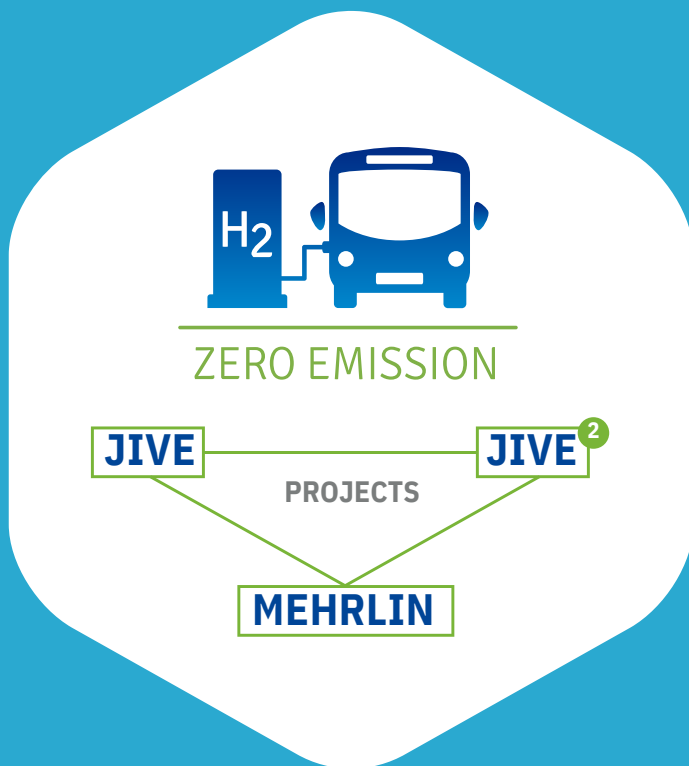




ZERO EMISSION

Towards clean public transport





Acknowledgements

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WHAT ARE FUEL CELL BUSES?

- A fuel cell bus is **an electric bus that includes both a hydrogen fuel cell and a battery pack**. The fuel cell provides all of the energy for the vehicle operation, while the batteries can provide peak power to the motors to meet rapid acceleration. Using a fuel cell in conjunction with a battery, bus performance can be optimised for any route. The batteries also provide storage for regenerated braking energy.

- The fuel cell power module onboard the bus generates electric energy through an electrochemical reaction that **produces only water and heat as by-products**; there are no harmful local emissions.

- Fuel cell buses have ranges upwards of 400km as it only takes **approximately 7 minutes to refuel**, allowing the buses to be operational for most of the day. Further, the bus **does not require any additional city infrastructure, such as overhead power lines, other than a hydrogen fuelling station**. This provides a lower initial capital at expenditure and greater operational flexibility than other low emission options.

- While most of the industrial hydrogen used in the world today is produced from natural gas (SMR), **the majority of hydrogen refuelling stations use hydrogen from low - and zero-carbon sources**, such as electricity generated from renewables. Further, carbon capture and storage offer routes to greening SMR.
- The fuel cell electric bus is a viable zero-emission alternative that offers **significant environmental benefits, such as air quality improvements, noise reduction and greenhouse gas emission reductions**, with the potential to decarbonise public transport when hydrogen is generated from renewables fully.

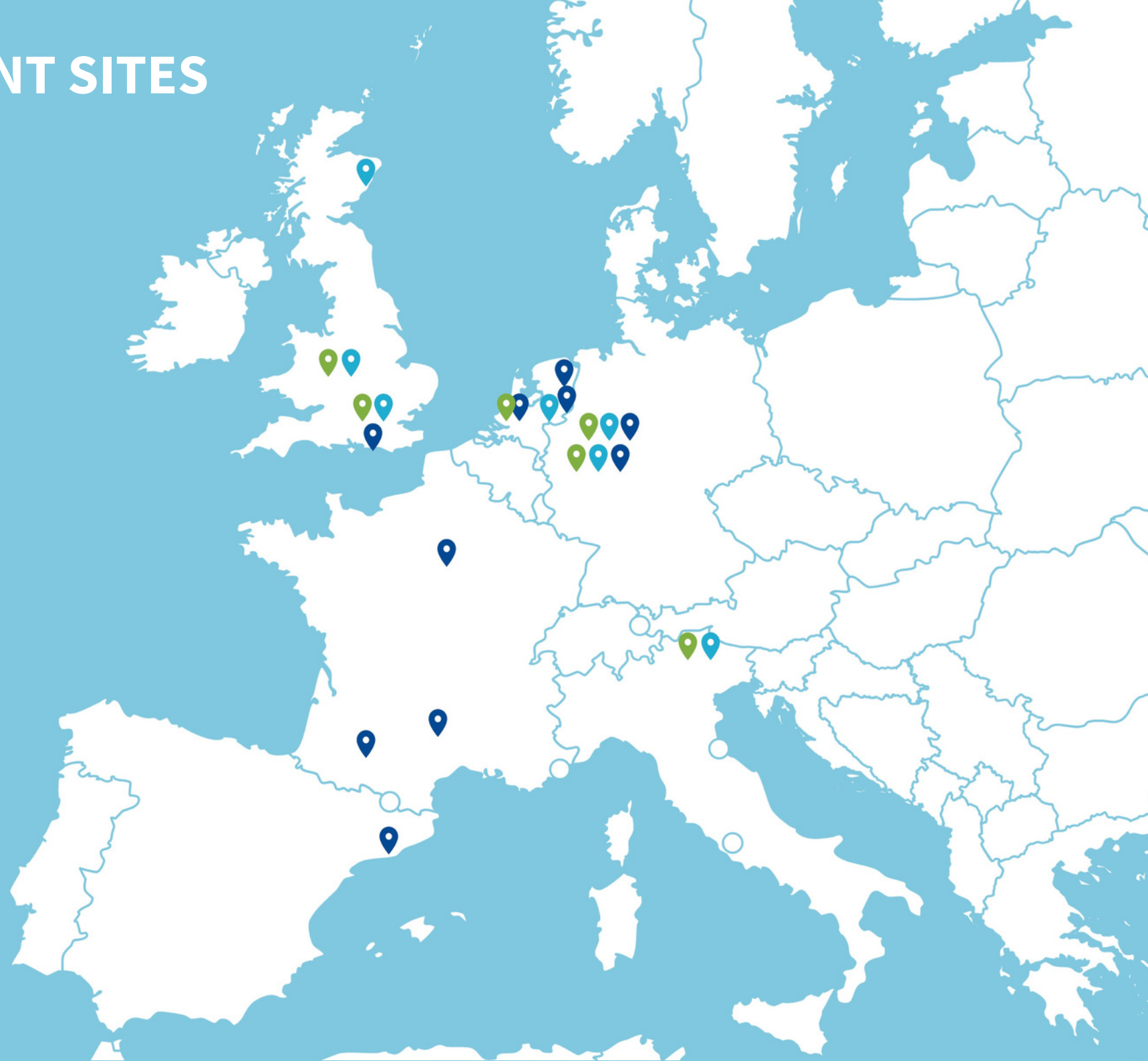


DEPLOYMENT SITES

Aberdeen, UK	
Auxerre, FR	
Barcelona, ES	
Birmingham, UK	 
Bolzano, IT	 
Brighton, UK	
Cologne, DE	  
Emmen, NL	
Gelderland, NL	
Groningen, NL	
London, UK	 
Pau, FR	
South-Holland, NL	 
Toulouse, FR	
Wuppertal, DE	  



*Hydrogen Refuelling Station



JIVE AND JIVE 2 PROJECTS

The JIVE and JIVE 2 projects, which started in January 2017 and January 2018, **will deploy over 300 zero-emission fuel cell buses and associated infrastructure (under the MEHRLIN project) in 16 European cities and regions by 2022 - the largest deployment in Europe to date.**

The buses will be deployed in cities and regions in France, Germany, Italy, the Netherlands, Spain, and the UK.

Objectives

- **Achieve a maximum prize of €650k (JIVE) and €625k (JIVE 2) or lower for a standard fuel cell bus.**
- **Demonstrate routes to achieve low-cost renewable hydrogen.**
- **Validate large scale fleets in operation and encourage further uptake, showcasing that fuel cell buses represent a viable alternative for public transport authorities,** offering the same operational flexibility as diesel buses but without the harmful tailpipe emissions.
- **Share data and best practices to support the adoption of the technology and provide evidence of the suitability of fuel cell buses for a wider rollout.**
- **Deploy large hydrogen refuelling stations and operate them at near 100% availability.**



MEHRLIN PROJECT

The MEHRLIN project will deploy seven hydrogen refuelling stations serving bus fleets in cities across Europe, in the UK, the Netherlands, Italy and Germany. MEHRLIN began in July 2016 and ended in June 2023.

The MEHRLIN project is co-funded by the European Commission's Connecting Europe Facility, and the support is managed by the European Climate, Infrastructure and Environment Executive Agency (CINEA).

Objectives

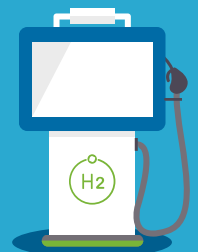
The overall objective of MEHRLIN is to **demonstrate a financeable demand-led business model for hydrogen refuelling stations** in order to further boost the deployment of hydrogen as an alternative fuel in the EU.

The project involves the **real-life trial of large hydrogen refuelling stations in seven different locations.**

By building and operating these stations, the MEHRLIN project will not only contribute to the expansion of hydrogen refuelling station infrastructure in Europe but will also provide data on the technical and economic performance of refuelling stations under real conditions and high load and daily utilisation. Using this data, MEHRLIN will undertake an **assessment of the financing case for hydrogen refuelling stations using a demand-led business model** to facilitate the deployment of hydrogen as an alternative fuel in the EU. This business model will be defined through study and seminars to be carried out jointly with key finance providers.



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