Clean Energy Generation

The leader in hydrogen fuel cell technologies and services.



www.ehgroup.ch

Our Mission

DECARBONISING HEAVY-DUTY MOBILITY, STATIONARY POWER & AVIATION







Fuel Cell Technology

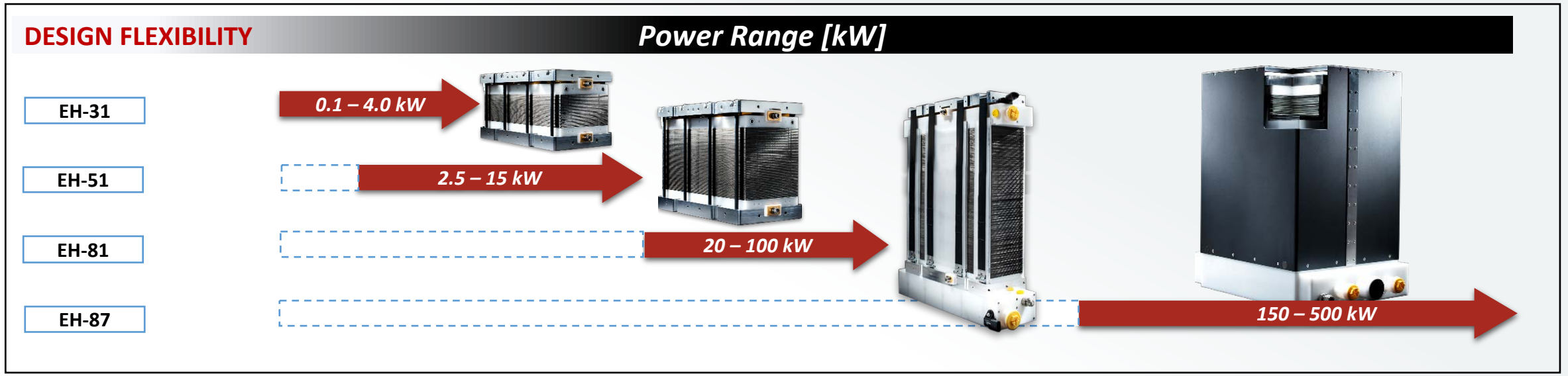


EH Group's unique & patented microstructure

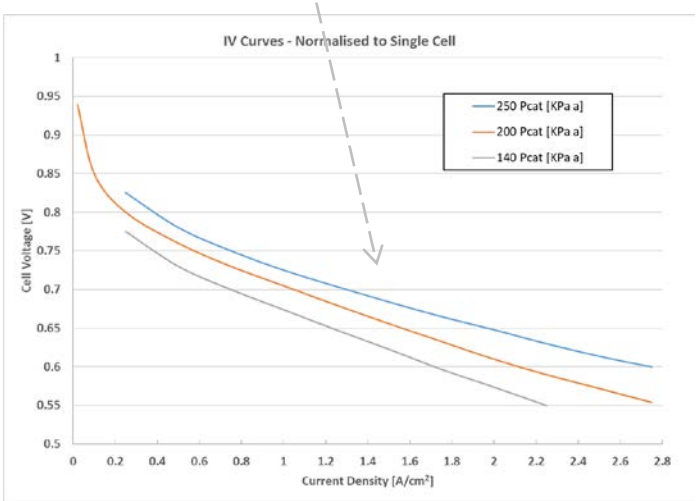
- **Unrivalled Power Density**
- **Stack Design Flexibility**
- **Greater System Efficiency**
- **Radical Cost Reduction**

Strictly Confidential – No Distribution

Fuel Cell Stacks



*High Power Density at **lower** air pressure*



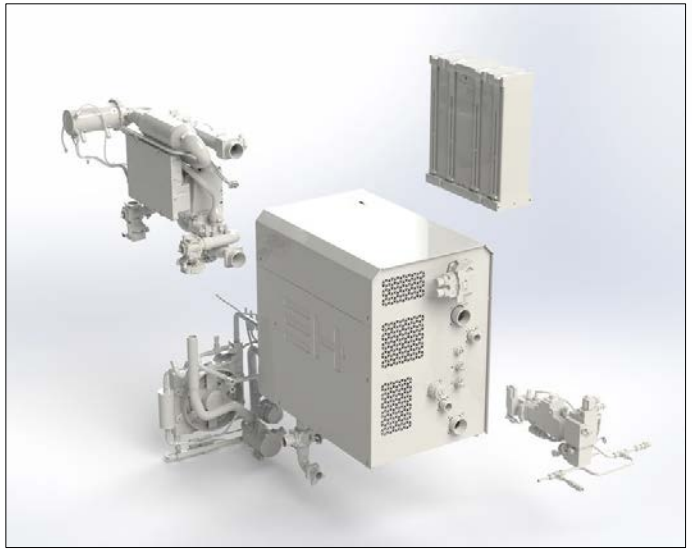
Technology Comparison

Parameters	Toyota (MIRAI)	Honda	PowerCell	Ballard	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

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Fuel Cell Systems





EH-TRACE

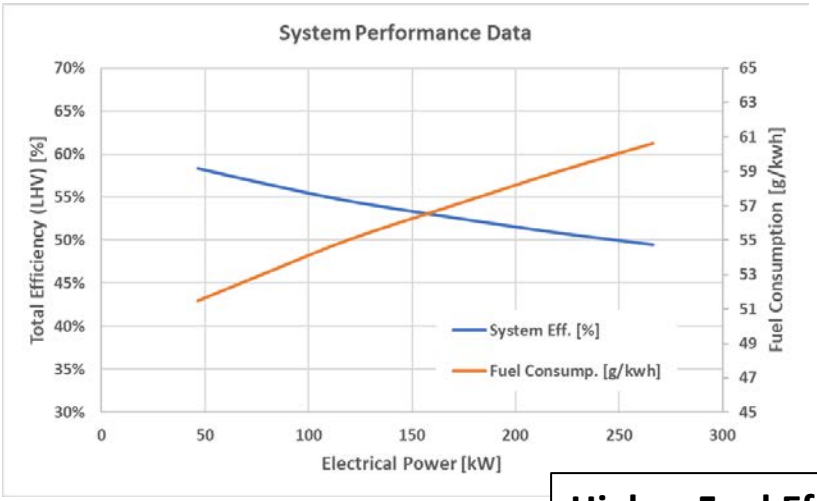
Two Platforms:

20-40kW

150-250kW

Modular & scalable

APPROVAL IN PRINCIPLE for Marine certification



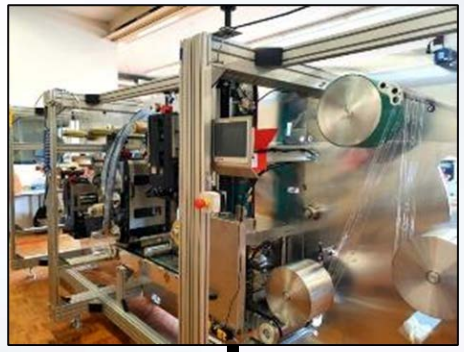
Higher Fuel Efficiency

	Ballard FC Wave	Powercell	EHG TRACE - 250
Efficiency (peak power)	47%	47-48%	**51%**
Efficiency (part load)	53%	54%	**57%**
Weight kg	1,000	1,070	**700**
Dimensions (m)	1.2 x 0.75 x 2.2	0.75 x 0.9 x 2.2m	**0.75 x 1.0 x 1.5**
Number of Stacks	4	2	**1**
Power rating	200kW	160kW	**250kW**

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FC Automated Production Innovation





Speed of production	**100kW → 20min 60kW → 12min**
Number of different Stack Platforms	**4 (Up to 300kW)**
Total capacity	**40,000 (100kW stacks) ~4 GW/year**

Fully automated process - high micro-precision

Integrated quality control & laser serialisation

Two modules already commissioned

Final assembly 2024

Significantly cheaper at scale*: **< 100EUR/kW**

***100,000 units per year**

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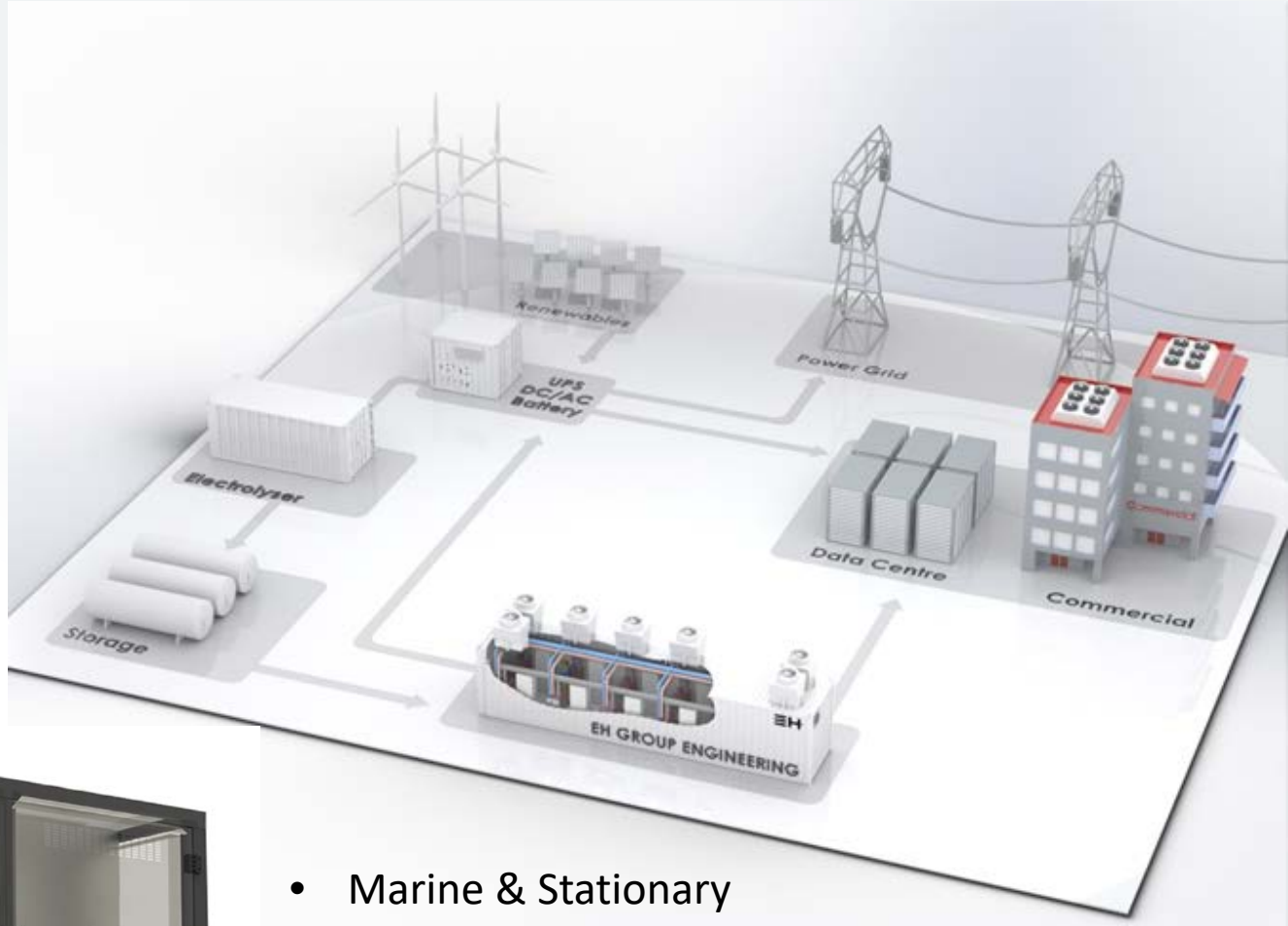
Fuel Cell Solutions

Turnkey containerised FC power solution comprising:

- Fuel Cell systems
- Power Converters
- Thermal Management
- Control Systems



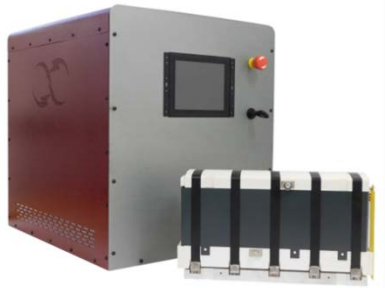




- Marine & Stationary
- Fully Customisable
- Scalable FC Power
- Multifuel capability

Collaboration partners:

Fuel Cell Deployments - Stationary

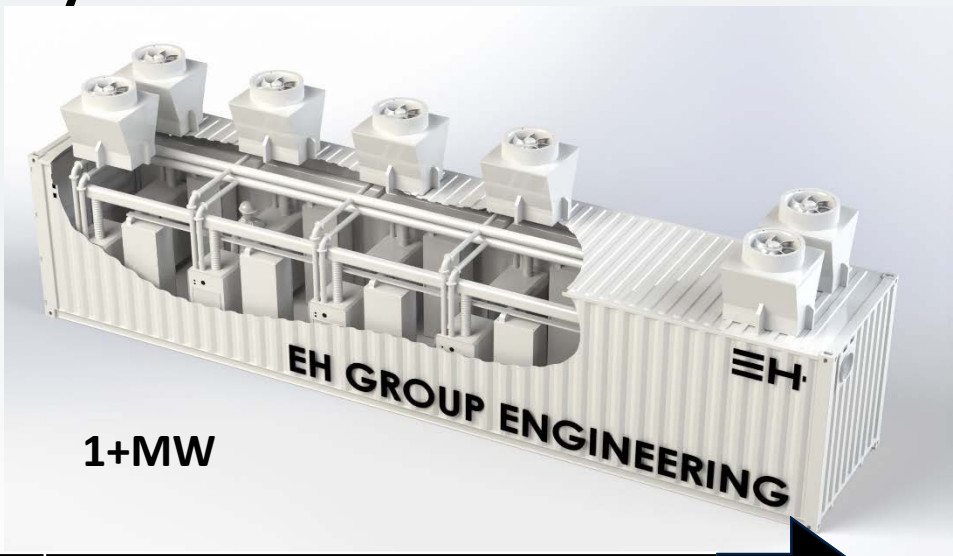


20kW



250kW





1+MW

2020	2021	2022	2023	2024

Micro-Grid

EPFL

Backup Power / EV supercharger



Data Center Backup / Energy Storage





Fuel Cell Deployments - Mobility



5 – 10kW



20 - 40kW



40 – 250kW



2020	2021	2022	2023	2024



Light commercial vehicles



Forklifts



Mining



Marine



Aviation

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Fuel Cell Data Science

Monitoring Dashboard



Alarm Management | Data Visualization | Equipment Condition Monitoring | Process Anomaly Detection

Remote Support & Predictive Maintenance

0D/1D Calculations

Controller Performance Monitoring

Cloud Database

Cloud Services

MATLAB Web App Server

EH ECU Measurement & Calibration

Edge ECU

Data Science



EH HIL for FCPS Testing

EH HIL for Controller V&V

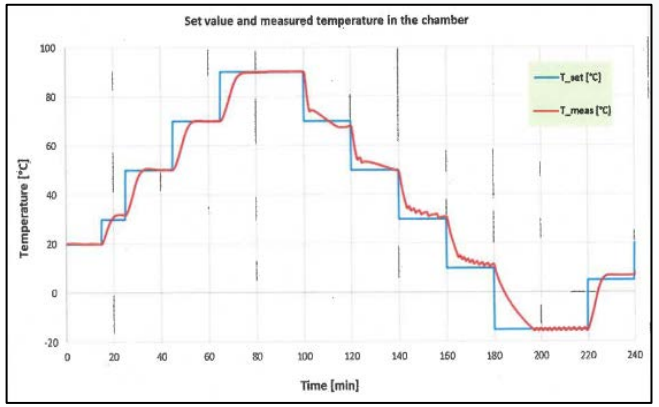


Cloud-based Data Telemetry

Digital Twin & vehicle simulations

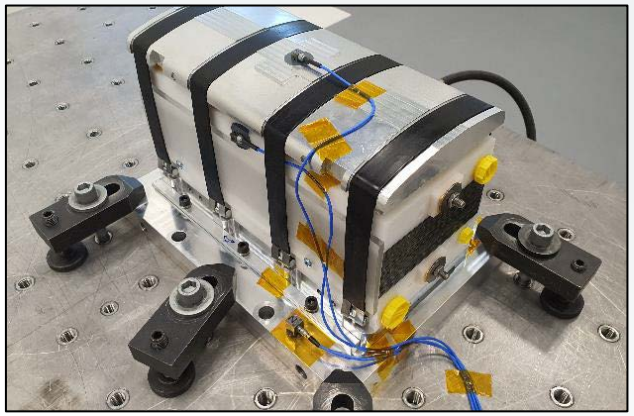
External Testing

esa business incubation centre Switzerland



Thermal tests

Empa Materials Science and Technology



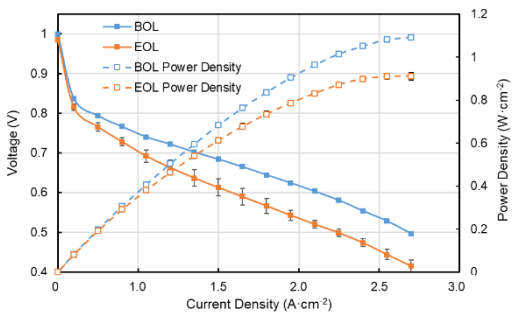


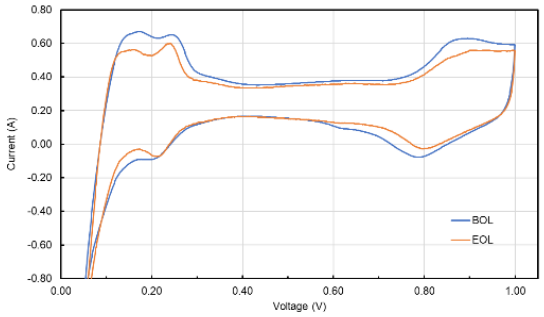
Vibration tests to 15g in space labs

RUAG

NFCRC NATIONAL FUEL CELL RESEARCH CENTER UNIVERSITY OF CALIFORNIA • IRVINE

Degradation Test Results

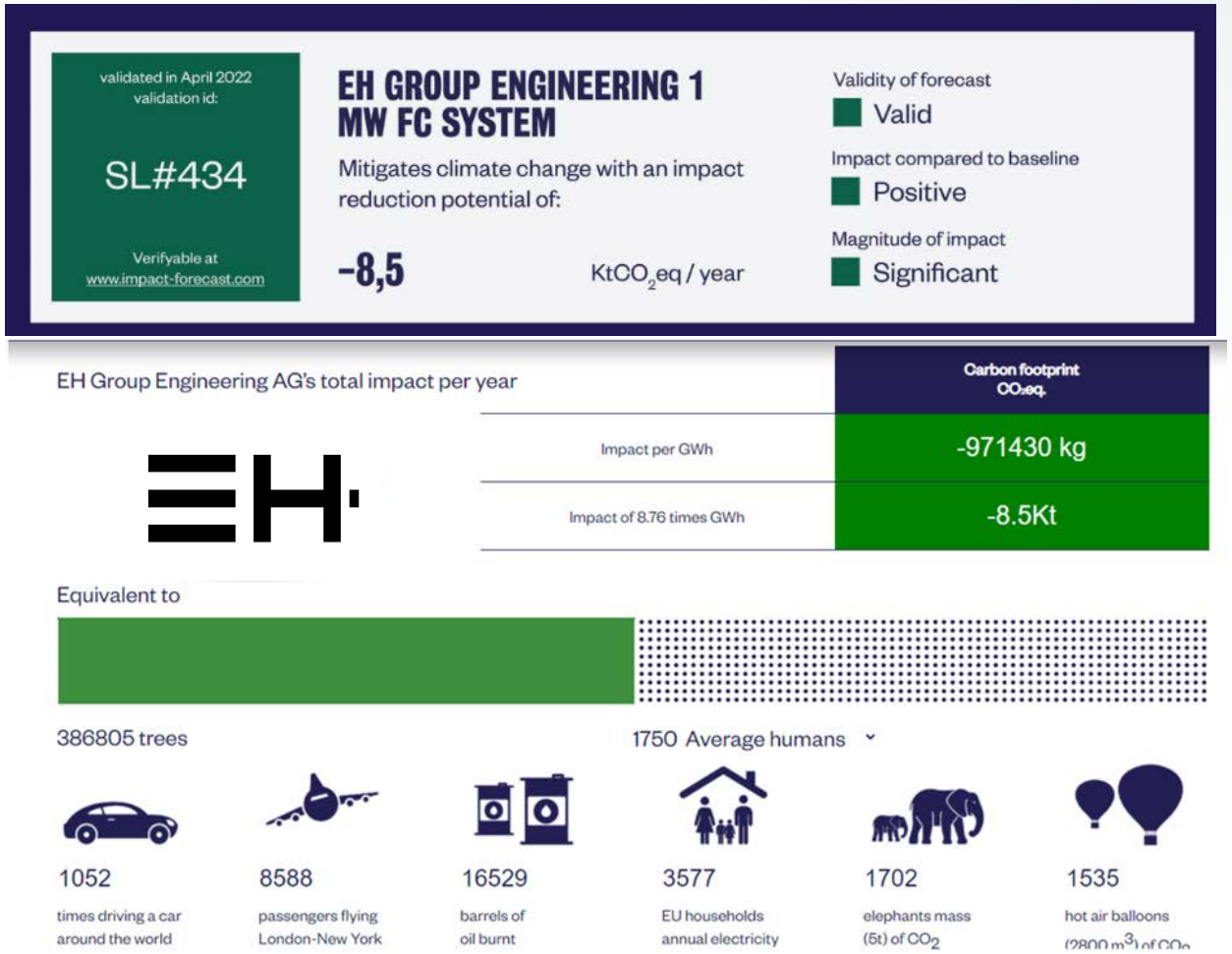




Test Protocols Defined by
DoE *(US Department of Energy)*

- *30,000 cycles*
- *Catalyst mass activity loss*
- *Electrochemical surface loss*
- *Voltage decrease*

Climate Impact



Source: Impact Forecast – (https://impact-forecast.com/)

THIRD PARTY VALIDATION PROCESS

Assumptions:

- 1MW Fuel Cell System
- Powered with GREEN HYDROGEN
- 1 year of power output

RESULT:

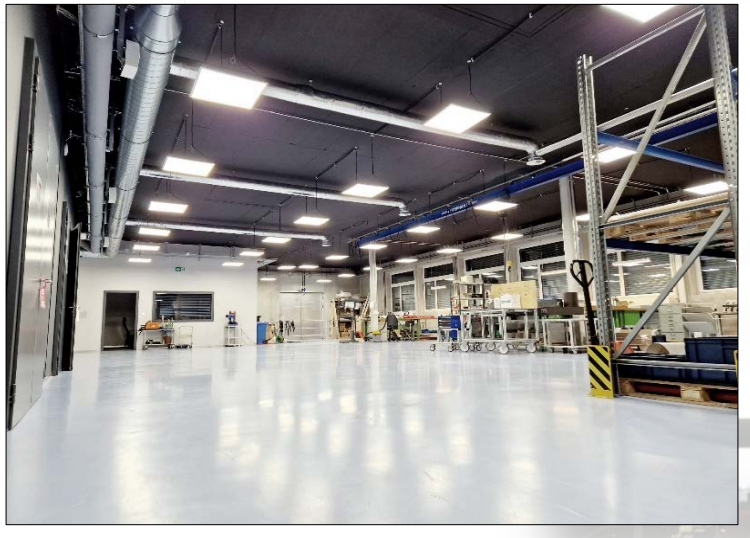
8,500 tons of CO_2eq avoided

Facilities





- Multiple test bench facilities to 300kW
- Dedicated Hydrogen Supply
- Testing labs & Production facilities
- 2000m^2 of customized lab space



Leadership Team



Dr Mardit Matian
- Founder/Director
- PhD - Imperial College London
- 20+ years fuel cells & hydrogen production
- Technical lead



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



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



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



Partners

Scientific Advisory Board



Dr 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

Senior 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

Selected Investors, Clients & Partners:

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Confédération suisse
Confederazione Svizzera
Confederaziun svizra

European Innovation Council

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