Albannach Power Island I - Energy Storage Facility at Spittal, Caithness

Spittal is a village located in the Caithness district of Highland Council in Scotland. With the introduction of Highview Power's CRYOBattery, the Council can demonstrate their commitment to introducing sustainable technologies and offer Spittal a unique chance to bring cleantech jobs to the village by leveraging a largely unused portion of the quarry currently managed by A & D Sutherland. This development positions Spittal at the forefront of Scotland's clean energy transition, attracting investment and jobs to the community.

About the Project

Albannach Power Island I is being developed by Highview Power, a UK-based leader in clean, reliable and cost efficient long-duration energy storage and grid stability solutions. Efficient storage of energy at scale is essential to support new, cleaner energy sources, and to ensure future energy security.

The storage technology proposed at Spittal uses liquid air energy storage. This works by taking ambient air, removing the CO_2 and particulates and cooling it to its liquid form, which is then stored on site in insulated, low pressure vessels. At times of demand, the liquid air is evaporated and expanded through a turbine to generate electricity. For long-duration storage, this is achieved at a lower cost than lithium-ion batteries and the technology provides valuable services to help integrate renewables and stabilise the electrical grid. The technology uses only benign materials with zero emissions and has zero water impact.

The project will be able to deliver 49.9MW of electricity for up to 6 hours (300MWh), providing enough power for around 120,000 homes. The system will charge from the grid at times of high levels of wind generation and discharge at times of high energy demand or low wind output.

The system also includes a 'stability island', which will be deployed to the national electricity transmission system to balance grid power supply by providing system inertia, which is key to grid stability, without adding to the carbon footprint.

The growth in non-synchronous renewable energy generation has created a need to develop ways of maintaining grid stability (to ensure balanced power supply despite the intermittency of renewable energy sources such as wind and solar), without relying on the large synchronous generators of traditional fossil fuel power plants. This technology has the same stabilising capability as traditional power plants but with zero emissions, at a lower cost and with a smaller building footprint. Facilities such as the stability island will play an essential role in achieving grid stability as more renewables get connected and help the UK meet net zero carbon goals.

The Location

The proposed site occupies the unused quarry to the north of the Spittal Mains Quarry where all existing buildings associated with the operational quarry activity are located. The total quarry site area is 17 acres. The footprint of the new plant would only be up to five acres, all of which has been previously quarried.

The site was selected because it is highly suitable for repurposing. The intention is to house the plant inside the second, disused quarry, adjacent to the working Spittal Mains Quarry. The system would connect to the transmission network at the existing Spittal substation, which benefits from distributing energy from local wind farms through the Caithness Moray interconnector and transmission network. All connecting cables would be buried.

From an environmental perspective, there will be little or no impact to wildlife or habitat and no adverse impact on the environment. All relevant surveys and mitigation measures will be undertaken as part of the development process. The quarry floor consists of bedrock and waste quarrying material and not only provides a suitable base for the foundation of the plant but is also unlikely to contain any environmental or ecological receptors.

The local area is sparsely populated and has been declining in recent years. Working age residents ordinarily travel to larger towns in Caithness for work. During construction, this

plant will bring workforce opportunities to both the local village of Spittal and surrounding areas.

The land on which the proposed plant will be built has for many years been used for industrial purposes and will continue as a disused quarry site for decades to come. The liquid air energy plant requires minimal maintenance, and therefore minimal transport. The previous use, extracting crushed stone for construction will have generated a significant number of heavy vehicles.

Planning applications to restore the Spittal Mains quarry site have been prepared and will be submitted to Highland Council. In addition, the future development of renewables and the interconnector from Orkney to the mainland will also require network support services that the Highview Power system can provide.

What will it look like?

The development will consist of a series of cylindrical storage tanks of modular construction with a maximum height of up to 45m, together with a charger (air liquefier), liquid air storage tanks, generator, control room, and ancillary plant. This is less than half the size of the nearby wind turbines. The taller structures will be located within some of the existing deeper parts of the quarry.

The site owner and operator of Spittal Mains Quarry, A&D Sutherland Ltd, will assist with site preparation, further reducing disruption and traffic levels during the construction period. Where possible, other local services will be used to minimise disruption and increase opportunities in the area.

Highview Power is committed to minimising the visual impact of the long-duration energy storage facility by locating the plant further away from the road. Forestry plans are also being considered which will include extending the tree line and putting in place long-term habitat management. All responses put forward through the public consultation will be considered as will feedback from the local planning authority and other statutory stakeholders.

The visualisation in Figure 1 shows the scale of the development when travelling north from the public road, coming from Spittal, with existing houses on the left.

Figure 1

The visualisation in Figure 2 shows the scale of the development travelling south from the public road (A9) with the existing quarry buildings on the right.

Figure 2

While the tanks are tall, they are less than half the height of the nearby wind turbines.

Will it cause any extra traffic?

To keep traffic off the main roads, access to the site will be via the A9

Some additional traffic will be generated during construction, but this will be short term and it will be less frequent than traffic normally associated with the Spittal Mains Quarry.

Once operational, the plant will be serviced with only maintenance personnel requiring access and therefore levels of traffic, once built, will be minimal.

Will there be any environmental impacts?

A liquid air energy storage plant is one of the safest energy storage technologies available on the market today. No combustion takes place at any stage of the process,

with the plant using only liquid air to generate electricity. This means that there is no air pollution created when charging, storing and generating electricity onto the grid network.

Because of the safe nature of the technology, liquid air energy storage plants have minimal environmental impact when compared to other technologies. The company will complete and submit all standard environmental surveys and reports with the planning application. These include:

- Ecology surveys
- Landscape Assessment
- Traffic Assessment
- Noise Assessment
- Flood Risk and Drainage Assessment
- Ground Conditions Survey

Initial indications are that the site is free of any significant environmental constraints and can be developed without adverse impact on the environment.

What benefits does it bring?

Environmental Benefits
In order to meet Scotland's NetZero goal by 2045, thermal generation plants will need to be replaced with clean power while also maintaining grid resilience. Long duration energy storage is an essential part of the solution, allowing more renewable energy while smoothing out their intermittency.

By charging from a low carbon intense grid (CO_2 per MWh) during periods of high renewables generation for prolonged periods of time and discharging when demand is high, the Albannach Power Island I plant could potentially help displace between 150-300 thousand metric tons of CO_2 emissions per year, depending on the contracted services with the National Grid.

This liquid air energy plant brings cutting-edge technology that meets with the Scottish Government's firm commitment to NetZero and supports renewable energy developments.

This is a globally pioneering project, which will make this rural part of Scotland synonymous with the delivery of much needed long-duration energy storage and the provision of valuable services to the National Grid. The Albannach Power Island I plant will demonstrably be at the forefront of the clean energy revolution and will be integral in helping Scotland meet its decarbonisation goals.

Community Benefits

The proposed Spittal plant will generate high-paying local jobs in design, project management, and construction, both directly with Highview Power and across the broader supply chain. During construction, this plant will bring workforce opportunities to both the local village of Spittal and surrounding areas. Once operational, the Spittal plant will create long-term, high-paying local jobs. Construction work alone is expected to create up to 300 jobs (over 2 years) and 7-10 high-paying permanent jobs overseeing operations and maintenance.

An information centre will also be housed in an existing building which will be used to provide facilities for visiting educational and public organisations from across the Highlands, highlighting the development of clean technologies, and specifically liquid air energy, and the part it has to play in Scotland's 2045 Net Zero Carbon Target.

As the plant is developed, it will require the use of local services including shops, services, and overnight accommodations, bringing welcome long-term investment to the Spittal area.

What happens next?

The planning application will be submitted to Highland Council in summer 2021, after the public consultation has concluded and comments have been taken into consideration. Once submitted, full copies of all application documents will be publicly available via the Council's planning portal.

Highview Power is pleased to address any further questions you may have by writing to us info@albannachpowerisland1.com.