

# ZEFER

## ZERO EMISSION FLEET VEHICLES FOR EUROPEAN ROLL-OUT



<b>Project ID:</b>	<b>779538</b>
<b>PRD 2023:</b>	<b>Panel 3 – H2 end uses – transport</b>
<b>Call topic:</b>	<b>FCH-01-6-2017: Large scale demonstration of hydrogen refuelling stations and fuel cell electric vehicle (FCEV) road vehicles operated in fleet(s)</b>
<b>Project total costs:</b>	<b>EUR 13 676 254.48</b>
<b>Clean H<sub>2</sub> JU max. contribution:</b>	<b>EUR 4 998 843.00</b>
<b>Project period:</b>	<b>9.1.2017–31.8.2023</b>
<b>Coordinator:</b>	<b>Element Energy Limited, United Kingdom</b>
<b>Beneficiaries:</b>	ERM France, Drivr Danmark A/S, Air Liquide Advanced Technologies GmbH, Linde GmbH, Toyota Danmark AS, Element Energy, Green Tomato Cars Limited, Breath, Air Liquide France Industrie, Air Liquide Belge, Hype, Air Liquide Advanced Technologies SA, ITM Power (Trading) Limited, CENEX – Centre of Excellence for Low Carbon and Fuel Cell Technologies, Air Liquide Advanced Business, Ville de Paris, Linde AG, Bayerische Motoren Werke AG, Mayor's Office for Policing and Crime (London)

<https://zefer.eu/>

### QUANTITATIVE TARGETS AND STATUS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?	SoA result achieved to date (by others)	Year of SoA target	
Project's own objectives	<b>FCEVs</b>							
	Min. distance for vehicles	km/vehicle	90 000 (60 000 for Copenhagen deployment)	62 900		FCEVs operated as taxis in H2ME drive an average of ~ 45 000 km per year	2020	
	Vehicle availability	%	> 98	> 99	✓	> 99	2021	
	Range	km	500	470 in Mirai gen 1 and 530 in Mirai gen 2	✓	756	2020	
	<b>HRSs</b>							
	HRS availability	%	> 98	94.3		98	2016	
	Hydrogen purity	%	99.99	99.99	✓	99.99		
	Level of back-to-back vehicle refuelling	refuelling events/hour	6	6	✓	6	2020	
	Cost of hydrogen	€/kg	≤ 10	10	✓	10		

### PROJECT AND OBJECTIVES

ZEFER aims to demonstrate viable business cases for fuel cell electric vehicles (FCEVs) in high-mileage fleet applications. The project aims to deploy 180 FCEVs into taxi, private-hire and emergency-service operations in three major European cities in which the operational benefits and zero-emission credentials of FCEVs can be monetised. The vehicles have used existing hydrogen refuelling station (HRS) networks to increase local utilisation levels and improve the business case for HRS operators. As of December 2022, the 180 vehicles had amassed 11.3 million km, and the prediction for the end of the project, in August 2023, is 13.9 million km.

### NON-QUANTITATIVE OBJECTIVES

- ZEFER aims to develop comprehensive lessons from the deployment project. Public deliverables have been produced, covering topics such as customer acceptance, the business case for FCEVs and the technical performance of HRSs and FCEVs under high utilisation.
- The project aims to increase investor and policymaker confidence 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.
- Of the 15 ZEFER partners, 6 are small and medium-sized enterprises (SMEs). In particular, the three largest fleet operators are SMEs, and therefore a large proportion of the ZEFER funding (84 %) is allocated to SMEs.
- ZEFER aims 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 aims to demonstrate, at utilisation levels, a significantly longer lifetime of fuel cells in FCEVs than that of those currently deployed. The bulk procurement of FCEVs is expected to reduce their costs to their lowest level to date.

- The project aims 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 aims to reduce the hydrogen cost at the pump. This can be achieved by providing a stable demand for hydrogen at an HRS. The project also aims to trigger further cost reductions by creating a climate of investment in the low-cost green production systems required to drive down the overall cost.

### PROGRESS AND MAIN ACHIEVEMENTS

- Nearly all 180 FCEVs have been deployed into everyday operation in Paris (60), London (10 in operation, 50 returned at lease end) and Copenhagen (32 in operation, 28 delivered).
- Most of the HRS upgrades have been completed, leading to improvements in the technical performance and customer experience of HRSs.
- Most deployment partners in the project have plans to scale up their FCEV fleets as a result of the ZEFER project.

### FUTURE STEPS AND PLANS

- ZEFER will complete all activities in Q2 2023.
- The project is due to be successfully completed with an immense dataset collected for the FCEVs and HRSs in operation. Public findings from the project related to better understanding how performance is affected by long-term high utilisation. Reports analysing the business case for FCEVs in high-mileage applications, and customer value propositions can be found on the project website (<https://zefer.eu/reports/>).
- ZEFER contributed to increasing awareness of the business case for FCEVs in fleet applications. There are now many FCEV taxi projects in Europe.