The Aberdeen Hydrogen Bus Project

SEAFUEL

ABERDEEN CITY COUNCIL

Local authority Aberdeen City Council

Local authority area population 228,800

Services Environmental Health; Roads; Social Work; Community Development; Organisational Development; Economic Development; Building Standards; Trading Standards; Housing; Waste; Education; Burial Grounds; Marine Services (acts as harbour authority for islands' 29 piers and harbours)

1 Scotland's third most populous city

2 Previously known as offshore oil capital of Europe

3 Effort to rebrand as energy capital of Europe

Aberdeen HydrogenProject

Background

Following a sharp downturn in the oil and gas sector in the North Sea - and Aberdeen's historic reliance on the sector - the city was naturally enthusiastic to be at the forefront of any renewable energy initiatives.

The innovative £19m Aberdeen Hydrogen Bus Project included funding for 10 hydrogen buses and the creation of a dedicated maintenance facility and acted as the catalyst for the

Orkney's hydrogen future

[1] Orkney Islands Council, The Orkney Hydrogen Economic Strategy, Appendix 1, http://www.orkney.gov.uk/Files/Committees-and-Agendas/Development%20and%20Infrastructure/2015/10-09-2015/I11_App1_Draft_Orkney_Hydrogen_Economic_Strategy.pdf

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION

Background

development of a Hydrogen Strategy and Action Plan for Aberdeen City Council; allowing for the first multi-sector part-nership to pioneer the development of advancements in sustainable transport, simultaneously deliv-ering the world's largest fleet of hydrogen fuel cell buses.

With a move both nationally and internationally towards an energy economy, and with many of Ab-erdeen's population having specific knowledge and skills base from the oil and gas sector, people within the city brought with them an enthusiasm to the project which helped to drive a positive mind-set throughout.

Many of the skills from the oil and gas sector can be transferred to hydrogen, with the techonologies having many similarities (high pressure technologies), and the idea that oil rigs could potentially be used to flare hydrogen was initiated from the outset. Aberdeen City Council saw hydrogen as a natural fit and progression from the previously dominant oil and gas sector, and recognised that hydrogen powered vehicles - namely buses used for public transport - would be a logical move, given that 50% of the project would be funded by the European Union. Aberdeen has a close cross-party interest in the EU and has been closely involved in the North Sea Commission, with Interreg funding having been a key player in driving the city's economy forward as well as having been a major part of the city's Hydrogen Strategy, through which the Hydrogen Bus Project has developed.

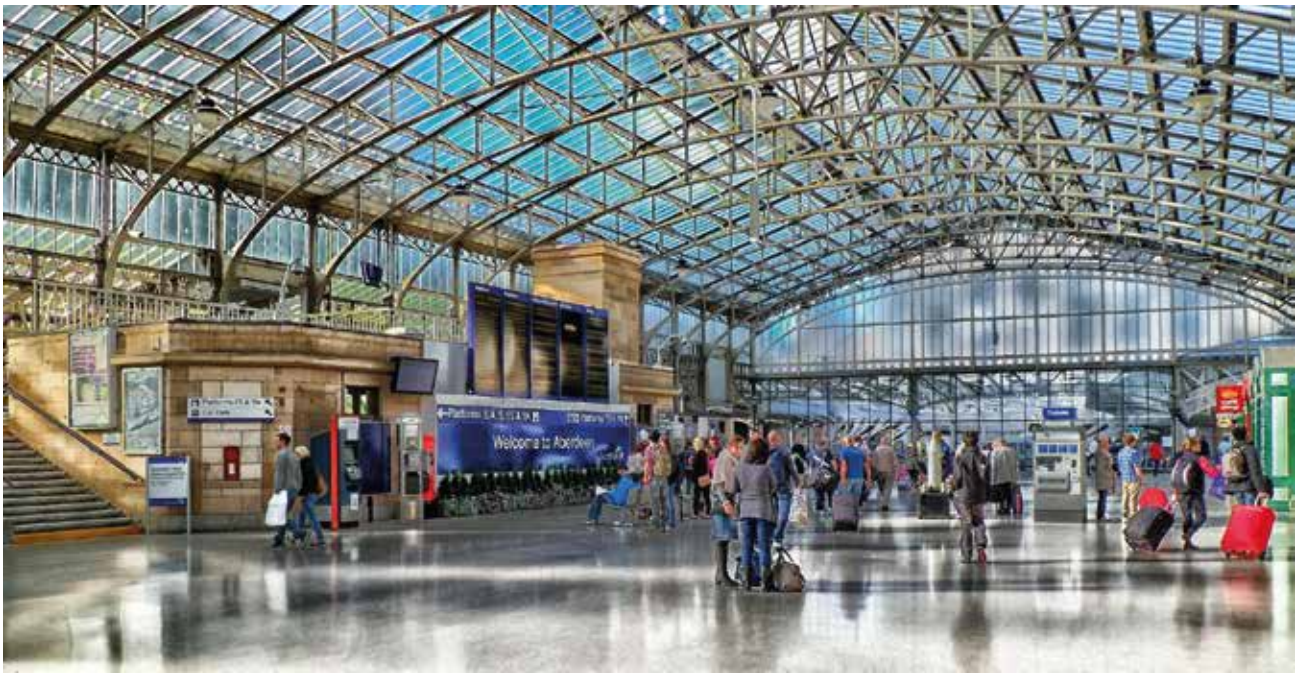
Partnership working across the UK has been essential throughout the project, particularly as only 50% of the £19m funding was provided by the FCH JU. To secure the additional funding, Aberdeen City Council worked alongside Innovate UK, The Scottish Government and Scottish Enterprise, and the project was pitched from an energy-based focus rather than from a transport-based focus to ensure its success in funding applications.

H2 Aberdeen

This energy focus was crucial to the initial success of the project and achieved considerable buy-in from funders and helped to create strong partnerships.

Aberdeen's already strong ties with the private sector allowed partners from various sectors, including public and private sector organisations, along with key hydrogen industry bodies, to join forces to help fund and administer the project; helping Aberdeen achieve its objective in becoming a world-leading city for low carbon technology. Additionally, the H2 Bus Project, part of the H2 Aberdeen Programme, delivered the UK's largest hydrogen production and bus refuelling station in Aberdeen.

These partnerships have been fundamental to the pro-ject's success and become even more significant going forward.



Project/Strategy Funding

Aberdeen City Council's Hydrogen Strategy was launched at the All Energy Conference in Brussels in 2015 and contained seven objectives:

Objectives

1. Vehicle Deployment
2. Green Hydrogen Refuelling Infrastructure
3. Communication
4. Education
5. Innovative Uses
6. Supply Development
7. Policy and Strategy

The £19m project funding was secured through a number of various channels, namely:

Aberdeen City Council have been following funding streams from the aforementioned sources which have allowed for the strategy's seven key objectives to be delivered. Within the city's Hydrogen Strategy, around eight projects are currently being delivered, all of which aim to meet the city's obli-gations on Low Emission Zones on major arterial routes for freight and city centre traffic.

The Scottish Government has committed to introduce Low Emission Zones into Scotland's four big-gest cities between 2018 and 2020, with a vision to deliver the best air quality in Europe right here in Scotland. By improving air quality, tackling congestion and helping to improve urban environ-ments, Low Emission Zones are designed to be a partnership between local authorities, industry and regional transport partnerships.

Of those eight projects currently being delivered, key hydrogen projects are as follows:

Objectives	Description
High Velocity Project	4 hydrogen buses to First
High Transit Project	6 hydrogen buses to Stagecoach

Both of these projects were funded by EU and Fuel Cell Hydrogen Joint Undertaking (which is in turn funded by EU funding, part-funded by the Scottish Government and the local authority, as well as private sector bus and transport providers).

Project	Description
JIVE	10 hydrogen buses to First and a dedicated supply of hydrogen

The JIVE (Joint Initiative for Vehicle across Europe) project was approved by both the EU and the local authority and has contributed towards the use of the Kittybrewster refuelling site - which was previously only used for buses - now being in use also for lorries, cars and other vehicles.

The Kittybrewster site is owned by the local authority and was used previously for local authority waste and fleet vehicles, although the refueling station itself is currently owned by BOC. With 24-hour security, a prime accessible city centre location, the site was conveniently placed to become the project's hydrogen refuelling station.

Project	Description
H2ME	10 hydrogen buses to First and refuelling stations now in place

Aberdeen City Council is a liaison point for this project, helping to redevelop the Kittybrewster refu-elling station to allow cars which charge at 700 bar, more than buses at 350 bar.

Project	Description
Hytrec1	Hydrogen strategy
Hytrec2	Testing vehicles

The Hytrec1 project consisted of drafting a hydrogen strategy, of which the overall hydrogen strategy was a work package outcome; with some test vehicles and an education learning programme being other outputs of this project. The project is now complete.

The purpose of the Hytrec2 project was to test more hydrogen vehicles (h2), deliver green hydrogen and develop the hydrogen supply chain. Ten cars and/or vans were tested in comparison to standard vehicles in terms of the following criteria:

- costs
- emissions
- fuel usage
- mileage
- reliability

There are currently three vehicles being tested, with the following seven to be tested by Feb 2019. The eventual project objective for Hytrec2 is to test twenty five cars across all regions, with ten of those in Aberdeen, with comparison materials are to be produced.

Project	Description
FCH Train	Training of technicians

The FCH Train project, which is funded through ERASMUS and others, looks at training technicians to work on the fleet of vehicles. The course is led by lead partner Ballard, based in Denmark, and involves hydrogen safety and the maintenance of hydrogen vehicles. It also links into WP5 of Hytrec 2, of which Norway is the lead partner.

Project	Description
HyTime	Waste disposal vehicles

HyTime is a completely innovative project to the UK. Currently two waste disposal vehicles are being funded, one of which has already been delivered and is being used effectively.

OLEV (Office of Low Emission Vehicles) has been a huge driver for the work that Aberdeen City Council has carried out in the hydrogen sector, with one of the local authority's road sweepers having been retrofitted through HyTime (funded through Innovate UK). OLEV also funded 10 Toyota Mirais which are now used by the NHS, Scottish Environment Protection Agency (SEPA) and Aberdeen City Council.

The intention of Aberdeen's hydrogen strategy is for the local authority to gradually move away from being the key delivery agent of project by becoming the facilitator. The local authority is looking to bring in major stakeholders from both the public and private sectors, with Police Scotland, The Scot-tish Environment Protection Agency and the NHS to name but a few.
Co-wheels are also likely to come on board to help establish the city's car club, using hydrogen as part of their fleet so that members of the public can trial hydrogen vehicles.

Challenges and Barriers

A significant barrier to the Aberdeen Hydrogen Bus Project has been a distinct lack of refueling stations – in other places. Aberdeen itself currently has two refueling stations, one for buses, and one for cars and lorries. With Aberdeen being in fact the only location within the UK - outside of London - to have two hydrogen refuelling stations, the challenge is in connecting and aligning the strategy with other parts of the country.

Another challenge of the city's hydrogen strategy has been in the coordination of each of the various aforementioned projects, ensuring no duplication in outcomes and objectives, and then beginning to off-load the projects as the local authority moves away from being the key delivery partner. Each and all of the outputs are being coordinated efficiently, tapping in to the Scottish Government's en-ergy policy which is that 100% of the city's requirements are delivered through electric and hydrogen energy.

The Scottish Government's energy policy also makes specific reference to the technical expertise that exists within the oil and gas sector and ensuring the highly-skilled workforce of this sector are made aware of hydrogen as an energy source has been another challenge along the way. By way of trying to tackle this challenge, a Hydrogen Supply Chain event is due to be held on 9th October to engage with local businesses, to help expand the supply chain. To encourage businesses and those from the oil and gas sector to engage, Aberdeen City Council will once again place emphasis on the energy aspect of the hydrogen strategy, rather than focusing on the transport element.

One of the biggest barriers thus far has been to balance short-term energy requirements along with a changing energy mix and changing economic landscape over the short, medium and long-term. There has, at times, been a slight disconnect with the delivery of the objectives and the long-term requirements from legislation and regulatory requirements from the Scottish Government and the EU.

Looking Ahead

Overall, the Aberdeen Hydrogen Bus Project - or at least the city's hydrogen strategy as an umbrella project – is deemed a success and is generally seen as a flagship initiative for a city which is trying to maintain its position as the energy capital of the EU, as well as the UK.

Aberdeen City Council currently has 35 hydrogen vehicles – making it one of the largest and most varied fleets in Europe – and the fleet is set to continue to expand, with plans in progress for a wide range of organisations to trial a further 10 buses and cars/vans in 2019/

The hydrogen strategy which was launched in 2015 attracted huge interest, both nationally and in-ternationally, and those stakeholders involved would be keen to look to relaunch a further strategy in the future; this time looking at the potential of hydrogen storage as well as wind to methane to hydrogen conversions, based on Japenese examples.

The impact of Brexit is set to hit Aberdeen slightly harder than most other areas of the UK, with the majority of Aberdeen's EU funded projects and commitments being tied in with Norway and other similar partners. Successfully building and maintaining links with the private sector has been key to economic development for Aberdeen, although continuing to sustain those relationships will be key to further success.

As previously mentioned, refuelling infrastructure is challenging, both in terms of cost and timings. With an electrolyser taking around 12 months to build, and with the supply chain being extremely limited around the world, the next phase of projects would need to bear this in mind.

Aberdeen City Council is keen to diversify and move away from being the key delivery agent of the hydrogen strategy, moving towards facilitating a private and public sector partnership. There is a huge opportunity ahead in terms of sharing learning and experiences, however, and the local au-thority would of course be a key player in this, despite having limited capacity in terms of being able to develop and deliver on all existing projects. One area of discussion has been whether or not to focus purely on hydrogen or also on electric – or both – as energy sources. Either way, it has, and will continue to ensure significant persuasion and information sharing with members of the public to ensure that they can grasp and embrace new technologies and practices.