

<b>Project Name</b>	JIVE - Renewable H2 Production and Supply	<b>Date</b>	14.05.18
<b>Author</b>	Claire Stevenson	<b>Version</b>	1.0

## Contents

<b>1. BUSINESS NEED.....</b>	<b>3</b>
<b>2. OBJECTIVES.....</b>	<b>4</b>
<b>1. PROMOTE HYDROGEN VEHICLE DEPLOYMENTS BY A RANGE OF STAKEHOLDERS IN THE REGION .....</b>	<b>4</b>
<b>2. EXPAND PRODUCTION AND DISTRIBUTION OF RENEWABLE HYDROGEN .....</b>	<b>4</b>
<b>3. DEVELOP HYDROGEN REFUELLING INFRASTRUCTURE.....</b>	<b>4</b>
<b>4. EXPLORE THE ROLL-OUT OF OTHER TRIED AND TESTED OR INNOVATIVE HYDROGEN USES .....</b>	<b>4</b>
<b>5. ENCOURAGE THE DEVELOPMENT OF THE HYDROGEN ECONOMY’S SUPPLY CHAIN, SEEKING OPPORTUNITIES FOR THE REGION’S EXISTING ENERGY EXPERTISE TO DIVERSIFY AND BENEFIT FROM THIS GROWING INDUSTRY .....</b>	<b>4</b>
<b>6. PROMOTE A GREATER UNDERSTANDING AND ACCEPTANCE OF HYDROGEN TECHNOLOGIES THROUGH COMMUNICATION AND EDUCATION ACTIVITIES .....</b>	<b>4</b>
<b>7. ENSURE STRATEGY AND POLICY DEVELOPMENT AT ALL LEVELS OF GOVERNMENT ARE SUPPORTIVE OF HYDROGEN TECHNOLOGIES .....</b>	<b>4</b>
<b>3. OPTIONS APPRAISAL .....</b>	<b>4</b>
3.1 OPTION 1 – DO MINIMUM .....	4
3.2 OPTION 2 – ENTER INTO PRODUCTION AND SUPPLY OF H2 CONTRACT .....	4
3.3 SCORING OF OPTIONS AGAINST OBJECTIVES .....	6
3.4 RECOMMENDATION.....	7
<b>4. SCOPE .....</b>	<b>7</b>
4.1 OUT OF SCOPE.....	7
<b>5. BENEFITS.....</b>	<b>9</b>
5.1 CUSTOMER BENEFITS .....	9
5.2 STAFF BENEFITS .....	10
5.3 RESOURCES BENEFITS (FINANCIAL).....	10
<b>6. COSTS .....</b>	<b>10</b>
6.1 PROJECT CAPITAL EXPENDITURE & INCOME.....	10
6.2 PROJECT REVENUE EXPENDITURE & INCOME .....	11
6.3 POST- PROJECT CAPITAL EXPENDITURE & INCOME.....	12
6.4 POST- PROJECT REVENUE EXPENDITURE & INCOME .....	13
<b>7. PROCUREMENT APPROACH – COMMERCIAL CONTRACT .....</b>	<b>15</b>
<b>8. KEY RISKS.....</b>	<b>15</b>
<b>9. TIME .....</b>	<b>15</b>
9.1 TIME CONSTRAINTS & ASPIRATIONS .....	15
9.2 KEY MILESTONES .....	16



# Business Case

10.	GOVERNANCE .....	16
11.	RESOURCES .....	16
12.	ENVIRONMENTAL MANAGEMENT .....	17
13.	STAKEHOLDERS .....	17
14.	ASSUMPTIONS .....	17
15.	DEPENDENCIES.....	17
16.	CONSTRAINTS – HYDROGEN SUPPLY .....	18
17.	ICT HARDWARE, SOFTWARE OR NETWORK INFRASTRUCTURE .....	18
18.	SUPPORT SERVICES CONSULTED.....	18
19.	DOCUMENT REVISION HISTORY .....	19

## 1. Business Need

Aberdeen City has Europe's largest fleet of fuel cell buses, along with the UK's largest hydrogen production and bus refuelling station. It has developed an international reputation as a 'centre of excellence' for hydrogen and fuel cell technologies.

The Aberdeen Hydrogen Bus Project has been operating for 3 years, and the buses have collectively travelled 857,208 miles, carrying 1,539,607 passengers on two cross-city routes. The refuelling station at Kittybrewster continues to offer 99.9% availability.

The European Funded Joint Initiative for hydrogen Vehicles across Europe (JIVE) project aims to develop further the hydrogen bus fuel cell technology and apply the learning from projects delivered and/or underway and bring a new generation of hydrogen fuel cell buses that are more reliable, economical and fuel efficient.

The project will introduce a fleet of 10 new buses that will complement Aberdeen's existing bus fleet. The intention is that the new fleet will extend the uses of these buses and their associated infrastructure past the Aberdeen Hydrogen Project's initial timescales; assisting the bus operators in the city to test the technology over the life of a diesel equivalent bus operational life.

Aberdeen's participation in the JIVE project helps support the eventual commercialisation of hydrogen and fuel cell technology in buses. This is an important step as being part of a larger bus deployment will reduce capital costs and further develop the manufacturing supply chain. A joint investigation into the production and supply of hydrogen in partnership with Dundee City Council, a partner within the JIVE project, also affords the opportunity to develop the supply chain and promote diversification within the energy sector.

For successful implementation of the additional 10 buses and to further contribute to the Aberdeen Region Hydrogen Strategy and Action Plan 2015-2025, there is a need for the production and supply of hydrogen. A recent market sounding exercise has demonstrated interest from suppliers and businesses, both local and international to produce and supply 1300Kg of hydrogen per day to serve the Aberdeen and Dundee hydrogen fleets. The key principle of the supply is that it will be delivered on a commercial basis and this is essential in ensuring the continued development of the hydrogen sector in Scotland

The City Region's Hydrogen Strategy has considered the public sector's role in the hydrogen sector. It notes that until the total cost of ownership of hydrogen buses is equivalent to a conventional bus, and there is sustained investment in the sector by bus manufacturers, the public sector will continue to have a role to facilitate the growth of this sector and develop policies to enable the private sector to adopt hydrogen technologies.

**2. Objectives**

1. Promote hydrogen vehicle deployments by a range of stakeholders in the region
2. Expand production and distribution of renewable hydrogen
3. Develop hydrogen refuelling infrastructure
4. Explore the roll-out of other tried and tested or innovative hydrogen uses
5. Encourage the development of the hydrogen economy's supply chain, seeking opportunities for the region's existing energy expertise to diversify and benefit from this growing industry
6. Promote a greater understanding and acceptance of hydrogen technologies through communication and education activities
7. Ensure strategy and policy development at all levels of government are supportive of hydrogen technologies

**3. Options Appraisal**

**3.1 Option 1 – Do Minimum**

<b>Description</b>	Use the existing infrastructure planned for the operation of the JIVE project
<b>Expected Costs</b>	£1.7 million Capex for expansion of hydrogen fuelling facilities
<b>Risks Specific to this Option</b>	There would be difficulty in securing a commercial cost of hydrogen production and potential issues surrounding the electricity from the grid coming from a traceable renewable source. With the additional 10 buses, this would put pressure on the sites at Langdykes Road and Kittybrewster.
<b>Advantages &amp; Disadvantages</b>	<p>Advantage – Existing infrastructure in place so timescales can be met.</p> <p>Disadvantages – Securing hydrogen fuel price, project viability, failure to fully meet the hydrogen strategy objectives.</p>
<b>Other Points</b>	

**3.2 Option 2 – Enter into production and supply of H2 contract**

<b>Description</b>	Enter into a supply contract with public sector partners based on a H2 price and manage the contractual requirements and interface between hydrogen vehicle uses and the refuelling
--------------------	---

**Business Case**

	infrastructure
<b>Expected Costs</b>	£1.7 million capital investment in hydrogen refuelling infrastructure
<b>Risks Specific to this Option</b>	The supply of hydrogen outweighs the requirements; timescales are not met.
<b>Advantages &amp; Disadvantages</b>	<p>Advantage – Supports and advances Government legislation and the long term outcomes of the Aberdeen Regions Hydrogen Strategy and Action Plan 2015-2025.</p> <p>Disadvantage – capacity created exceeds immediate demand; there may be a lack of uptake of hydrogen or a delay in the increase of a hydrogen fleet of vehicles.</p>
<b>Other Points</b>	UK Government legislation and commitment to hydrogen as an alternative fuel should mitigate the above risks. A recent market sounding exercise demonstrates the enthusiasm from suppliers and businesses to meet the above objectives.

**3.3 Scoring of Options Against Objectives**

Use the table below to score options against the objectives in order to create a shortlist of options to be considered.

Objectives	Options Scoring Against Objectives							
	1	2						
1. Promote hydrogen vehicle deployments	1	2						
2. Expand production and distribution of renewable H2	1	3						
3. Develop hydrogen refuelling infrastructure	2	3						
4. Explore other hydrogen uses	1	2						
5. Encourage hydrogen supply chain development	2	3						
6. Promote understanding and acceptance of H2 technology	2	2						
7. Ensure government support of H2 technology	2	2						
<b>Total</b>	11	17						
<b>Ranking</b>	2	1						

**Scoring**


Fully Delivers = 3

Mostly Delivers = 2

Delivers to a Limited Extent = 1

Does not Deliver = 0

Will have a negative impact on objective = -1

 <p><b>ABERDEEN</b> CITY COUNCIL</p>	<p>Corporate Project Management Toolkit</p> <h1>Business Case</h1>	<p>Project Stage</p> <h2>Define</h2>
---	--	--------------------------------------

<b>3.4 Recommendation</b>
<p>The recommended course of action would be to enter into a commercial supply agreement for the production and supply of hydrogen in conjunction with partner councils.</p>

<b>4. Scope</b>
<p>Aberdeen City Council and Dundee City Council will procure the production and supply of renewable hydrogen to Aberdeen City and Dundee City by the end of 2019. The preferred supplier(s) will need to deliver the following elements:</p> <ul style="list-style-type: none"> <li>- Design, build and operate a hydrogen production facility to meet Aberdeen and Dundee City Councils daily requirements</li> <li>- Produce hydrogen through the use of energy traceable to a renewable energy source to supply 1300Kg of hydrogen 365 days per annum for a minimum of 10 years on the basis of the initial demands: <ul style="list-style-type: none"> <li>- 900Kg for Aberdeen</li> <li>- 400Kg for Dundee</li> </ul> </li> <li>- Distribute the hydrogen fuel to fuelling stations in Aberdeen and Dundee City centres at a target price of between £3.50 and £5.00 per Kg for a delivered cost at the dispenser.</li> </ul> <p>This project and the supply of the services would be entirely on a commercial basis; Aberdeen City Council would be facilitating the development of this service whilst the supplier(s) would be responsible for building, maintaining and operating the production facilities.</p> <p>The Council may contribute capital funding to redevelop existing refuelling stations or develop a new facility in the City however this is dependent on the solution provided by bidders during the proposed procurement process..</p> <p>At present, this would only supply Aberdeen City and Dundee City fuel requirements but would anticipate that there would be opportunity to supply to other Cities and their Regions throughout Scotland. This also has a positive effect on improving the environment, developing the supply chain and diversifying within the oil and gas sector.</p>

<b>4.1 Out of Scope</b>
<p>Projects to create increased demand and generate financial support to increase low carbon vehicles in the city will run parallel to this project. These include partnership building with the private sector, such as taxi fleets and the airport, to increase vehicles numbers by accessing OLEV (Office for Low Emission Vehicles) funding. Further projects to support city fleets, including refuse trucks are also being developed. Whilst out of scope of this project, their success and implementation will improve financial sustainability of this project, and the</p>

 <p>ABERDEEN CITY COUNCIL</p>	<p>Corporate Project Management Toolkit</p> <p><b>Business Case</b></p>	<p>Project Stage</p> <p><b>Define</b></p>
--	---	---

commercial model of the Langdykes Road fuelling station.



**5. Benefits**

**5.1 Customer Benefits**

Benefit	Measures	Source	Baseline	Expected Benefit	Expected Date	Measure Frequency
Encourages more Original Equipment Manufacturers (OEMs) to the area and encourages more affordable purchasing options for fuel	Comparable price with diesel	AHBP	£8 per Kg H2	£3-£5 per Kg H2	Dec 19	Annual
Lower Greenhouse Gas Emissions (GHG) promoting a healthier city	GHG emission measurements	AHBP	460 tonnes CO2e	Increase on baseline	Dec 19	Annual
Public acceptance of zero emission transport technologies	Public satisfaction surveys	AHBP	Original survey from 2015 AHBP	Increase in public satisfaction	Dec 19	Annual
Competitive dialogue encourages innovation and competition between suppliers and increases number of companies getting involved in hydrogen production	Market Testing Exercise	ACC	16 companies	Increase on 16	Dec 19	Annual
Increase in uptake of low carbon vehicles (LCV) for private use	Increase in number of vehicles purchased for private use	Government (registered vehicles)	689 LCV in Aberdeen(shire)	Increase from baseline	Dec 19	Annual

## Business Case

### 5.2 Staff Benefits

Benefit	Measures	Source	Baseline	Expected Benefit	Expected Date	Measure Frequency
Personal development opportunities to engage with the hydrogen and renewables sector and increase learning opportunities	Employment of 1 FTE at salary G14	ACC	4	1 FTE	Dec 18	Annual

### 5.3 Resources Benefits (financial)

Benefit	Measures	Source	Capital or Revenue?	Baseline (£'000)	Saving (£'000)	Expected Date	Measure Frequency
Joint procurement with Dundee City Council for the supply and production of H2 from a renewable source will reduce costs compared with single city procurement	Project remains within budget	ACC	Revenue	£424,240 per annum (£8 per Kg H2 for 10 buses)	£159,090 per annum (for 10 buses)	Sept 2019	Annual
	Reduced cost of hydrogen						

## 6. Costs

Related to JIVE Business Case which was agreed at Capital Board in December 2017 – following costs relate to hydrogen supply only.

### 6.1 Project Capital Expenditure & Income

(£'000)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
<b>Staffing Resources</b>	0										



**Business Case**

Project Stage  
**Define**

<b>Land Acquisitions</b>	0											
<b>New Vehicles, Plant or Equipment</b>												
10 H2 buses	5,500											
<b>Construction Costs</b>												
HRS Capex	1,700											
<b>Capital Receipts and Grants</b>												
Scottish Government	(3,000)											
EU Funding	(1,700)											
<b>Sub-Total</b>	<b>£2,500</b>											

<b>6.2 Project Revenue Expenditure &amp; Income</b>											
(£'000)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
<b>Staffing Resources (same position as shown on capital table)</b>											
Staff Project Management costs	61	62	63								
<b>Non Staffing Resources</b>											
Commercial/Legal Support	22										
Maintainance (including 2.5%	180	185	190								

## Business Case

annual RPI)											
Hydrogen Fuel Costs (including 2.5% annual RPI)	266	272	279								
Operational Costs (including 2.5% annual RPI)	14	14	15								
<b>Revenue Receipts and Grants</b>											
EU funding contribution towards staff costs	(61)	(62)	(63)								
Hydrogen Fuel (Bus operators)	(266)	(272)	(279)								
<b>EU funding contributions towards maintenance and operation costs</b>	(194)	(199)	(205)								
<b>Sub-Total</b>	<b>22</b>	<b>0</b>	<b>0</b>								

### 6.3 Post- Project Capital Expenditure & Income

(£'000)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
<b>Staffing Resources</b>	0										
Add cost items under each heading											
<b>Land Acquisitions</b>	0										
<b>New Vehicles, Plant or Equipment</b>	0										

## Business Case

<b>Construction Costs</b>	0										
<b>Capital Receipts and Grants</b>	0										
<b>Sub-Total</b>	<b>£0</b>										

### 6.4 Post- Project Revenue Expenditure & Income

(£'000)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
<b>Staffing Resources</b>	0										
<b>Non Staffing Resources</b>											
Maintenance (including 2.5% annual RPI)	200	203	205	207	209	211	213				
H2 Fuel Costs	286	293	300	308	316	324	332				
<b>Revenue Receipts and Grants</b>											
Operator Maintenance	(200)	(203)	(205)	(207)	(209)	(211)	(213)				



## Business Case

Project Stage  
**Define**

Recoveries											
H2 Fuel (Bus operators)	(286)	(293)	(300)	(308)	(316)	(324)	(332)				
<b>Sub-Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>				

### 7. Procurement Approach – Commercial contract

Given the interfaces between the different suppliers as well as the maturity in the UK market for hydrogen production and supply, the procurement approach lends itself to a competitive dialogue/negotiated procedure.

The advantage of this procedure is that it allows the Council to speak to bidders during the tender process, so it can ensure that viable submissions and innovation solutions can be developed. It should be noted that more time and required resources to attend the negotiation meetings.

### 8. Key Risks

Description	Mitigation
Commercial – contract finalisation causes delays	Contracting process has begun with early stage discussions to help mitigate any potential delays
Commercial – contracts – relationships with other partners/Scottish cities	Ensure back to back contracts
Operational – Timescales slip during the project implementation phase	Flexibility built into contracts and delivery strategies
Legal – planning application delays	If site is required for H2 infrastructure – utilise land already used for H2 production
Environmental – ensuring a safe system	Suppliers will be appropriately checked to ensure safety aspects of delivery are not compromised.
Technical/Operational – Maintenance	Compile a schedule of components and their supply routes to ensure that any maintenance items are easily traceable and accessible.
Communications – Public engagement	Public consultations with local residents with regular updates concerning build disruption/ safety concerns

### 9. Time

#### 9.1 Time Constraints & Aspirations

# Business Case

Committee Approval (Strategic Commissioning Committee)	September 2018
Contract Award Decision	December 2018

9.2 Key Milestones	
Description	Target Date
Committee Approval	June 2018
Contract Award Decision	December 2018
Site Construction	Early 2019
Commissioning	Autumn 2019
Supply Commencement	Winter 2019

10. Governance	
The JIVE project will be managed through the Council's existing Capital programmes governance with the project reported through the energy programme board.	
Role	Name
Project Sponsor	Richard Sweetnam
Project Manager	Andrew Win/ Claire Stevenson
Other Project Roles	

11. Resources			
Task	Responsible Service/Team	Start Date	End Date
Development of the procurement documents	Commissioning - CPS		
Legal terms and conditions	Commissioning - CPS		
EU funding	City Growth - Partnerships		
Asset Management	Corporate Governance – Asset Management		



## 12. Environmental Management

The project will have a positive environmental impact. Hydrogen fuel cell vehicles significantly reduce air and noise pollution which has a positive impact on public health. The electricity and hydrogen are produced from renewable energy and the deployment of hydrogen fuel celled vehicles will have a significant benefit to local air quality.

## 13. Stakeholders

First Group/Stagecoach – the development of a hydrogen supply will support the deployment of future low carbon vehicles, which will contribute toward the financial viability of the hydrogen supply.

Private & Public Companies – Inclusion of low carbon vehicles in fleets will create demand on site and ensure financial viability of the hydrogen supply.

Other Local Authorities: Fiona Goodenough (SCA), Iain Leith (Dundee City Council), Barbara Whiting (Fife), Michael Figures (Perth & Kinross)

## 14. Assumptions

The market sounding exercise demonstrated that there are many suppliers and interested business who could deliver the requirement. However, the response indicates that the preferred response will be consortium bids involving a renewable energy supplier or more, an electrolyser/hydrogen manufacturer/supplier and a gas supplier/ transport operative.

Given the interfaces between the different suppliers as well as the maturity in the UK market for hydrogen production and supply, there is an assumption that the market can deliver against this requirement.

## 15. Dependencies

Many project dependencies have been identified and these need to be considered as part of the procurement decision and timescales.

- Bus deployment timescales (end of 2019)
- Bus operator agreement/ lease agreement
- Commercial risks identified in the market sounding responses
- Refuelling infrastructure sites and land
- Dundee/Perth & Kinross/Fife financial and contractual commitment
- Technical and legal support

**16. Constraints – Hydrogen Supply**

The maturity of the market could be a potential constraint however the market sounding exercise shows that hydrogen production and supply sector is available and some form of public sector intervention will be required.

**17. ICT Hardware, Software or Network infrastructure**

Description of change to Hardware, Software or Network Infrastructure	EA Approval Required?	Date Approval Received
None		

**18. Support Services Consulted**

Service	Name	Sections Checked / Contributed	Their Comments	Date
PMO				
Finance				
Asset Management				
Estates				
Legal (Conveyancing)				
Legal (Procurement)				
Procurement				
ICT				
Architecture and Design Team				
Grounds Maintenance				
Environmental Policy				
Planning				
Communications				
HR				



# Business Case

## 19. Document Revision History

Version	Reason	By	Date