UK H_2 Mobility

Communication pack

Jan 2017

Introduction – the UK H_2Mobility initiative

Section 1 – Key insights from the study phases

Section 2 – Status of UK hydrogen activity

Section 3 – Next steps

UK H_2Mobility is a joint industry-government project assessing the benefits and developing a rollout strategy for H_2 transport in the UK

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Goal

Evaluate the potential for **hydrogen as a transport fuel** and develop a **rollout strategy** that will contribute towards

- Decarbonising road transport
- Creating new economic opportunities
- Diversifying the energy supply
- Reducing local environmental impacts

UK H_2 Mobility

UK H_2Mobility followed a staged approach; partners are now working to support the first deployment of hydrogen refuelling stations and vehicles

	Dec 2011 - Dec 2012	*Jan 2013- Dec 2013*	*Jan 2014 – Dec 2015*	*Ongoing*
	Phase 1: Role of hydrogen transport in the UK	**Phase 2: Business case development**	**Phase 3: Implementation plan**	**Initial deployment phase**
Core activities	▪ Establish a robust evidence base for the role of H_2 in the UK transport sector ▪ Develop a strategy for H_2 rollout in the UK and stress test alternative scenarios to prove robustness of plans	▪ Explore a range of business models to finance a hydrogen refuelling station (HRS) rollout in the UK ▪ Identify roles and investments from each stakeholder group	▪ Refine near-term HRS rollout plans and identify key industry needs ▪ Finalise a geographic strategy for the first HRS ▪ Co-ordinate with UK and EU stakeholders	▪ Deployment of first HRS and Fuel Cell Electric Vehicles (FCEVs) ▪ Continued co-ordination of follow-on investments (supported by the UK government and EU)
End products	▪ Range of infra-structure and vehicle roll-out scenarios, including likely investments and revenues ▪ A detailed plan for structuring rollout of hydrogen vehicles and infrastructure in the UK ▪ Published Phase 1 report	▪ Refined HRS and FCEV rollout scenarios ▪ Conclusion on a workable approach ▪ Definition of the principle of a readiness project, followed by a more widespread roll-out	▪ Identification of and actions on a set of practical needs for the industry ▪ Establishment of a collaboration with SMMT and BCGA ▪ Support of several EU-UK collaborations and funding applications	▪ Now developing new approaches to expand the roll-out from this initial phase
Status	☑	☑	☑	☐

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Phase 1 quantified the substantial benefits which hydrogen mobility can provide to the UK in the medium to long term

Long-term benefits of hydrogen infrastructure as quantified by the UK H2Mobility Phase 1 study

A	**CO_2 emissions**	▪ **Well to wheel CO_2 emissions ~75% less** than equivalent diesel car in 2030 ▪ **CO_2 abatement** between **~10 mn** and **~30 mn tonnes of CO2/year** possible by 2050
B	**Local emissions & Air quality**	▪ **FCEVs** have **no harmful tailpipe emissions** and could lead to significant health benefits ▪ **Air quality damage costs** could be reduced by **~100-200 mn GBP/year** in 2050
C	**Energy security**	▪ Switching from imported fuels to domestically produced hydrogen could deliver a **benefit of 1.3bn GBP/year by 2030** to the UK economy
D	**Wider energy system benefits**	▪ Hydrogen production via water electrolysis can offer **synergistic benefits to an energy system with an increasing share of renewable generation** by offering **grid balancing services** and **local storage capacity** at strategic locations across the UK grid
E	**Economic effects**	▪ Setting up **FCEV** and **H_2 production in the UK** could provide **high-skilled jobs** and additional **value creation** ▪ UK could become internationally **leading market for hydrogen transport** if the skill base and competitiveness develops

Note: The benefits calculations are based on the Phase 1 report assumptions of 1.6 million vehicles and 1,150 new stations by 2030

Both the UK Government and European Commission recognise the potential of hydrogen mobility

UK Government

"Ultra-low emission vehicles, such as electric, plug-in hybrid and **hydrogen** powered cars and vans, **help cut down greenhouse gas emissions and air pollution** on our roads"

[Policy paper, 2010 to 2015 government policy: transport emissions (Updated 8 May 2015)]

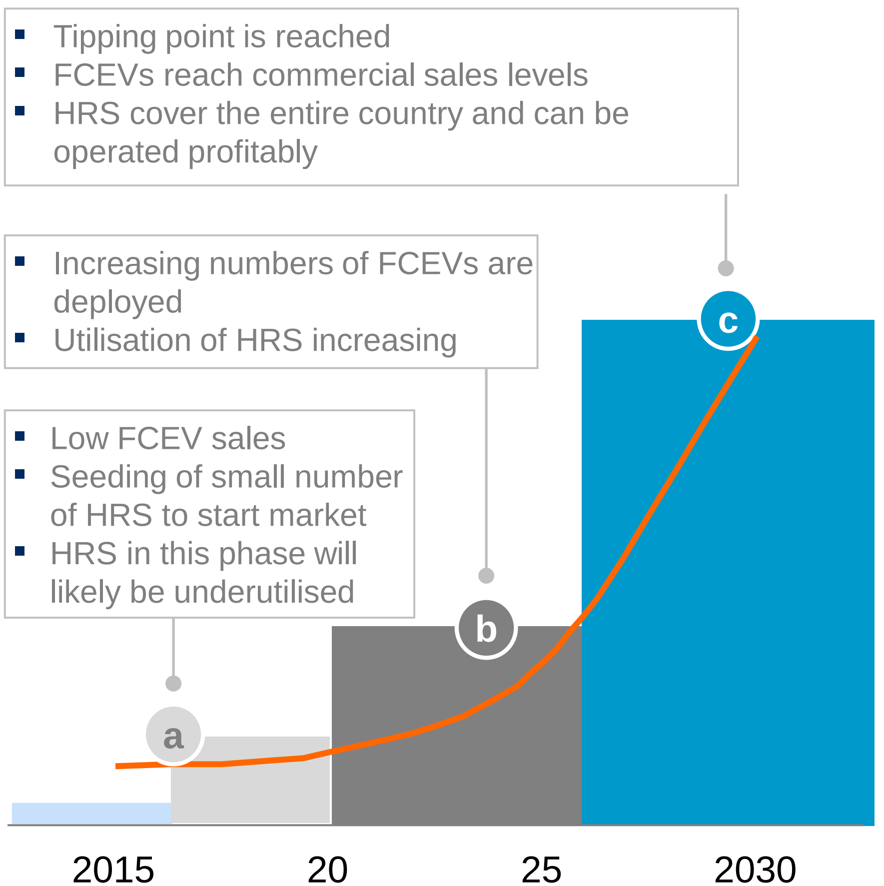
European Commission

"**Hydrogen** is an energy carrier with great potential for clean, efficient power in stationary, portable and transport applications. It is envisaged as a **significant element of the future fuel mix for transport**, enhancing energy security, reducing oil dependency, greenhouse gas emissions and air pollution"

[European Commission, Transport, webpage on hydrogen and fuels cells for transport, 2016]

Phase 1 identified three main distinct phases for the FCEV and HRS rollout, each of which reflects a different market readiness

Progressive FCEV and HRS deployment



Main stages:

a Seeding stage (2015 - 20)

- HRS in this stage will be clustered - there will be a strong regional focus for the earliest stations
- Coordination of rollout is necessary to maximise coverage for a given no. of HRS
- Support for early vehicle and HRS rollout is required due to high cost early on
- Combination of mechanisms to de-risk investment into underutilised ‘seed’ HRS

b Accelerated ramp-up (2020 - 25)

- As FCEVs become price competitive, infrastructure rollout needs to accelerate
- Policy uncertainty should be avoided as market starts to pick up

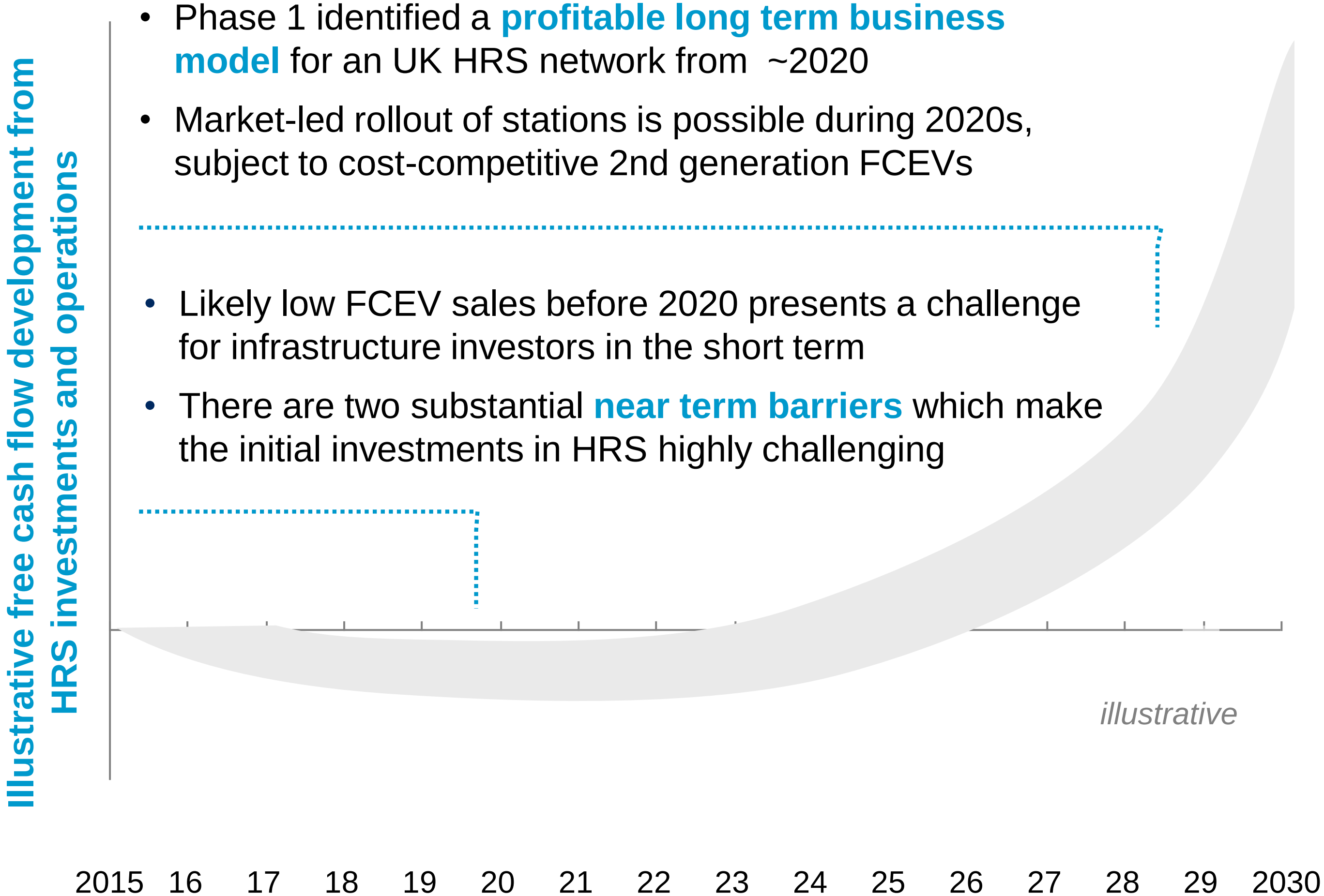
c Established market (2025 - 30)

- As FCEVs reach mass market, HRS unlock increasing utilisation
- Potential for taxation without harming the infrastructure and vehicle case

The UK H2Mobility analysis concluded that establishing a national HRS network can be profitable from the 2020s

- Phase 1 identified a **profitable long term business model** for an UK HRS network from ~2020
- Market-led rollout of stations is possible during 2020s, subject to cost-competitive 2nd generation FCEVs

- Likely low FCEV sales before 2020 presents a challenge for infrastructure investors in the short term
- There are two substantial **near term barriers** which make the initial investments in HRS highly challenging



Two main near term barriers

- Investors in early HRS face a net **first mover disadvantage** compared to new entrants after the first stage – they incur high costs, low revenues and risk, but struggle to secure any competitive strength versus new entrants once the market is secure
- In addition, early HRS investments are **risky due to uncertainty over the pace of FCEV sales** and hence uncertainty in the level of demand

Phase 2 explored models for reducing first-mover disadvantages and securing initial investment in hydrogen refuelling stations

Synopsis of the models explored in Phase 2

	Description	Upsides	Downsides
The Joint Venture (JV) model	HRS investors and OEMs set up a JV to seed a national HRS network. The JV has a 'time defined life' and exit strategy to foster a competitive fuel market	Links partners in a risk-sharing structure to overcome demand risk and first mover disadvantages from the outset	Complex legal arrangement linking many actors including competitors
The Network Operator (NO) model	NO entity (commercial or public private) establishes and operates (or franchises) a network of HRS and sells fuel packages (contracts) to customers	Model requires a limited number of core tasks and has a far more simple commercial structure than the JV model	Requires buy-in from OEMs from start of rollout, and long-term contracts with customers (certainty of revenue stream)
Mandate	The Government issues a mandate to require construction of HRS following a market related 'trigger' (e.g. a certain FCEV market share)	It applies to each UK fuel retailer, who can recoup their expenditures by levying their existing fossil fuel customers	A substantial and challenging market intervention which goes against the principle of free markets
Individual investments model	As per the existing fuel retail market, individual investors invest in HRS with no binding commercial agreements with customers or OEMs	Avoids market distortions and supports a fully competitive market from the outset	It does not address the first mover disadvantage nor the demand certainty problem

Conclusions

- Phase 2 concluded that i**ndividual HRS investments are the only plausible option for the UK roll-out**
- The other models were ruled out as they introduce legal complications (between partners) or risk the creation of monopolies or extreme market distortions

Phase 2 concluded that a 'readiness' phase is required to cement confidence among investors and prepare for larger-scale HRS rollouts

- **Phase 2** concluded that a short 'readiness' period (2015-17) was needed to seed a basic national network of hydrogen refuelling stations, allow initial sales and resolve a number of technical and commercial gaps in hydrogen fuel retailing

- Following this readiness period, reduction in hydrogen retail costs and the introduction of more affordable (next-generation) FCEVs will lead to more commercial HRS investments

- In **Phase 3** the group thereby worked to develop common terms of reference for rolling out the first stations and develop a siting strategy. This led to the following outputs:

A. A shared **geographic strategy** for the rollout of the first stations across the UK, aiming at identifying key priorities

B. Minimum **guidelines for harmonising performance** and customer experience among future HRS

C. A plan for resolving outstanding **practical needs** ('coordination and readiness issues') and for **securing confidence** among early HRS investors

Discussed in the next slides

A

Phase 3 identified a plausible three stage strategy for the rollout of the initial "seed" stations to maximise attractiveness to early adopters

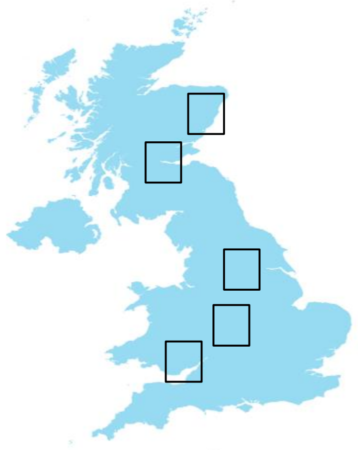
1) Initial cluster in the South East

- Early stations should ensure drivability by creating a viable network in and around London
- Stations should be sited near main roads
- Approximately 20 stations provide initial coverage

No minimum spacing requirement between stations

2) Create new HRS clusters

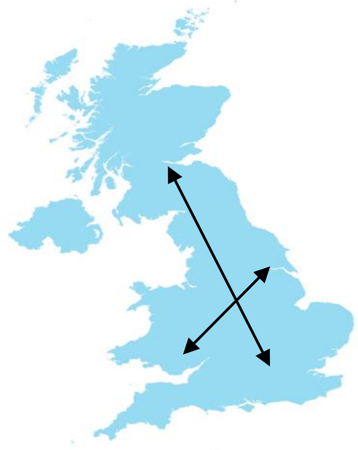
- Groups of early stations can also be used to create new HRS clusters in other large urban areas, which have a clear hydrogen strategy and willing early adopters
- Stations should be sited near main roads and also major national motorways
- Minimum 2 stations needed per cluster



Minimum of 2 HRS per cluster; synergy expected between motorway HRS

3) Secure basic national driving

- Following the creation of such clusters, a basic national coverage can be secured by locating stations along the major North-South and East-West motorways
- These stations should ideally be strategically located near to urban centres to partly seed additional uptake



Main Motorways: M4; M1; A1(M); M3; M5; M11; M40/M6/A74(M); M20

B

A 'Technical Requirements for Hydrogen Refuelling Stations' paper was produced as a tool for supporting technical decisions on HRS

Topic	Topics addressed	Scope of the exercise
Refuelling specifications	a. Refuelling protocols and pressure b. Minimum daily refuelling capacity c. Minimum peak refuelling capacity	• Ensure that the stations can refuel all OEM cars and serve an adequate number of customers
Fuel specifications	a. Hydrogen purity b. Hydrogen quality assurance c. Hydrogen carbon footprint d. Hydrogen cost	• Ensure that the fuel dispensed is compatible with FCEVs and the UK's decarbonisation targets, at an affordable cost
Quality of service	a. Minimum station availability b. Service Level agreements c. Opening hours d. Minimum station life e. Hydrogen metering accuracy f. Hydrogen billing capabilities g. Consumer accessibility, appearance and interface h. Station layout i. Live customer information	• Ensure that customers can benefit from a regular and reliable service • Ensure that customers' refuelling experience is equal to or better than for incumbent fuels • Ensure that there is a mechanism for retailing fuel on a truly commercial basis
Other specifications	a. Security and safety requirements b. Minimum station servicing c. Data collection capabilities d. Noise requirements	• Ensure the safety of refuelling infrastructure • Ensure that servicing is in line with incumbents • Ensure public bodies (e.g. OLEV, DECC) have access to performance data to inform policies

C

Phase 3 identified and acted on a set of practical needs for moving the UK hydrogen mobility sector forward

Priorities	Status
Seeding actions ('readiness phase'): • Start the HRS seeding across the most promising UK areas • Deploy the first vehicles • Accumulate learnings / best practices on regulatory, safety and practical aspects, resolve any outstanding technical gaps • Engage with very early customers	☑ **Achieved** • UK H2M members are working on several UK demonstrations, supported by the UK Government and European Commission (*see next section*)
Communication and industry consolidation actions: • Offer a single discussion forum for all hydrogen mobility stakeholders • Review and act on regulatory and standards needs • Communication with existing UK and international institutions • Communication with the buying / general public and sector statistics compilation	☑ **Achieved** • The SMMT have set up a FCEV Task Force • The BCGA have set up a gaseous fuels working group
Future network expansion actions: • Planning for future waves of HRS investment to 2020 • Co-ordination of national deployments (station location, timing etc.) • Development of a sustainable funding strategy • Identification of any actions (policies or otherwise) to ensure greenness of hydrogen	☐ **Work in progress** • UK H2M is continuing a dialogue with all stakeholders to plan future actions

SMMT = Society of Motor Manufacturers & Traders; BCGA = British Compressed Gases Association

Phase 1 to 3 concluded that a first, controlled approach based on clustering is needed to start the roll-out, with rapid expansion thereafter

Transition to national hydrogen mobility

- Technical analyses and market research carried out by UK H_2Mobility have **highlighted the long term potential for hydrogen mobility in the UK**, as a key element in the efforts to decarbonise the transport sector and our society
- The deployment strategy proposed will **prepare the UK for the mass market deployment** of FCEVs in the 2020s, by providing a plausible customer offer and basic refuelling network ready for subsequent expansion
- From the 2020s, it will enable a **profitable and self-sustaining HRS network**, while offering ownership costs similar to conventional diesel cars

Short term strategy for moving forward

- The UK H2M strategy is based on **investments by individual organisations.**
- **The early rollout will be challenging**, due to limited FCEV sales volumes and relatively high costs for both FCEVs and HRS. HRS investors will be required to invest in tens of stations even if existing demand does not justify genuinely private initiatives and future demand is uncertain
- The current readiness phase aims to partially resolve these barriers by using public funding to seed a basic network of stations and minimise risk to investors
- Following this phase, **coordinated national planning** will be needed so that each party has confidence in continued commitment of all others and in the FCEV market outlook after 2020

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A number of demonstration projects are taking place across the UK to prepare the market and accelerate progress toward commercial maturity

Readiness phase (2015-2017)

- Demonstration projects to date have secured UK and EU funding for 12 x 700bar public HRS in selected UK regions, as well as two mobile HRS
- These demonstrations are being used by UK stakeholders as a ‘readiness’ phase to address the following needs:
  a. Test hydrogen refuelling technologies and equipment in the real-world
  b. Provide the means for resolving outstanding technical and commercial issues in H2 fuel retailing (which, if unresolved, could prevent hydrogen fuel retailing from reaching full commercial maturity)
  c. Provide a very basic network of stations to allow early OEM vehicle deployment (10’s to 100’s of vehicles)
  d. Test the customer reaction to the early FCEVs and refuelling networks
  e. Prepare for the next deployment phases by engaging with the relevant national stakeholders (customers, policy makers, local councils, gas and automotive trade associations, safety authorities, etc.)
- Stakeholders are planning further HRS deployments with new station announcements expected shortly

Several domestic and international programmes have been or are active in the UK hydrogen mobility sector

Selected initiatives promoting hydrogen transport in the UK

OLEV grant scheme	The Hydrogen Refuelling Station Infrastructure Grant Scheme provides funding for a total of 12 new or upgraded stations
HyFive	This European project seeks to deploy 110 FCEVs across Europe and clusters of HRS to support them, including three HRS in London
H2ME 1 & 2	49 HRS and >1,400 FCEVs across Europe, of these, five new HRS will be in the UK and the Aberdeen bus station will be upgraded to 700 bar
London bus project	As part of the Clean Hydrogen in European Cities Project (CHIC), Transport for London has run a fleet of eight hydrogen fuelled buses since 2011
SWISH	A new public access refuelling station at the Honda plant in Swindon, uses electrolytic hydrogen production and fuels a fleet of vans and forklift trucks
Aberdeen bus project	Ten buses and a large 300kg/day HRS in Aberdeen with funding from FCHJU projects (HyTransit and High VloCity) and Scottish Government
ACHES	A second refuelling station in Aberdeen which will support the deployment of OEM passenger cars
LHNE	LHNE has delivered a public HRS in London (Hendon) along with eight diesel-hydrogen hybrid vans and four Hyundai ix35FC cars
HyTEC	HyTEC saw the deployment of FCEVs and HRS in London, Copenhagen and Oslo. Hybrid taxis and Hyundai ix35 FCEVs were deployed in London along with a new HRS at Heathrow airport

Note: Other initiatives include the Levenmouth Community Energy project (in Fife), where two small stations will be installed, the SWARM project which will install/upgrade three small refuellers and deploy fleets of small cars from Microcab and Riversimple

A number of OEMs are planning to release or have released fuel cell electric vehicles onto the European and UK markets

Manufacturer	Release dates
Hyundai	Since 2014
Toyota	Since 2015
Honda	From 2016
Daimler	From 2017
BMW	From 2020

Comments

- Major international OEMs are adopting phased production & introduction strategies for rolling out their fuel cell vehicles
- Vehicle production volumes before 2020 will be limited (1,000's per year globally)
- Vehicles will be priced at a premium to gasoline/diesel cars
- Production volumes will increase from around 2020, supporting further cost reductions and the introduction of next regeneration of affordable FCEVs
- Hyundai, Honda and Toyota have already commenced series production of fuel cell electric vehicles. Daimler will introduce their next generation FCEVs next year (2017)
- Others, such as Audi, BMW and GM have committed to starting production from 2020

Vehicle developers are also introducing hydrogen fuelled vehicle solutions for commercial applications, public transport and microcars

	Type	Manufacturer	Date available
	Microcar	**Microcab**	Today
	Microcar	**Riversimple**	From 2018
	Van	**Renault** with **Symbio FCell**	Today
	Refuse vehicle (H_2-diesel dual fuel)	**ULEMCO**	Today
	Bus	**Van Hool**	Today
	Bus	**Solaris**	Today
	Transit vans (H_2-diesel dual fuel)	**ULEMCO**	Today
	Truck	**Renault Trucks** with **Symbio FCell**	From 2018

Comments

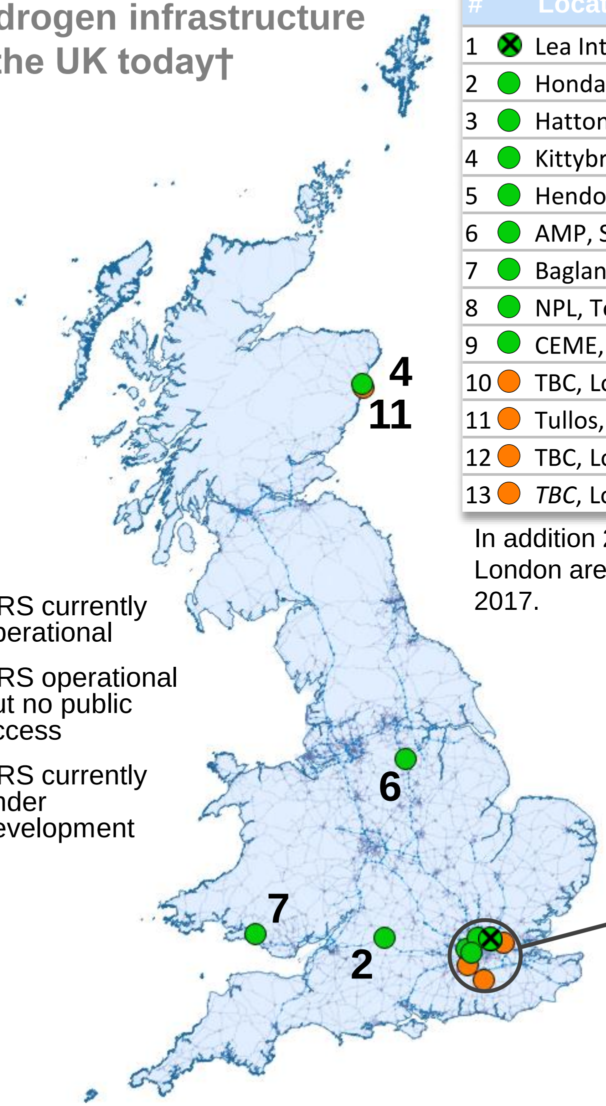
- A number of other hydrogen fuelled vehicle solutions have emerged in recent years. These could generate substantial demand for hydrogen fuel and thus support the investment case for hydrogen refuelling stations. In turn, this may directly support the rollout of FCEVs
- Commercial fleet and public transport applications offer the additional benefit of clustering fuel demand (and can thus secure high station utilisation from the outset)

Examples:

- The Aberdeen bus project is supporting ten hydrogen fuelled buses. Transport for London operates a fleet of eight hydrogen buses. Both plan to expand their fleets
- The SWARM project will support twenty Riversimple Rasas and ten Microcab FCEVs by the end of 2016

There are nine operational HRS in the UK with a combined capacity of 1.2 tonne-H_2/day, with five more expected to be deployed by the end 2016

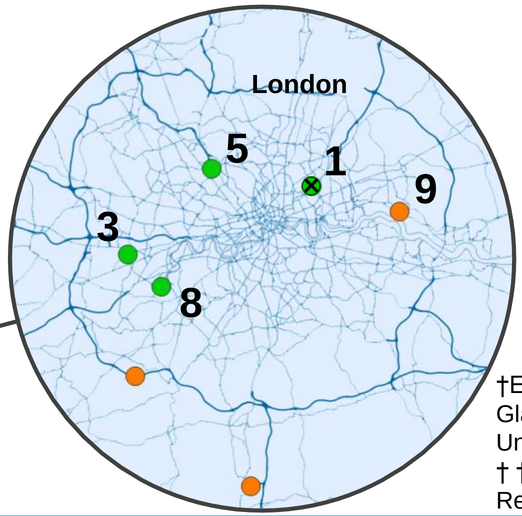
Hydrogen infrastructure in the UK today†



#	Location	Operator	Capacity	Pressure	Source††	Project(s)	Launch
1	Lea Interchange, London	Air Products	320 kg/day	Bus only 350 bar	Delivered SMR	CHIC	2011
2	Honda, Swindon	BOC	200 kg/day	350 (& 700) bar	On-site WE	SWISH, SWISH2	2011, (2014)
3	Hatton Cross, London	Air Products	80 kg/day	700 bar	Delivered SMR	HyTEC, HyFIVE	2012
4	Kittybrewster, Aberdeen	BOC	360 kg/day	350 [& 700] bar	On-site WE	HyTransit, H2ME	2015, [2016]
5	Hendon, London	Air Products	80 kg/day	350 & 700 bar	Delivered SMR	LHNE, HyFIVE	2015
6	AMP, Sheffield	ITM Power	80 kg/day	350 [& 700] bar	On-site WE	Innovate-UK	2015, [2016]
7	Baglan, South Wales	Uni of S. Wales	35 kg/day	350 [& 700] bar	On-site WE	OLEV	2011, [2016]
8	NPL, Teddington	ITM Power	80 kg/day	350 & 700 bar	On-site WE	HyFIVE	2016
9	CEME, Rainham	ITM Power	80 kg/day	350 & 700 bar	On-site WE	HyFIVE	2016
10	TBC, London	ITM Power	80 kg/day	700 bar	On-site WE	HyFIVE	[2016]
11	Tullos, Aberdeen	Hydrogenics	80 kg/day	700 bar	On-site WE	ACHES	[2016]
12	TBC, London	ITM Power	80 kg/day	700 bar	On-site WE	H2ME	[2016]
13	*TBC*, London	ITM Power	80 kg/day	700 bar	On-site WE	H2ME	[2016]

In addition 2 mobile refuellers (OLEV) and 3 HRS in London area (H2ME2) are already funded for installation in 2017.

Completed upgrade indicated by ( )
Target launch or upgrade indicated by [ ]



Main hydrogen infrastructure players active in the UK

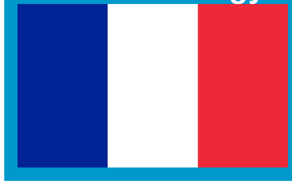
BOC A Member of The Linde Group; Air Products; Shell; ITM Power Energy Storage | Clean Fuel; Hydrogenics Shift Power | Energize Your World

†Excludes small-scale HRS in Birmingham, Coventry, Glamorgan (Glyntaff), Isle of Lewis, Loughborough, Nottingham, University of South Wales.
†† WE – Water Electrolyser, SMR – Steam Methane Reformation

Main issues being resolved by the existing European and UK demos

Fuel metering	• The accuracy of existing meters is +/- 5%, which is not sufficient to allow sale to the general public according to existing weights and measures legislation across most EU states • Early stations in Europe and the UK are now testing novel solutions with potential for accuracies better than +/-2% which could be suitable for commercial operations
Fuel quality and assurance	• PEM fuel cell systems for automotive applications are very sensitive to trace impurities in hydrogen. Global vehicle manufacturers have adopted an international purity standard (SAE J2719) which is proving demanding to adhere to along the supply and delivery chain • The existing EU and UK demonstrations have considered, or are testing, novel fuel production, purification and quality assurance approaches to meet high standards without impacting the fuel price
Station performance and availability	• Some of the early European stations have not achieved the reliability levels expected of equipment used in conventional fuel retailing (>98%). The main cause of this poor reliability is believed to be due to the lack of throughput at the stations, leading to periodic failures • The existing EU and UK demonstrations are testing a) higher throughout and b) novel equipment and maintenance solutions to improve reliability and minimise inefficiencies
HRS layout improvement and consistent refuelling experience	• Early stations are inevitably tailor-made and designed differently • The existing EU and UK demonstrations offer an opportunity for the industry to optimise the HRS layouts (e.g. reduced footprint, etc.) as well as to harmonise the refuelling interface to customers (agreed card payment methods, a consistent “hydrogen” branding etc.)

The main hydrogen mobility initiatives in Europe are following different models for the rollout of national networks of stations

Approaches implemented in other European countries		Status of HRS rollouts
German Strategy 	▪ Construction of a dense network of large-capacity 700bar stations, as a precursor to large-scale introduction of OEM vehicles ▪ Efforts are driven by a Joint Venture between HRS suppliers and a national OEM (Daimler)	▪ 18 HRS in operation. 50 HRS planned by 2016, 150 by 2017 and 400 by 2023 ▪ ~100 FCEVs deployed across the country to date
Scandinavian Strategy 	• Deployment of large-capacity 700bar stations, revised annually to coordinate with FCEVs • Strategy based on investments by individual organisations supported by favourable local tax and regulatory regimes	▪ ~20 HRS currently operational or near completion. 150 HRS planned by 2020 and 300 by 2025 ▪ ~100 FCEVs deployed across the region
French Strategy 	▪ Local captive fleets are served by small capacity 350bar HRS in localised clusters. 700bar stations will be introduced following FCEV deployments ▪ Strategy based on investments by individual organisations centrally coordinated by H2M France	▪ 5 HRS are operational and 12 awaiting completion. 250 HRS planned by 2025 ▪ ~10 FCEVs and ~100 FC RE-EV vans (350bar) deployed across the country
Other European countries 	▪ Other European initiatives are less well developed, but there is still notable activity in deploying a small number (<5) stations and vehicles in the Netherlands, Belgium, Italy, Austria and Latvia ▪ These are expected to develop into nationwide roll-out plans in the next years	▪ There are ~5 public station in the Benelux region, with tens of cars ▪ Austria has plans to install a first set of 5 stations, with 3 currently installed ▪ Italian (2) and Latvian (1) stations are designed for buses and cars

Hydrogen mobility is achieving significant traction in South Korea, Japan and California

Approaches implemented beyond Europe		Status of HRS rollouts
Californian Strategy 	▪ State-wide deployment of HRS, coordinated to provide a minimum threshold of accessibility, with a lean HRS network ▪ This strategy is aimed at maximising the throughput of HRS in order to recover investments rapidly	▪ ~28 HRS in operation with plans to build over 100 HRS in the next decade ▪ ~300 FCEVs deployed across the state, ~10,500 are expected by the end of 2018
Japanese Strategy 	• Government subsidised construction (roughly half of the cost of an HRS) of a nationwide HRS network • Deployment coordinated and overseen by the *Japan Hydrogen and Fuel Cell Demonstration Project*	▪ 76 stations in operation or planned to date ▪ ~400 FCEVs deployed to date, with plans for 40,000 by 2020 and 800,000 by 2030
South Korean Strategy 	▪ Clusters of HRS in densely populated areas and near H_2 production sites will form an early network ▪ This will then expand to cover large cities, before expanding further to become a national network ▪ Significant role for buses	▪ 16 HRS currently in operation, with plans to deploy ~170 HRS by 2020 and ~500 by 2030 ▪ Hyundai aims to sell 10,000 FCEVs in South Korea by 2025

Main conclusions from the international cases

- International experience suggests that there is not one dominant model for financing HRS
- The long-term principles of the UK H2M strategy will continue to underlie deployment efforts but recent market developments and lessons from the international strategies suggest that a new model is needed to obtain financing the earliest stations in the UK
- This could be based on a hybrid approach adopting elements from the French, German and Scandinavian models – including a focus on larger stations (which offer a better economy of scale) and the use of captive fleet approaches to improve the utilisation of early stations

UK H2Mobility partners are now working on a follow-on HRS strategy

Before 2020

- The next step for the industry is to coordinate larger-scale deployments to reach the target for a seed network of HRS by around 2020
- The UK H2Mobility members are in regular dialogue to initiate and coordinate investments in new hydrogen refuelling assets before 2020
- The new build programme will require mechanisms to secure sufficient fuel demand in order to de-risk investments
- In addition, the high cost of initial stations, combined with the challenges of increasing hydrogen demand means there is likely a requirement for some form of public sector support for the next wave of station deployments in the first stage of the roll-out, before a large fuel cell fleet has been established

Post 2020

- Major OEMs are planning to introduce a larger variety of price-competitive FCEVs from 2020
- HRS rollouts will be driven by the progressive reduction in FCEV costs (and thus higher sales) and increasing profitability of hydrogen fuel retailing
- New station investments will be linked to the uptake of FCEVs to ensure a viable investment case for private investors