Large Scale Demonstration of H2 fueled HD Trucks with High Capacity Hydrogen Refueling Stations (HRS)

The project aims at demonstrating at least 15 mid or heavy-duty (19+ tons) trucks in total, used for long-haul traffic and in interurban areas.

The trucks should fulfill the following requirements:

- The powertrain should be based on hydrogen fuel cells and electric motors;
- The truck should integrate a fuel cell system from 85 to 300 kW (net power), depending on the truck size and type of use;
- Availability > 90% of the operation time (excluding preventive maintenance time);
- The truck consumption target in kg of H2 / 100 km should be defined in the proposal;
- The expected Gross Vehicle Weight Rating (GVWR) should address the 19 to 44 tons Gross Combined Weight Rating (GCWR) truck segment;
- The FCE truck should be designed to meet end-users' needs and therefore should be able to perform the same tasks as the equivalent diesel truck, notably assure a one-day operation with one refueling or two refueling when a mid-day refueling is feasible;
- For standardization reasons, the hydrogen tanks should be based on an existing standard (e.g. 350 and/or 700 bar, liquid hydrogen storage systems;
- The range of the trucks should be sized according to the end-users' needs; it is however, typically expected to be in the range of 400 to 1000 km autonomy between refuelings;
- The hydrogen consumption should be provided and monitored according to the delivery routes profile.

Each site should demonstrate a fleet of minimum 4 FCE trucks and each of the related refueling station should have the adequate capacity to supply the hydrogen. Existing stations, or upgrades thereof, would be prioritized. In addition, the hydrogen production and delivery to the refueling station should reduce the FCE trucks CO2 emissions by at least 50%, as compared to the emissions of the equivalent diesel trucks, calculated on a well-to-wheel basis. The necessary trucks refueling protocol put in place should be made available to the FC and H2 community in order to log and share the experience gained.

The proposal is expected to contain minimum three different demonstration sites in at least two different countries, with a minimum of 15 trucks in operation during the project. As the focus is on long-haul, the number of trucks >26 tons should represent minimum 80% of the total.
The trucks should be operated for minimum two years (minimum of 30 000 kilometers per truck and per year), including the time to maintain and repair the trucks.
The TRL for trucks at the start of the project should be 6 and the project should aim to reach a TRL of 8 at completion.
While the operation costs that are specific to the FCE technology are considered eligible, the costs incurred by the operation, similar to the ones for the equivalent diesel solution (typically driver costs or non FCE-specific maintenance), are not eligible.
Some actors are positioning themselves to develop FCE trucks, whether being in the USA or in Europe (eg. Scania/ASKO, COOP/Swiss Hydrogen, VDL/Colruyt). In the USA we can mention the Project Portal from Toyota, Nikola trucks, Kenworth or Loop Energy. It is thus of outmost importance that Europe moves also quickly on this and the consortium should demonstrate how the proposed solution is competitive with regards to solutions mentioned here above, but also identify in which conditions the operation of the trucks could be continued after the end of this publicly funded project.
Any safety-related event that may occur during execution of the project shall be reported to the European Commission's Joint Research Centre (JRC) dedicated mailbox JRC-PTT-H2SAFETY@ec.europa.eu, which manages the European hydrogen safety reference database, HIAD.
Test activities should collaborate and use the protocols developed by the JRC Harmonisation Roadmap (see section 3.2.B ""Collaboration with JRC – Rolling Plan 2018""), in order to benchmark performance of components and allow for comparison across different projects.

The maximum FCH 2 JU contribution that may be requested is EUR 12 million. This is an eligibility criterion – proposals requesting FCH 2 JU contributions above this amount will not be evaluated.
A maximum of 1 project may be funded under this topic.
Expected duration: 4-6 years

In the context of a global reduction of emissions from the transportation sector, the decarbonization of the mid and heavy-duty (HD) truck fleets, such as those used for the transportation of goods from logistic centers to urban-based retail outlets but also those used in long-haul services represents a major challenge.
For the various needs linked to payloads and urban/suburban access requirements, the 19 to 44 (gross weight) tons range is meeting the expectations of the truck market.

Furthermore, urban areas are increasingly facing air quality degradation through, amongst other contributors, delivery trucks equipped with ICE technologies and emitting local pollutants, e.g. particulates, NOx and noise. Consequently, an increasing number of cities across Europe have decided or are in the process of deciding, to restrict access to urban areas of diesel fueled HD vehicles. Alternative truck technologies such as battery and fuel cell technology offering adequate performance must therefore be developed and implemented to replace the diesel trucks and alleviate the emissions problems. For the required daily ranges and payloads in question, hydrogen can offer a very promising zero emission alternative. Opening the scope to 19 tons class allows the vehicles to enter the most restricted urban areas.

The project should contribute to developing a new business model on FCE trucks that has never been demonstrated beforehand, therefore specific dissemination actions should be foreseen to promote the project, share the experience gained and present the lessons learned.

The final target is to operate zero CO2 emissions, long distance transportation truck fleet, together with the refueling infrastructure and the delivery of significantly decarbonised hydrogen (according to CertifHy project recommendations [15]). As the technology is just being implemented for the first demonstration projects, the costs associated are expected to be still important. The funding in the frame of this project is meant to fill this gap with the state of the art solution. In the frame of the project, the consortium should demonstrate how this gap is filled, based on a TCO analysis.
Existing and/or new hydrogen refueling stations will be heavily utilized thanks to the large hydrogen consumption expected for the type of truck (30 to 50 kg H2 estimated per refueling) and therefore generate a quicker learning curve that will help the deployment of the hydrogen infrastructure.

Footnote [15]: http://www.fch.europa.eu/project/developing-european-framework-generation-guarantees-origin-green-hydrogen

Type of action: Innovation Action
The conditions related to this topic are provided in the chapter 3.3 and in the General Annexes to the Horizon 2020 Work Programme 2018-2020 which apply mutatis mutandis.

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