

HYDROGEN FUEL: TACKLING THE INFRASTRUCTURE CHALLENGE

24TH JUNE 2015 | LONDON | LCVP ANNUAL CONFERENCE



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HGas

HGas brings together rapid response and self-pressurising PEM electrolysis into a fully integrated package.

Power-to-Gas



HFUEL

HFuel is a self-contained module suitable for refuelling hydrogen-powered road vehicles and forklift trucks.

Refuelling Stations



REFUELLING STATIONS | P2G UNITS
HYDROGEN ENERGY SYSTEMS

WHAT IS A FUEL CELL CAR?

An EV drive train that's refuelled rather than recharged

- Refuel in 3 mins
- Range 400 miles
- Managed export of energy from the grid



FUEL CELL CARS
VEHICLES | ROLL OUT

2013 | FCEV ALLIANCES

Four fuel cell manufacturers have emerged; with 8 OEM's rolling out cars

- Hyundai
- Nissan: Ford | Daimler
- Toyota: BMW
- Honda: GM



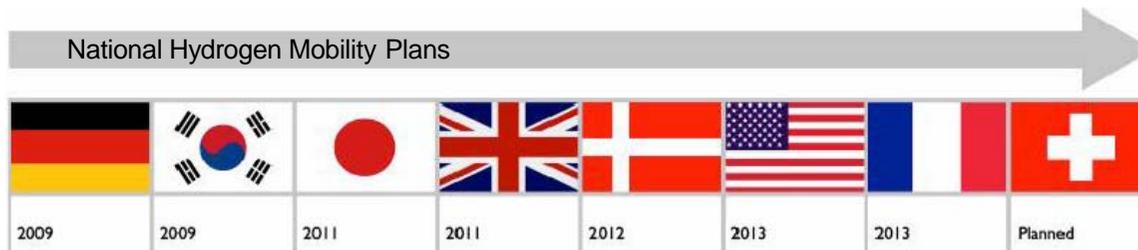
FCEV ALLIANCES
ENERGY STORAGE | CLEAN FUEL



UK H₂ Mobility

UK Government has committed £500m to ULEV

- Public consultation closed 9th January
- Industry call for evidence closed 9th January
- OLEV visited ITM Power and the CEC in California
- Initial roll out of 65 x 80kg/day stations | 50% electrolysis



| | | |
|-------------------------------------|------------------------|---|
| Air Liquide | ITM Power | BOC |
| Johnson Matthey | Toyota | Nissan |
| Daimler | Vauxhall | Hyundai |
| SSE | Intelligent Energy | Dept for Business Innovation & Skills |
| Dept of Energy & Climate Change | Morrisons | Sainsbury's |

UKH₂MOBILITY

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ITM POWER | HYDROGEN REFUELLING STATIONS

| Code | Status | Project | Location | Specification | Funding |
|---------|--------------|------------------|------------------------|-------------------|---------------|
| HRS 001 | Operating | Nottingham | M1 Nottingham | 5kg/day 350 bar | TSB (UK Gov) |
| HRS 002 | Operating | HOST | Mobile refueller | 15kg/day 350 bar | TSB (UK Gov) |
| HRS 003 | Operating | Ecoisland marine | Ventnor, Isle of Wight | 15kg/day 350 Bar | TSB (UK Gov) |
| HRS 004 | Commissioned | M1 vehicle | M1 Junction 33 | 80kg/day 350Bar | TSB (UK Gov) |
| HRS 005 | In Build | HyFive | London | 80kg/day 700 bar | FCH JU (EU) |
| HRS 006 | In Build | HyFive | London | 80kg/day 700 bar | FCH JU (EU) |
| HRS 007 | In Build | HyFive | London | 80kg/day 700 bar | FCH JU (EU) |
| HRS 008 | In Build | CHINO Hyundai | Chino, California | 100 kg/day 700bar | CEC |
| HRS 009 | In Build | Riverside | Riverside, California | 33kg/day 700 bar | CEC |
| HRS 010 | Contracts | UKH2M | London Forecourt | 80kg/day 700 bar | OLEV FCH JU |
| HRS 011 | Contracts | UKH2M | London Forecourt | 80kg/day 700 bar | OLEV FCH JU |

REFERENCE PLANT | ASSETS
HYDROGEN ENERGY SYSTEMS



Innovate UK

Technology Strategy Board

ITM Power will open a public hydrogen refuelling station in May 2015 at the Advanced Manufacturing Park, just off the M1 Motorway. The station will serve fuel cell electric vehicles and the electrolyzers will be powered by the wind turbine on site.



ON-SITE HYDROGEN PRODUCTION

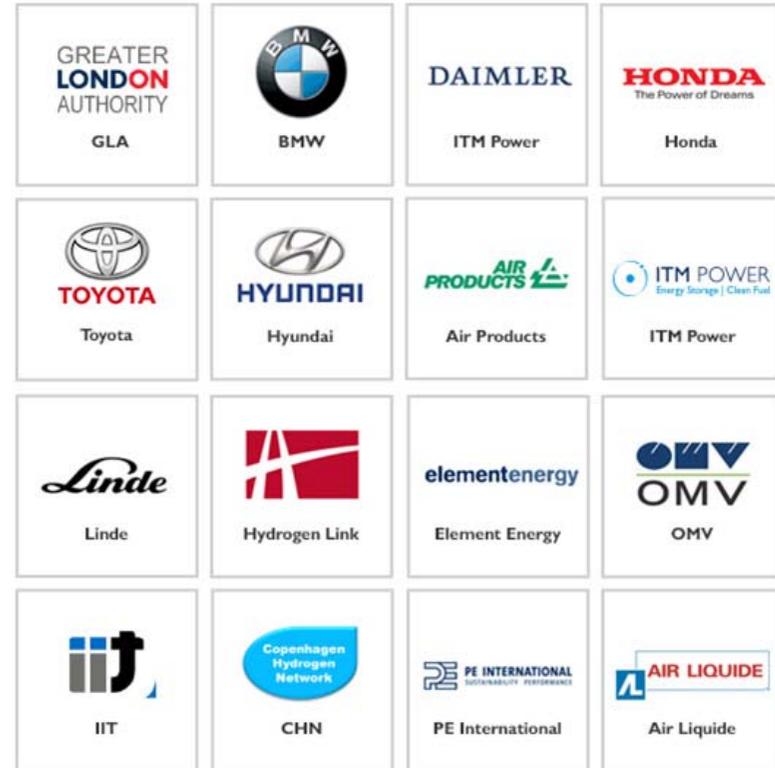
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GREATER LONDON AUTHORITY

Selected by the LHP as the 2013 HRS partner

- Funding the ITM Power 2013 JTI submission
- 100 Fuel Cell Electric Vehicles from 5 OEMs
- 3 refuelling stations in London
- Backing from the Mayor's office
- €18m total EU (JTI) funding



LONDON HYDROGEN PARTNERSHIP

LONDON HYDROGEN PARTNERSHIP

ENERGY STORAGE | CLEAN FUEL





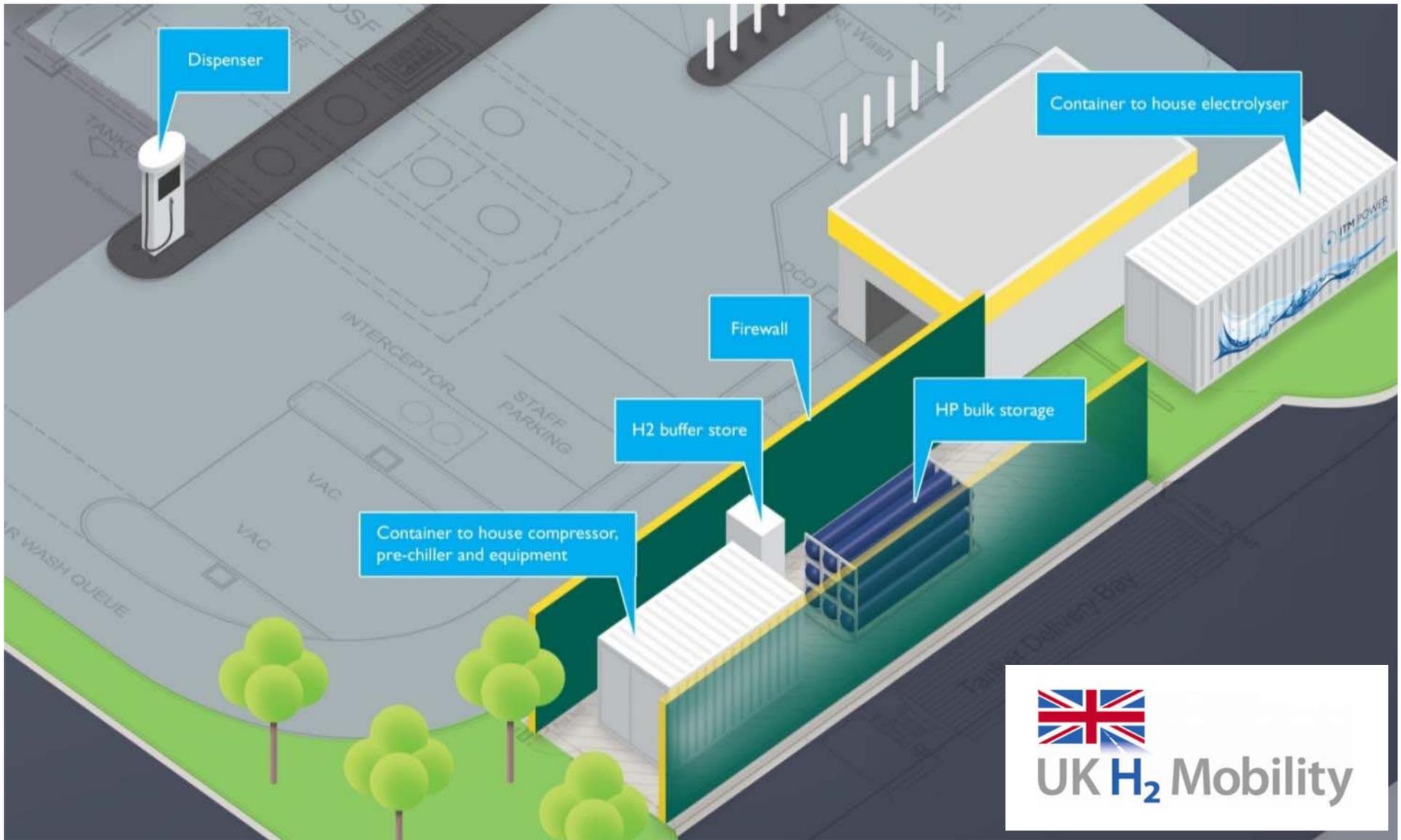
HyFive is an EU funded project which will see hydrogen stations being deployed to European cities as well as 100 fuel cell vehicles from 5 OEM's. ITM Power was awarded three stations, all of which will be 80kg/day refuelling at 700bar. These stations will be deployed in London in Q3 2015.

hyFIVE
HYDROGEN FOR INNOVATIVE VEHICLES



ON-SITE HYDROGEN PRODUCTION
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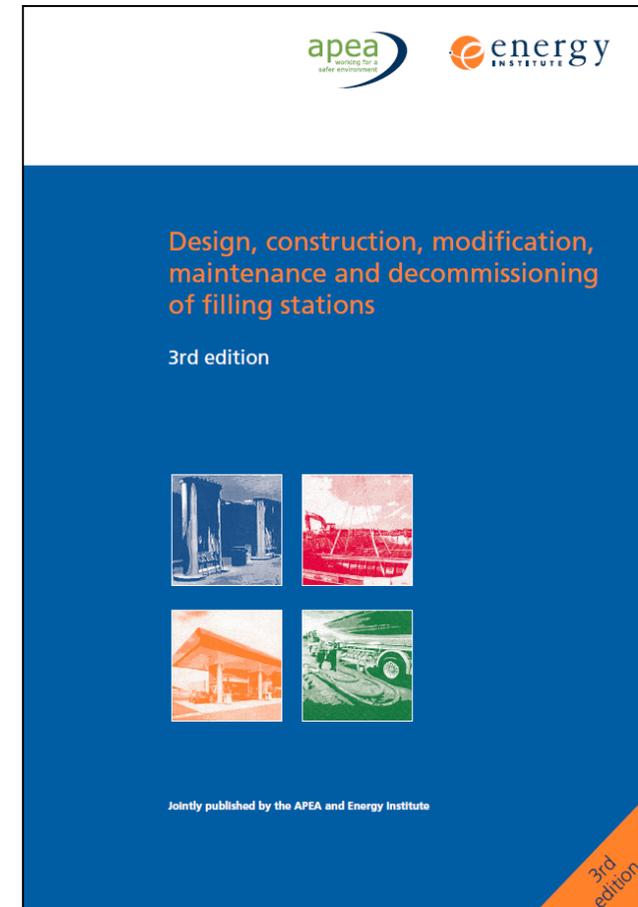
ON-SITE HYDROGEN PRODUCTION ENERGY STORAGE | CLEAN FUEL



HRS ON FUEL FORECOURTS

Progress with Forecourt Compliance

- BCGA developed CP41 – 2014: Code of Practice for HRS
- Based on international best practice, with UK relevance
- Covers best practice for hydrogen filling
- Compliance with this alone appears inadequate to get permit
- Sainsbury’s experience at Hendon
- Addendum to “Blue Book” led by Energy Institute; also involves:
- APEA, BP, Gilbarco, BCGA, London Fire Brigade and HSE



ON-SITE HYDROGEN PRODUCTION
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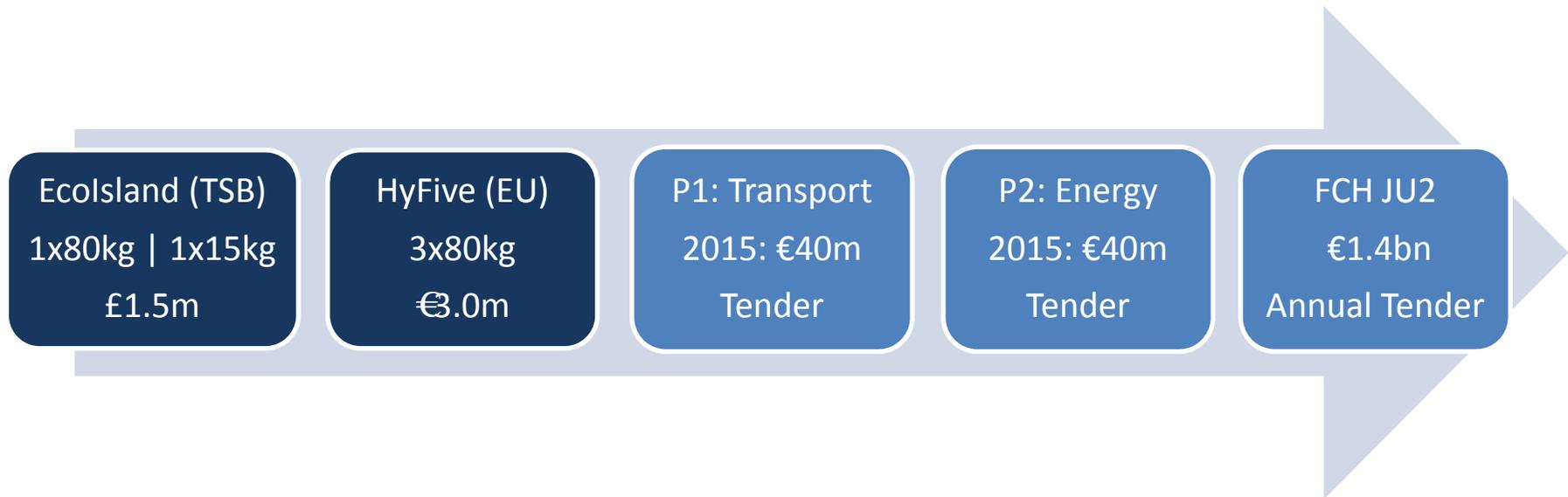


FCH JU 2: 2015



FCH budget €1.4bn over 4yrs

- Development: 100% of the total eligible cost
- Demonstrations: 70% maximum will apply for profit making entities



FCH JU 2: 2015
HYDROGEN ENERGY SYSTEMS

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Summary:

- UK is developing as an entry market for FCEVs
- Portfolio of HRS is developing | centred on London
- Future funding from OLEV | FCHJU | TenT's