	<p>Corporate Project Management Toolkit</p> <h1>Business Case</h1>	<p>Project Stage <b>Define</b></p>
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<b>Project Name</b>	HyWAVE (HYdrogen WAsTe VEHicles)	<b>Date</b>	02/08/18
<b>Author</b>	Laura Paterson	<b>Version</b>	1.0

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## Business Case

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## 1. Business Need

Aberdeen has developed an international reputation as a 'centre of excellence' for hydrogen and fuel cell technologies and is Scotland's leading deployment centre for hydrogen technologies. The city is home to Europe's largest fleet of fuel cell buses and Aberdeen City Council has incorporated several other hydrogen fuel cell vehicles into the city fleet in recent years, including vans, cars and a roadsweeper.

Policy drivers for hydrogen (h2) development include:

- New petrol and diesel cars and vans to be phased out by 2032 (Scottish Government, 2018);
- 60% of domestic energy provided by hydrogen and 100% of cars and vans powered by hydrogen by 2050 (Scenario 2, Scottish Energy Strategy, 2018);
- Introduce Low Emission Zones in each of Scotland's 4 biggest cities by 2020 (Building Scotland's Low Emission Zones, 2017)
- NO<sub>2</sub>: Annual mean concentration of 40 ug/m<sup>3</sup> and an hourly mean concentration of 200 ug/m<sup>3</sup> to be exceeded no more than 18 times per year (Statutory EU and Scottish Air Quality targets 2010);
- Pm<sub>10</sub>: Annual mean concentration of 18 g/m<sup>3</sup> and 24-hour mean concentration of 50 g/m<sup>3</sup> to be exceeded no more than 7 times a year (Statutory EU and Scottish Air Quality targets 2010);
- 90% reduction in GHG emissions by 2050 from baseline (draft Scottish Climate Change Bill 2018).

The HYdrogen WAsTe VEhicle in North West Europe (HyWAVE) project will introduce a hydrogen fuel cell waste truck to the city fleet. The project is funded by the Interreg NWE Programme. Up to 60% of total eligible project costs are recoverable from the programme. Using existing Fleet budget of comparable costs of a diesel truck, the programme intervention will facilitate the demonstration of a hydrogen fuel cell garbage truck.

This project will trial operational viability of an ultra low emission vehicle (ULEV) compared to traditional diesel and dual fuel versions. A number of factors will be evaluated, including: life span; reliability; range; environmental benefits; public opinion; and operational benefits, such as being utilised later in the day due to reduced noise and toxic emissions.

This project supports a number of objectives as identified in the Aberdeen City Region Hydrogen Strategy and Action Plan 2015-25, including:

- 1) Promote vehicles deployments by a range of stakeholders in the region

This objective was reviewed by Communities, Housing & Infrastructure Committee 16<sup>th</sup> January 2018 with the specified outcome of:

**Fleet replacement** – work with Fleet to develop a clear strategy for vehicle change out over the remainder of the hydrogen strategy timeframe.

Participation in the project supports the eventual commercialisation of hydrogen and fuel cell vehicles. Deployment of more hydrogen vehicles contributes to the hydrogen supply/demand chain in the city, resulting in more competitively priced vehicles, refuelling and infrastructure.

An investment in ULEVs is a primary driver in the Local Outcome Improvement Plan, with an increase of hydrogen vehicles identified as one of the improvement measures of the Investment in Infrastructure priorities.

A review of the Local Transport Strategy is one of the Coalition Priorities in the Policy Statement. This will be linked to wider national and regional strategies, such as a commitment by the Scottish Government to ban new diesel and petrol vehicles by 2032. The deployment of a ULEV waste truck supports this strategy and ensures Aberdeen City has the infrastructure and experience to operate vehicles by the time the legislation comes into place.

**2. Objectives (based on Aberdeen City Region Hydrogen Strategy and Action Plan)**

1. Promote hydrogen vehicle deployments by a range of stakeholders in the region by integrating new vehicle technology to Aberdeen City Council’s Waste Management Fleet
2. Expand production and distribution of renewable hydrogen by creating increased refuelling demand through increased vehicles
3. Promote a greater understanding and acceptance of hydrogen technologies through communication and education activities by advertising the technology on the vehicle and working with Fleet to ensure the vehicle operates on a public route which will communicate the technology to city communities
4. Ensure strategy and policy development at all levels of government are supportive of hydrogen technologies by reviewing environmental and operational benefits of a fuel cell vehicle compared to diesel and incorporating results into organisational strategy and policy development

**3. Options Appraisal**

**3.1 Option 1 – Do Nothing**

<b>Description</b>	An application is not submitted to Interreg NWE and existing budget is used to purchase a diesel waste vehicle. This option does not support ACC organisational or Scottish Government national objectives as listed in the above Hydrogen Strategy, Scottish Government emission targets, Regional Economic Strategy or Local Transport Strategy.
<b>Expected Costs</b>	No additional spend to existing budget
<b>Risks Specific to this Option</b>	<p>This option does not support a number of city and region strategies as it fails to utilise external funding for the development of ultra low carbon vehicles.</p> <p>Diesel vehicles produce higher air quality and noise emissions than ULEVs which poses an increased risk to the environment and community.</p>
<b>Advantages &amp; Disadvantages</b>	<p>Advantages:</p> <ul style="list-style-type: none"> <li>Fleet continue to use existing vehicle which they are familiar with and can accurately gauge costs and reliability</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>Failure to utilise an external funding opportunity to trial a hydrogen waste truck</li> <li>Does not support city or regional strategies</li> <li>Diesel vehicle releases higher emissions than fuel cell hydrogen equivalent</li> </ul>
<b>Other Points</b>	n/a

**3.2 Option 2 – Participate in Project**

<b>Description</b>	This option is to submit an application to the Interreg NWE programme for financial support in the demonstration of a hydrogen fuel cell waste truck. It meets all of the objectives as listed above.
<b>Expected Costs</b>	Total estimated costs of this project are approximately £950,000. Interreg NWE has an intervention rate of 60%. Existing fleet budget of equivalent costs of a diesel truck will be used as ACC match funding. Essentially the externally funding from Interreg NWE contributes to the demonstration costs of a hydrogen fuel cell waste vehicle.

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<p><b>Risks Specific to this Option</b></p>	<p>This is a demonstration project and as such a number of operational activities will be tested during the project, such as vehicle reliability.</p>
<p><b>Advantages &amp; Disadvantages</b></p>	<p>Advantages:</p> <ul style="list-style-type: none"> <li>• Supports key objectives of city and region strategies;</li> <li>• Utilises external funding opportunity to trial new technology, ultimately reducing cost to ACC;</li> <li>• This is an ultra low emission vehicles, which has positive environmental effects;</li> <li>• Has the potential to widen operational delivery of Waste Services – due to reduced noise, vehicle could be used earlier/later in the day;</li> <li>• Ensures ACC has experience of operating ULEV waste vehicles by the time the petrol/diesel ban comes into place in 2032</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>• This is a demonstration project and operational factors, such as range and lifespan, are estimated</li> </ul>
<p><b>Other Points</b></p>	<p>n/a</p>

**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	3	4	5	6	7	8
Promote H2 Deployment	-1	3	0	0	0	0	0	0
Expand H2 Production	-1	1	0	0	0	0	0	0
Engagement with communities	-1	1	0	0	0	0	0	0
Contribute to strategy development	-1	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
<b>Total</b>	-4	8	0	0	0	0	0	0
<b>Ranking</b>								

**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

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<p><b>3.4 Recommendation</b></p>
<p>Based on the above, it is recommended to submit an application to Interreg NWE to support the deployment of a hydrogen fuel cell waste vehicle in the city.</p>

<p><b>4. Scope</b></p>
<p>This project will deploy a hydrogen fuel cell waste truck to Aberdeen City Council Fleet. It is a demonstration project and a number of factors will be measured to ascertain whether further procurement of this technology is beneficial to council services at the end of the project period. Factors which are to be measured include: costs (purchase, maintenance, refuelling); reliability; range; environmental impact; and public perception. The project will be led by Fleet Management with support from the External Projects &amp; Partnerships Team.</p>

<p><b>4.1 Out of Scope</b></p>
<p>This is a three year project. Maintenance and refuelling costs are included during this period but costs thereafter will return to be the responsibility of Fleet Services. However, the current lifespan of a diesel waste vehicle is 3-4 years so project delivery costs are in line with current lifespan of the diesel vehicle this hydrogen fuel cell version is intended to replace.</p>



## Business Case

### 5. Benefits

#### 5.1 Customer Benefits

Benefit	Measures	Source	Baseline	Expected Benefit	Expected Date	Measure Frequency
Increased vehicles encourage more competitive purchase price for fuel	Comparable price with Diesel	ACC H2 Project Team	£8 per kg	£3-5 per kg	Dec 21	Annual
Lower Greenhouse Gas Emissions (GHG) promoting a healthier city	GHG emission measurements	ACC H2 Project Team	460 tonnes CO2e	Increase on baseline	Dec 21	Annual
Public acceptance of zero emission transport technologies	Public satisfaction surveys	ACC H2 Project Team	Original survey from previous projects	Increase in public satisfaction	Dec 21	Annual

#### 5.2 Staff Benefits

Benefit	Measures	Source	Baseline	Expected Benefit	Expected Date	Measure Frequency
Personal development	1 x FTE Fleet driver for three year	ACC		1 x FTE	Jan 19	Quarterly



# Business Case

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**Define**

opportunities to engage with the hydrogen and renewables sector and increase learning opportunities	period at G10  Project Management by Fleet Services, H2 Project Team and External Funding Team			Fleet Driver		
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### 5.3 Resources Benefits (financial)

Benefit	Measures	Source	Capital or Revenue?	Baseline (£'000)	Saving (£'000)	Expected Date	Measure Frequency
External funding to deliver pilot	No additional cost to ACC compared to diesel vehicle equivalent and existing staff costs	ACC	Revenue	£383,864	-	Dec 21	Annual

## 6. Costs

### 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>											
Add cost items under each heading											
<b>Land Acquisitions</b>											

## Business Case

<b>New Vehicles, Plant or Equipment</b>												
<b>Construction Costs</b>												
<b>Capital Receipts and Grants</b>												
<b>Sub-Total</b>												

### 6.2 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>											
1 x FTE Fleet Driver	33	33	33								
Various staffing for Project Management (from Fleet Services, H2 Project, External Funding Teams)	7	7	7								
<b>Non Staffing Resources</b>											
Waste truck	531										
Maintenance		28	28								
Depot Upgrade	4										

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Refuelling	25	25	25								
Travel	4	4	4								
Engagement & Comms Activities	2	2	2								
Overheads @ Interreg rate of 15% (inc office equipment, insurance, contingency etc)	91	15	15								
Management fees	11	11	11								
<b>Revenue Receipts and Grants</b>											
Interreg NWE Funding	425	75	75								
<b>Sub-Total</b>	<b>283</b>	<b>50</b>	<b>50</b>								

\* Application is in Euro, these workings take current exchange rate of 1.13 to determine GBP equivalent – July 18\*

<b>6.3 Post- Project Capital 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</b>											
Add cost items under each heading											
<b>Land Acquisitions</b>											
<b>New Vehicles, Plant or Equipment</b>											




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**Define**

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

<b>6.4 Post- 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</b>											
Add cost items under each heading											
<b>Non Staffing Resources</b>											
<b>Revenue Receipts and Grants</b>											
<b>Sub-Total</b>											

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<b>7. Procurement Approach</b>
Will use existing Fleet Services Procurement Framework.

<b>8. Key Risks</b>	
Description	Mitigation
Procurement – delays in tendering process	Procedure agreed in advance of hearing outcome of application so that activity can commence as soon as period starts
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 route disruption/ safety concerns

<b>9. Time</b>
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<b>9.1 Time Constraints &amp; Aspirations</b>
<p>Approval to submit the application will be submitted to City Growth &amp; Resources Committee in September 2018 and, if approved, the application will be submitted in October 2018 with outcome anticipated in December 2018/January 2019.</p> <p>If approved by the Joint Secretariat, the project will be on a 42 month programme starting from January 2019 until June 2022. The majority of works will take place during a three year period from March 2019 to March 2022, with shoulder months allowed at the beginning and end for project initiation and closure.</p>

<b>9.2 Key Milestones</b>	
Description	Target Date
Committee Approval to submit application	September 2018
Submit Application	October 2018
Funding results	Dec 18/Jan 19
Initiate procurement docs	Jan 19



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Purchase of truck	June 19
Project end	June 22

10. Governance	
TBC – following meeting in August which decides which cluster H2 projects sit	
Role	Name
Project Sponsor	
Project Manager	
Other Project Roles	

11. Resources			
Task	Responsible Service/Team	Start Date	End Date
Development of the procurement documents	Commissioning - CPS	Jan 19	Jun 19
Legal Terms & Conditions	Commissioning - CPS	Jan 19	Mar 19
Compliance to Interreg Programme	City Growth – External Project and Partnerships	Jul 18	Jun 22
Management of truck	Operations – Fleet	Jan 19	Jun 22
Baselining and strategy development	Capital – H2 Projects Team	Jan 19	Jun 22

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
Localities – requirement for reliable waste collection service Fleet Services – requirement for reliable equipment and infrastructure

14. Assumptions
Operational baselines are based on a prototype which the city of Groningen is currently piloting: <ul style="list-style-type: none"> <li>Lifetime of truck – 11 years</li> </ul>

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- Expected hydrogen consumption – 14kg per day
- Storage capacity – 20-30kg of hydrogen
- Maximum range based on full tank of 30kg – 320km
- CO2 saved per day of operation – 109.37kg

### 15. Dependencies

Competitive operation of the truck is dependent on a regular supply of hydrogen from the existing refuelling station.

### 16. Constraints

The project is time restricted and must be complete by March 2022. Milestones should be met to ensure procurement and evaluation of truck occur before project end.

### 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				





# Business Case

**Define**

Environmental Policy				
Planning				
Communications				
HR				

19. Document Revision History			
Version	Reason	By	Date