

# HORIBA, CREATING SOLUTIONS FOR TOMORROW'S CHALLENGES



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**HORIBA**

# Our Business Segments

# HORIBA

Automotive  
Test Systems



Process &  
Environmental



Medical



Semiconductor



Scientific



Measurement is at the heart of HORIBA!



# Providing Solutions Across the hydrogen value chain from R&D to applications, including industrialization and manufacturing

## Research and Development on Materials

- Technologies for characterization at macro-, micro- and nano-scales
- Laboratory systems for performance test of fuel cells and stacks
- Partner for R&D national and international projects
- Application laboratories open to researchers



## Manufacturing Process Control

- End-of-line full testing
- Quality control of materials and on-line characterization tools
- Full link with Manufacturing Execution Systems (MES)



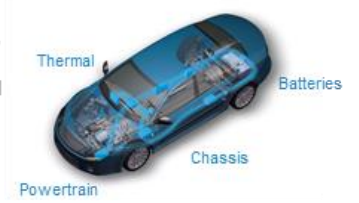
## Gas Management

- H<sub>2</sub> quality control and standards compliance from production to fueling stations. Precise and safe measurement of impurities
- H<sub>2</sub> concentration measurement
- H<sub>2</sub> detection in testing system
- Durability of storage materials



## Solutions for Testing

- Reducing development cycle with the help of a complete test facility providing a safe, efficient, optimized, and integrated testing experience
- Wide range of test bed types for fuel cell powertrain integration
- Durability and performance testing
- H<sub>2</sub> ICE engine test bed
- H<sub>2</sub> fuel flow measurement



## Engineering and Consultancy

End-to-end powertrain system development, optimization, vehicle integration and validation service for H<sub>2</sub> powered vehicles, thanks to advanced model-based design techniques.

- Benchmarking and performance target setting
- System architecture definition
- Modeling and performance simulation
- Design and components selection
- Thermal and energy management control
- Powertrain and vehicle prototype building
- Component, system and vehicle level testing
- Validation and certification





# HYDROGEN & FUEL CELL SOLUTIONS

Scientific Analysis

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# Scientific Products for Fuel Cells







# HYDROGEN & FUEL CELL SOLUTIONS

Test & Manufacture

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# Test Products Overview

## Turnkey laboratory and testing environments

### Fuel cells

- PEM, SOFC
- BoP components
- R&D + Durability

### Electrolysers

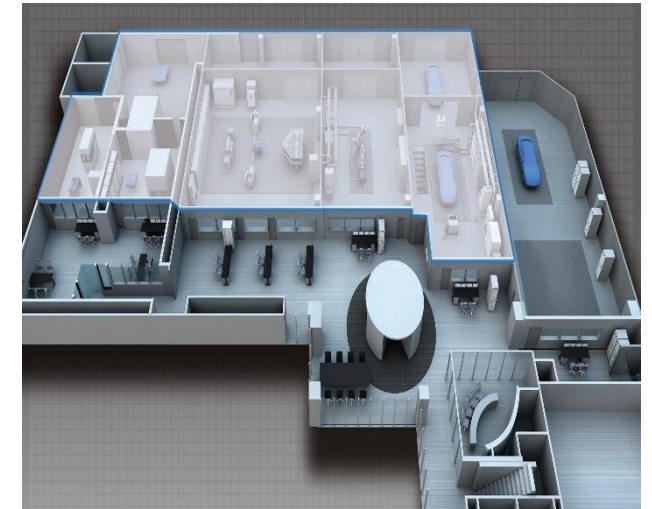
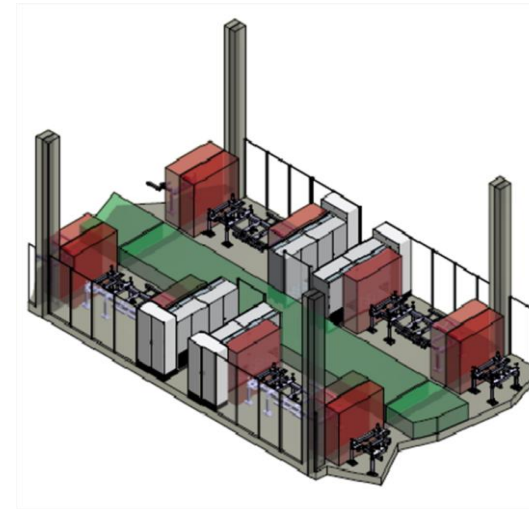
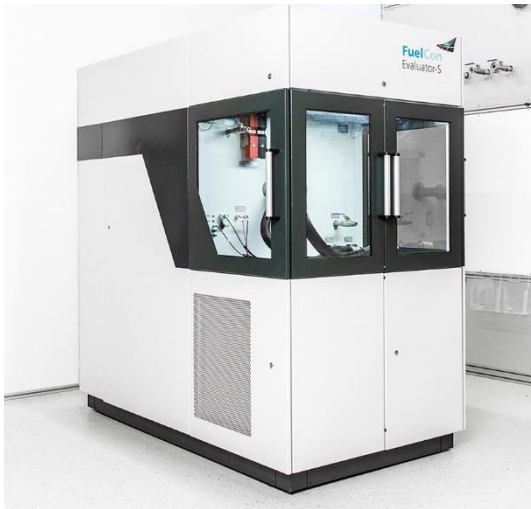
- PEM
- SOEC
- R&D + Durability

### End of Line

- Integrated Line Testing
- Automated
- Quality Assurance

### Turn-key Facilities

- Facility Design & Build
- Evaluator Equipment
- Safety Management





# HYDROGEN & FUEL CELL SOLUTIONS

Hydrogen Impurities

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# The Need to Ensure Fuel Quality



Reference number  
ISO 14687:2019(E)

Hydrogen fuel cell-powered electric vehicles offer great potential for clean, carbon-neutral transportation. However, contaminants originating in the hydrogen supply chain can damage fuel cells as well as increasing overall pollution.

The **ISO 14687:2019** standard provides acceptable limits for impurities within hydrogen fuel and the necessary sampling methodology needed to ensure fuel delivered to vehicles meets these requirements.



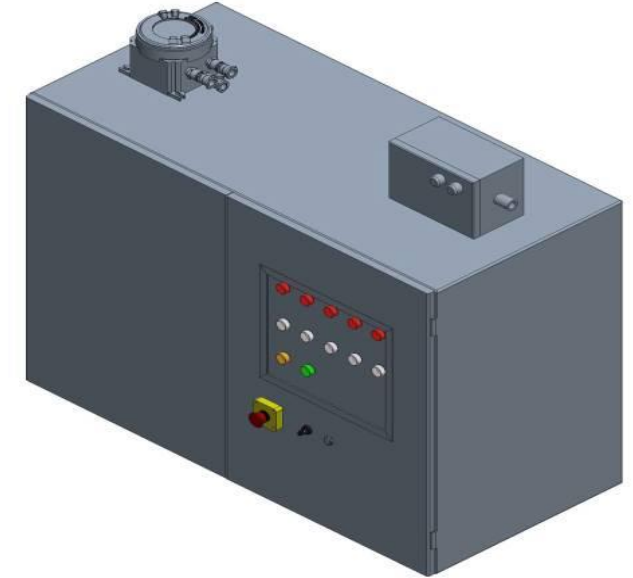
## Measuring Purity – Current Status

Currently only a few laboratories, including NPL, can provide full testing to ISO 14687:2019. This requires collection of hydrogen, ideally at the dispensing nozzle, transport of pressurised containers to the laboratory site and its analysis. Even in the fastest scenario this can take days to provide results.

# The Future – On-Line Monitoring

NPL and HORIBA are developing an online hydrogen fuel quality monitoring system that will trigger a warning when any impurities that could damage a fuel cell reach critical levels.

This innovative and low-cost solution is a significant improvement over current best practice. HRS operators will be notified immediately online if there is a problem with the hydrogen they are selling and act accordingly.



## Roadmap to Rolling Out this Technology

NPL and HORIBA are now leading a project to develop a prototype demonstrator online monitoring system that can be tested at partner hydrogen refuelling facilities to prove the capability of the hardware.



Independent expertise provided by  
**Imperial College  
London**  
Consultants







# HYDROGEN & FUEL CELL SOLUTIONS

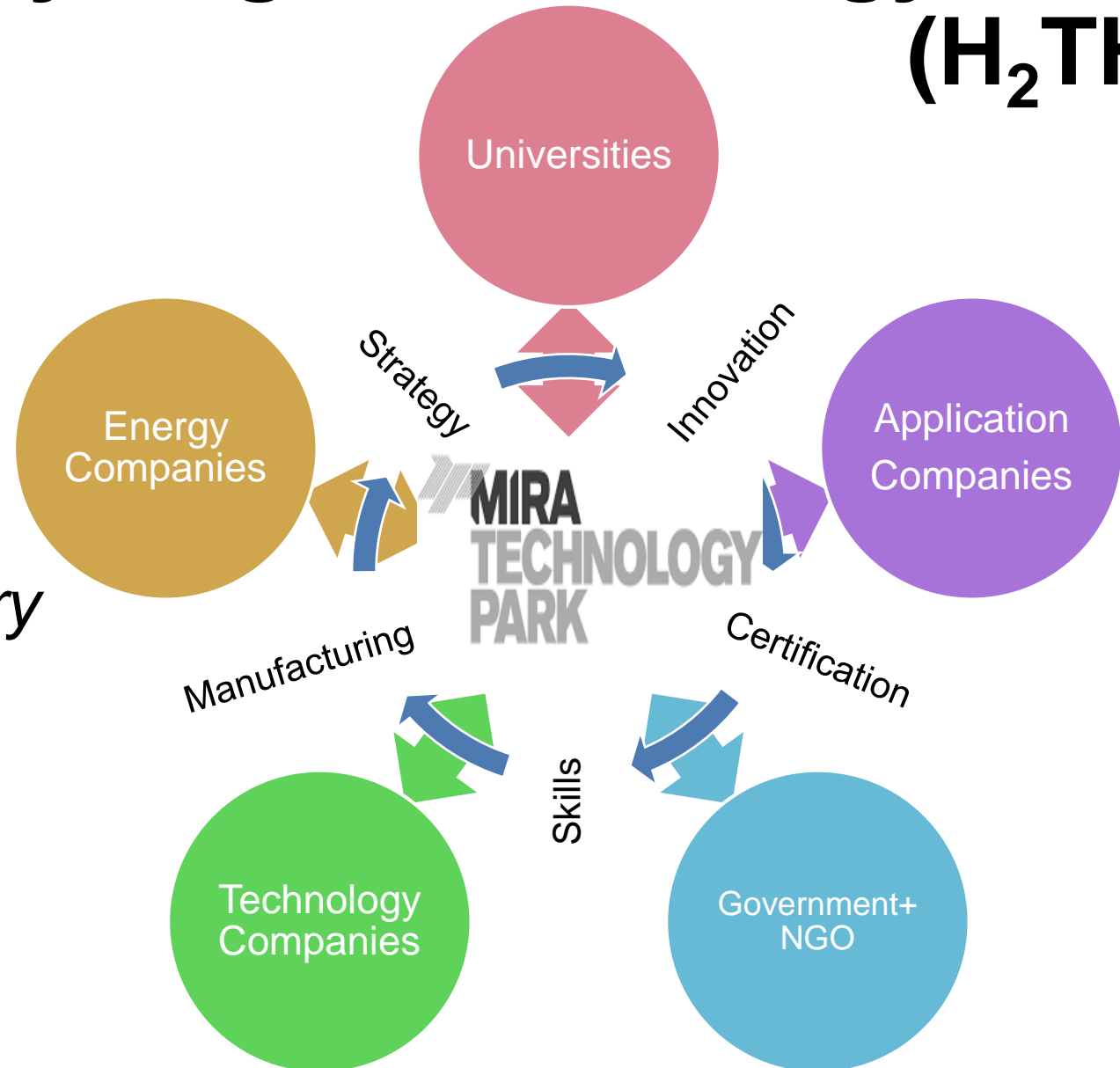
Introducing The UK's Hydrogen Technology Hub

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# UK's Hydrogen Technology Hub (H<sub>2</sub>TH)

*Focus;*

1. *H<sub>2</sub> Production & Storage*
2. *Integrated Energy Systems*
3. *H<sub>2</sub> Combustion*
4. *Fuel Cell Electrochemistry*
5. *Stationary & Mobility Applications*





# H<sub>2</sub> Technology Hub - Our Vision

*To create a thriving UK Hydrogen location developing technologies to accelerate the large-scale adoption of zero-emission green Hydrogen in the energy and automotive sectors.*



# Octopus Hydrogen & MIRA Technology Park, partner to power clean mobility revolution

- ❑ Octopus's green hydrogen infrastructure to support the world's fastest-growing cluster of next-gen mobility companies
- ❑ Octopus Renewables to develop solar array for feeding Green Hydrogen production
- ❑ Hydrogen refuelling forecourt to support growing community of hydrogen technology businesses
- ❑ Green hydrogen infrastructure combined with HORIBA MIRA's facilities, specialist engineering and measurement products provide a catalyst location for new H2 technology eco-systems.



# Octopus Hydrogen & MIRA Technology Park, partner to power clean mobility revolution

- ❑ 5x 150kW electric vehicle chargers
- ❑ 2x 300kW electric vehicle chargers
- ❑ 1.1MW electrolyser producing 300kg of Green hydrogen
- ❑ 350bar Hydrogen Refuelling Station
  - Supporting;
    - ✓ Trucks
    - ✓ Buses
    - ✓ Cars
- ❑ Hydrogen distribution multiple cylinder unit
- ❑ 7MW solar array
- ❑ 435kg total onsite storage





# HYDROGEN & FUEL CELL SOLUTIONS

H<sub>2</sub>GVMIDS Project

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# H2GVMids helping the Midlands make the transition to hydrogen powered HGVs



## Feasibility Study

The H2GV project is based around the development of a feasibility study.

The study will examine:

- A design for a 44t HGV including a detailed analysis of the fuel requirements and fuel efficiency
- Modelling of logistics routes across the Midlands in collaboration with logistics organisations
- A plan for the optimal distribution of hydrogen refuelling stations, capacity requirements and a plan for the generation of hydrogen with both on- and off-site options
- An evaluation of the skills required to underpin a hydrogen freight programme
- A map of Midlands-based supply/value chains to identify gaps and opportunities

### The Partners

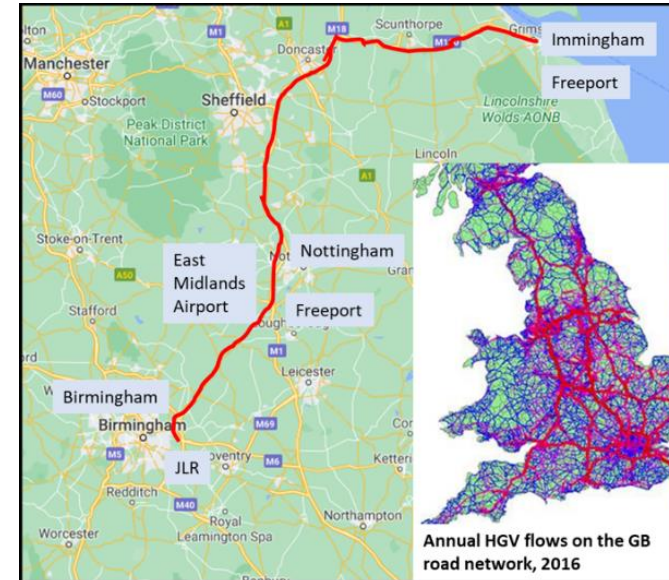


# H2GVMids helping the Midlands make the transition to hydrogen powered HGVs



## Work package 1:

- ❑ WP1a: Develop 44t FC HGV vehicle target performance requirements
- ❑ WP1b: Develop 44t FC HGV vehicle glider-based concepts
- ❑ WP1c: Evaluation of FC vehicles in the market and glider-based solutions against vehicle target performance requirements



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**MIRA**



**Innovate UK**



Omoshiro-okashiku  
Joy and Fun



Danke

Grazie

ありがとうございました

Dziękuję

Tack ska du ha

Σας ευχαριστώ πάρα πολύ

**THANK YOU**

ขอบคุณครับ

Obrigado

Большое спасибо

Cảm ơn

Merci

धन्यवाद

شُكْرًا

நன்றி

Terima kasih

谢谢

Gracias