ZEFER

ZERO EMISSION FLEET VEHICLES FOR EUROPEAN ROLL-OUT

Project ID	779538
PRR 2024	Pillar 3 – H_2 end uses: transport
Call topic	FCH-01-6-2017: Large scale demonstration of hydrogen refuelling stations and fuel cell electric vehicle (FCEV) road vehicles operated in fleet(s)
Project total costs	EUR 13 676 254.48
FCH JU max. contribution	EUR 4 998 843.00
Project start - end	1.9.2017–31.8.2023
Coordinator	Environmental Resources Management Ltd, United Kingdom
Beneficiaries	Air Liquide Advanced Business, Air Liquide Advanced Technologies GmbH, Air Liquide Advanced Technologies SA, Air Liquide France Industrie, Bayerische Motoren Werke AG, Breath, Centre of Excellence for Low Carbon and Fuel Cell Technologies, DRIVR Danmark AS, Element Energy, Element Energy Ltd, Environmental Resources Management France, Green Tomato Cars Ltd, Hype, ITM Power (Trading) Ltd, Air Liquide Belge, Linde AG, Linde GmbH, Mayor's Office for Policing and Crime (UK), Toyota Danmark AS, City of Paris

https://zefer.eu/

PROJECT AND GENERAL OBJECTIVES

The ZEFER project aimed to demonstrate the feasibility of hydrogen mobility from a technical and financial perspective, and hence to accelerate the roll-out of vehicles and hydrogen refuelling infrastructure across Europe. Through the project, the ZEFER partners aimed to:

- deploy 180 fuel cell passenger cars in fleet operations across three major cities in Europe: Paris, Copenhagen and London;
- test the performance of fuel cell electric vehicles (FCEVs) in high-mileage fleets, travelling millions of kilometres over the project period;
- prove that the fleet operation of FCEVs is a viable business model for high-mileage fleets in urban areas, bringing potential savings to the fleet operator when the externalities of choosing a zero-emission vehicle over an incumbent diesel vehicle are considered;
- gather data on the performance of FCEVs as high-mileage fleet vehicles to provide an evidence base that these vehicles are reliable and suitable to be deployed in major cities around Europe, and across the world;
- increase the utilisation of hydrogen refuelling systems (HRSs) to demonstrate the viable business models for early HRSs supported by captive fleets;
- test the performance of today's best-in-class hydrogen refuelling station technology under significantly increased loads compared with current levels, which will help to highlight the reliability of the stations and their ability to meet the demands of a growing number of FCEVs on the road;
- communicate the benefits of FCEVs in fleet operation through the widespread dissemination of the technical and business modelling research results, targeting decision-makers to initiate conversations in local authorities and to foster the acceptance of FCEV fleets.

NON-QUANTITATIVE OBJECTIVES

- The project aimed to increase the confidence of investors and policymakers in FCEV and HRS roll-out. Analysis in ZEFER has proven that FCEVs and HRSs can meet the demands of high-mileage fleet operations. This has led to fleet operators increasing the number of FCEVs in their fleets. It has also attracted investors.
- Six out of the 15 ZEFER partners are small or medium-sized enterprises (SMEs). In particular, the three largest fleet operators are SMEs, and therefore a large proportion of ZEFER's funding (84 %) is allocated to SMEs.
- ZEFER aimed to reduce the production cost of fuel cell systems to be used in transport applications, while increasing their lifetimes to compete with conventional technologies.
- The project aimed to increase the energy efficiency of hydrogen production while reducing operating and capital costs so that the combined system can compete with alternatives on the market. ZEFER aimed to reduce the hydrogen cost at the pump. This could be achieved by providing a stable demand for hydrogen at an HRS. The project also aimed to trigger further cost reductions by creating a climate of investment in the low-cost green production systems required to drive the overall cost below this level.

PROGRESS AND MAIN ACHIEVEMENTS

- 180 FCEVs have been deployed in Paris (Hype), London (GTC and the Metropolitan Police) and Copenhagen (DRIVR).
- The ZEFER vehicles in service have been operated rigorously in everyday operation and had driven over 15 million kilometres as of August 2023.
- All HRS upgrades necessary to support the deployment of FCEVs in the project have been completed.
- HRSs in France (Air Liquide), in the United Kingdom (ITM Power) and in Denmark (Nel) had dispensed 149 000 kg of H_2 to ZEFER vehicles as of June 2023.
- The peak of number of data-reporting vehicles (104) was reached in the second quarter of 2022, thanks to the increase in vehicles through DRIVR's deployment in Copenhagen alongside Hype's and GTC's deployments.
- The project was successfully completed, with an immense dataset collected for the FCEVs and HRSs in operation.
- ZEFER contributed to increasing the awareness of the business case for FCEVs in fleet applications. Following the project, there was an increase in taxi projects in Europe.

FUTURE STEPS AND PLANS

The project has finished.

Hype continued in Paris. Hype is in the process of deploying additional vehicles in Paris with a fleet of 350 FCEVs overall at the beginning of 2024 and the objective of further expanding their operation in Paris to other European locations. The presence of these vehicles is, however, still most significant in Paris, with an associated distribution network of 26 stations to fuel the vehicles. Plans are also already in place for Hype to replicate the taxi business model in seven other cities in Europe: Le Mans, Bordeaux, Brussels, Madrid, Barcelona, Lisbon and Porto.

Clean Hydrogen Partnership
Co-funded by the European Union

PROJECT TARGETS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?	SOA result achieved to date (by others)	Year for reported SOA result
			FCEVs				
Project's own objectives	Minimum distance for vehicles	km/vehicle	90 000 (60 000 for those deployed in Copenhagen)	A strict KPI km per vehicle was hard to achieve given the challenges faced by the project, and therefore it was agreed that the average number across all ZEFER vehicles would be considered	✓	FCEVs in taxi operations in H_2ME drive on average around 45 000 km per year	2020
	Vehicle availability	%	> 98	> 99 %		> 99 %	2021
	Range	km	500	470 km in Mirai generation 1 and 530 km in Mirai generation 2		756	2020
			HRSs				
Project's own objectives	Hydrogen purity	%	99.99	99.99	✓	99.99	2020
	Level of back-to-back vehicle refuelling	number of refuelling events per hour	6	6		6	2020
	HRS availability	%	> 98	96.2 %	⚙	98	2016
	Cost of hydrogen	€/kg	10	The project pump price target of € 10 / kg has not been achieved because of the energy crisis.		10	2020

Clean Hydrogen Partnership
Co-funded by the European Union