



# EH GROUP ENGINEERING



[www.ehgroup.ch](http://www.ehgroup.ch)

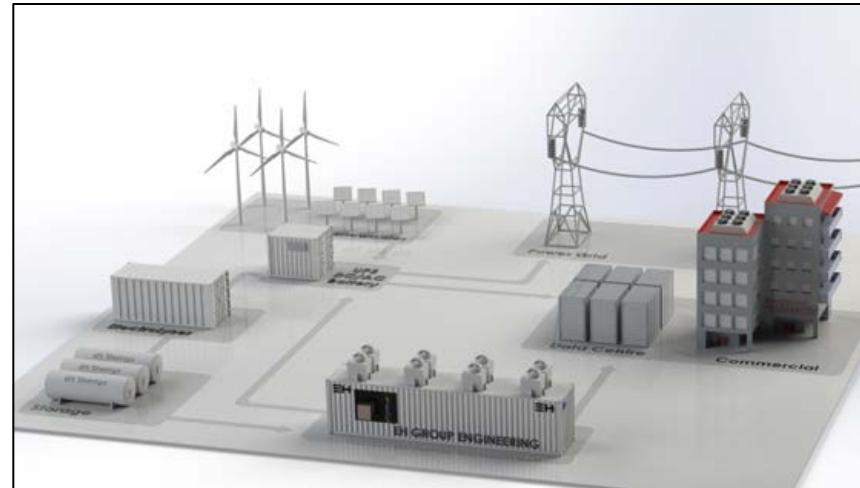
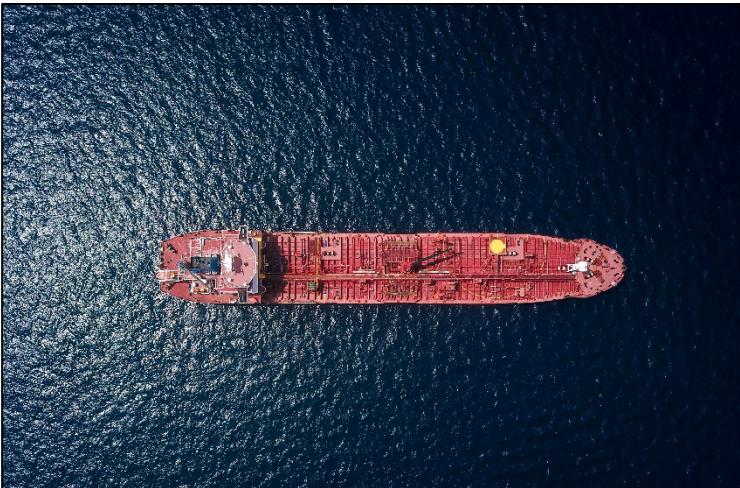


# THE CHALLENGE

**DECARBONISING HEAVY DUTY MOBILITY & LARGE POWER UNITS**

**OVERCOME THE LIMITATIONS OF BATTERIES**

**REDUCE THE COST & COMPLEXITY OF HYDROGEN FUEL CELLS**



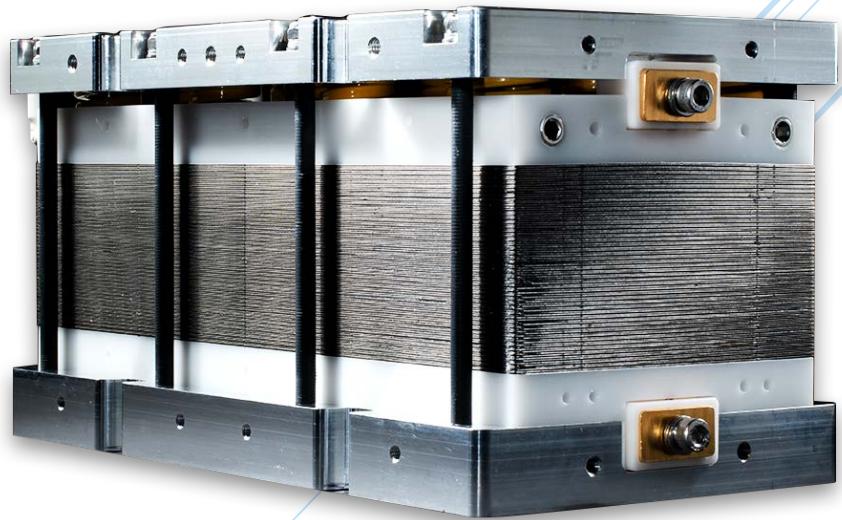


# EH Group Fuel Cell Technology

- Uniquely re-designed fuel cell stack at the microstructure level - more compact, lightweight and efficient.
- New concept of continuous FC production process
  - Unique machinery with fully integrated assembly
  - Significantly faster & cheaper at scale\*: < 100EUR/kW
- Operates with minimal effects of gravity & in any orientation - great candidate for mobile applications;  
→ Collaboration with



\* At scale refers to 100,000+ units per annum



EU GA945810 – EHSTACK.

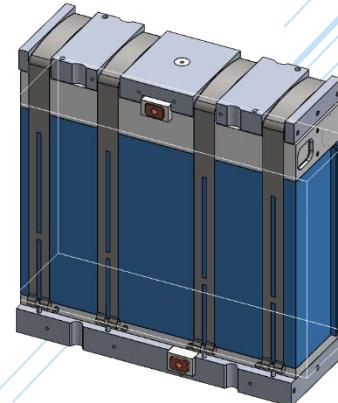


# Our Technology Edge

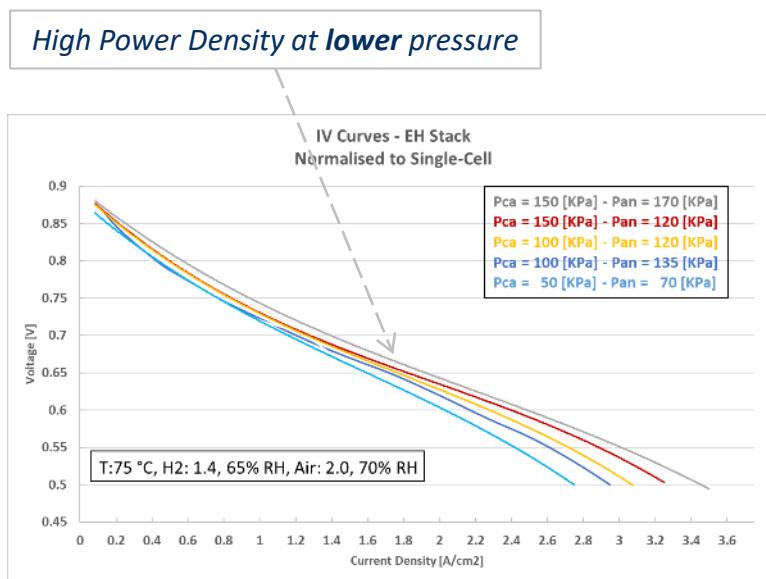
## Technology Comparison

Parameters	Toyota (MIRAI)	Honda	PowerCell	Ballard (High Performance FC)	EHG FC STACKS
Volume Power Density [kW/L]	5.4	3.1	4.8	4.3	8.0
Weight Power Density [kW/kg]	3.0	2.0	2.9	2.7	4.0
Cell Pitch [mm]	~1.0	~1	~1.0	N/A	<0.8

NOTE: data from other suppliers are collected from the public domain and EHG doesn't guarantee 100% accuracy



## Example of Performance Curve



## The Edge

### STACK:

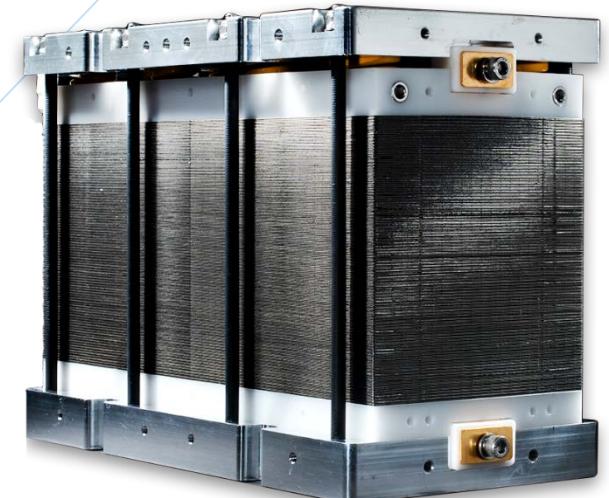
- Higher Power Density
- Power range: **1.0 – 300 [kW]**

### SYSTEM

- Compact design
- Higher fuel efficiency

### SOLUTION

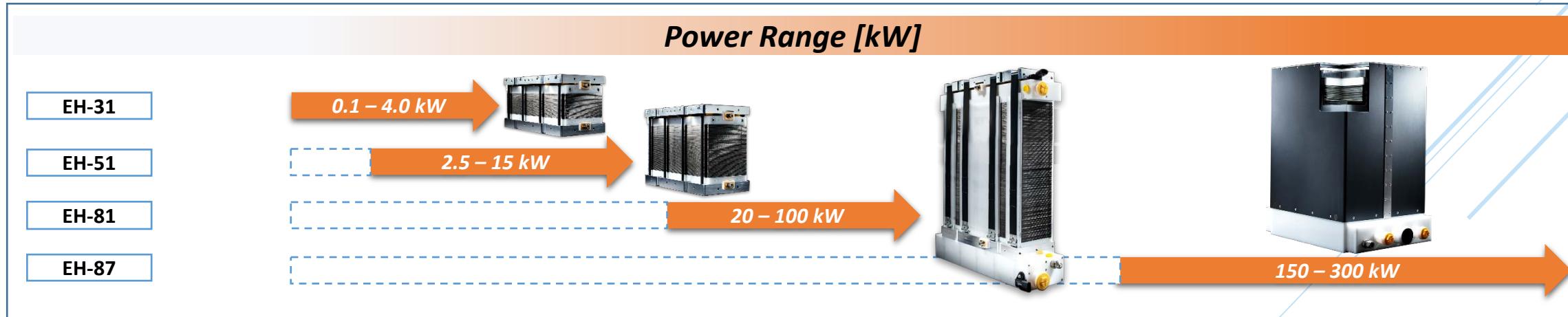
- Scalable
- Reliable
- Customisable



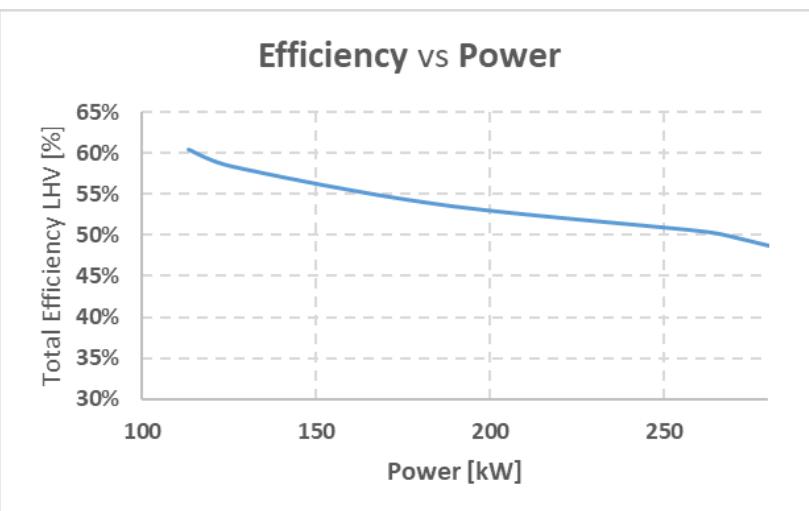


# EHG Fuel Cell Products

## Fuel Cell Stack & System Platforms



## Total System Efficiency vs. Power output





# EH Fuel Cell - Mobile Applications

## Stacks & systems deployed since early 2020

- Electric vehicles – commercial & off-road
- Forklifts
- Marine projects
- Mining Sector

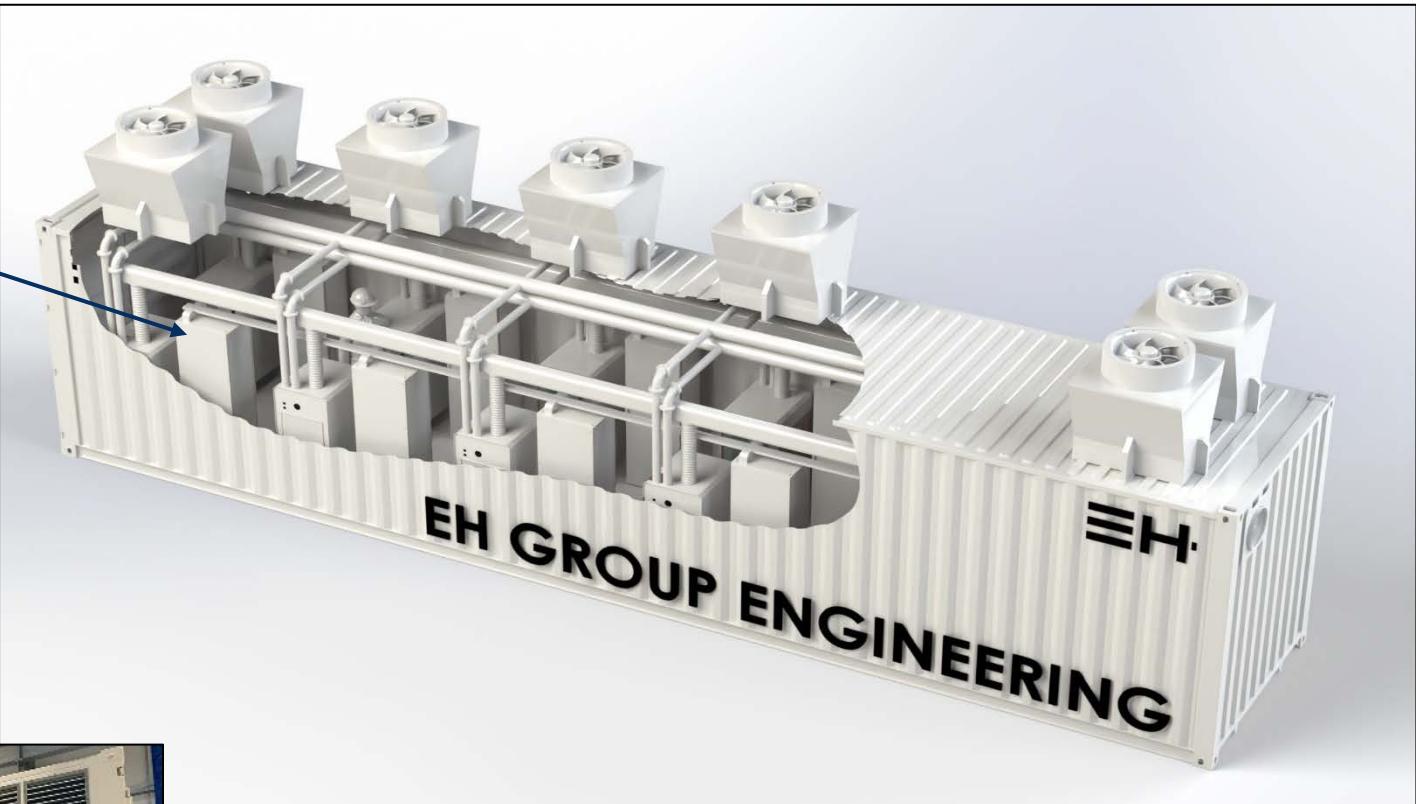




# EHG Fuel Cell - Stationary Applications



EHG 200kW FC module



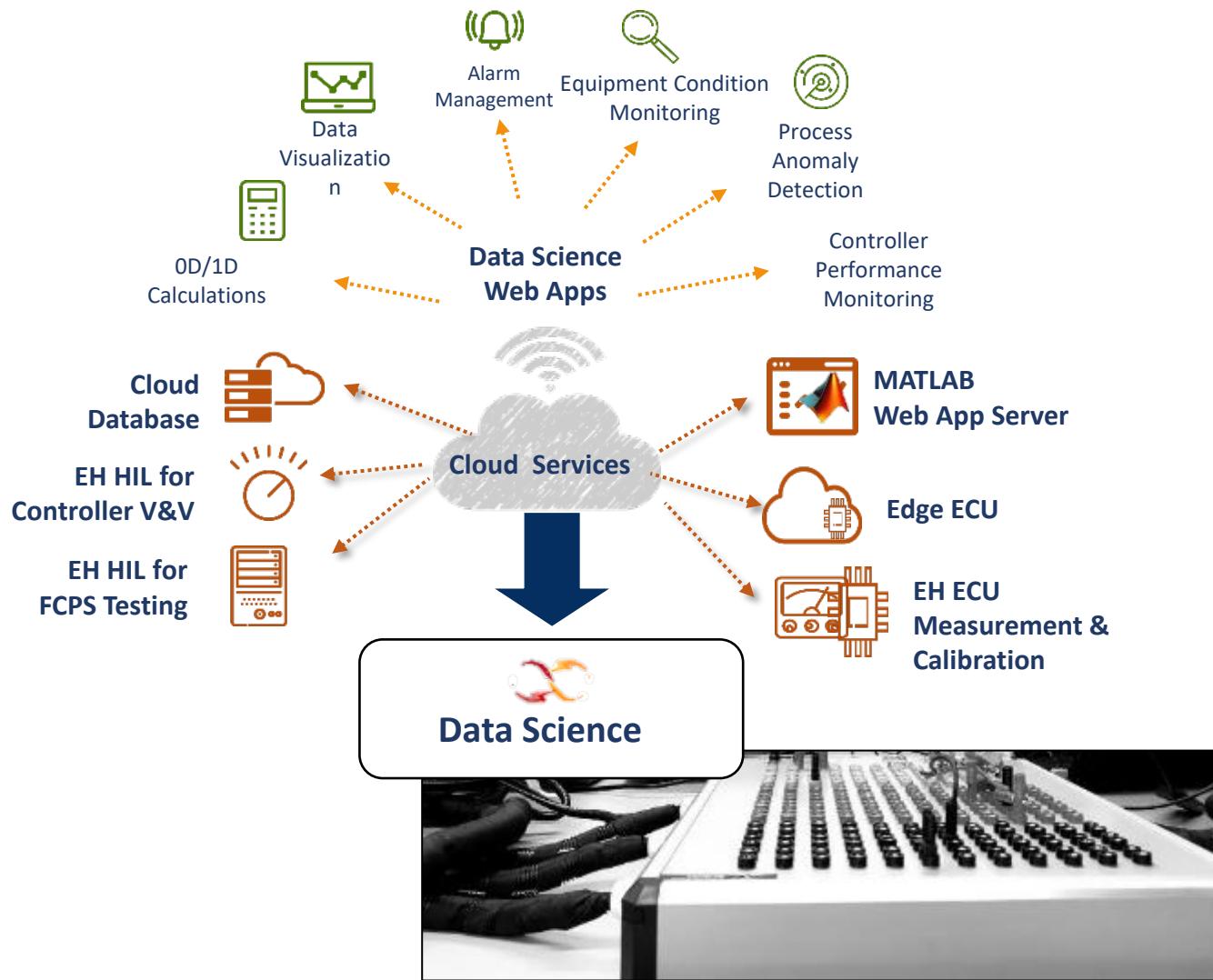
Backup Power & EV Supercharger



Collaboration with Snam –  
Europe's largest gas grid operator



# EHG Fuel Cell Data Science



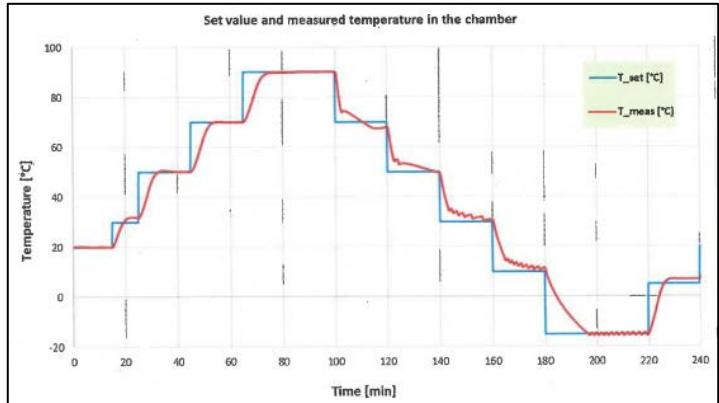
- Process Control Automation Cloud-based Data Telemetry with **Edge ECU**
- **FCPS Dashboards for monitoring**



- **Cloud services -**
  - Remote Support
  - Predictive Maintenance
- **EH FCPS Digital Twin**
- **FCPS & vehicle simulations**



# External Testing



Thermal tests



Materials Science and Technology

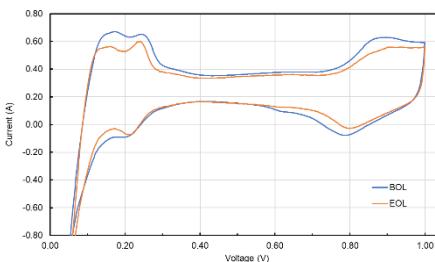
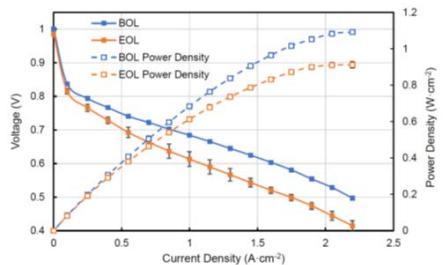


Vibration tests in space labs



**RUAG**

## Degradation Test Results



Test Protocols Defined by  
*DoE (US Department of Energy)*

- Positive results on durability and degradation



# The Impact



Equivalent to



386805 trees



1052

times driving a car  
around the world



8588

passengers flying  
London-New York



16529

barrels of  
oil burnt

1750 Average humans



3577

EU households  
annual electricity



1702

elephants mass  
(5t) of CO<sub>2</sub>



1535

hot air balloons  
19800 m<sup>3</sup> of CO<sub>2</sub>

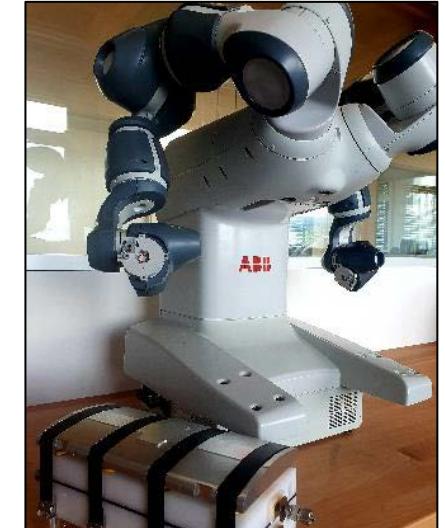
Source: Impact Forecast - Dutch impact software & services company with a scientific team to apply science-based impact assessments (<https://impact-forecast.com/>)



# FACILITIES



- Multiple test bench facilities for testing up to 250kW
- Dedicated Hydrogen Supply
- Testing labs & Production facilities
- 2000m<sup>2</sup> of customized lab space





# Leadership Team



## Dr Mardit Matian

- Founder/Director: Technical lead
- PhD - Imperial College London
- 18+ years fuel cells, H2 production



## Christopher Brandon

- Co-Founder/Director: Finance & strategy
- MA Economics (Hons) – Univ Edinburgh
- 23+ years finance & entrepreneurship



## Anand Vasappanavara

- Senior Control/Automation Engineer
- MSc Mechanical Engineering, Controls
- 10+ years in fuel cell applications



## Alexandre Chainho

- Mechanical designer/integrator
- 14+ year experience FC assembly, system design and prototyping.



## Alice Maffezzoli

- Business Development Manager
- MSc Electrical Engineering, MBA
- 10 years business management



## Dr Isabel Vazquez

- PhD Chemistry Queens University
- Electrochemist & Material Scientist
- 5+ years PEMFC Characterisation

Supported by more than 20 talented engineers

## Scientific Advisory Board



### Prof. Jan Van Herle



EPFL Switzerland  
Senior lecturer and researcher  
Fuel Cells, catalyst contamination



### Prof. Nigel Brandon



Imperial College London  
Professor of Electrochemistry  
Dean, Faculty of Engineering ICL

## Advisory Board



### Bernard Sabrier

Group Chairman of Unigestion  
CEO Unigestion Asia Pte Ltd  
Leading European PE & alternatives manager  
Swiss Entrepreneur & philanthropist



### Carl-Peter Forster

Former Group CEO Tata Motors  
Chairman & Managing Director Opel AG  
President General Motors Europe  
Board Member - Geely Automobile & Volvo Cars





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Some of our selected partners:



**esa** business incubation centre  
Switzerland



**FIT**  
fondation pour l'innovation  
technologique

**VAUD**

**CalSEED**



**EPFL**

**Imperial College  
London**

**UCL**