

PRESS KIT  
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HYDROGEN FUEL CELL  
ZERO EMISSION

STELLANTIS



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## Hydrogen Fuel Cell Zero Emission by Stellantis: EDITO



Harald J. WESTER  
Head of STELLANTIS Engineering

### Zero emission mobility for people and goods

Our mission at Stellantis is to provide freedom of mobility with safe, affordable and sustainable solutions.

Stellantis Engineering intends to hold a leading role in the fields which will determine the transformation of the automotive markets:

- Race for electrification and range,
- Connectivity and artificial intelligence for smarter services and autonomous driving functions,
- Global life cycle assessment (targeting carbon neutrality).

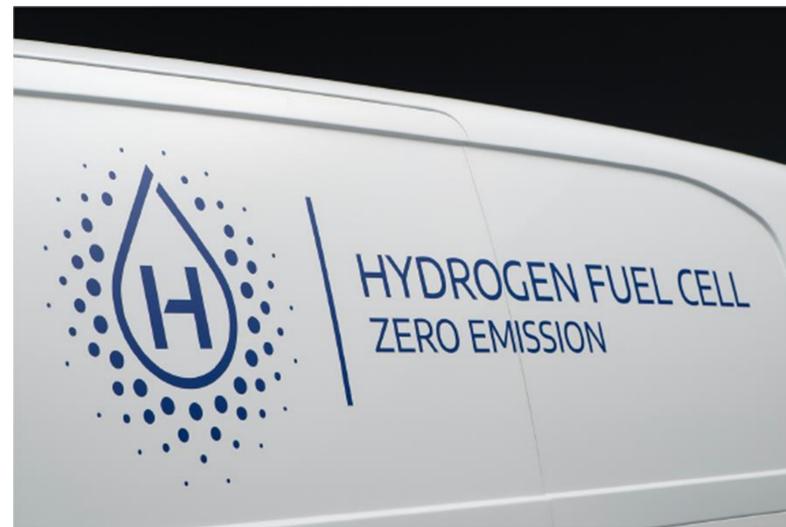
Today, we have a significant number of electrified vehicles available in the market and we are committed to bringing 10 additional models to our customers this year.

As we look further into the future, hydrogen fuel cells show great promise - especially for light commercial vehicles (LCV) - as the next level of zero emission propulsion technology. The technology will fulfill customer range expectations combined with towing and payload capacity.

At Stellantis, we believe that light commercial vehicles zero emission offers shall meet all customer demands and user profiles, to ensure sustainable delivery activities, in line with environmental stakes.



## Hydrogen Fuel Cell Zero Emission by Stellantis: IN THE RACE FOR CARBON NEUTRALITY



Different approaches are necessary to meet all types of transportation requirements. Stellantis will accomplish this through attractive products that remain affordable to customers around the world. Beyond the electrification of powertrains, Stellantis is pursuing a broad spectrum of energy carriers and powertrain technologies. This includes hydrogen, because fuel cell electric vehicles offer a unique combination of three properties:

1. Zero emission
2. Long driving range
3. Fast refueling within 3 minutes

Hydrogen is now becoming a key energy transition pillar. In Europe in particular, large investments are planned in hydrogen and the required ecosystem, as announced recently by the European Clean Hydrogen Alliance (mentioning an investment of over 60 billions € to promote the hydrogen ecosystem).

Fuel cell technology combines hydrogen and air to provide the electricity to the electric motor. It allows us to offer a zero emission propulsion technology, complementary to the 100% battery-electric solution. Thus, we can attract new customers, in particular those who drive frequently long distances and need to refuel quickly.

Stellantis will be part of the hydrogen economy with a fuel cell electric LCV as the first step.



## Hydrogen Fuel Cell Zero Emission by Stellantis: DRIVEN BY CUSTOMER NEEDS

In LCV applications, not all the usage profiles can be covered by battery-electric propulsion. Indeed, for commercial needs, LCV customers are asking for:

- Zero emission long range solutions, taking into account the fact that a vast majority of these vehicles operate in sub-urban areas as well as city centers, where zero emission solutions are becoming more essential.
- Shorter charging times because their operational model frequently does not allow for periods of unavailability during recharging.
- Maintaining payload capability to allow the transportation of large and heavy items, which is one of the primary functions of an LCV.

The Stellantis solution makes no compromise:

- Same cargo volume and loading capacity like the internal combustion engine version
- Fast refueling: 3 min
- > 400 km WLTP range (certification pending)





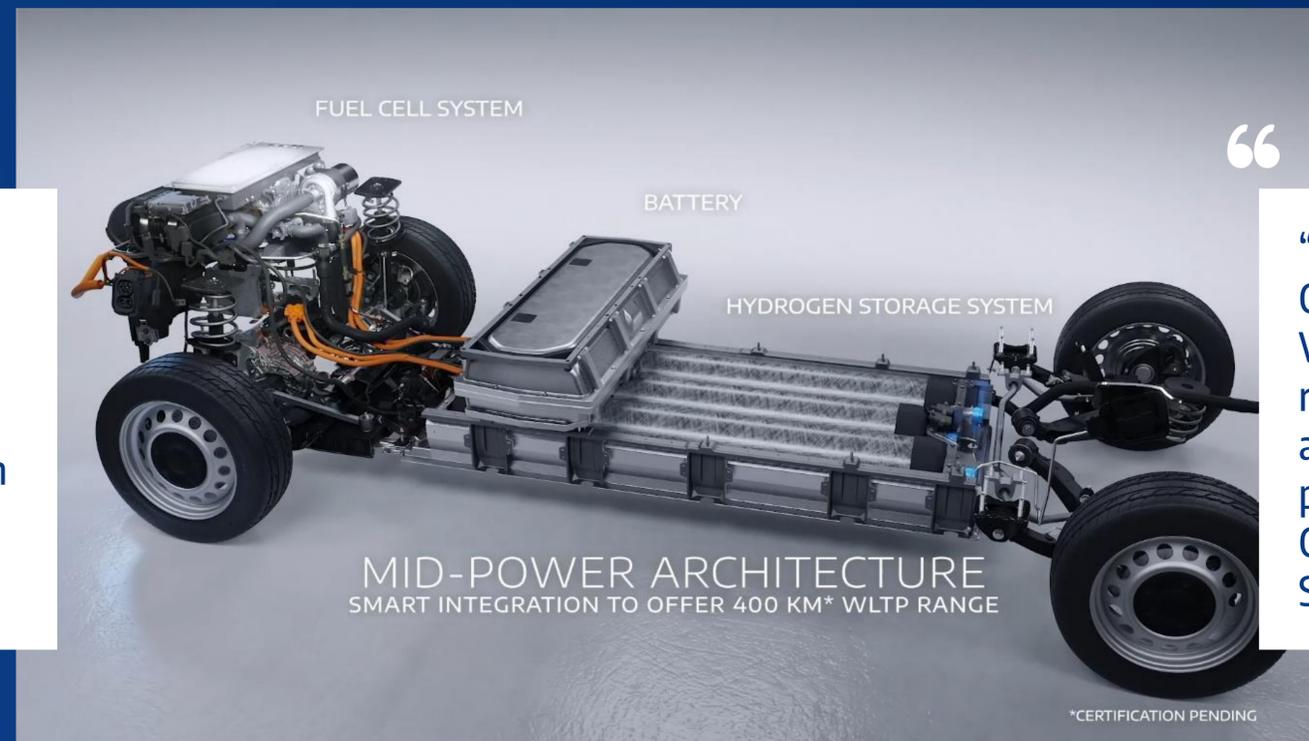
## Hydrogen Fuel Cell Zero Emission by Stellantis: DRIVEN BY CUSTOMER NEEDS

In order to meet LCV customers' requirements, we designed a tailor-made mid-power fuel cell system architecture:

- To offer a range of more than 400 kilometers (certification pending), a refueling time of only 3 minutes, in combination with energy recovery capacity and plug-in capability, we designed a mid-power architecture fuel cell system. This solution combines the advantages of both hydrogen and battery technology.
- To preserve the payload capacity, all fuel cell propulsion system's components had to be integrated outside the cargo space. Also, the system is integrated into our current LCV electrified platform to enable a minimum amount of change between the full battery-electric platform and the hydrogen version.
- Our plug-in fuel cell electric LCV is developed in our global Center of Competence Hydrogen & Fuel Cells located in Rüsselsheim, Germany. For the development of the two main systems, the fuel cell stack and the hydrogen storage system, we have entered into strategic partnerships with Faurecia and Symbio.

A tailor-made solution:

- Mid-power architecture
- Carry-over from BEV platform
- Strategic partnerships



“We chose our existing medium vans Citroën Jumpy, Peugeot Expert and Opel Vivaro as the base vehicle. This enabled rapid adaptation with smart investment and fast integration of our existing production processes.”  
Carla GOHIN - Research & Innovation Senior Vice President – Stellantis





## Hydrogen Fuel Cell Zero Emission by Stellantis: MID-POWER ARCHITECTURE

### What is a fuel cell?

By combining hydrogen and air in the presence of a catalyst, a fuel cell generates electricity to drive an electric motor, with water vapor as the only product.

So, unlike batteries, the fuel cell is an energy converter, not a storage device.

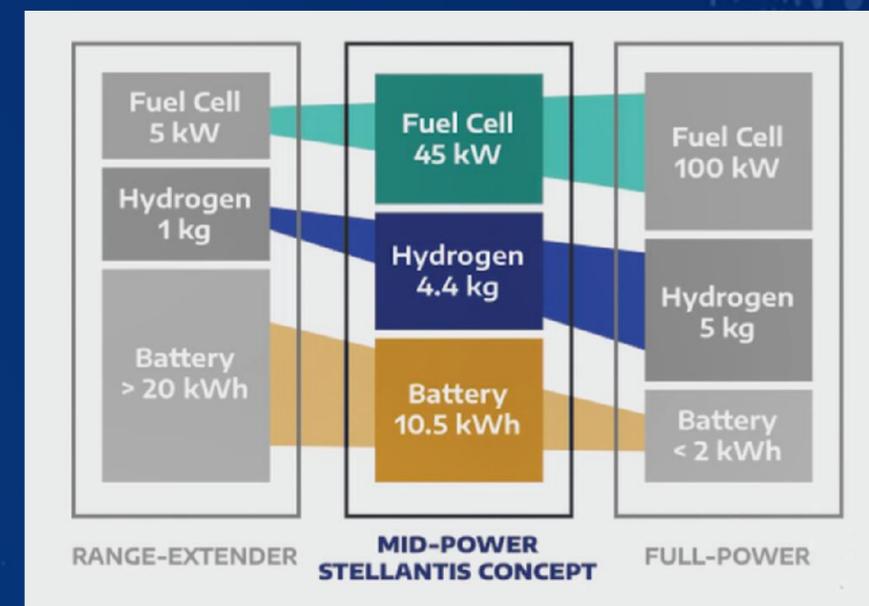
Different options are possible to define the configuration of a fuel cell electric vehicle architecture. The extremes are:

- A full-power fuel cell system in which a large fuel cell represents the main propulsion source under all operating conditions. This requires a large and powerful fuel cell and a small battery.
- A range extender system which is a battery-electric vehicle with a large battery and an additional small low-power fuel cell that extends the range of the vehicle by providing power to the battery. However, when the battery is empty, the fuel cell won't be able to provide enough power to propel the vehicle. Only a limp-home functionality at low speed is possible.

Given the customer requirements, we have chosen an intermediate concept – between full-power and range-extender.

The mid-power architecture we use offers advantages in terms of:

- Packaging
- Performance
- Durability
- Cost





## Hydrogen Fuel Cell Zero Emission by Stellantis: MID-POWER ARCHITECTURE - BENEFITS

What are the advantages of our mid-power plug-in hydrogen fuel cell electric vehicle?



First, it enables smart packaging compared to the full-power system.

Since a mid-power fuel cell is also mid-size, the whole system can be integrated under the hood of the production battery-electric LCV. To provide the hydrogen to the fuel cell system, we replaced the propulsion battery of the battery-electric vehicle by a hydrogen storage system consisting of three tanks.

This solution converts the battery-electric LCV into a fuel cell electric LCV without any modifications to the body and thus, without any impact on cargo space or payload. At the same time, the vehicle is capable of providing more than 400 kilometers of driving range in the WLTP cycle (certification pending).



## Hydrogen Fuel Cell Zero Emission by Stellantis: MID-POWER ARCHITECTURE - BENEFITS



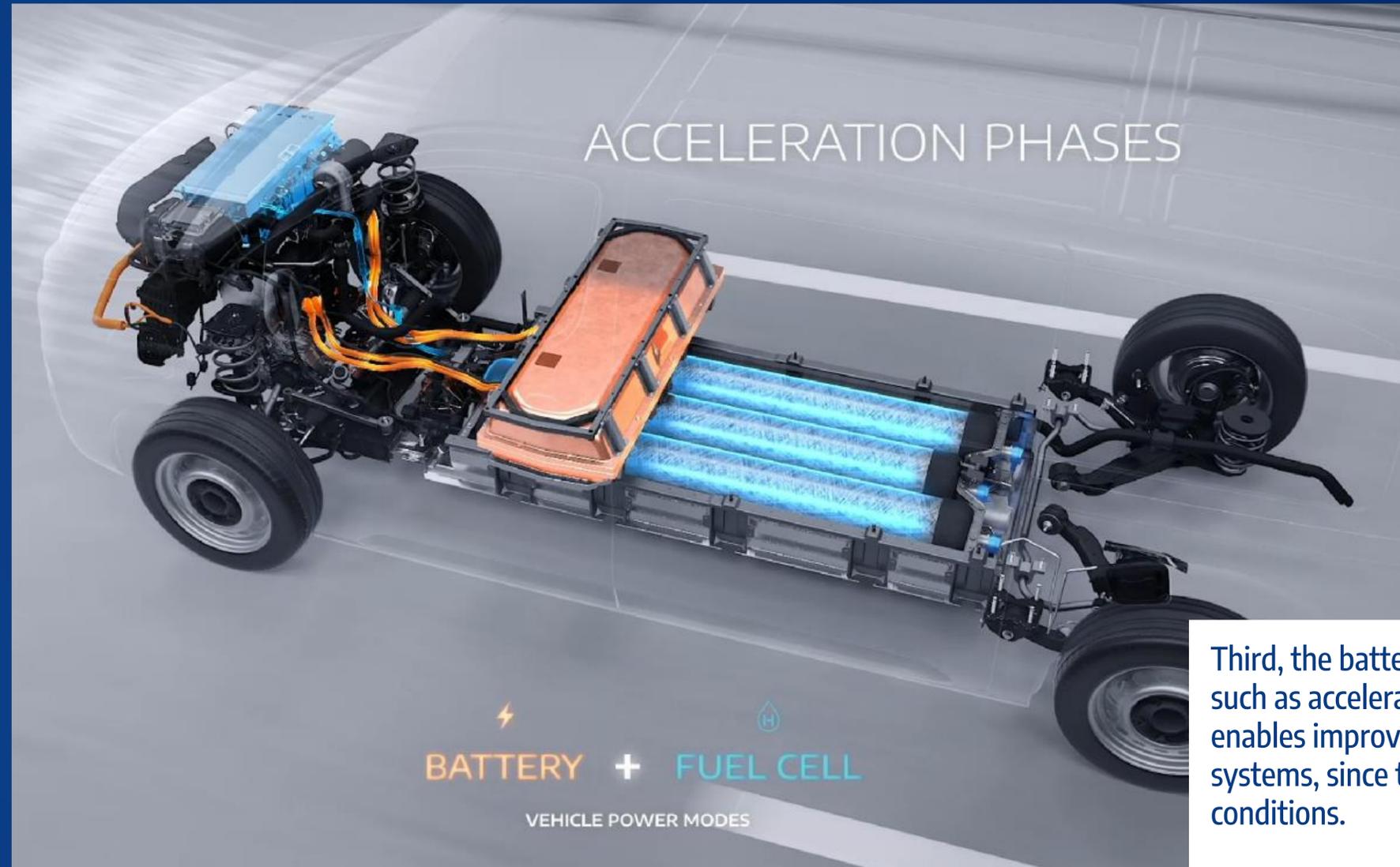
Second, compared to a range-extender system, there is no compromise with a mid-power system in terms of performance.

The fuel cell system is capable of providing enough power for continuous highway speed.

When required, peak power is provided by the battery located under the front seats. The battery is a carry-over component from our existing plug-in hybrid electric vehicle program.



## Hydrogen Fuel Cell Zero Emission by Stellantis: MID-POWER ARCHITECTURE - BENEFITS



Third, the battery covers power requirements for conditions such as acceleration, but also during start-up and first mile. This enables improved durability when compared to full-power systems, since the fuel cell system can run at optimum operating conditions.

In addition, the battery enables regenerative braking – the greatest benefit to hybrid systems. Also, the plug-in capability offers the opportunity to recharge the battery externally when needed, providing pure battery-electric range of 50 km.



## Hydrogen Fuel Cell Zero Emission by Stellantis: STRATEGIC PARTNERSHIPS

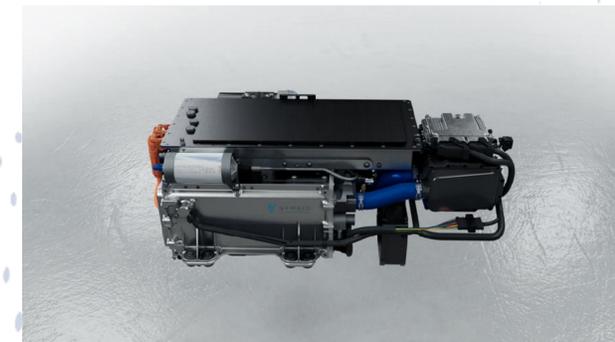
For the development of the two main system components, which are the fuel cell stack and the hydrogen storage system, we have entered into strategic partnerships with Faurecia and Symbio. These companies are currently developing these components at best-in-class level. In a spirit of effective collaboration, these partnerships enable us to offer a zero-emission vehicle that fully meets our customers' needs.



Faurecia develops, supplies and assembles the hydrogen storage systems for Stellantis' vehicles. With three high-pressure homologated (R134/EC79) tanks at 700 bars that carry a total of 120 liters of hydrogen per vehicle, Stellantis' light commercial vehicle will have a zero-emission range of more than 400 kilometers (certification pending). Faurecia has worked with Stellantis to optimize the system's design as well as its integration in order to offer a best-in-class weight/performance ratio. The hydrogen storage systems are produced at Faurecia's French facilities.



Stellantis and Symbio have worked together to enable a mid-power architecture offering the best of two worlds in terms of zero emission mobility technologies for Stellantis' light commercial vehicles. Building on more than 10 years of experience, Symbio has designed and developed a powerful, compact, and reliable fuel cell system. Together, Symbio's fuel cell system and Stellantis' battery system enable high peak power, fast refueling, and much greater range than with a battery-only solution. The fuel cell system is manufactured at Symbio's facility in Lyon region (France).





## Hydrogen Fuel Cell Zero Emission by Stellantis: ASSEMBLY PLAN

Assembly of our plug-in fuel cell electric LCV is done at the Opel Special Vehicles (OSV) facility in Rüsselsheim, Germany, where also Stellantis' global Center of Competence Hydrogen & Fuel Cells is located.

The fuel cell system is mounted entirely in the engine compartment on top of the existing electric propulsion system to which it supplies the electricity.

The additional battery providing dynamic peak power and regenerative braking has been adapted from our plug-in hybrid electric vehicle program. It is placed under the seats in the passenger compartment.

The 700 bar hydrogen tank system providing hydrogen to the fuel cell is placed underneath the vehicle where the traction battery is located in the battery-electric version.

The tanks can be filled with hydrogen via a specific filler neck, located at the fuel door normally reserved for diesel applications. Integrating the components of the entire fuel cell propulsion system as described maintains the same cargo space as in the internal combustion engine version.

After being assembled, the pre-production vehicles are ready for test and validation on our proving grounds and public roads.

The main subsystems of the fuel cell drivetrain to be integrated into the battery-electric base vehicle are:

- the fuel cell system
- the hydrogen tank system
- the high-voltage battery



Pilot workshop - Operators training

By the end of 2021, our new zero emission LCV will be produced on the assembly line of OSV.



## Hydrogen Fuel Cell Zero Emission by Stellantis: AN ARISING ECOSYSTEM SUPPORTED BY PUBLIC AUTHORITIES

“If we want carbon-neutrality by 2050, we need electric vehicles, and we need hydrogen vehicles. Above all, we need to innovate.

We will be there to support the offer: vehicles R&D and manufacturing, as well as hydrogen production and distribution. We will be there to support the demand, with more incentives for buyers.

And we will be there to support the national development of fueling stations, with local hydrogen hubs.

By 2030, we’re investing 7 billion euros in hydrogen, with two priorities: producing green hydrogen, and developing mobility. I know we need to do more for light commercial vehicles. And we will do more.”

Jean-Baptiste DJEBBARI, Transports French Minister



“Today, this fuel cell electric vehicle of Stellantis takes center stage. I am proud to say that we could make 5.6 million euros in funding available for the development of this light commercial vehicle as part of the German National Hydrogen Strategy. In the Ministry of Transport alone, we have 1,6 billion euros available for this strategy. We must bring hydrogen technology to the road now. This requires key projects, in particular in the commercial vehicle sector. We have to put the hydrogen strategy into practice and in that sense, I wish your project every success. These vehicles will help us achieving our National Hydrogen Strategy goals, and the commercial vehicle sector is the right place to start.”

Andreas SCHEUER, German Federal Minister of Transport and Digital Infrastructure



## Hydrogen Fuel Cell Zero Emission by Stellantis: 20 YEARS OF EXPERIENCE

Stellantis has more than 20 years of experience in all areas of hydrogen and fuel cell vehicle technology.

The know-how ranges from systems engineering, hydrogen storage and refueling, controls and calibration, up to prototype builds and testing a demonstration fleet. We have developed several generations of fuel cell electric vehicles, with different architectures, pioneering in fuel cell system integration, cold-start performance as well as 700 bar hydrogen storage and standardized refueling.

Technological hurdles had to be overcome and also awareness, understanding and agreement had to be achieved among all stakeholders involved – be it the auto industry, oil, gas, energy companies as well as governmental bodies.

“

“For the first time in more than 100 years of automotive development, hydrogen and fuel cell technology has brought us far beyond the automobile. Today, hydrogen is seen as the central element of a future integrated and efficient energy system – free of fossil fuels. As an energy carrier, hydrogen will connect the areas of power generation, heat supply, industry and transportation.”

Dr. Lars Peter THIESEN - Manager Hydrogen & Fuel Cell Deployment Strategy – STELLANTIS

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### Technological challenges resolved over last 20 years:

- Hydrogen storage
- Refueling
- Performance (including cold-start)
- Safety
- Reliability / Durability





## Hydrogen Fuel Cell Zero Emission by Stellantis: REMAINING CHALLENGES

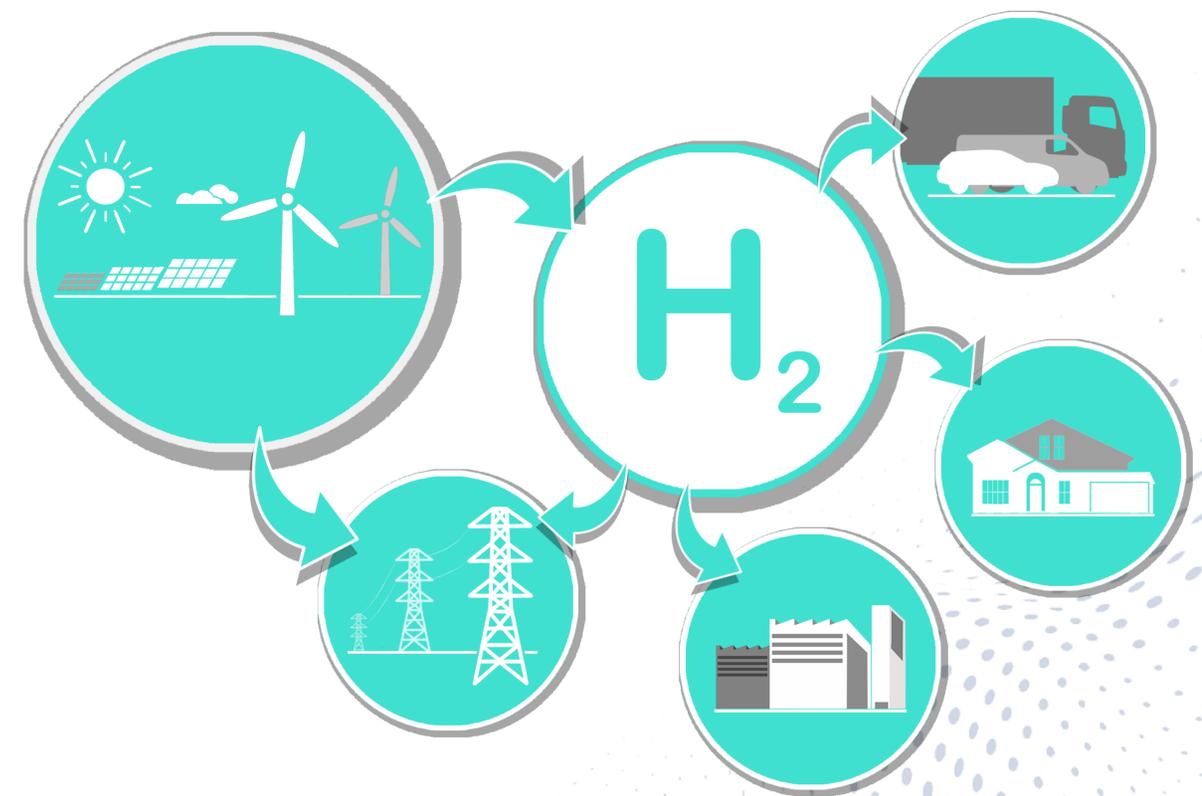
At present, only four challenges remain:

**1** Full-scale production of green hydrogen at economically viable cost. This goal is the focus of the European and national hydrogen strategies.

**2** Nation-wide networks of hydrogen filling stations, as it is the case in Germany, with a basic nation-wide coverage established, operated by H2Mobility. Appropriate programs are planned in other countries as well. In general, however, investment in hydrogen refueling infrastructure needs to be increased.

**3** Integration of the fuel cell system into the vehicle platform. Our light commercial vehicle presented today shows a smart and innovative approach, with the focus on maximizing customer value.

**4** Cost reduction, by focusing on economies of scale.





## Hydrogen Fuel Cell Zero Emission by Stellantis: PROVISIONAL TECHNICAL DATA



### Dimensions:

Length	
L2 version / L3 version	4959 mm / 5306 mm
Height	
L2 version / L3 version	1965 mm / 1975 mm
Width	2204 mm (with external mirrors)
Wheelbase	3275 mm
Trunk space	
L2 version / L3 version	5.3 m <sup>3</sup> / 6.1 m <sup>3</sup>
Load length	
L2 version / L3 version	2512 mm / 2862 mm
Load width	1628 mm
Load height	1397 mm
Curb Weight	
L2 version / L3 version	1952 kg / 1975 kg
Turning circle	12.4 m
Payload	1000 kg
Towing capacity	1000 kg

### Hydrogen storage system:

Type	3 type IV CGH2 vessels
Operating pressure	70 MPa
Capacity	4.4 kg
Refueling time	3 minutes

### Fuel cell stack:

Type	Proton Exchange Membrane (PEM)
Power	45 kW

### Battery system:

Type	Lithium-ion
Power	90 kW
Energy content	10.5 kWh
Possible charging power	11kW maximum
Charging time (empty --> full)	~ 60 minutes

### Electric propulsion system:

Type	3-phase permanent magnet synchronous motor
Power (Eco Mode)	60 kW
Maximal Power	100 kW
Maximal Torque	260 Nm

### Performance:

Top speed	120 km/h (130 km/h peak)
Acceleration (0-100km/h)	15 seconds
Range (WLTP)	> 400 km (certification pending)
Operating temperature	-20°C / + 45°C



## Hydrogen Fuel Cell Zero Emission by Stellantis: THE START OF AN INNOVATIVE ZERO EMISSION JOURNEY



Now you know more about this world premiere of our latest propulsion technology in the LCV market.

The hydrogen version of our successful medium vans will be a key asset in the promising development of the hydrogen ecosystem, including the transportation sector.

And the first vehicles will be delivered before the end of 2021!

First step: for the European market, the vehicles will be sold by Peugeot, Citroën and Opel, available for B2B customers with two lengths (medium & large) and left-hand drive.

The Stellantis' hydrogen adventure is starting NOW.

We look forward to sharing the PHYSICAL LIVE EXPERIENCE of driving these vehicles with you very soon.





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