

ABERDEEN CITY COUNCIL

COMMITTEE	Finance, Policy and Resources
DATE	1 December 2016
INTERIM DIRECTOR	Marc Cole
TITLE OF REPORT	FCHJU JIVE business case
REPORT NUMBER	CHI/16/258
CHECKLIST COMPLETED	Yes

1. **PURPOSE OF REPORT**

The purpose of this report is to present the business case for Aberdeen City Council for the Joint Initiative Hydrogen Vehicles Across Europe (JIVE) project - a Fuel Cell Hydrogen Joint Undertaking (FCHJU) funded project which aims to commercialise hydrogen fuel cell buses in Europe. The project will introduce additional hydrogen buses into Aberdeen City Council's hydrogen fuel cell bus fleet.

The report provides an updated project budget based on due diligence activities undertaken to present accurate costs and revenues and the external match funding requested for the project.

2. **RECOMMENDATION(S)**

That Committee:

1. Notes the Council's updated project budget in the FCHJU Fuel Cell Commercialisation Project
2. Notes the project risks around the budget;
3. Agrees the Council's participation and financial contribution of £2,500,000 towards the project subject to:-
 - a. a Scottish Government financial contribution of £3,000,000;
 - b. bus operators' agreement and financial contribution;
 - c. the Council's capital budget review process.
4. Notes that a decision on Scottish Government funding would not be received until early 2017.

3. FINANCIAL IMPLICATIONS

The financial implications associated with the FCHJU Fuel Cell Commercialisation Project (JIVE) are outlined in the main issues section of the report.

Exposure risk to currency exchange rate is also noted within this report.

4. OTHER IMPLICATIONS

Aberdeen City has Europe's largest fleet of fuel cell buses, along with the UK's largest hydrogen production and bus refuelling station. The city has become a centre of excellence for hydrogen and fuel cell technologies and has been recognised internationally on its achievements so far.

The Aberdeen Hydrogen Bus project in the first eighteen months of operations continues to exceed expectations with the fleet travelling 440,000 miles and carrying more than 590,000 passengers on two cross-city routes. The hydrogen production and refuelling station continues to offer 99.99% availability.

However the current hydrogen bus project remains in an early operational phase where learning and issue resolutions for the buses provides a range of on-going operational challenges. The current project partners, notably the bus operators and bus manufacturer remain committed to the project delivery, improving the buses availability and developing more streamlined operational processes and practices. A total cost of ownership study and assessment of the performance, reliability and benefits of this generation of hydrogen bus, will be undertaken during the project life.

The JIVE project aims to develop the hydrogen bus fuel cell technology further and take 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 and the intention is that the new fleet will extend the uses of these buses and its 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 large bus deployment will reduce capital costs and further develop the manufacturing supply chain. The

recently published 'Road Map for Hydrogen in the UK' by the UK Government predicts the commercialisation of fuel cell buses will occur in the next 5 – 10 years.

Aberdeen City Council, as a local authority has played a crucial facilitation role to date in allowing the private sector to develop hydrogen bus operations. These efforts are aimed towards supporting the route towards full commercialisation within the hydrogen sector and bringing economies of scale. As part of the hydrogen strategy work for Aberdeen, the Council will look for other areas to add value to this emerging sector through:-

- facilitating the development of the hydrogen economy's supply chain by seeking opportunities for the region's existing energy expertise to diversify and benefit from this growing industry;
- engaging with Aberdeen's Universities, North East College and oil and gas training organisations to support the training and education in the hydrogen field, as well as vocational skills relevant to the sector;
- Working with the wider region to identify areas where investments may be more attractive or the development of the supply chain may be feasible earlier, when skills shortages or high supply chain costs are seen as barriers against inward investment.
- ensuring policy and regulation encourages early adoption of hydrogen technologies in order to help to decarbonise road transport and the grid, reduce greenhouse gas emissions and improve air quality
- educating and raising awareness to stakeholder groups to successful commercialisation and acceptance of hydrogen technologies.

The hydrogen strategy for the region includes a 3 stage implementation plan delivered between 2015 - 2025. It should be considered that by 2025, the Councils facilitation role in the hydrogen sector should be significantly reduced if not redundant, with a number of outcomes achieved to allow this sector to grow organically in the city, notably that:

- the total cost of ownership of hydrogen buses over a diesel bus life is quantified
- Aberdeen becomes a hub for OEM hydrogen car deployments
- sustained private investment in the sector is achieved locally
- political support remains and policies are developed to enable private sector adoption of hydrogen technologies
- hydrogen assets and infrastructure are owned and operated by private entities

5. **BACKGROUND/MAIN ISSUES**

At its meeting on 20 January 2016, Communities Housing and Infrastructure requested a detailed business case that outlined the financial implication of Aberdeen City Council participating in the Fuel

Cell Hydrogen Joint Undertaking's (FCHJU) European Fuel Cell Bus Commercialisation Project.

On 19 April 2016, Finance, Policy and Resource Committee approved in principle, Aberdeen City Council's participation in JIVE and to seek external matching funding to provide additional vehicles to the City's hydrogen fuel cell bus fleet. This match funding was based on indicative figures based on the business case presented to the FCHJU as part of the JIVE project application.

The JIVE project will provide 10 European cities with a commercial and affordable offer for zero emission buses that provide the same range and operational flexibility as diesel buses. The project will secure funding to purchase 140 fuel cell buses and provide the infrastructure necessary for the operation of large bus fleets (of at least 10 buses per location). The coordinated approach will provide meaningful economies of scale and unlock the further cost reductions, which are required for the commercialisation of the technology.

This project will significantly increase the number of hydrogen fuel cell buses operating in Europe, and will include four cities deploying significantly larger fleets than are in operation today (fleets of 30 buses in Cologne, 26 in London and 20 in Birmingham whereas the largest concentration of fuel cell buses is currently a 10 bus fleet in Aberdeen). The project offers 10 fuel cell buses to be deployed in Aberdeen.

The JIVE project's funding approach is to use a combination of international public funding, national grants, and project partner contributions to fund the difference between the costs of a hydrogen fuel cell bus to that of a diesel vehicle and associated operational costs to run a fleet of hydrogen buses.

Officers were asked to consider two options for the commercialisation project in Aberdeen - a 10 bus and a 20 bus option. The JIVE project provides a solution for the 10 bus option. Officers have pursued an increase in FCHJU funding based on FP&R committee request in April, however were unsuccessful in this effort to lobby the FCHJU for additional funding and due to the costs and operational implications associated with a fleet of 20 buses, a 20 bus project is not a viable option for the city at this time.

In the April Committee Report, officers presented an indicative budget outlining the total estimated capital and revenue budget for a 10 bus option and 20 bus option. These figures were presented to the Council, as part of the project development work undertaken by Element Energy, the JIVE project coordinator and the Scottish Cities Alliance.

Further due diligence has been undertaken with bus operators and hydrogen re-fuelling station manufacturers to reach a position to outline

the project's costs for a 10 bus fleet. Table one below outlines the project budget changes since the April report.

Table One – Total JIVE project expenditure

	10 Fuel Cell Buses - April 2016	10 Fuel Cell Buses - December 2016
Project Totals (for 5 Year project)	£	£
Capital Expenditure	6,200,000	7,500,000
Revenue Expenditure	6,466,800	2,767,000
Total Expenditure	12,666,800	10,267,000

The capital cost, outlined in Table Two, include the fuel cell buses and the hydrogen refuelling and maintenance/operational infrastructure. The table also outlines the proposed contributions from funding bodies set against capital expenditure. It identifies the changes in funding contribution since the April report following officer discussions with the bus operators and the Scottish Cities Alliance (SCA) approach for funding to the Scottish Government.

Table Two – Capital expenditure and funding

	For 10 Fuel Cell Buses – April 2016	For 10 Fuel Cell Buses – December 2016	
Capital Expenditure	£	£	
Bus Purchase Cost	5,000,000	5,600,000	Note 1
Re-fuelling Station Infrastructure	1,200,000	1,900,000	Note 2
Total	6,200,000	7,500,000	
Funded By:			
EU Funding	1,440,000	1,739,130	Note 3
Government Funding	2,000,000	3,000,000	Note 4
Other Public Sector Partner Funding	450,000	0	Note 5
Bus Operator Contribution	1,660,000	300,000	Note 6
Aberdeen City Council Non-Housing Programme	650,000	2,500,000	Note 7
Total	6,200,000	£7,539,130	
Deficit / (Surplus) Funding	0	(39,130)	

Note 1 - This represents the capital cost of €650,000 per bus. This cost has yet to be finalised through a procurement process however through a range of meetings with bus manufacturers, this maximum bus unit price has been confirmed. The difference in cost represents the change in currency exchange between the Euro and Sterling.

Note 2 – This cost is for re-fuelling station plant and other operator capital requirements such a bus electrical fuel cell protector charge points. Tender processes would need to be followed to confirm these costs and the cost does include £300,000 project contingency. The difference in cost represents the change in currency exchange between the Euro and the pound.

Note 3 - The JIVE project was approved in September 2016 with Aberdeen City Council allocated €1,951,000 (equivalent to £1,739,130) of funding.

Note 4 - No financial commitment will be made by the Scottish Government to the JIVE project until January 2017 following the autumn statement. While an initial sum of £2,000,000 was identified in April, the SCA in July 2016 requested £3,000,000 from the Scottish Government for the Aberdeen project. This formed part of an overall funding bid to support bus deployments in Aberdeen and Dundee.

Note 5 – This figure represents a contribution from private sector project partners and other local agencies. Further discussions will be had with NESTRANS and the UK Government’s Office for Low Emission Vehicles (OLEV) once Scottish Government and Council’s match funding is agreed.

Note 6 - the bus operators have indicated that they will pay the equivalent cost and exposure to risks of operating a diesel bus. In return the operators will commit to operating the buses and take a partnering approach to the deployment, recognising that there will be new learnings and challenges associated with deploying an innovative, zero emission vehicle technology. The bus operators will pay a lease payment for the buses at an equivalent diesel bus rate– circa £700 per bus per month

Note 7 – the Council is being asked to fund the project in return for the benefits of fleets of zero emission buses operating in Aberdeen. This figure identified represents the project’s remaining capital cost.

The commercialisation project will require the fuel cell buses to operate in Aberdeen at the same cost as a diesel vehicle on a total cost of ownership basis. The forecasted annual revenue expenditure and income is shown in Table Three.

Table Three – Annual expenditure and revenue income

	For 10 Fuel Cell Buses – April 2016	For 10 Fuel Cell Buses – December 2016	
Revenue Expenditure per annum	£	£	
Fuel Cell Bus Maintenance	292,500	180,000	Note 1
H2 Fuel Costs	184,180	360,000	Note 2
Operational Costs and Contingency	10,000	13,500	Note 3
Total	646,680	553,400	
Revenue Income per annum			
Bus Operator Maintenance	292,500	200,000	Note 4

Recoveries			
Bus Operator Fuel sales	264,550	264,550	Note 5
BSOG Uplift	93,600	93,600	Note 6
Total	650,650	558,150	
Deficit / (Surplus) in Funding per annum	(3,970)	(4,750)	

Note 1 – This figure represents predicted fuel cell/hydrogen maintenance & parts contract value in line with current hydrogen bus project contract. These costs have reduced following the review of maintenance requirements for the buses.

Note 2 – This figure equates to monthly production electricity rates in line with the current bus project electricity tariff. This figure is higher than the forecasted amount presented by Element Energy within the initial project business case.

Note 3 – This figure represents expected operational costs and project contingency.

Note 4 – The bus operators would pay a diesel maintenance equivalent rate, which represent the maintenance work to repair and maintain the conventional elements of a bus.

Note 5 – This figure represents the total costs that the operator will pay for hydrogen. This is estimated on a bus travelling 65,000km per year and using 0.9kg/100km with the operator paying the equivalent cost of diesel.

Note 6 – Through the current Bus Service Operating Grant (BSOG), the operator will be eligible for an enhanced payment equivalent to 14.4p per km.

The JIVE project's financial model shows that the ten fuel cell bus option currently has a total project capital deficit of £2,500,000. However it has to be noted that if the Scottish Government do not contribute the £3,000,000 requested, the financial request to Aberdeen City Council would increase if the project was to proceed.

It is recommended that the Council contributes match funding towards the project, but this funding should be conditional on Scottish Government funding being approved and bus operator agreements being in place.

If the Council proceeds with the project, the first step will be a procurement process to purchase the new fleet of buses and this will be led by Transport for London. They have indicated that this will be completed by June 2017. The procurement will see a phased production of the buses for each cities requirement. No affirmative date is set for Aberdeen in the production process; however it is likely that no buses would be operational in Aberdeen until at the very earliest 2018.

6. **IMPACT**

Improving Customer Experience

This proposal will benefit both the operators and the general public in the future by providing clean, quiet, zero emission buses and improving the air quality within the city.

Improving Staff Experience

Working within this technically challenging but rewarding sector has broadened the knowledge, improved project management and negotiation skills of the staff involved in the various projects.

Improving our use of Resources

The reasons for spending public funds must always be analysed to ensure that they are valid and are necessary. This particular project has gone through the validation process and the outcome from this project will reap the rewards for Aberdeen City Council moving forward in terms of providing the general public with clean, quiet, zero emission buses, improving the air quality within the city and the travel and wellbeing of its citizens.

Corporate

This project links into the North East's Regional Economic Strategy - "Further diversification into alternative energy technologies must be accelerated to complement work already being undertaken in shale gas, tar sands, hydrogen fuel cell supply chain opportunities, energy and carbon capture and storage and decarbonising food production."

This project is also detailed within the Strategic Infrastructure Plan as one of the projects with substantial direct involvement from Aberdeen City Council that contribute to economic growth. It will also offer 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 Aberdeen City Region's Hydrogen Strategy cannot be delivered. The External Funding Plan reinforces the importance of joined up partnerships at local, national and international level.

This project also links to the Aberdeen City Region Hydrogen Strategy and the transport and energy priorities within Aberdeen – the Smarter City Vision to "define the image of an international 21st century energy city, leading a new leaner, cleaner industrial revolution using the intensity of our social, business and community connections" and taking "a European lead in adapting new transport technologies" to

“provide and promote a sustainable transport system, including cycling, which reduces our carbon emissions”.

Public

This project is of interest to the public in terms of the potential economic and environmental benefits that hydrogen and fuel cell technologies can bring to the City including job creation as well as air quality improvements. 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 (NOx), sulphur oxides (SOx) and particulate matter (PM₁₀).

7. MANAGEMENT OF RISK

The returns from the Council's investment to date in hydrogen technologies (in relation to economic growth, business diversification, energy security, environmental and air quality benefits) continued to be examined through the life of city hydrogen projects.

The level of any capital financing required from Aberdeen City Council can only be determined once the level of external financing is confirmed.

As the proposal is to include European partners and funding within the project, the Council will be exposed to exchange rate risk between Euros and Sterling. The Council will have to underwrite any significant exchange rate movement which impact on project cash flows.

In regards to Brexit, officers have been informed that the EU will meet its funding obligation for EU funded projects, including FCHJU that begin before the UK Government triggers Article 50 of the Lisbon Agreement.

The Council could be subject to reputational damage within the FCHJU and the Scottish Cities Alliance, if the JIVE project business case is not supported.

It should be noted that there are a number of risks that will remain in the project that could influence the budget throughout the life of the project:

Exchange Rate fluctuations	EU funding provided to all partners in Euros – ACC risk when to convert to sterling.
BSOG position	The Government position on BSOG is likely to change in 2017
Hydrogen Fuel production costs	These could vary depending on production times & energy tariff – learning has been taken from the current bus project on estimating

	these costs
Scottish Government Funding	Through the Scottish Cities Alliance, a pitch paper has presented a financial ask of £3,000,000 – however no commitment has been made to that level of request only that a decision will be made by the Scottish Government in the new year.
Hydrogen re-fuelling upgrade	A procurement exercise will be undertaken to purchase hydrogen plant to meet project requirements.

Additionally it should be noted that there are a number of unsecured costs at this time that could favourably alter the project budget going forward namely:

Bus purchase price	€650,000 has been provided as the capped maximum price per bus but the procurement's Request For Information response has indicated that bus prices could be as low as €550,000 once the procurement exercise is concluded
Electricity tariff	Energy providers could be lobbied to provide reduced tariffs to support new technology projects
Additional Funding	Further support will be sought from other funding sources including NESTRANS and the UK Government Low Emission Vehicle fund. This will be used to reduce the Council's contribution.

8. BACKGROUND PAPERS

CHI 15/341 - FCHJU Fuel Cell Bus Commercialisation Project
 CHI 15/34 - FCHJU Commercialisation Study
 CHI/14/048 - Aberdeen City Region Hydrogen Strategy 2015-2025

9. REPORT AUTHOR DETAILS

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