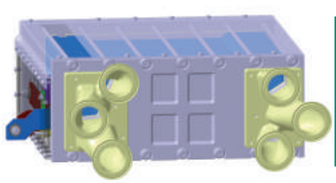
INSPIRE CONTEXT

Most of the world's leading vehicle manufacturers now have significant hydrogen-powered fuel cell vehicle (FCV) development programmes, and the general public can enjoy high performance, emissions-free driving from FCVs. However, FCV deployment in this first wave of commercialisation will likely be counted in levels of 10's of thousands for the next few years until the early 2020s. Greatly accelerated growth in the market for FCVs to a noticeable level of penetration of the overall vehicle market is projected to occur from 2025 onwards. Critical to these projections is the implementation of the next generation of improved fuel cell technology and manufacturing processes to further improve performance over the fuel cell engine lifetime and reduce cost - down towards the headline target for the fuel cell stack of €50/kW.



Project INSPIRE is charged with the development, manufacturing and implementation of new stack component technology, including catalysts, membranes, gas diffusion layers and metallic bipolar plates, that can meet this challenging stack cost target.

INSPIRE

A Significant Enabler for FCV Market Growth from the Early 2020s

PROJECT COORDINATOR

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CONSORTIUM

Johnson Matthey, the speciality chemicals and sustainable technologies company; and a global supplier of MEAs for PEM fuel cells, leads the consortium and coordinates the project activities; **and Pretexo** provides project management support. Other major European fuel cell component suppliers **SGL Carbon and DANA Power Technologies** are developing novel designs for the gas diffusion layer and bipolar plates respectively, whilst academic partners **CNRS Montpellier, VTT Technical Research Centre of Finland Ltd, Technical University of Munich, Technical University of Berlin** and **University of Freiburg (IMTEK)** are working on the next generation electrocatalysts, catalyst layer structures and membranes. The renowned global automotive company **BMW Group** is setting out the stack requirements and assembling the MEAs and bipolar plates into new high power density stack designs.

INSPIRE

Integration of Novel Stack components for Performance, Improved duRability and lowEr cost

www.inspire-fuelcell.eu

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PROJECT OBJECTIVES

- Realise the potential of **new world-leading stack components** (electrocatalysts, gas diffusion layers, membranes, and bipolar plates) and integrate these into fuel cell stacks to deliver an increased automotive beginning of life power density of 1.5 W/cm² at 0.6 V.

- Demonstrate the ability of the stack to achieve over **6,000 hours** operation with less than 10% power degradation, over an operationally-relevant drive cycle.
- Provide a cost assessment study that demonstrates the stack can achieve the automotive stack production **cost below the target of 50 €/kW** for an annual production rate of 50,000 units.
- Progress the establishment of a series of new stack materials and components from laboratory demonstration to **full demonstration of scaled materials in practical fuel cell hardware under relevant conditions**, involving continued development and optimisation of the technology and demonstrating the manufacturing scalability.

INSPIRE

A High Level of Innovation Potential

TECHNICAL APPROACHES

*This industry-led project has an overall aim of bringing together the **most advanced critical PEMFC stack components** existing today and integrating these into a fuel cell that is capable of **delivering on the most challenging of the performance, durability and cost targets** required for **large-scale automotive fuel cell commercialisation**.*

INSPIRE is composed of five technical work packages (WP2 - WP6): **WP2** defines the stack and component requirements to meet the power density, durability and cost targets of the project; and coordinates the project's testing activities to ensure relevance and consistency.

The flow of technical development begins in **WP3** where catalysts of proven high kinetic activity are being further developed and down-selected, with one or possibly two leading concepts being scaled up and fed into the CCM design and development activity in WP4.

WP4 incorporates these catalysts into high performance and durable catalyst layers, optimises the ionomer and membranes and integrates these together into CCMs; these in turn feed into the stack component work package, WP5. WP4 also includes a modelling and characterisation activity to enhance the correlation between catalyst layer performance degradation and structural changes.

WP5 develops GDLs, integrates them with CCMs from WP4 to fabricate MEAs and also designs and manufactures advanced metallic bipolar plates, and delivers them to the stack development and testing activity in WP6.

WP6 designs the stacks, manufactures the housing and compression components and assembles these together with the MEAs and plates into stacks. A series of stacks is being tested to validate the performance, operational stability and durability of the integrated components.