hyFIVE
HYDROGEN FOR INNOVATIVE VEHICLES

# Hydrogen For Innovative Vehicles

FCHJU Grant: 621219

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# PROJECT OVERVIEW

- **Hydrogen for Innovative Vehicles**
- **Topic 1.1** Large-scale demonstration of road vehicles and refuelling infrastructure VI
- April 2014 – September 2017
- **Budget: € 38,418,137 with FCH JU contribution: € 17,970,566**
- Deploy **110 vehicles and 6 refuelling stations in 3 European regions**
- Tackle all of the final technical and social issues which could prevent the commercial roll-out of hydrogen vehicles and refuelling infrastructure across Europe.

AIR PRODUCTS · BMW · DAIMLER · elementenergy · Danish Hydrogen Fuel

GREATER LONDON AUTHORITY · HONDA The Power of Dreams · HYUNDAI NEW THINKING. NEW POSSIBILITIES. · iij · TOYOTA

ITM POWER Energy Storage | Clean Fuel · THE LINDE GROUP Linde · OMV · thinkstep · THE DANISH PARTNERSHIP FOR HYDROGEN AND FUEL CELLS

# PROJECT TARGETS AND ACHIEVEMENTS

| Status before project | MAIP target | Project Target | Current status/ achievements | Expected final achievement |
|---|---|---|---|---|
| Light Duty Vehicles (mainly cars) at 3 additional sites with 3 new stations | ~ 500 | Ambition to deploy 110 new FC passenger cars and six new HRS in three clusters across Europe | 69 vehicle orders Stations: 2 operational,2 ready end of 2015, 2 in 2016 | 100% |
| Appropriate H2 supply chain to match Transport, Stationary and Early Markets requirements. | 10 - 20% of general H2 demand should be produced via carbon free processes | >50% of hydrogen to be sourced from renewables | On-site hydrogen production via water electrolysis using renewable electricity | 100% |

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|---|---|---|---|---|
| Vehicle Operation lifetime | >2,000 hrs | min. 3,000 hrs as project target | Up to March 2015 300 hours | 80% |
| Minimum vehicle operation | 12 months or 10,000 km | 12 months or 10,000 km | Vehicles in operation for more than 4 months | 100% |
| Vehicle availability | 95% | 95% | first 6 month of the project: 99,8% | 100% |
| Hydrogen purity and refuelling process | SAE J2601 and 2719 and ISO. SAE TIR J 2799 | SAE J2601 & J2719 SAE TIR J2799 | average refuelling time of 2 min 48 sec. | 100% |

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|---|---|---|---|---|
| Availability of refuelling | 98% measured as usable operation time | 98% measured as usable operation time of the whole station | average for first 6 month 95,4% | 100% |
| HRS refuelling capacity | min. 50kg/day at start of project, | All HRS will have a capacity of >80kg/day initially and the network in each cluster will exceed the 200kg/day target | Target on track new stations in CHN 100kg/day | 100% |

# PROJECT TARGETS AND ACHIEVEMENTS

- HyFIVE is leading to considerable improvement in the state of the art for fuel cell passenger cars deployed in Europe. These vehicles are the closest to market vehicles deployed to date in Europe in terms of technical readiness and cost.

## The Consortium Focus for next year is on:

- Organising more dissemination events and test drives across the three clusters to promote the project and activities.
- Organising cluster events around the opening of the refuelling stations.
- Working on the customer experience (expectations and reality; refuelling experience; maintenance of the vehicles)
- Gathering data for both vehicles and stations and compiling public reports.

# RISKS AND MITIGATION

- **Risk:**
  - Delays in design and construction; HRS siting permitting issues
- **Mitigation:**
  - The London refuelling stations are highly modular in nature and make use of standardised equipment.
  - Delays lead to more suitable locations and valuable learning.
  - With delays in opening of the stations the vehicles are relying on the existing network of stations and/or temporary back-up solutions to ensure the smooth operation of the HyFIVE vehicles and a maximum refuelling availability across the local networks.


# RISKS AND MITIGATION

- **Risk:**
  - Inability to place vehicles with end users
- **Mitigation:**
  - The end-user identification is facilitated by the way the HyFIVE budget is structured, which allows the OEMs to offer lower cost vehicles to the end users than under previous projects.
  - The OEMs are collaborating with their local dealers and distributors to help in end user selection. These deployments will be supported by the cluster coordinators.




# SYNERGIES WITH OTHER PROJECTS AND INITIATIVES

- **Copenhagen:**

  The Malmo station is made available to the HyFIVE vehicles providing a refuelling connection between Denmark and Sweden. This will further facilitate FCEV travel along the hydrogen corridor being established as a part of the Scandinavian H2 Highway partnership.

- **London:**

  The three new HRS delivered through HyFIVE will expand the existing refuelling infrastructure to create an integrated and strategic network for hydrogen transport users in the city. HyFIVE will make use of stations deployed through CHIC, HYTEC, LHNE.

- **Southern Cluster:**

  Bolzano is one of the five cities partnering in the FCH JU-funded CHIC project by deploying five FC buses and one hydrogen refuelling station. This station, operated by IIT and capable of both 350 bar and 700 bar refuelling, will be made available to HyFIVE vehicles.

# HORIZONTAL ACTIVITIES

- **Refuelling infrastructure:**

Partners are collaborating in the development of training materials for three groups:

  - First responders – require information on how to deal with incidents at the HRS.
  - Vehicle users – require easy to use information on the fuelling procedures and specific health and safety issues around the use of unmanned HRS.
  - Technicians – involved in installing and maintaining the HRS.

- **Vehicles:**

In each of the clusters where the OEMs deploy vehicles, they will establish / adapt after-sales support infrastructure. This infrastructure will not only support the vehicles deployed in this project, but will also act as the start of the full commercial supporting service which is required for the full commercial roll-out stage.

# DISSEMINATION ACTIVITIES

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- On average members of the consortium are attending 3 large events per month and have presented the project, transmitting key messages set out in the project's Communication Plan.
- Over 40 publications in regional newspapers and over 80 online articles.


Mayor of London, Boris Johnson visits Japan and takes a ride in Toyota Mirai

The Mayor of London, Boris Johnson, today welcomed news that some of the world's most advanced new hydrogen cars are coming to London, as part of his work to pioneer the use of the cleanest, greenest technology for the future of transport and infrastructure in the capital.

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CENEX LCV 2015 – fuel cell technology receives attention at UK's biggest low carbon event

The CENEX – Low Carbon Vehicle event (LCV) is the largest event in the UK for celebrating and showcasing LCVs. Occurring annually, this year's event took place over two well attended days on September 9 and 10 at Millbrook Proving Grounds.

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Danish Government agree to run tax exemption for FCEVs to 2019

The Danish fuel cell industry is pleased with the settlement on fuel cell electric vehicles (FCEV) and battery electric vehicles (BEV) made today. The Danish industry association, The Danish Partnership for Hydrogen and Fuel Cells, commend the government (Venstre) and the engaged political parties Socialdemokraterne, Dansk Folkeparti and Det Radikale Venstre and is particularly pleased that the tax exemption for FCEVs now runs to 2019.

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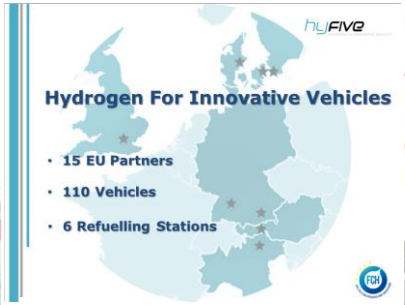
Daimler, Linde and TOTAL open 5th HRS in Baden-Württemberg

HyFIVE partners Daimler, Linde and Clean Energy Partnership (CEP) partner TOTAL are continuing their joint plans for the expansion of the German hydrogen infrastructure with the opening of a 5th hydrogen refuelling station in Baden Württemberg.





ITM Power surges after signing Toyota fuel contract
Proactive Investors UK - 19 Oct 2015
... it has signed its first fuel contract with Toyota, covering the green hydrogen fuel dispensed from the three London **HyFive** refuelling stations, ...

AirQualityNews

London set for 12 new Toyota hydrogen vehicles
AirQualityNews - 19 Oct 2015

A Peek Into The Future — Toyota Mirai
Fx Report Daily - 7 hours ago

ITM Power signs Toyota fuel deal and receives the first Mirai in the UK
gasworld - 19 Oct 2015

**Explore in depth** (91 more articles)

First drive: the hydrogen-powered Toyota Mirai
Top Gear - 16 Oct 2015
Toyota is trying to soften the blow – it has applied (decision pending) to have £15,000 knocked off that by the Government's **HyFive** grant.

# EXPLOITATION PLAN/EXPECTED IMPACT

- HyFIVE is a key aspect of the FCH JU's efforts to commercialise hydrogen technology across the transport and hydrogen production sectors.

- The HyFIVE vehicles represent a major step towards the affordable fuel cell vehicle which the sector requires and the large fleet of vehicles allows HRS operators to make investments to test a network of HRS.

- Each of HyFIVE's partners has joined the project consortium and will be investing considerable resources in the project's activities in order to exploit the project's learning for their hydrogen transport activities and ultimately to secure a stake in the emerging hydrogen and FCEV market.