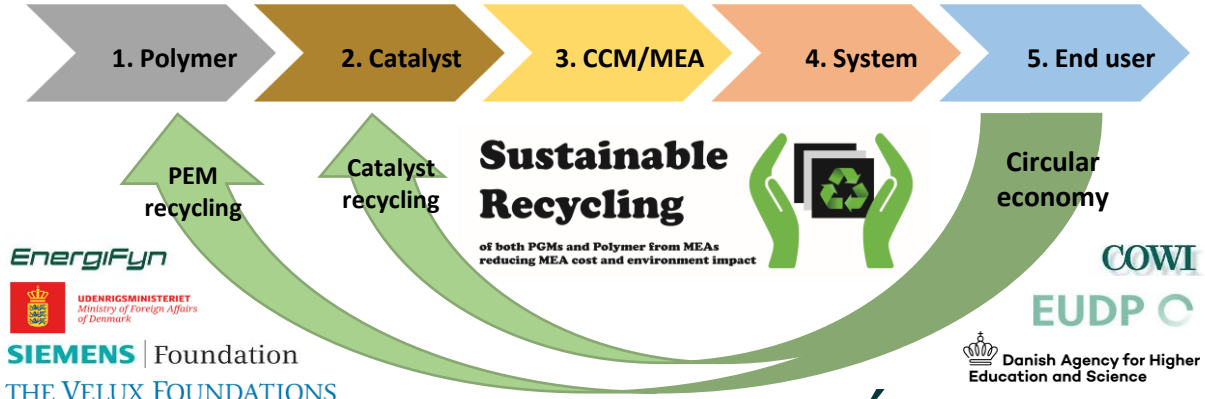

*Sustainable Energy Fuels*, 2022,6, 5177




*ACS Appl. Mater. Interfaces* 2023, 15, 41, 48705

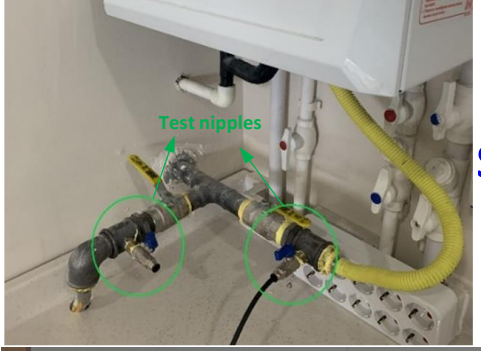
## Impact

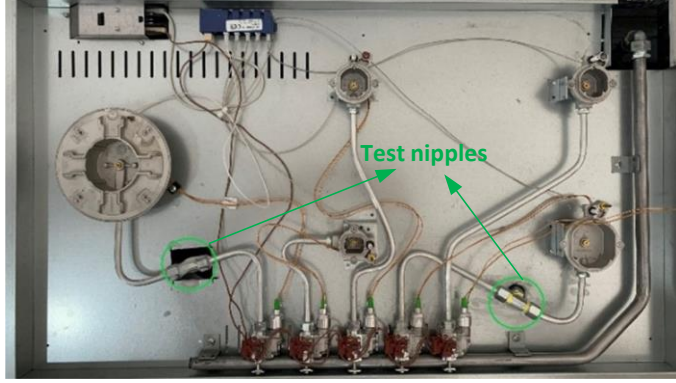
- Recycling efficiency > 90%
- Material cost reduction >50%
- Improved technoeconomic values & market potential
- Strengthen competitiveness, robustness & sustainability



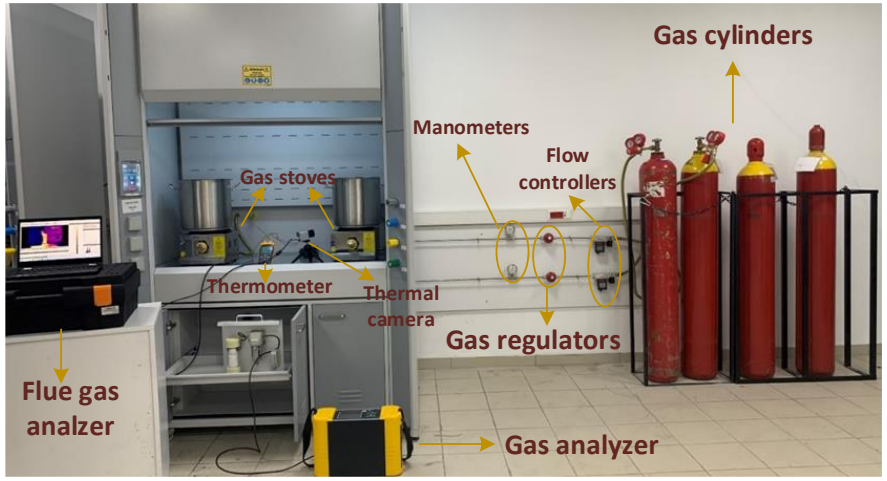
# Scale-up project for hydrogen and natural gas blend-based systems

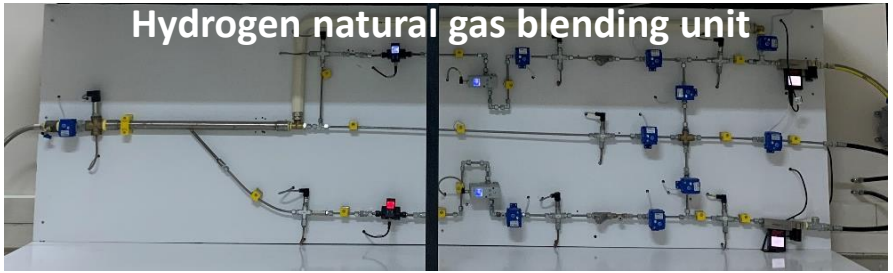
- Save 8% of NG with **20% of $H_2$** but Increase in heating time: 15.87%
- Increase in LHV (mass-based): 4.2% but decrease in density: 16.9%

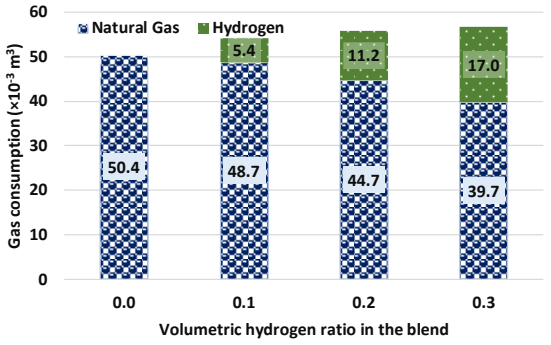


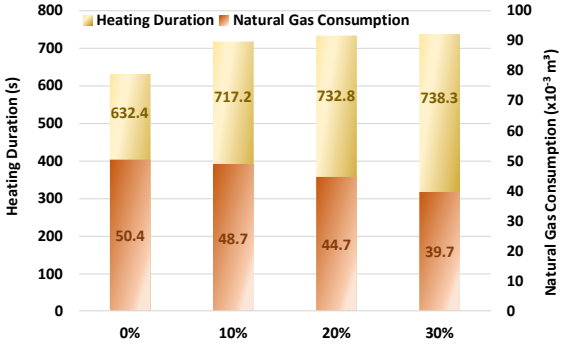







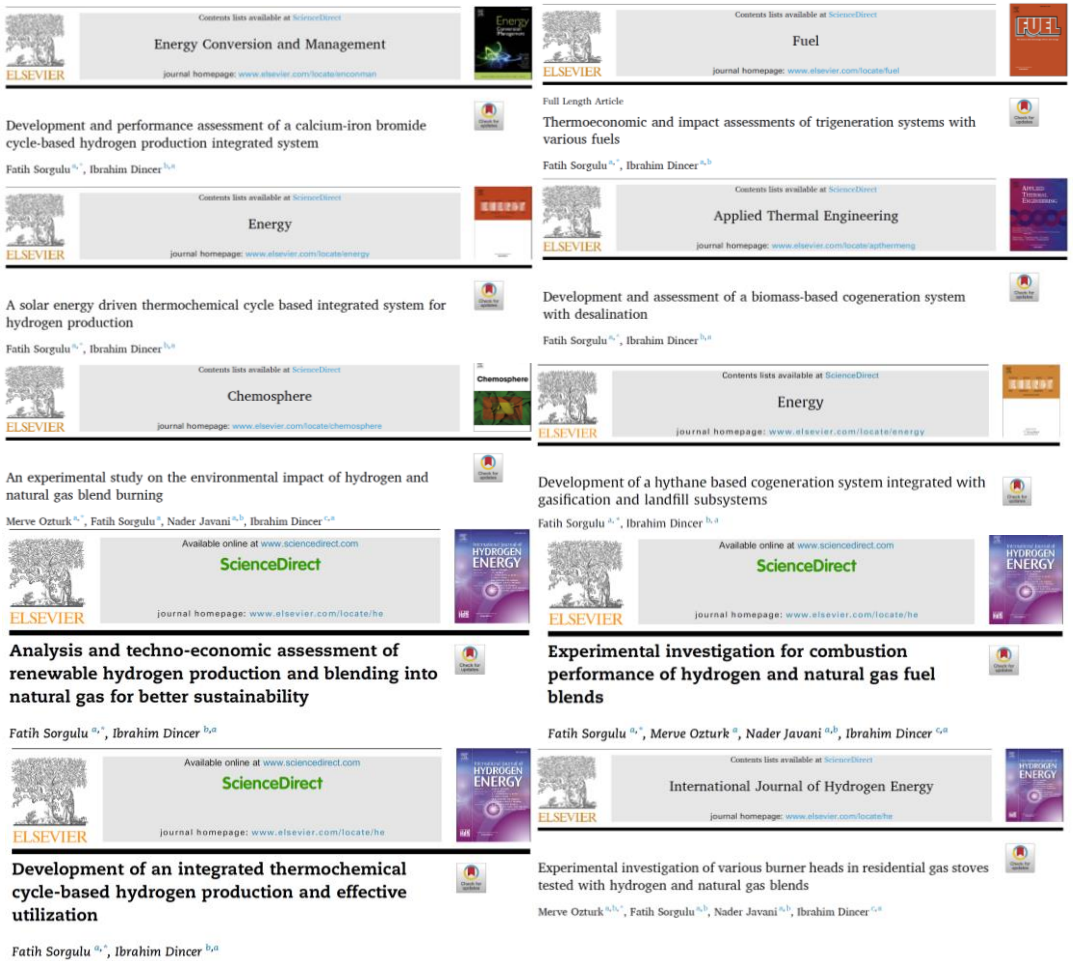





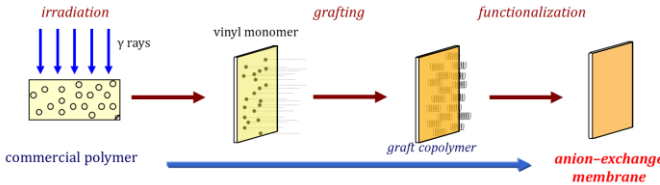
## Our papers on hydrogen and natural gas blend-based systems in Q1 Journals:



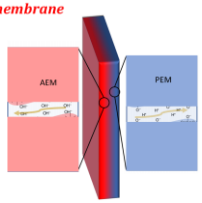
# Hydrogen Production

## TC1-02: Advanced anion exchange membrane electrolysers for low-cost hydrogen production for high power range applications

- ✓ New generation **thin, crosslinked** and **reinforced** anion exchange membranes to enhance membrane stability, $OH^-$ conductivity and decreased gas crossover by *radiation-induced grafting* and *new functionalization* approaches.

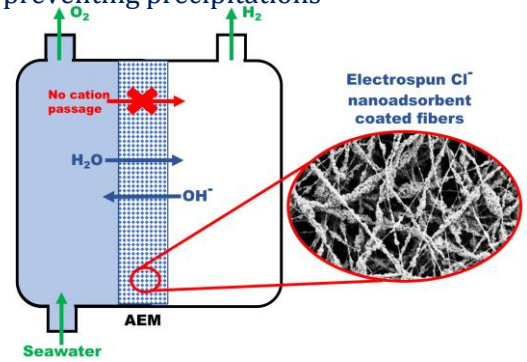



- ✓ As an alternative route, **one-piece non-laminated bipolar membranes** exhibiting dual functionality and different properties on both sides /across the membrane to fulfil the different requirements of anode and cathode.



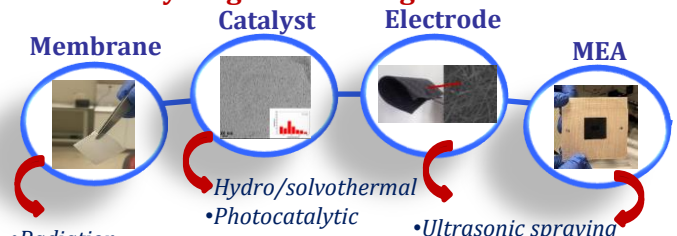

## TC1-03: Development of innovative technologies for seawater electrolysis

- ✓ AEMEL, allowing for the use of non-precious metal catalysts and cost-effective steel hardware.
- ✓ Water is supplied solely to the anode, diffusing across the membrane to the cathode, preventing precipitations
- ✓ **Electrospun AEM with $Cl^-$ adsorbents** to address concerns about $OH^-$ and $Cl^-$ oxidation competition




## Strong background & long term experience and a wide range of equipment and facilities on hydrogen technologies

### Design & Synthesis & Fabrication




### Ex-situ & In-situ Analysis & Electrochemical Testing

## Selected projects & publications on hydrogen technologies

- ✓ Hydrogen Valley- South Marmara Hydrogen Shore (2023-2028) (Core partner)
- ✓ M-ERA.NET Project, Novel Asymmetric Anion-Exchange Membranes for Fuel Cells (2023-2026) (Coordinator)
- ✓ Graphene Flagship: Graphene-based Disruptive Technologies — GrapheneCore1 (2016-2018) (Task leader for fuel cells)
- ✓ Graphene Flagship: Graphene-Driven Revolutions in ICT and Beyond (2013-2023) (Task leader for fuel cells)
- ✓ S. Alkan Gürsel *et al. Chem Catalysis* 3 (5) 100601 (2023)
- ✓ S. Alkan Gürsel *et al. ACS Appl. Energy Mat.* 5(11), 13939 (2022)
- ✓ S. Alkan Gürsel *et al. Energy & Fuels* 36(16), 9282 (2022)
- ✓ S. Alkan Gürsel *et al. ACS Appl. Energy Mat.* 3, 532 (2020)
- ✓ S. Alkan Gürsel, *et al. ACS Sustainable Chem. Eng.* 6, 3773 (2018)
- ✓ S. Alkan Gürsel, *et al. Materials & Design* 151, 29 (2018)
- ✓ S. Alkan Gürsel, *et al. ACS Sustainable Chem. Eng.* 5 (9), 8407 (2017)
- ✓ S. Alkan Gürsel, *et al. Progress in Polymer Science* 63, 1 (2016)

*Prof. Selmiye Alkan Gürsel & Prof. Alp Yürüm- SABANCI UNIVERSITY*

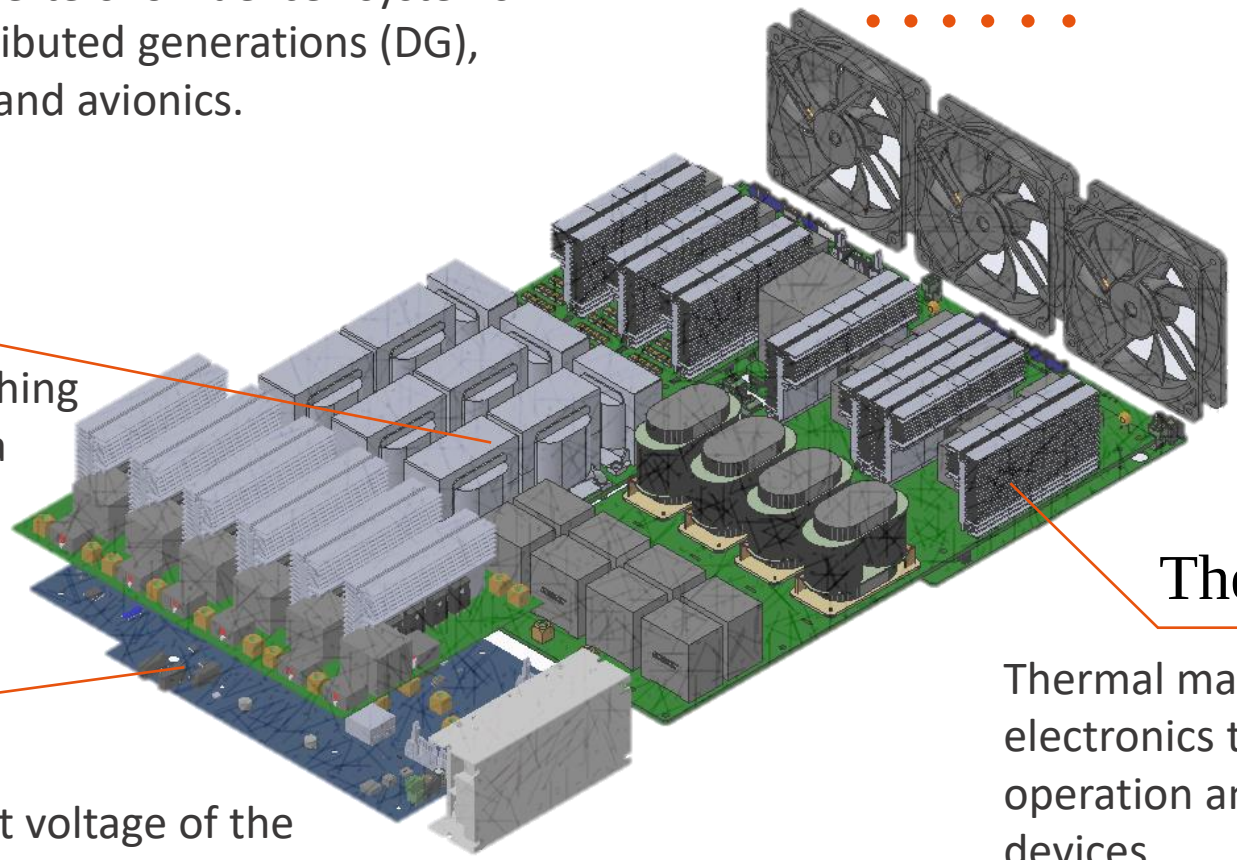
# Sabanci University – TC7-02: Small-scale Hydrogen Valley

We can contribute

- Optimization of low-carbon hydrogen supply chain networks in industrial clusters
- Optimal dispatch model for RES-electrolysis plants in self-consumption regime to produce green hydrogen
- Development of an optimization model for the feasibility analysis of hydrogen application as energy storage system in microgrids
- Optimization model for the installation of a green hydrogen power plant
- High visibility to the local public and EU citizens; Learnings from existing valleys and dissemination to emerging ones
- On going project – **HYSouthMarmara**

# Power converters for fuel cells

**Applications**: Power electronics converters for fuel cell systems. Hybrid electrical vehicles (HEV), distributed generations (DG), uninterruptible-power-supply (UPS) and avionics.



## Converter topology

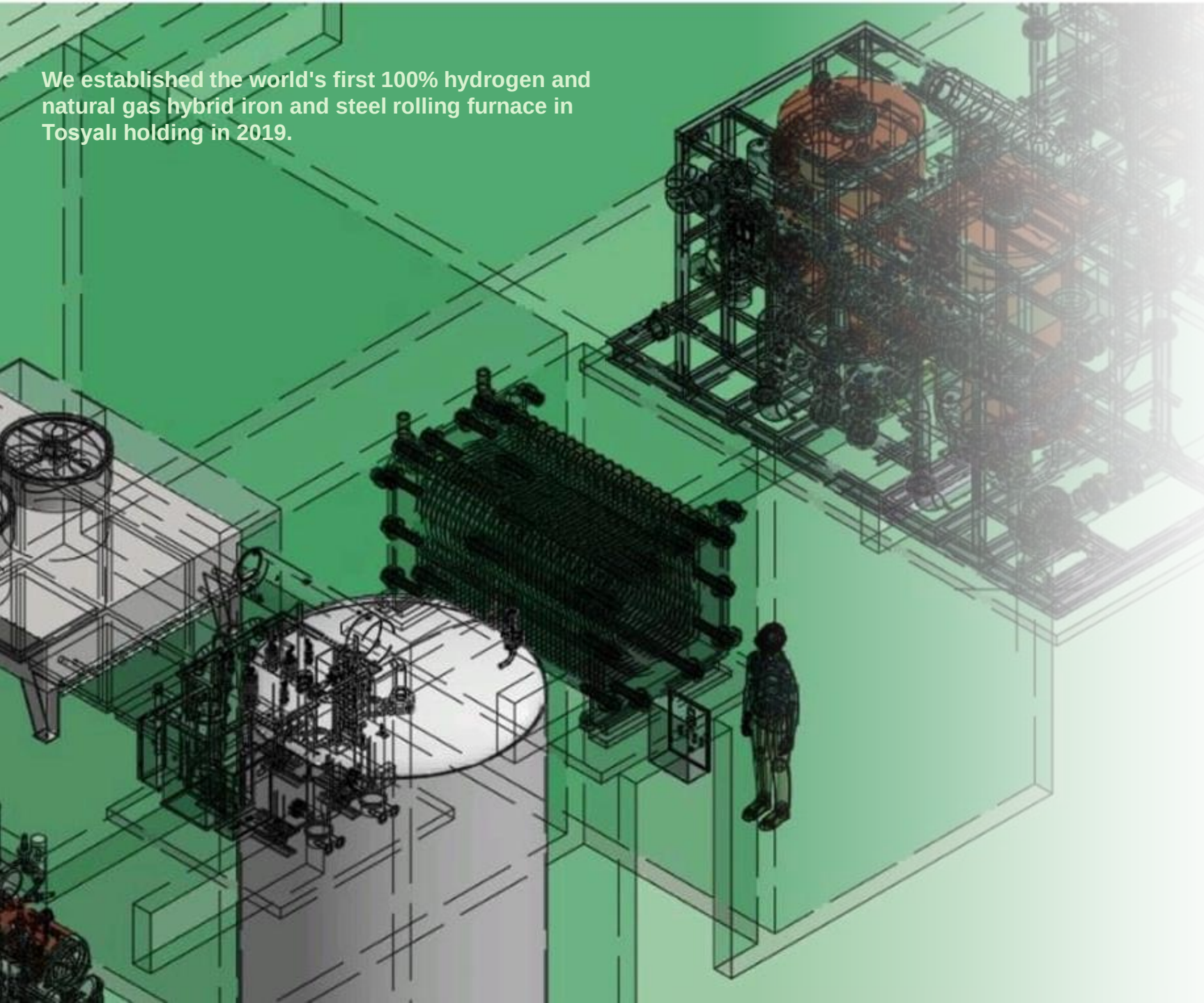
High frequency operation, soft-switching commutation, and operation under a wide range of input and output conditions.

## Control

Voltage controller to keeps the output voltage of the converter constant under loading variations PEM controller to improve performance by keeping the fuel cell in its optimal operating point.

## Thermal management

Thermal management in power electronics to ensure the efficient operation and longevity of electronic devices.



We established the world's first 100% hydrogen and natural gas hybrid iron and steel rolling furnace in Tosyalı holding in 2019.

# GREEN HYDROGEN ENGINEERING

- Manufacturing industrial furnaces entirely suitable for 100% green hydrogen production
- Developing an industrial furnace with high efficiency
- Hybrid system using 100% H2 and 100% natural gas for combustion
- Utilizing oxygen produced during electrolysis to enhance combustion efficiency
- Shortening process duration by integrating oxygen, simultaneously reducing NOx emissions
- Electricity consumption of only 40 kWh per 1 kg/h of hydrogen (H2)
- Optimizing environmentally friendly production

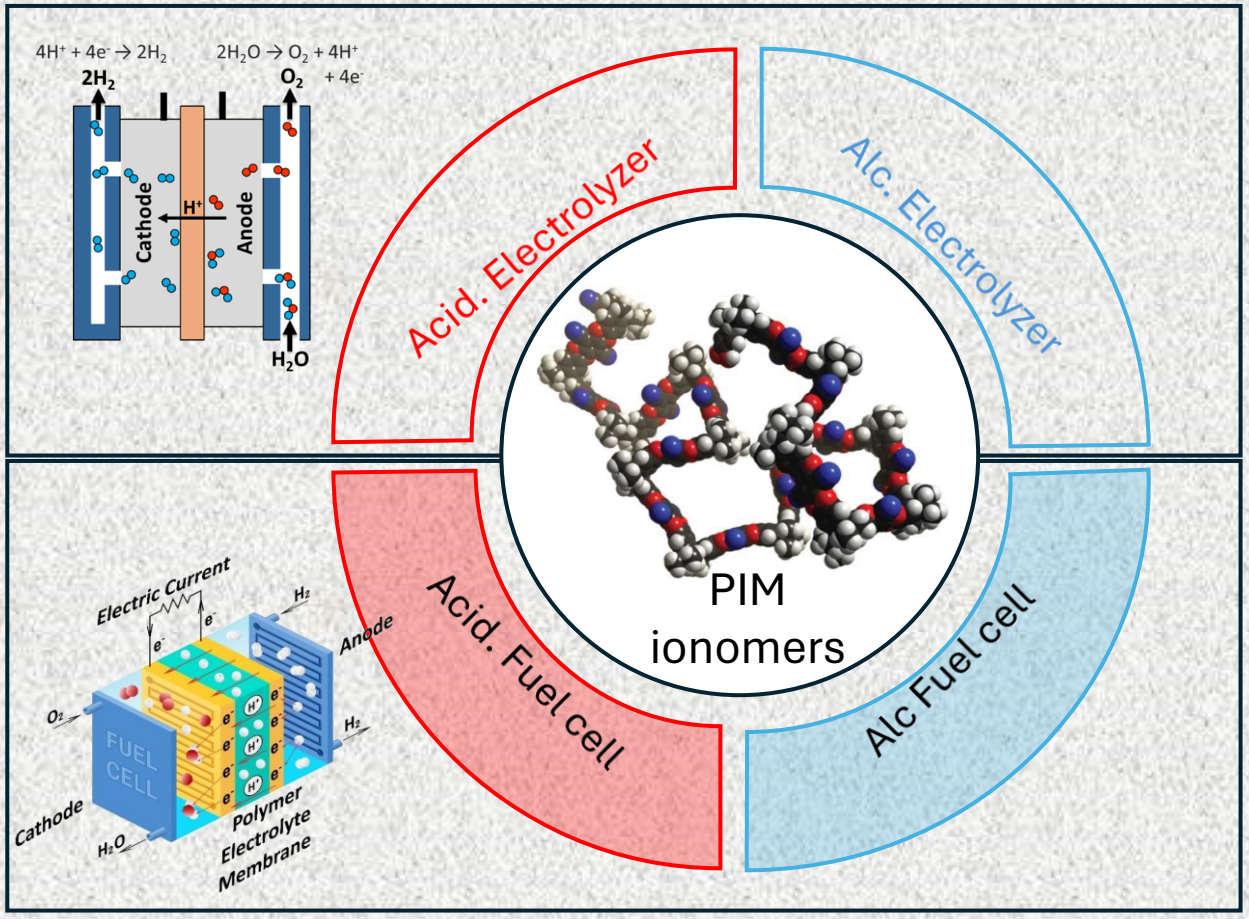
IFS detail engineering

**IFS Mechanical & Industrial Engineering GmbH**

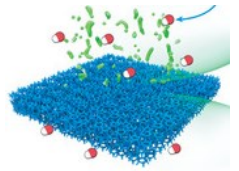
# Polymers of intrinsic microporosity (PIM) Ionomers: A Fluorine-Free Sustainable Innovation for Electrolyzers and Fuel Cells

Politecnico di Torino

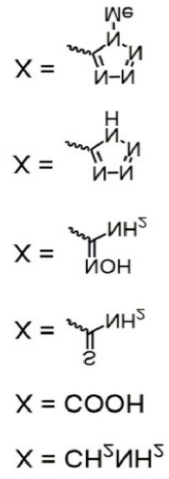
- Microporous Structure: Enables efficient gas transport
- Enhanced Mass Transport
- Improved Ion Transport: Boosts Conductivity
- High *Tg*: Stability in Harsh Conditions
- Interface Enhancement
- Reduced Mass Transport Resistance



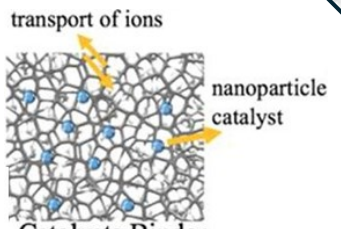

## Membranes



Proton/anionic




Several functional groups

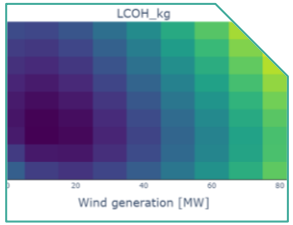



Binder

For more info

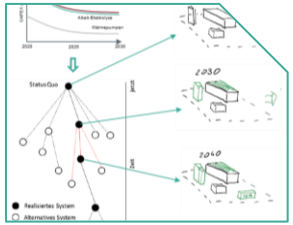

sergio.bocchini@polito.it
Politecnico di Torino (ITALY)

# AIT'S HYDROGEN PORTFOLIO



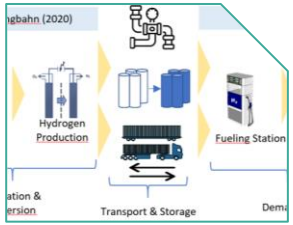

## TECHNO-ECONOMIC ASSESSMENTS

- Technical plant simulation & assessment
- Economic assessment and cost-benefit analysis
- Technology learning curves
- Business models and operation strategies



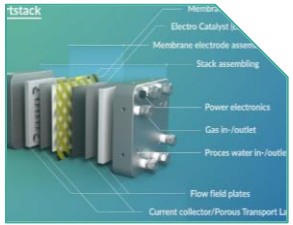
## INDUSTRY & DECARBONISATION PATHWAYS

- Transformation of plants and processes towards $H_2$ and derivates
- High-temperature applications in industry
- Derivation of concrete decarbonisation scenarios & pathways




## $H_2$ MARKET & SUPPLY CHAINS

- Hydrogen market design and simulation
- Grid-support and flexibility
- Price scenarios: $CO_2$, $H_2$, electricity, gas
- Assessment of infrastructure integration and logistic concepts

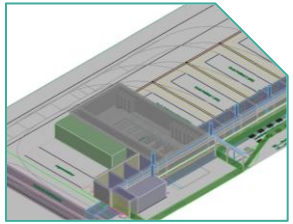



## HYDROGEN TECHNOLOGIES & MATERIALS

- Functional coatings for green hydrogen and power-2-X technologies
- PEM-, AEM- and PEC-based electrolysis
- Active storage materials, i.e. (Magnesium) hydrides

## INFRASTRUCTURE, LOGISTICS & OPTIMISATION

- $H_2$-transportation related logistics operations (technology, rail/truck/vessel, transport network, logistics services)
- Location planning and service network planning for $H_2$ hubs and distribution networks



## TESTING LAB INFRASTRUCTURE

- Test Fields for DUT up to 2MW & 40ft container
- Test Benches for DC stacks
- $H_2$-Demo: P→$H_2$→P w. hard-wired PV; 2x10kW PEM/AEM EL; 5kW PEM FC; 10 m³ Storage

Klara Maggauer // M +43 664 785 88 129 // klara.maggauer@ait.ac.at

# FORD OTOSAN - FUEL CELL / FCEV ROAD MAP



- **Ford Trucks**, **the global brand of Ford Otosan,** which started a great transformation journey with **zero emission**, **connected, and autonomous technologies** with the "Generation F movement".
- **Ford Trucks** currently working on various projects including **Electrification, FCEV, and $H_2$ ICE** to cater to diverse fleet and customer requirements and align with the ACEA's Declaration of Transition to **Zero Emission** Freight Transportation-compliant 2040 target.
- **Ford Trucks** will develop **FCEV** Tractor including **Fuel Cell Power Unit** within this projects' scope.


**Ford Trucks has pushed its efforts to further develop zero-emission products and technologies by joining the Horizon Europe zero-emission logistics project ZEFES (www.zefes.eu).**

ZEFES

- A **FCEV F-MAX** concept being developed for Horizon Europe ZEFES project; planned to execute **real-world demonstrations** on European Ten-T (Italy &Austria) corridor in **2025 and 2026** as part of the ZEFES project goals.

## Some of Ford Otosan's Engineering Competencies

- End-to-end experience in **design and development** of ICE (diesel, petrol, natural gas, and hydrogen) for passenger and commercial vehicle applications
- Extended knowledge and experience on **vehicle and powertrain system engineering, control, calibration, test and optimization**,
- Experienced in **CAE**; **1D system** (powertrain and thermal) simulation and **3D CFD** modelling of oil, glycol\water and air fluid flow, all kinds of heat transfer and combustion.

**Ford Otosan is open to potential collaborations in the development of FUEL CELL Power Units and FCEVs that will add value to the product.**
**Interested in calls : HORIZON-JTI-CLEANH2-2024-03-01 and HORIZON-JTI-CLEANH2-2024-03-02**

Contact: Özcan Gül | ogul1@ford.com.tr

FORD OTOSAN

FRONTIER™
TECHNICAL

**Innovation:** Controllable float module, Buoyancy and Orientation control enabling a method for assembling modular offshore structures in situ

- Configurable floating energy platform
- International Transport by Container freight
- Generation and onboard storage of Electricity, Feedwater, **Hydrogen**
- ‘Library’ of Modules and Connection Nodes

**Next Step Hydrogen Partnership:**
pilot demonstration: Green Hydrogen Production for refueling **Zero Emissions** Port and Harbour vessels


**trevor@frontier-technical.com**

# HYDROGEN VEHICLE SYSTEMS

## THE HVS JOURNEY

// UK based hydrogen technology disruptor, founded in 2017

// £52 million total grants and investments secured

// 2 ground-up designed technology demonstrators launched

// 2 test vehicles delivered with extensive testing underway

// ~10,000 vehicle deliveries planned by 2030

// 1 patent granted, 13 Patents in development

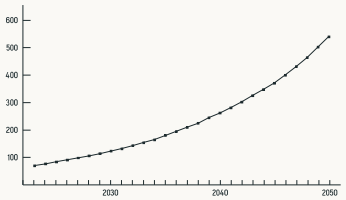
// Multi award-winning technology and leadership

// Grown to a 235 strong, experienced and diverse team

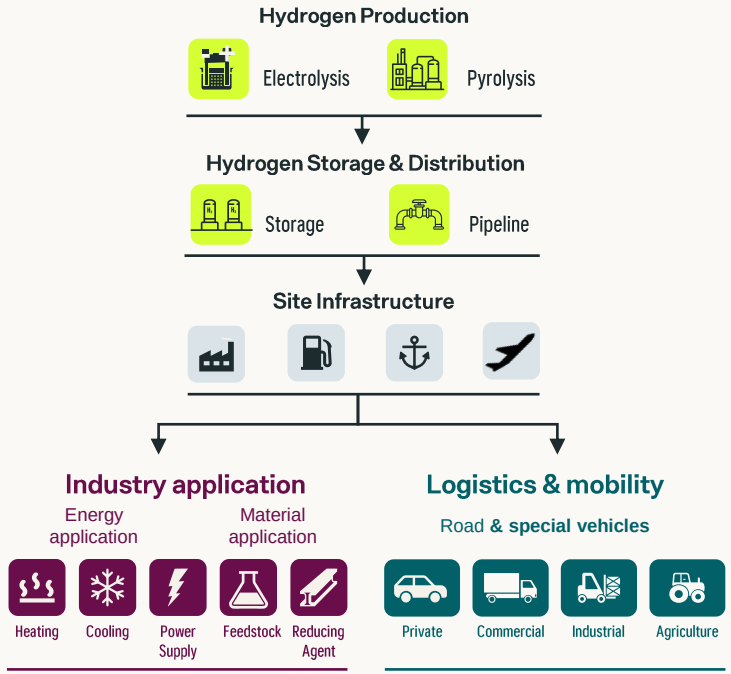
## THE MARKET OPPORTUNITY

### MARKET OPPORTUNITY FOR COMMERCIAL HYDROGEN VEHICLES

Hydrogen is a **£80+bn** global market, expected to grow **7+%** per year and reach **£500+bn** by 2050




### THE HYDROGEN MARKET




## KEY INVESTMENT HIGHLIGHTS

**01** **Purpose built fuel cell vehicle with proprietary AI management software system** that can deliver competitive driving range and total cost of ownership (TCO)

**02** First mover advantage addressing a **£38bn serviceable addressable market** in key strategic markets[1]

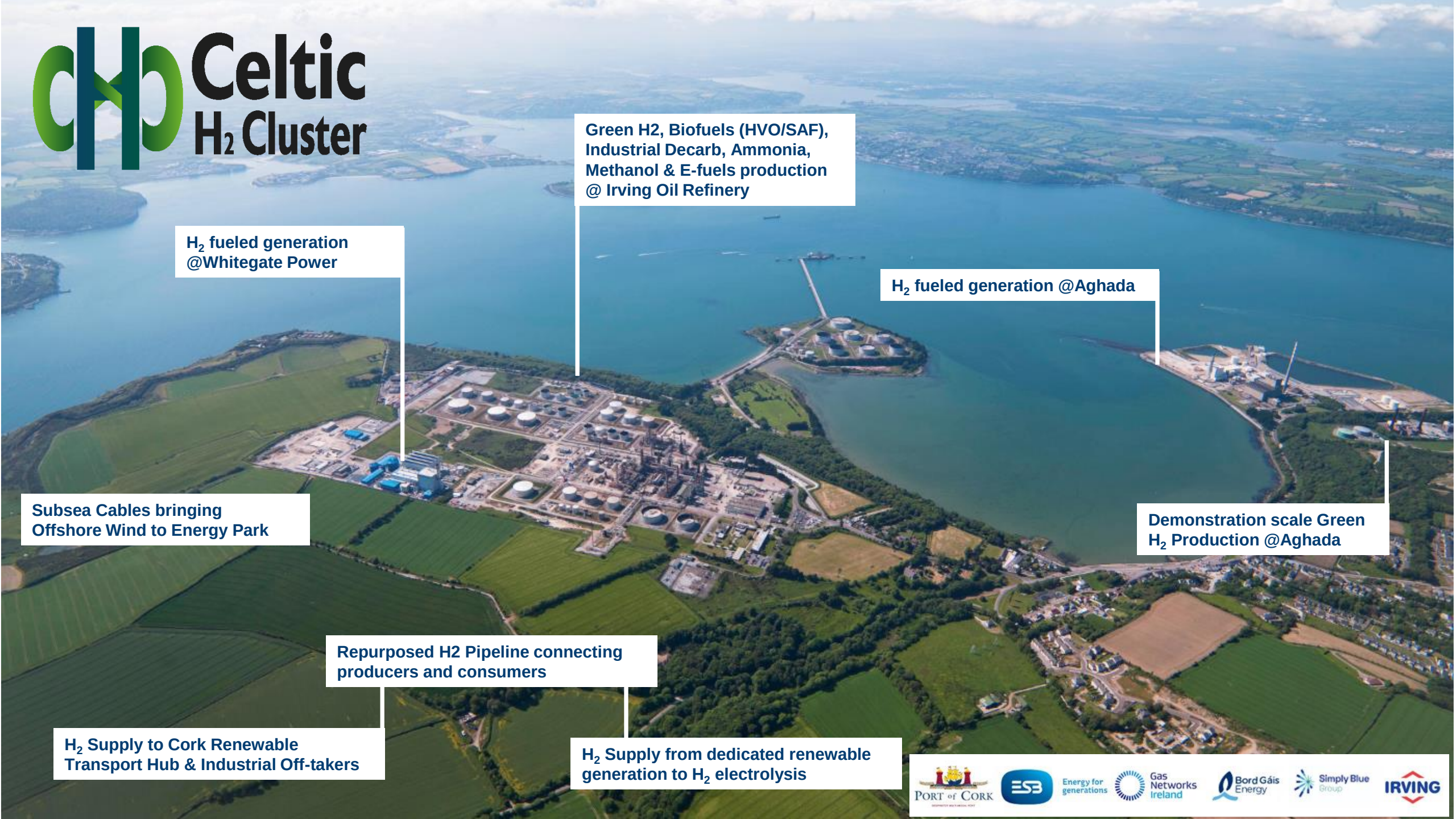
**03** **Secular regulatory tailwinds and government subsidies** that demand an acceleration in decarbonising the heavy duty transportation sector

**04** Active leads with over 50 tier 1 organisations globally, including an **anchor partnership with the EG Group,** with a commercial relationship in establishing the hydrogen refuelling infrastructure and HGV offtakes

**05** Clear plan to scale up manufacturing capacity **to deliver 10,000 vehicles per annum by 2030**

**06** Highly experienced **management team with strong automotive specialisations**

# Celtic $H_2$ Cluster



# Enagás: energy supply and the decarbonization through H2

To contribute to guaranteeing the **security of energy supply** in Spain and Europe and to speed up the **decarbonization** process

## Enagás

**Over 50 years of experience**

A **midstream company**

European Union accredited **independent TSO**

**Top** natural gas **transmission company** in Spain

**Technical Manager** of Spain's Gas **System**

**Committed to decarbonisation**: natural gas and renewable gases

## Purpose

**Looking ahead to 2030…**

The **integration of a European energy system** through infrastructure

The promotion of a **future hydrogen network** in Europe

The creation of a **market for renewable gases** through our Enagás Renovable subsidiary

## H2 Projects

**Technical Challenges**

H2 Compression
H2 Separation
Hydro pipelines
H2 Leak detection
Detection models
Deblending
Carriers

**Some examples:**

H2 PORTS

OPTHYCS

Clean Hydrogen Partnership

Co-funded by the European Union

# HYDROGEN @ INEGI | Activities & Services

## Hydrogen Production

- Decision-making and planning support systems for H2 production, distribution and use.
- Advanced numerical simulation tool for design optimization of $H_2$ production plants.
- Prediction of the production profile over time of the plant's operation, according to the demand profile.

## Hydrogen Use

- Decarbonization pathways based on the industrial uptake/ retrofitting of technologies/systems for hydrogen use.
- Evaluation of materials, burning processes and safety and operational conditions.
- Technology Roadmap

## Hydrogen Transport/Distribution

- Study and test of the feasibility of injecting hydrogen into the natural gas distribution network.
- Eletrochemical charging.
- Mechanical testing (in H2 atmosphere).

EcoEnergyH2 Sp. z o. o.
Świnoujście, Poland
www.ecoenergyh2.pl

EcoEnergyH2

# TECHNOLOGICAL DIAGRAM OF THE EcoEnergyH2 Sp. z o. o.PROJECT [EEH2]
## HYDROGEN ENERGY COMPLEX in the area of the UZNAM-WOLIŃSKA HYDROGEN VALLEY in Świnoujście

BALTIC SEA

POLAND

ŚWINOUJŚCIE / ISLAND UZNAM

ŚWINOUJŚCIE / ISLAND WOLIN

OFFSHORE WIND FARMS

PGE | ORLEN

LH2

IMPORT LH2
EEH2

REGASIFICATION TO H2
EEH2

ELECTROLYZER
EEH2

NH3

IMPORT NH3
EEH2

CONVERSION TO H2
EEH2

H2

GROUND WAREHOUSES H2
EEH2

LNG

Port of Świnoujście

LNG TERMINAL

GROUND WAREHOUSES CH4

GAZ SYSTEM

UNDERGROUND WAREHOUSES H2 IN SALT CAVERNS

EXPANDER
EEH2

RAILWAY DISTRIBUTION

CAR DISTRIBUTION

CH4

BUNKERING OF SHIPS
EEH2

COAST H2 REFUELING STATION FOR BOATS AND CARS
EEH2

HEAT AND POWER PLANTS
PEC Sp. z o. o.

central heating

Uznam-Wolin Hydrogen Valley
www.uwdolinah2.pl

Port of Świnoujście

Amber Hydrogen Valley

# AMBER HYDROGEN VALLEY

ORLEN

## North of Poland H2 Ecosystem


### Hydrogen production

**Hydrogen HUB Offshore/Onshore RES**

**H2 SaltStorage**

Electrolyzers + cavern, hydrogen distribution

### Hydrogen consumption

**Seaports** Gdynia, Gdańsk

- Utilization of H2 for powering port infrastructure

**Road transport** Tri-city

- Utilization of H2 in transportation H2 buses, cars and trucks,

**Industry** Gdansk Refinery

- Utilization of H2 in refineries

**Airport** Gdańsk

- Utilization of H2 in aiport infrastructure

## 1st phase (2023-2026)

- 11 partners
- >4kta RFNBO H2 production
- **Hydrogen introduction to ports and cities**

## 2nd phase (2030)

- we are inviting new partners
- >30kta RFNBO H2 production
- **Hydrogen to Refinery by pipeline**

## 3rd phase (2035)

- we are inviting new partners
- >100kta RFNBO H2 production
- **H2 Salt Caverns Storage**

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# HYDROGEN (TESTING) CAPABILITIES

## Explosion / fire capabilities:

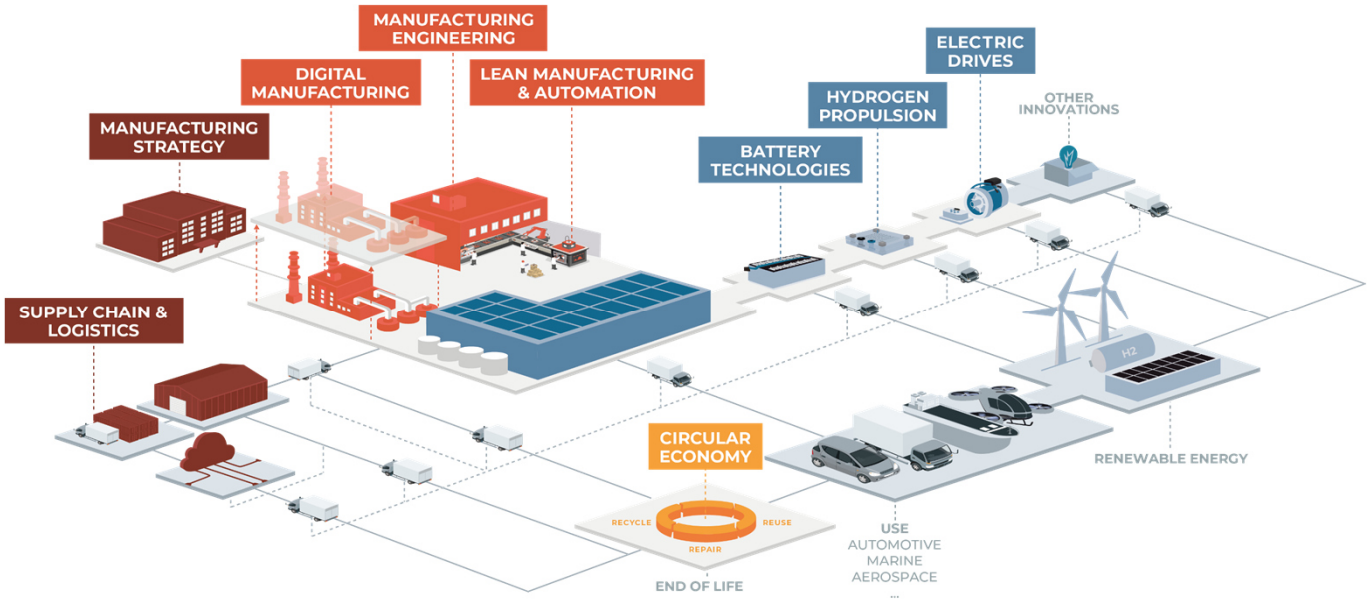
- Hydrogen explosion testing (deflagration/detonation/DDT).
  - High temperature (up to 1600 °C)
  - High pressure (up to 7000 bar)
  - Cryogenic conditions (-250 °C)
  - In-situ measurements at the prevailing conditions like optical access, Raman spectroscopy.
- Safety assessments

## Other capabilities for instance:

- Liquid hydrogen infrastructure.
- Compatibility assessments of materials with hydrogen at various conditions.
- Gas bursting testing of (composite) samples.
- Dispersion characteristics of hydrogen / hydrogen blends in the open air.
- Determination of tensile / fatigue properties of materials in hydrogen environment (-250 °C – +325 °C and pressures up to 650 bar).
- Permeation testing / pressure cycling (up to 2000 bar).

# HSSMI

**WE ARE A WORLD CLASS CONSULTANCY WITH ACCESS TO UNIQUE EXPERTISE AND EXPERIENCE IN ADVISING ON GLOBAL MANUFACTURING PROGRAMS FOR INDUSTRY, MAJOR AUTOMOTIVE OEMS AND TIER 1 SUPPLIERS**




## HSSMI VALUE PROPOSITIONS

- UK based consultancy with 40 staff
- Focused on supporting projects that transform manufacturing competitiveness towards net zero
- Specialist in Energy, Automotive, and Aerospace sectors and their manufacturing challenges
- Scope of projects concentrate on:
  1. manufacturing scale up,
  2. enhancing productivity and
  3. enabling circular economy
- Dedicated experts in the areas of circular economy, life cycle analysis, supply chains and digital tools
- Experience delivering grant funded research projects, both in Europe and UK, including:
  1. Production scale-up of solid-state hydrogen storage technologies
  2. Fuel cell manufacture process definition
  3. Manufacturing scale-up strategy for electrolyser production facility

**Contact: torquil.landen@hssmi.com**

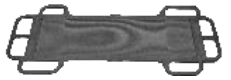
illuming power
energy innovation

## Unique clean power system accelerator

Illuming Power speeds develops and manufactures high-performing materials, components and stacks for stationary and transportation OEMs and their suppliers. The Company's cost leadership in expanded graphite and resin bipolar plates ("BPP") is key to its growth as a full stack supplier to electrification programs. Its innovation is based on trade secrets, knowhow and filed patent applications

Membrane Electrode Assemblies ("MEA")

Seals



Expanded Graphite Bipolar Plates

Fuel Cell Stacks

**By the Numbers**

| >2000 | >85M | 3 - 500kW |
|---|---|---|
| Stacks shipped by customers in 2023 | Kilometers Driven | PEM stack designs |

**Advantages of Illuming Power's Technology**

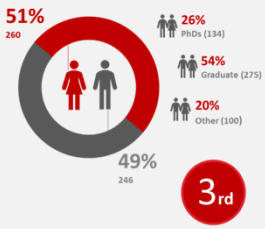
- Proprietary Materials and Processes
- Lower Materials Cost
- Lower Capital Cost
- Thinner Plates
- High Durability
- Higher Power Density

## Illuming Power Core Businesses

| Fuel Cell Raw Materials | | Fuel Cell Components and Stacks | |
|---|---|---|---|
| Fuel cell plate resin | Composite expanded graphite material | Custom Design and build | Mass produced stack and kits |

Jeff Plato – jm.plato+Europa@illumingpower.com

# ABOUT LEITAT




3rd Centro tecnológico español por retorno H2020

LEITAT, AN INTERNATIONAL REFERENCE IN
**APPLIED R&D, PROJECT MANAGEMENT AND LEADERSHIP**

MORE INFO ABOUT OUR $H_2$ PROJECTS:

**104**
**R&D European projects**

537M€ Overall Budget | 58 Countries | 1.799 partners

## PROJECTS RELATED TO HYDROGEN

STACKAEM | LULYPLAST | FUELS-C
X-SEED | NINBI | SH2AMROCK

# EOI FOR CHP JU 2024 TOPICS

LEITAT managing technologies

### ➢ *TC1-02: Advanced anion exchange membrane electrolysers for low-cost hydrogen production for high power range applications*

•Development of membranes, catalyst and electrodes based on carbon nanofibers doped with metals
•Support on the development of membranes electrodes, assembled electrodes, bipolar plates and/or other cell and stack components by additive manufacturing (3D printing) (polymers and metals). Electrochemical characterization of membranes and electrodes (HER, OER), electrochemical stability tests of electrodes, membranes and MEAs
•Support on AEM cell and stack desing, Operation and charadcterizaion of AEM cell and stack devides (up to 5 kW stack)
•Water purification technologies for inlet water of AEM cell

Projects related: ANEMEL_– EIC (2022-2026), SH2AMROCK CHP JU - (2023-2027), STACKAEM – PCPP ESP (2023-2026),
X-SEED - HORIZON (2024-2027), GH2 - EIC (2022-2026), REGENERA PCPP ESP (2021-2024)

### ➢ *TC01-05: Hydrogen production and integration in energy-intensive and speciality chemical industries in a circular approach to maximise total process efficiency and substance utilization*

- Multiples Industrial partners and demo cases in the decarbonization sector, Steel and Cement industry.
- Dark Fermentation expertise
- PEM, AEM manufacturing and operation
- LCA, LCC: LEITAT holds licenses of the two most recognised LCA software: o SIMAPRO (Pré Consultants) & o GaBi Professional (PE International). As well as, license of the main LCA Databases such as Ecoinvent and Gabi Professional databases.

Projects related: SH2AMROCK CHP JU - (2023-2027), FUELS-C – HORIZON (2024-2028), ANEMEL_– EIC (2021-2025), GENESIS - H2020 (2018-2021), GH2 - EIC (2020-2023), ROBINSON - H2020 (2020-2024), LULYPLAST – PCPP ESP (2023-2026), NIMBI (2023-2026), FLOWPHOTOCHEM - HORIZON (2020-2024)

### ➢ *TC 01-04: Development and implementation of online monitoring and diagnostic tools for electrolysers*

- Implementation of data management plans (ma-DMP) for automated AI forecasting
- Multiparametric correlation of datasets to identify relationships, including non-direct using deep learning.
- Manual and automated data acquisition methods for variable aging test data.

*LEITAT's Supercomputer Facility at DFactory:*

- Two High-Performance Computing (HPC) facilities: CPU and memory storage, and GPUs for image processing and intensive computing.
- HERMES infrastructure and OMEGA initiative: HPC and a dedicated set of racked GPU (initially 50, planning to scale up to 700).
- Critical hardware infrastructure supporting model execution, simulations, and handling heavy computational loads.

Projects related: ECS4DRES-Horizon (2023-2026), DIGICELL-Horizon (2023-2027), PROGRESSUS-H2020 (2020-2023), PortForward-H2020 (2018-2022), CONNECT-H2020 (2017-2021)

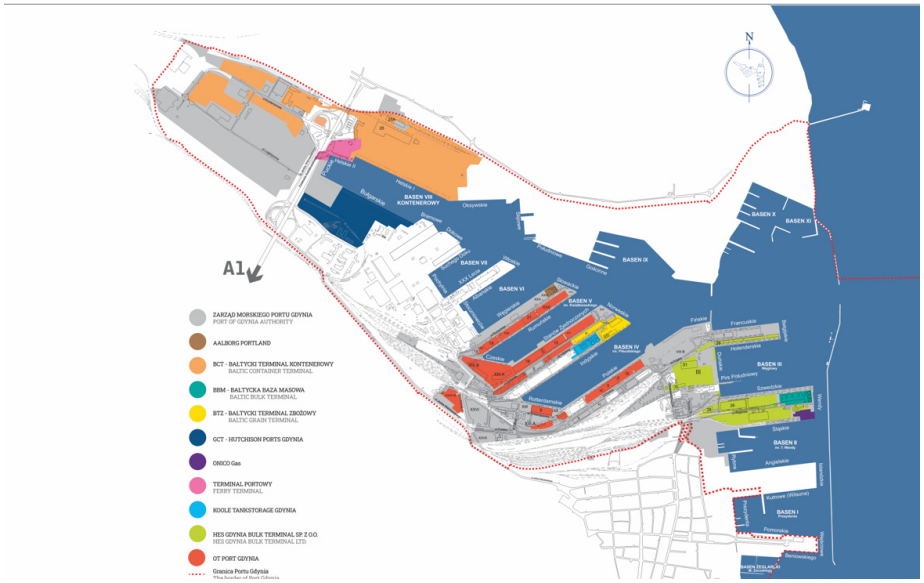
### ➢ *TC6-02: Small-scale Hydrogen Valley*

- LCA, LCC: licenses of the two most recognised LCA software: SIMAPRO, professional LCA software tool to collect, analyze and monitor the sustainability performanceof products and services. different impact methods according to European guidelines: ILCD method, CML, ReCiPe, among others.

- Water purification technologies for inlet water of PEM cell

Projects related: VIVALDI (2021-2025), SH2AMROCK CHP JU - (2023-2027), FUELS-C – HORIZON (2024-2028), GENESIS - H2020 (2018-2021), GH2 - EIC (2020-2023), ROBINSON - H2020 (2020-2024), LULYPLAST – PCPP ESP (2023-2026), NIMBI PCPP ES (2023-2026), BIOCONCO2 H2020 (2018-2021)

# Fuel and energy transformation





PORT GDYNIA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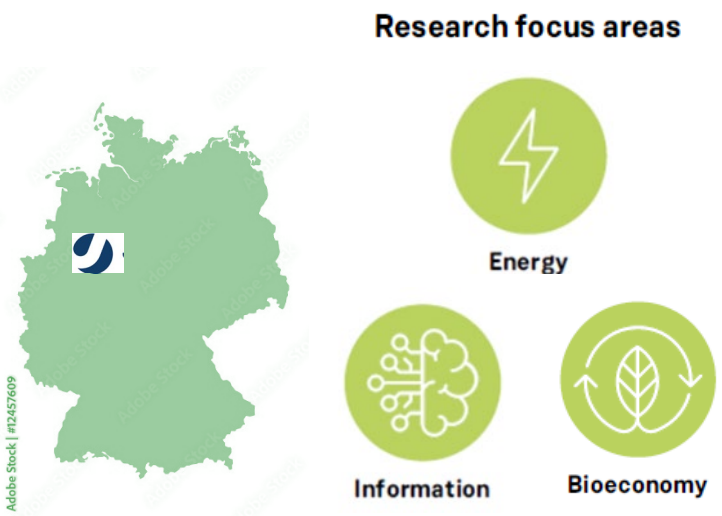
# HYDROGEN RESEARCH AT FORSCHUNGSZENTRUM JÜLICH

## 40 YEARS EXPERIENCE IN FUEL CELL AND ELECTROLYSIS RESEARCH AND DEVELOPMENT

### FACTS AND FIGURES




**2.891**

**Scientists**

**1.595**

**Technical staff**

### HYDROGEN RESEARCH IN JÜLICH

- Hydrogen Technologies: From Materials Science and Electrochemistry to Engineering, also Techno-economic Analysis, including LCA and critical raw materials
- New institute for sustainable hydrogen (INW) with research focus on innovative ways to store and transport hydrogen as chemical H2 carriers
- Key competences:
  - Multiscale mechanical testing
  - Functional coating systems
  - Development of electro-catalysts
  - Electrochemical testing (durability)
  - Manufacturing technology
  - Thermochemistry and HT corrosion
  - Hydrogen effects in materials
  - Development of protective coatings
  - Ceramic matrix composites
  - High-resolution characterization
  - Modelling and simulation

### RESEARCH INTERESTS

Electrolysers
Technical development of stacks & systems
400 kWe-testing site

Materials research
- hydrogen embrittlement
- protective coatings
- definition of novel materials solutions for (LT and HT)

Lifetime enhancement (100Th)
- SOC development

Techno-economic analysis of various aspects of the hydrogen economy

Development of chemical H2 carriers including use case integration

Mitglied der Helmholtz-Gemeinschaft

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JÜLICH Forschungszentrum