

## ABERDEEN CITY COUNCIL

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COMMITTEE	Communities, Housing & Infrastructure
DATE	16 <sup>th</sup> January 2018
REPORT TITLE	Aberdeen City Region Hydrogen Strategy 2015-2025 Update
REPORT NUMBER	CHI/17/303
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### 1. PURPOSE OF REPORT

The purpose of this report is to update Members on the delivery of the Aberdeen City Region Hydrogen Strategy 2015-2025 and to recommend a series of actions to ensure that the Council's investment in hydrogen is capitalised on in order to secure future economic benefits for the City.

### 2. RECOMMENDATION(S)

It is recommended that Committee:

- (a) Note progress to date in delivering the Aberdeen City Region Hydrogen Strategy and Action Plan 2015-2025 and continue to support its delivery through the Council's current approved hydrogen projects;
- (b) Note the wider national policy context within which the Strategy is being delivered and approve the following key actions to allow Aberdeen to cement its position as one of the leaders in hydrogen within Scotland, the UK and Europe:
  - i. Continue to support the delivery of the Hydrogen Strategy and Action Plan programme and the actions as outlined in Table 3;
  - ii. Note specific project proposals and their associated funding mechanisms will be progressed through established governance routes in due course;
  - iii. Instruct a review of all Council policies within fleet, transport, energy, economic and environment to support the adoption of hydrogen; and
  - iv. Nominate an Elected Member as a Hydrogen Champion for the Hydrogen Transport Economy (HyTrEc2) project, of which Aberdeen City Council is the Lead Partner.

### 3 MAIN ISSUES

#### *Hydrogen Strategy and Investment*

- 3.1 Aberdeen City Region Hydrogen Strategy and Action Plan 2015-2025 was approved by CHI Committee in March 2015. The aim of the Strategy is to

maintain and build on Aberdeen's existing lead in the hydrogen sector and being the leading hydrogen energy hub in Scotland, UK and Europe.

3.2 A summary of progress towards delivering the Strategy's objectives is provided in Table 1 below. Additional detail on the Council's projects and benefits is provided in Appendix A, along with definitions of the acronyms used.

**Table 1: Hydrogen Strategy - Progress against Objectives**

<b>Objective</b>	<b>Progress against Tasks</b>	<b>Projects Delivering</b>
1: Promote <b>vehicle deployments</b> by a range of stakeholders in the region	Stakeholders trialling 18 vehicles: ACC, NHS, SCARF, Scottish Environmental Protection Agency, Co-wheels Car Club, and Aberdeen Taxis.	HyTrEc2, Aberdeen Hydrogen Bus Project, OLEV, JIVE, Hytime
2: Expand <b>Production and distribution</b> of renewable hydrogen	Pilot project at Aberdeen City Hydrogen Energy Storage (ACHES) to install wind/solar panels for which a feasibility study has taken place late 2017.	HyTrEc2
3: Develop <b>hydrogen refuelling infrastructure</b>	Two refuelling stations available serving 10 buses, 4 vans and 14 cars. The H2ME & JIVE projects need to be effectively developed to increase re-fuelling opportunities in the city to meet current & future demand.	ACHES, H2ME
4: Explore the roll-out of other tried and tested or <b>innovative hydrogen uses</b>	Innovative use of hydrogen as a by-product: The new Exhibition and Conference Centre Energy Centre building will be capable of utilising various technologies to produce power, heat and cooling. Combined heat and power will be generated using one or more of: spark ignition (SI) gas engines coupled to alternators and heat recovery boilers and static hydrogen fuel cells. The hydrogen by-product could then be used for supplying a new HRS in the north of the City.	New arena and conference centre
5: Encourage the development of the hydrogen economy's <b>supply chain</b> , seeking opportunities for the region's existing energy expertise to diversify and benefit from this growing industry	FCH Train – developing NESCOL course for hydrogen fuel cell technicians.  HyTrEc 2 – Mapping supply chain and developing supply chain through Work Package 5.  ACHES Operations – appointing local company to be trained by Hydrogenics to be local operator of the re-fuelling station at Cove.  HRS – Use of local contractors in the design and build of Kittybrewster and ACHES refuelling station. Undertaken initial discussions with Opportunity North East (ONE) on energy transition, hydrogen and renewable technologies.	FCH Train, HyTrEc2, ACHES
6: Promote a greater understanding and acceptance of hydrogen technologies through <b>communication and education activities</b>	H2 Aberdeen website and Communications Plan.  H2 Summit took place in Aberdeen March 2017.  Education Activities – see below Benefits and Learning in Appendix D.	HyTrEc2
7: Ensure <b>strategy and policy</b> development at all levels of government are supportive of hydrogen technologies	Hydrogen is included in the Regional Economic Strategy.  Scottish Government and UK Government engagement, for example through Scottish Cities Alliance Hydrogen Officer. Scottish Government and UK Government are engaged through project delivery and recent policy announcements within energy and transport recognise hydrogen as a key technology.	HyTrEc1

- 3.3 The Council's targeted investments have secured the city's position as Scotland's leading deployment centre for hydrogen technologies, and Aberdeen has been recognised nationally as a location of best practice through a number of awards (indicated in Appendix B). Aberdeen currently hosts two hydrogen refuelling stations, and an expanding fleet including:
- ten fuel cell buses;
  - two diesel/hydrogen transit vans;
  - two Renault Kangoo electric vans with hydrogen range extenders;
  - ten Toyota Mirai hydrogen fuel cell cars; , and
  - four Hyundai ix35 hydrogen fuel cell SUVs.
- 3.4 Ongoing projects will also see Aberdeen trialling a hydrogen road sweeper, up to three hydrogen refuse lorries and further generations of hydrogen vans. A full list can be seen in Appendix A.
- 3.5 The investment secured to date until 2025 totals approximately £33.5 million and has been across a range of different funding programmes secured from a number of sources, including from within the UK and Europe. A breakdown is contained within the table below and further information can be found in Appendix C:

**Table 2: Summary of Investment in delivering the Hydrogen Strategy (£)**

	<b>ACC</b>	<b>External Funding</b>	<b>Total</b>
Investment	£6,306,362	£28,182,926	£34,489,289

- 3.6 While this level of expenditure represents a significant return on the City Council's initial investment, the focus to date has been on the Council as the key delivery driver – as the funding has generally been for public sector bodies. The Hydrogen Strategy and Action Plan recommends a shift over time with the Council's role working with leading industry bodies and creating the opportunity for Aberdeen businesses and organisations to embrace hydrogen as part of their supply chain for the benefit of the wider economy (and environment) and ensure that the £34m investment is built on.
- 3.7 This would mean that the Council would still maintain/ operate its existing hydrogen assets (hydrogen refuelling centre, vehicle deployments), and potentially scale these up in order to ensure there is a minimal level of demand for services, thereby stimulating diversification for existing Aberdeen businesses, or attracting inward investment from other places.

***Policy Direction***

- 3.8 The Regional Economic Strategy (2015) commits to maximising the potential of hydrogen to develop medium-long term demand for the transferable skills in the oil and gas sector and delivering the supply chain development activities in the Hydrogen Action Plan. Aberdeen's Inward Investment Plan, and the City Council's response to the UK Industrial Strategy have also highlighted the role that hydrogen can play.
- 3.9 The key driver for the adoption of hydrogen in the City was initially for securing economic benefits – which given the status of the oil and gas industry in Aberdeen is still pertinent. However environmental considerations

are becoming increasingly prevalent and the Council, like every other authority in the UK, is under increasing pressure to meet climate change and air pollution targets.

- 3.10 In July 2017 the UK Government announced a ban on sales of diesel and petrol cars and vans from 2040 and the Scottish Government has reduced this to 2032. This requires a significant shift in thinking on how the roll out of ultra-low emission vehicles (ULEVs) can be escalated; only 1.7% of new vehicle registrations in Scotland in 2015 were for ULEVs.
- 3.11 In response, the Council is working with the Scottish Government on the development of a Low Emission Zone to be in place in Aberdeen by 2020. The Scottish Government's preference for LEZs are 'road access restriction schemes'. This essentially equates to the most polluting vehicles being banned from the area, or heavily penalised. It has been estimated by the RAC that it is likely to 'include most diesel cars', which make up 40% of all licensed cars in Scotland (2015). While many newer diesel cars might be compatible with a Low Emission Zone, this could have a potentially material impact on deterring people from entering the city centre if an LEZ were implemented. It is in the City's best economic interest to not only promote a transfer to sustainable modes of travel (foot, bus, bike), but also to ensure that if someone wants to bring their vehicle into town that the Council is providing the basic infrastructure to enable them to do this in the most low emission way possible – by facilitating public and private uptake of hydrogen, electric and other low emission vehicles. Getting this infrastructure in place may result in the non-requirement of the Low Emission Zone if we are already meeting NOx and Particulate Matter targets. We have just two years to get this take up in place, however.
- 3.12 The draft Scottish Energy Strategy (2017) has also similarly identified the role that hydrogen can play, recommending that hydrogen should be further scaled up for transport and energy requirements, identifying that innovative projects involving hydrogen should continue to be funded. The paper also included a positive statement for Aberdeen, noting that:

“many of the skills and supply chain requirements for future hydrogen infrastructure already exists in the oil and gas sector, with vast experience of producing, storing and transporting gases”.

The Hydrogen Council (launched at the World Economic Forum in 2017 its members include leading companies from transport, industry and energy) have recently launched a roadmap to “Scaling Up Hydrogen” for which a link is provided in the Background Papers section. This makes the clear case for the development of hydrogen with the final conclusion that investors, industry and government need to ramp up and coordinate their efforts. Its hydrogen vision for 2050 is for hydrogen to create 30 million jobs and over 2.5 trillion dollars in annual sales, services and maintenance globally.

#### ***Next steps – Moving to the Council as the Facilitator***

- 3.13 In response to the emerging policy direction, a range of activities will be delivered from 2018 to develop Aberdeen's hydrogen sector and promote the opportunities that the sector can offer local companies wishing to diversify so that the Council's (and other Partners) significant investment in hydrogen can be capitalised on.
- 3.14 A very simple example of this is the delivery of ACHES where a local company, Norco, is now operating the Hydrogen Refuelling Stations (HRS)

and there is real potential to expand their new expertise to other areas where HRS are being set up elsewhere in Scotland and the UK. This can be replicated throughout the supply chain with the aim of using the Invest Aberdeen brand to target opportunities in car manufacturing, development of green energy, uptake of hydrogen vehicles and skills and training.

**Table 3: Future Actions to deliver against H2 Strategy Objectives and Benefits**

H2 Strategy Objective	Target Area	Action	Anticipated Benefit
1. Promote vehicle deployment by a range of stakeholders in the region	Taxis and Businesses	Develop bids to publicly accessible funding with taxi firms and businesses for the deployment of hydrogen vehicles within their firms.	Increased numbers of H2 vehicles increases use of ACHES, reducing the price of H2 and offering a method of income generation for the Council in addition to environmental benefits.
	Research and Development	Development with OEM to develop vehicle types that support the transport and service sector.	Reduction in carbon emissions.
	Internal	Fleet replacement – work with Fleet to develop a clear strategy for vehicle change out over the remainder of the hydrogen strategy timeframe (to 2025).	To bring economies of scale through fuel production supply at Kittybrewster & ACHES – thereby reducing the burden on the Council.
2. Expand production and distribution of renewable hydrogen	Green hydrogen	Establishing the economic viability of locally produced renewable hydrogen.	Carbon neutral energy production meeting new Climate Change targets.  Opportunity to engage with large energy suppliers and facilitate H2 production for North East Scotland.
	Expertise	Market expertise in building hydrogen re-fuelling stations, managing civils contractors, following UK Health & Safety legislation.	Increasing Aberdeen business' involvement in building hydrogen refuelling stations.
3. Develop hydrogen refuelling infrastructure	Hydrogen infrastructure	Undertake a study to determine the technical and market feasibility of integrating hydrogen re-fuelling onto existing forecourts within the City.	Moving beyond the Council as the key delivery agency for hydrogen technology and expanding the supply chain by building new infrastructure. Opportunity to persuade Toyota (and others) to base in the City when two publicly accessible HRS are available.
		Depending on adoption of above, trial of delivery services using H2 trucks.	Moving beyond the Council as the key delivery agency for hydrogen technology and expanding the supply chain.
4. Explore the roll out of other tried and tested or innovative hydrogen uses	Other uses	HEAT network, Energy, Harbours.	Moving beyond the Council as the key delivery agency for hydrogen technology and expanding the supply chain.

H2 Strategy Objective	Target Area	Action	Anticipated Benefit
	New Exhibition and Conference Centre	The Energy Centre building will be capable of utilising various technologies to produce power, heat and cooling to the AECC and the remainder of the buildings on the masterplan site. The hydrogen generated is a bi-product and discussions are currently underway to consider uses for the hydrogen generated onsite – one being a third fuelling station to cover the north of the city.	Presence of HRS's demonstrates to the public that there is a commitment to hydrogen as a relevant fuel technology and this increases adoption of the technology/ vehicles. Opportunity to persuade Toyota (and others) to base in the City when additional HRS opportunities in place.
5. Encourage the development of the supply chain	ACHES as an 'operator' training centre	Allow hydrogen industry partners to use the ACHES station to train engineers – opportunity for local companies to learn and diversify from oil providing a hydrogen station operator service from an Aberdeen base.	Potential market opportunity and fits with engineering and technical training roll out as Aberdeen as a Centre of Excellence.
	Partnerships and Funding	Targeting investment from key industry partners.	Increased partnerships and funding.
	Business Development	Working with hydrogen stakeholders to understand what their requirements would be to base themselves in Aberdeen.  A hydrogen strategy group will begin to meet regularly with external stakeholders from January 2018.	Moving beyond the Council as the key delivery agency for hydrogen technology and expanding the supply chain.
6. Promote a greater understanding and acceptance of hydrogen technologies through communication and education activities	University/ college industry partners	Develop MOU's with key hydrogen industry stakeholder(s) to work with our local education establishments in technology development & trialling.	Roll out to further public sector uptake moving beyond the Council using hydrogen technology and opportunity to expand hydrogen to other sectors including energy.
		Establish training programmes as part of technical and engineering courses.	Establish Aberdeen as a Centre of Excellence in hydrogen training.
7. Ensure strategy and policy development at all levels	Internal Policy	Taxi Licensing to include ULEVs.	Increase numbers of clean vehicles on the road using hydrogen and able to access low emission zones in 2020.
		Procurement protocol to incorporate hydrogen targets.	Increased numbers of H2 vehicles increases use of ACHES, reducing the price of H2 and offering a method of income generation for the Council.
	External Policy	Scotland's Low Emission Zones, Cleaner Air for Scotland, Scaling Up Hydrogen, National Transport Strategy Review,	Ensuring that Aberdeen City Council's policies are reflective of the Hydrogen Strategy but also those on a national and regional

H2 Strategy Objective	Target Area	Action	Anticipated Benefit
		Regional Transport Strategy, Powering Aberdeen, CCMP, SUMP, Air Quality Action Plan, Local Transport Strategy, Regional Economic Strategy, Scottish Energy Strategy, Industrial Strategy.	level – in transport, environment, economic and energy are committed to hydrogen.
	Establishment of a local end user group to:	Collate numbers on interested parties for hydrogen vehicles.	Moving beyond the Council as the key delivery agency for hydrogen technology and expanding the supply chain.
		Providing support for interested parties to access funding for hydrogen vehicles. Work with OEM's on vehicle leases/purchases.	Increased numbers of H2 vehicles increases use of ACHES, reducing the price of H2 and offering a method of income generation for the Council.

***Nominate an Elected Member to be HyTrEc2 (Hydrogen Transport Economy) Champion***

- 3.15 Aberdeen is Lead Partner in the HyTrEc2 (Hydrogen Transport Economy) project. There is an obligation upon all Partners involved in European projects to appoint a political 'representative' to represent the project and to 'champion' the project. The Lead Partner's champion not only does this at a local level but at a regional, national and European level representing all project partners.
- 3.16 In order to meet the EU Funding agreement, and progress the HyTrEc2 commitments, an elected member needs to be approved as the HyTrEc2 political representative. The role would not be responsible for any financial or project decisions. There will be a commitment to attend two meetings over the course of the four year project (90% funded by the project).

**4. FINANCIAL IMPLICATIONS**

- 4.1 As the Council transitions to a facilitative role, there would be a reduction in the amount of capital funding required for bespoke hydrogen solutions after 2020. There are however ongoing revenue requirements to deliver, such as at ACHES, or for the continued running of Council hydrogen vehicles.
- 4.2 There are limited financial implications associated with the appointment of the Hydrogen Champion. These are anticipated to relate to overseas travel by an elected member and supporting officer, which will be paid for via the HyTrEc2 budget, and for potential hosting of international trade delegations specifically interested in the hydrogen economy if Aberdeen is positioned as a "Centre of Excellence". Where the Hydrogen Strategy actions seek Council funding in order to leverage other funds, this will be sought on a project by project basis following the H2 Governance process and the Council's budget setting processes.

## **5. LEGAL IMPLICATIONS**

- 5.1 There are no direct legal implications associated with the Hydrogen Champion or support of the Hydrogen Strategy. Legal advice is sought where required for each individual project.

## **6. MANAGEMENT OF RISK**

### **Financial**

If the Hydrogen Strategy and Action Plan is not supported the returns from the Council's investment to date (in relation to economic growth, business diversification, energy security, environmental and air quality benefits) will be reduced without capitalising on the wider benefits to the city's economy. It will also be more difficult to secure external funds without a strategic approach and formal commitment. The risk of this is medium.

### **Employee**

If the Hydrogen Strategy and Action Plan is not supported, employees will have less access to low carbon hydrogen vehicles and infrastructure. The risk of this is medium.

### **Customer/Citizen**

If the Hydrogen Strategy and Action Plan is not supported, citizens will have less access to low carbon hydrogen vehicles and vehicles. The risk of this is medium.

### **Environmental**

If the Hydrogen Strategy and Action Plan is not supported environmental benefits such as reduction of greenhouse gas emissions and air quality benefits will be reduced. The risk of this is medium.

### **Technological**

If the Hydrogen Strategy and Action Plan is not supported the potential diversification from oil and gas to hydrogen technologies will be reduced for the region. The risk of this is medium.

### **Legal**

If the Hydrogen Strategy and Action Plan is not supported the ability of ACC to reach our climate change and air quality legal targets will be reduced. The risk of this is medium.

### **Reputational**

There is a risk that if Aberdeen does not capitalise on its existing hydrogen investment, or indeed pull out of that investment in its entirety, that this would be seen as wasted investment and could prove reputationally damaging. If the recommendations within this report are followed then the risk of this is low.

## **7. IMPACT**

### **Economy**

The actions contained in this report contribute to the Regional Economic Strategy's ambitions for hydrogen in the City. The recommendations are also consistent with the Inward Investment Action Plan. The Hydrogen Strategy



and the recommendations within this report are consistent with the Regional and Local Transport Strategies and the Strategic Infrastructure Plan – hydrogen is one of the projects with substantial direct involvement from Aberdeen City Council that contributes to economic growth.

To date the City's Hydrogen projects have been supported by both internal and external funding and it is anticipated that the actions within this Strategy can be delivered with continuing support to ensure a robust hydrogen economy in Aberdeen. By being an early adopter, it is important to capitalise on this momentum and attract further commercial investment to the city.

### **People**

This strategy may be of interest to the public in terms of the potential economic and environmental benefits that hydrogen and fuel cell applications could bring to the City, including: job creation (such as through vehicle technicians, green hydrogen creation, maintenance of HRS infrastructure, etc), training/ qualification opportunities through NESCOL and others, as well as air quality improvements.

The Hydrogen Strategy offers many opportunities for joint working with partner organisations on projects. One of the key successes of the hydrogen projects to date is the public/ private consortiums which have been built. Without this collaborative approach the aims of the strategy cannot be delivered.

### **Place**

Significant local and national air quality benefits can be derived from the deployment of low carbon vehicles offering zero exhaust emissions, reducing harmful pollutants such as nitrogen oxides (NO<sub>x</sub>), sulphur oxides (SO<sub>x</sub>) and particulate matter (PM<sub>10</sub>).

The hydrogen strategy links to the transport and energy priorities within the Aberdeen – the Smarter City Vision to:

- “define the image of an international 21<sup>st</sup> century energy city; leading a new leaner, cleaner industrial revolution using the intensity of our social, business and community connections”
- take “a European lead in adapting new transport technologies”
- to “provide and promote a sustainable transport system; including cycling, which reduces our carbon emissions”.

### **Technology**

Advancing the adoption of hydrogen technologies is supported throughout Government policy. At EU, UK and Scottish Government levels, there are ambitious policies to reduce greenhouse gas emissions by 80% by 2050, increase the proportion of energy coming from low carbon sources and increase security of energy supply; to all of which hydrogen technologies can contribute.

In addition to the clear environmental benefits, the decarbonisation of the transport sector offers a range of benefits, which are in themselves strong drivers for deploying low carbon transport technologies, including energy security, expansion of renewables capacity, energy storage and air quality.

## 8. BACKGROUND PAPERS

Aberdeen Hydrogen Strategy and Action Plan 2015-2025  
[http://archive.northsearegion.eu/files/repository/20150918111637\\_AberdeenHydrogenStrategy\\_MarcH2015.pdf](http://archive.northsearegion.eu/files/repository/20150918111637_AberdeenHydrogenStrategy_MarcH2015.pdf)

Hydrogen Council: Scaling Up Hydrogen  
<http://hydrogencouncil.com/wp-content/uploads/2017/11/Hydrogen-scaling-up-Hydrogen-Council.pdf>

## 9. APPENDICES

Appendix A: Hydrogen Projects, Funding and Benefits  
Appendix B: Hydrogen Awards  
Appendix C: Breakdown of Hydrogen Investment and Funding  
Appendix D: Hydrogen and Fuel Cell Learning and Engagement

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## Appendix A: Hydrogen Projects, Funding and Benefits

This table details the current hydrogen projects and in addition to significant investment other benefits.

Project	Budget	Description	Benefits/Learning
<p>Aberdeen Hydrogen Bus Project (AHBP)</p> <p>Closes: 2018</p>	<p><b>£22.5 million</b> (Various EU, National and local funders)</p>	<p>A key project helping to deliver some of the strategy objectives is the Aberdeen Hydrogen Bus Project. The project is formed from a number of key industry and public sector organisations who have joined forces to demonstrate the world's largest integrated hydrogen project.</p> <p>The purpose of the hydrogen bus project is to demonstrate how hydrogen fuel cell buses can be incorporated into operational bus fleets and how they compare to diesel equivalents.</p> <p>The project consists of Europe's largest fleet of hydrogen buses, with 10 operating in Aberdeen currently and the UK's first fully integrated hydrogen production and bus refuelling station.</p>	<p>Project management expertise in re-fuelling station build &amp; operation</p> <p>Operational learning from buses – comparative against diesel equivalents</p> <p>1,238,440 passengers and 1,181,530 km driven by the 10 buses up until 31<sup>st</sup> August 2017.</p>
<p>Hydrogen Transport Economy 2 (HyTrEc2) Lead Partner</p> <p>Closes: 2021</p>	<p>Project Budget: £600,642 (EU Interreg NSR/Partners)</p>	<p>Aberdeen City Council is Lead Partner and responsible for 8 Partners within the Partnership of Aberdeenshire Council, CENEX (UK), the EIFI (Germany), City of Groningen, Province of Drenthe (The Netherlands), University of Narvik – UiT (Norway) and RISE (Sweden).</p>	<p>Creation of two FTE posts within Aberdeen City Council for duration of project. Continued engagement with, and opportunity to influence, EU funding bodies on opportunities for development of hydrogen projects.</p>
<p>Hydrogen Transport Economy 2 (HyTrEc2) Delivery</p> <p>Closes:2021</p>	<p>Project Budget: £800,770 (ACC/EU Interreg NSR)</p>	<p>This project aims to: increase the fleet of hydrogen vehicles (vans and refuse truck), collect data on their usage; deliver a pilot project on green hydrogen production; develop the hydrogen economy supply chain and training opportunities.</p>	<p>Demonstration of up to 12 vehicles including new generations of hydrogen vans &amp; refuse lorries.</p> <p>Explore and deliver renewable hydrogen production.</p> <p>Report on hydrogen codes of practice &amp; industry standards in health &amp; safety.</p>

Project	Budget	Description	Benefits/Learning
			Analyse supply chain in the North Sea Region.
Aberdeen Hydrogen Energy Storage (ACHES) – operational pilot project  Build Complete: 29017  Maintenance ongoing	<b>£2.9 million</b> (ACC, Transport Scotland, NESTRANS, European Regional Development Fund)	Aberdeen City Hydrogen Energy Storage (ACHES) project built a second refuelling station in the City to allow for refuelling of passenger cars as well as vans (350 and 700 bar refuelling).  The station, which is owned by Aberdeen City Council has been operational since April 2017.	Aberdeen City's second hydrogen production & refuelling station Owned & operated by Aberdeen City Council. Operator contract with local company Norco. Maintenance contract with station manufacturer hydrogenics.  £12,000 income generation from fuel sales April to October 2007.
Fuel Cell & Hydrogen Train  Closes: 2018	<b>£39,034</b> (Erasmus)	Aberdeen City Council is working with partners in Denmark and Belgium to develop a training course for technicians of hydrogen and fuel cell vehicles which will be available in Aberdeen at North East of Scotland College (NESCOL).	Working with European partners to develop a course for technicians of hydrogen and fuel cell vehicles in Aberdeen – at North East of Scotland College.
Office of Low Emission Vehicles (OLEV)  <b>Closes: 2020</b>	<b>£310,221</b> (OLEV, Transport Scotland)	Ten Toyota Mirais are being trialled for 3 years by the NHS, Co-Wheels Car Club; Scottish Environmental Protection Agency (SEPA) and ACC. Data is being collected on the vehicle use by CENEX.	Public sector organisation operation of 10 hydrogen Toyota Mirai cars: NHS, Scottish Environment Protection Agency (SEPA), Co-wheels and ACC.  44,923 miles driven by over 200 drivers.
Hytime  Closes: 2019	<b>£89,723</b> (Innovate UK, ACC)	Trialling two hydrogen waste trucks and one road sweeper with delivery expected at the start of 2018.	Demonstration of 2 refuse waste lorries and one road sweeper.
Joint Initiative for the Vehicle Expansion (JIVE)  Closes: 2023	<b>£9.4 million</b> (FCH JU, Scottish Government, ACC, Diesel Bus Capex Offset)	Aberdeen will increase its hydrogen bus fleet with an additional 10 buses.	Next generation of hydrogen buses 10 buses Commercial operation, cost savings from AHBP.
H2ME – Hydrogen Refuelling Station Expansion		BOC received funding from the Scottish Government through the H2ME project to upgrade of Kittybrewster hydrogen station for use with van and cars including 700 bar fuelling as well as 350 bar. Various considerations are currently being explored as to if this upgrade is possible	Upgrade of Kittybrewster station to allow the re-fuelling of cars & vans as well as buses.

Project	Budget	Description	Benefits/Learning
		and the implications of these alterations. This is a BOC led project.	
Hydrogen Vehicle deployments – local pilot of leasing hydrogen ACC owned vehicles	(Transport Scotland, Interreg NSR, ACC).	Two Renault Kangoo electric vans with hydrogen range extenders are being trialled by ACC. Two diesel/hydrogen transit vans are being trialled by ACC. Two Hyundai ix35 SUV hydrogen cars are being trialled by Co-Wheels Car Club. Two Hyundai ix35 SUVs are being leased to SCARF and to Aberdeen Taxis, the first hydrogen taxi in Scotland.	ACC fleet of 4 hydrogen cars & 5 vans – used by ACC Fleet and City Wardens, and externally by interested parties SCARF and Aberdeen Taxis.

### Key Facts:

#### Aberdeen Hydrogen Refuelling Station (ACHES)

ACHES	
Number of Refuelling's to 31.08.17	269
Kg of H2 to 31.08.17	1,018

#### Aberdeen Hydrogen Bus Project (AHBP)

Aberdeen Hydrogen Bus Project	
Passengers to 31.08.17	1,238,440
Mileage (KM) to 31.08.17	1,181,530
Kg H2 to 31.08.17	122,748
Average % Bus Availability for 2017 (Ballard info)	85.80%

#### Total daily production capability of H2?

	Max. Production Per day	Storage
ACHES	130 kg/ day	150 kg
Kittybrewster	360 kg/ day	420 kg

#### Daily Requirement of Hydrogen

	Daily Requirement	Servicing
ACHES	12 kg per day (Nov 17)	4 vehicles/ 3 kg each
Kittybrewster	230 kg per day (Nov 17)	10 buses/

### Hydrogen Refuelling Station (HRS) Reliability

	<b>Availability</b>	<b>Time Period</b>
<b>ACHES</b>	95%	April – Sept 2017
<b>Kittybrewster</b>	99%	April – Sept 2017

### Predicted Hydrogen Requirement of AECC

<b>Production Capacity</b>	200 kg/ day
<b>Potential Demand</b>	Buses, taxis, private vehicles, business vehicles

## **Appendix B: Hydrogen Awards**

2016 Awards:

### **Low Carbon Champions Awards 2016 – H2 Aberdeen**

'Grand Prix' Award: Outstanding Achievement in Low Carbon Transport  
Low Carbon Road Transport Initiative of the Year: H2 Aberdeen

### **National Transport Awards 2016 – Highly Commended**

Contribution to Sustainable Transport for Aberdeen City Region  
Hydrogen Strategy and Action Plan 2015-2025

### **Scottish Transport Awards 2016 - finalist**

Best Public/Private Partnership: Aberdeen Hydrogen Bus Project

### **Association for Public Service Excellence awards 2016 - finalist**

Best renewable energy or energy efficiency project: Aberdeen Hydrogen Bus Project – finalist  
Best public private partnership/working initiative: finalist

### **Scottish Public Service Awards 2016**

Commercial partnerships award – finalist

2017 Award Submissions:

### **Low Carbon Champions Awards 2017**

Deadline to submit 16<sup>th</sup> June 17'.

### **National Transport Awards 2017**

Submissions made under 6 categories.

### **Scottish Transport Awards 2017**

Shortlisted for 'Partnership of the Year'.

### **Association for Public Service Excellence awards 2017**

Submission made for 'Best Commercialisation Initiative'.

## Appendix C: Breakdown of Hydrogen Investment and Funding

### European Funds – Euro (€)

Project	ACC	External Funding	Total Project Cost
HyTrec Delivery	221,549	221,549	443,098
HyTrec – Management Fee	0	558,165	558,165
H2 Bus Project	2,560,000	23,808,000	26,368,000
Hyacinth	3,301	27,170	30,471
ACHES	1,136,500	757,631	1,894,131
New Bus Fuel	0	29,587	29,587
HyTrEc2 Delivery	451,319	451,319	902,638
HyTrEc2 – Management Fee	33,853	643,198	677,051
FCH Train	0	44,000	44,000
TOTAL in Euros (€)	€4,406,522	€26,540,619	€30,947,141
<b>Conversion to Pounds (£)</b>	<b>£3,797,540</b>	<b>£22,872,705</b>	<b>£26,670,246</b>

\*(based on exchange rate of 11.04.17: 1Eur = 0.8618 GBP) – please note that this is therefore an estimated figure given the exchange rate will be different amounts over the last 5 years. The figures have also been rounded to the nearest Euro/ Pound.

### UK-Based Funds – (£)

Project	ACC Match Funding (£)	External Funding	Total Cost of Project (£)
Hydrogen Cars OLEV	8,822	310,221	319,043
JIVE 1	2,500,000	5,000,000	7,000,000
<b>Total</b>	<b>£2,508,822</b>	<b>£5,310,221</b>	<b>£7,319,043</b>

<b>Combined Total</b>	<b>£6,306,362</b>	<b>£28,182,927</b>	<b>£34,489,289</b>
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As some of these projects are still on going the final figure may go up or down slightly given the exchange rate fluctuations.



## **Appendix D: Hydrogen and Fuel Cell Learning & Engagement**

### **Learning**

Delivery of the range of hydrogen demonstration projects has allowed the city to gather key project data on the efficiency of the technology being employed and compare data against for example against diesel vehicles. Such data assists in decision making for future project, such as the requirements to improve bus operational efficiency for JIVE, taking learning from the AHBP.

In addition, the softer hydrogen projects looking at stakeholder surveys, site feasibilities and skills & training required in the sector allow Aberdeen to have a holistic experience of the practical requirements to achieve sector growth locally.

A high level summary of the key learning and benefits from the hydrogen programme of projects can be found in Appendix A.

Following the series of infrastructure investment, the next steps are to explore and where possible exploit the tangible economic benefits deriving from the hydrogen programme.

### **Engagement**

The H2 Aberdeen Communications Programme has reached an estimated 80,000 people within the past 12 months through a range of press releases, articles, reports, social media and events.

Some notable events include the ACHES and Toyota Launch Event in February 2017, and The H2 Summit in March 2017.

Both Hydrogen stations attract many study visits from across the globe every year bringing visitors to the city, which contributes to the economic benefits of these projects locally

### **Education / Training**

Five staff at local company NORCO Group have been trained in operating ACHES refuelling station retaining expertise locally. Several staff at Arnold Clark have been trained in servicing and maintaining hydrogen cars. Drivers at all organisations using hydrogen vehicles have received training on refuelling and operating hydrogen vehicles.

Both stations provide important educational opportunities which have included visits from NESCOL and the University of Aberdeen (41 students in May 2017).

One S3 work experience placement took place in May 2017 looking at hydrogen technologies. Pupils aged 8-18 also took place in a 'hydrogen hack' event at ACHES in August 2017, where they worked with Hydrogenics and Arcola Energy to build gadgets to be powered by a hydrogen fuel cell.

These types of events have provided unique local opportunities for our future engineers to develop their interest and knowledge within Aberdeen and encourage young talent to remain in the region.