

Levenmouth Community Energy Project



What is the Levenmouth Community Energy Project?

This innovative and transformational project has secured over £4million from the Scottish Government 's Local Energy Challenge Fund and aims to demonstrate that green hydrogen can tackle two of Scotland's biggest energy challenges - energy storage and low carbon transport.

The project is primarily centred on the further development of the Hydrogen Office in Methil and on Fife Council's Bankhead site in Glenrothes and involves:

Micro-Grid

Creation of a zero carbon smart grid at Methil Docks Business Park, utilising a sophisticated hydrogen energy management system which will be implemented by project partner Toshiba.

The project will expand on a current private wire network to include six other buildings onsite including the children's nursery, the community medical centre and East Fife Football Club.

The smart grid will run parallel to the current national grid lines and each building will have both microgrid and national grid connection points.

Hydrogen will be stored at the Methil site and reconverted to electricity at times when onsite wind and solar generation is low. This will help offset the intermittency of renewable generation and as a result, improve the business park's ability to be energy self-sufficient.

This will demonstrate how more renewable energy can be connected to the grid nationally by alleviating the network export constraints that are becoming all too common in areas such as Scotland in times of peak renewable generation.

Hydrogen Vehicle Fleet

Creation of a fleet of 17 hydrogen vehicles which comprise:

Ten Renault Kangoo's with a hydrogen range extender, owned by Bright Green Hydrogen and available to lease to local organisations.

Seven diesel dual fuel Transits which will run partially on hydrogen as part of Fife Council's fleet

Two of Fife Council's Refuse Collection Vehicles converted to run partially on hydrogen – this is believed to be a world first.

Hydrogen Refuelling

New hydrogen production and refueling facilities at the Hydrogen Office and Hydrogen Refueling facilities at Fife Council's vehicle depot in Glenrothes.

Solar Installation

The Hydrogen Office's 750kW wind turbine will be complemented by around 200kW of solar PV to be installed within Methil Docks Business Park, to create more energy that will be stored as hydrogen.

Rural Investigation

A feasibility study will examine how low-cost hydrogen may be sourced from farms that have significant stranded renewable electricity.

Community Benefit

Development of a programme of education, skills and supply chain development activities. This would include a schools' education programme and working with Fife College to address skills programmes for new hydrogen vehicle technology.

A partnership will be formed with Levenmouth Valley Development Trust (LVDT) to drive forward the community benefits from the project.

What are the key aims of the Levenmouth Community Energy Project?

- To improve access to, and understanding of, the technology.
- To improve confidence in the reliability and encourage future take-up of the technology by promoting its benefits.
- The project will also demonstrate how greater supplies of renewable energy can be connected to the grid nationally by alleviating network export constraints that are becoming all too common in times of peak renewable generation.

Who is behind Levenmouth Community Energy Project?

The Levenmouth Community Energy Project is being led by Bright Green Hydrogen along with project partners, Fife Council and Toshiba. Other members of the consortium include Leven Valley Development Trust; Fife College; Green Business Fife and the Scottish Hydrogen, Fuel Cell Association (SHFCA), Symbio, Ulemco and Gaet Transport.

How will the Levenmouth project benefit the local community?

Levenmouth Community Energy Project is expected to bring long-term socio and economic benefits to the area and help secure future energy supplies for generations to come.

Surplus income from the leasing of the Kangoo vans will be given to a local charity, Leven Valley Development Trust LVDT which will use the funds to support sustainable energy projects in close cooperation with the project.

What is hydrogen?

Hydrogen is the most basic and common element on Earth. Very little hydrogen occurs naturally on Earth on its own. It is found in compounds like water and hydrocarbons such as fossil fuels.

Electrolysis can be used to produce hydrogen, by splitting water (H₂O) into hydrogen (H₂) and oxygen (O₂) using an electrical current. If energy from renewable sources is used to power this process, the hydrogen can be produced with zero carbon emissions.

Working efficiently and effectively in countries around the world, hydrogen is a proven technology, with a wide number of practical applications in transport, heat and power.

Is hydrogen safe?

The hydrogen facilities that will be used in the Levenmouth project have all been approved by the relevant safety authorities to stringent international standards. Hydrogen has been used for a wide variety of industrial applications for more than 100 years.

Other local authorities are already developing hydrogen, for example, Aberdeen City Council launched their fleet of 11 Hydrogen buses in 2014. The people of Aberdeen find the experience more enjoyable than diesel powered buses, due to how silent the buses are while driving. Aberdeen also now have a small number of Kangoos and dual fuel Transits as part of their fleet.

What happens if Hydrogen escapes?

Hydrogen is amazingly light, in fact it is the lightest gas ever found. If it was to escape, it would go up into the atmosphere at around 50mph.

In the case of vehicles, the hydrogen system is fixed to the vehicle chassis to be crash resistant. In particular, the hydrogen tanks are positioned in the middle of the vehicle, in the area where the deformations are the most reduced in case of crash. We especially take care of hydrogen tanks reliability. They are composed of an aluminium liner ensuring hydrogen impermeability, surrounded by carbon fibre winding, ensuring mechanical resistance. It results in a solution with an extremely low leak rate.

The manufacturer of the hydrogen system also adds hydrogen sensors to detect any potential leaks.

Why choose hydrogen as a renewable technology?

Scotland has the richest and most diverse renewable resources in Europe as well as world-leading academic research and development and energy expertise.

However, some of these renewable resources are intermittent (notably wind and solar) and therefore the ability to store this green energy is paramount. Hydrogen provides a first class mechanism for doing so, allowing its later use for transport, heating, and even reconversion back to electricity. This is of particular importance to parts of Scotland including Fife - and more widely - where there is insufficient grid capacity to develop the available resources of renewable energy.

With just under a quarter of Scotland's emissions coming from transport, the use of hydrogen in transport offers great promise as a key component of a low carbon energy system.

With no harmful emissions from the exhaust, hydrogen fuel cell vehicles can help to improve air quality and reduce air pollution.

Hydrogen refuelling has already been installed in London, Swindon and Aberdeen but the Levenmouth project will develop one of the largest concentration of vehicles in the UK. As a result, it is pivotal to putting the region on the global, clean energy map.

Why is hydrogen being used as a fuel ?

Hydrogen is being used as it is the world's simplest and most abundant element and when used as a fuel, it produces no harmful emissions. Compared with conventional power sources, fuel cells also bring various advantages such as having a higher efficiency than diesel or gas engines.

What is a hydrogen fuel cell?

A fuel cell is an electrochemical device in which hydrogen (or hydrocarbon / biogas fuel dependent on fuel cell type) can combine with oxygen, directly producing DC electricity and heat. Fuel cells offer high efficiency almost regardless of size therefore offer a modular, flexible power source.

As such, there is potential for them to power everything from portable, handheld devices to back up generators or even provide large-scale, distributed electrical generation.

When are the vehicles expected to be rolled out?

The Refuse Collection Vehicles and the Transits which will be part of Fife Council's fleet are expected to be operational by Spring 2016. The Kangoos which will be owned by Bright Green Hydrogen will also be in operation by Spring 2016.

What are the emissions at the tailpipe?

The Transits will emit 70% less CO2 than an equivalent diesel Transit.

The Kangoos are zero emission vehicles.

The Refuse Trucks will be a world first therefore emissions have not yet been measured.

Where will the vehicle fleet refuel?

The fleet includes 17 hydrogen dual-fuel and range extended vehicles with refuelling points being installed in Methil and at Fife Council's vehicle depot at Bankhead in Glenrothes.

How much hydrogen is stored on each vehicle?

There will be 5kg tanks fitted to each of the Refuse Collection Vehicles.

The Transit Vans will carry 3kg tanks of hydrogen.

The Kangoo Vans will carry 2.5kg of hydrogen.

How will the vehicles be refuelled?

This will be done via a standard nozzle, similar to one used during petrol or diesel refuelling.

How will the Refuse Trucks and Transit Vans be powered?

The Refuse Collection Vehicles and the Transit vans will be powered via a combination of hydrogen and diesel mixed in the engine manifold, with hydrogen stored in supplementary fuel tanks installed underneath the vehicle. The conversion work was developed by Revolve Technologies and is now being commercialised by ULEMCo.

Are the hydrogen powered vehicles quieter than diesel vehicles?

The dual fuel vehicles (Transit & Refuse trucks) use combustion engines so will have no noticeable difference to standard diesel vehicles. Kangoos vans are virtually silent.

What about the Kangoo Vans?

The Kangoo vans are to be fitted with a supplementary tank of hydrogen which will recharge the battery through a dual-fuel device. As a result, each of the van's normal operational range of around 100 miles will be doubled.

How will local businesses and organisations benefit from the vehicles?

The Levenmouth project will help local Fife organisations to boost their green energy credentials by leasing out its dual-fuel powered vans which have 100% zero emissions if charged using the Hydrogen Office's 100% green electric vehicle charging station.

Local organisations will also be able to refuel the vehicles with hydrogen at the Hydrogen Office or Fife Council's Bankhead depot in Glenrothes with both locations having hydrogen refuelling stations installed as part of the project.

While the vehicles are expected to start becoming available for lease in early 2016, representatives of the project have already been engaging with local organisations and the feedback so far has been extremely positive.

How do hydrogen vehicles compare with electric vehicles?

Hydrogen vehicles take less than 10 minutes to refuel compared to electric vehicles which require a far greater amount of time to recharge once the battery has run out (anything from 30 minutes to nine hours).

Hydrogen vehicles have the same range as any other conventional gasoline vehicles (the Hyundai ix35 Fuel Cell for example has a range of approximately 350 miles) whereas most electric vehicles have a driving range of 100 miles maximum.

Why choose the dual-fuel Refuse Collection Vehicles?

The dual-fuel technology also allows an introduction to hydrogen fuel without incurring the high costs of hydrogen fuel cell which runs on 100% hydrogen. It can also operate in diesel only mode in the event there is any interruption to the hydrogen supply. The vehicles will also deliver reduced carbon emissions as well as an improvement in air quality for the local community.

What scale of carbon/fuel efficiency savings are the hydrogen Refuse Collection Vehicles expected to represent for Fife Council compared to its existing fleet?

Due to the innovative nature of the refuse vehicle design, it is not possible to quantify the expected carbon savings until the design is completed. However, the saving is expected to be significant and will apply to both the motive and the compactive energy used on the vehicle.

Once the vehicles are operational, they will become the focus of a major data-collating programme that will enable the cost-benefit of such vehicles to be better understood. Operational data collected from the Toshiba control system, from the vehicles, and from the hydrogen refuellers will be used to study and optimise the efficiency of the scheme.

Does the Council have plans to add more hydrogen vehicles to its fleet in the future if this first step proves successful?

Fife Council is keen to expand its deployment of low-carbon vehicles, and will be seeking new opportunities following the current project.

Has Fife Council liaised with Aberdeen City Council at all to understand the practicalities of operating hydrogen vehicles within its fleet?

Fife Council has long-standing links to the Aberdeen hydrogen bus project. A member of the current Levenmouth project team was also involved with the Aberdeen hydrogen bus project.

Is this project costing Fife taxpayers anything?

A significant portion of the funding comes from private sector investment, UK Government and European funding bodies. The public sector money in this project was necessary to demonstrate the commitment to a low carbon future and projects like this are essential to show that such a future is possible in Scotland as well as ensuring the region's long-term prosperity.

For more information:

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