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News

- Innovation and Industry
- Sustainable mobility
- Electrified Mobility

Through its IFPEN Transports Energie Carnot Institute, IFP Energies nouvelles (IFPEN) has just commissioned a new 210 kW test bench for fuel-cell systems on its site in Lyon.

With this experimental tool, which is the only one of its kind in France, IFPEN aims to accelerate its research into the use of hydrogen-powered fuel cells in electric vehicles, particularly for heavy road vehicles (trucks and coaches) and for the rail sector.

Using hydrogen in fuel cells: a promising solution

Using hydrogen to power a fuel cell that generates electricity is an interesting alternative to using batteries in electric vehicles. A fuel cell can be used to significantly reduce the size of an electric vehicle's battery (by up to 90%), and also has considerable benefits in terms of on-board weight, range and recharging time.

Although this solution remains complex and costly for private vehicles, it is particularly well suited to use in transport sectors that require a long range in terms of autonomy and/or a short recharging time, and notably in certain market segments such as freight trucks, long-distance coaches, off-road vehicles (construction equipment, agricultural machinery, etc.) as well as in the rail, river and sea transport sectors.

The work to be carried out on the new test bench aims to optimize the management of the energy in the fuel-cell system in the vehicle and reduce costs. To achieve this, the tests will address the durability, range, cooling, purging and operational control of fuel-cell systems.

> "Drawing on the experience we have acquired over the last ten years with battery-powered vehicles, we aim to be able to predict how fuel cells age in real-life conditions. This is a key issue for ensuring the competitiveness of this technology, and particularly for heavy-duty vehicles that can have an in-service life of tens of thousands of hours. Currently, fuel-cell systems cannot yet achieve this length of life-span," explains **Pierre Leduc, Project Manager for Electrified Vehicles and Fuel Cells.**

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Since 2019, IFPEN has been working on two hydrogen mobility solutions: the use of hydrogen in a fuel cell and in a hydrogen-powered engine. They will both have their place in the ecological transition, each one having particular applications, while the development and market roll-out will probably take longer for fuel cells. IFPEN is drawing on its acknowledged expertise in the optimization of energy systems to move forward in these two directions at the same time.

As regards the installation of the fuel-cell test bench, IFPEN drew on its extensive knowledge of both hydrogen energy and the automotive industry.

> "This test bench is a tangible example of how we are transforming R&I to serve the needs of low-carbon mobility. In concrete terms, we adapted one of our internal combustion-engine test benches to the specific characteristics of a fuel-cell bench running on hydrogen," explains **Stéphane Henriot, Head of the Battery, Fuel Cell and Energy Systems program.**

The new fuel-cell test bench is located next to the hydrogen-engine test bench installed in early 2021. Certain skills and infrastructures (hydrogen network, safety systems, etc.) are therefore shared.

The installation and implementation of this fuel-cell test bench was partly financed thanks to the support of the Carnot network.

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For more information on IFPEN Transports Energie Carnot Institute et the expertise Sustainable Mobility

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