

Highview leads the way in LAES for frequency response market using Siemens advanced technology

- *Supercapacitors and flywheels will be added to the existing 5MW LAES Pre-Commercial Demonstrator*
- *New hybrid liquid air energy storage initiative will provide near instant response and cost-effective long duration energy storage*
- *Versatile Siemens Sinamics drive range proven in fully containerised system*

London, 11th October 2017: Highview has selected Siemens to provide advanced technology for the new hybrid Liquid Air Energy Storage (LAES) system at Viridor's Pilsworth landfill gas plant in Bury. Highview was awarded funding of £1.5 million for a new hybrid configuration of its existing 5MW/15MWh Liquid Air Energy Storage (LAES) Pre-Commercial Demonstrator from Innovate UK, the UK's innovation agency in August.

The system will instantly respond to grid frequency events, meeting the requirements of National Grid's Enhanced Frequency Response (EFR) service and Firm Frequency Response (FFR), enhancing the economic case for its adoption.

Highview is leading the way in the development of liquid air energy storage (LAES) systems, which offer flexible large-scale, long duration energy storage that is not reliant on specific geography; unlike for example, pumped hydro. The hybrid system combines instant start and cost-effective long duration storage, broadening the range of services LAES can supply and making it a very competitive alternative to batteries.

As part of a new development phase, Siemens Large Drives was awarded a contract to deliver the short-term energy storage and power conversion system, utilising the Sinamics range of power converters. These will provide almost instant start capability (under a second) to the plant at Pilsworth, and will enable the system to respond to National Grid's service needs.

Gareth Brett, CEO of Highview, said: *"The grid needs both flexible response and longer duration storage which a hybrid LAES system can provide. Working closely with Highview's engineers, Siemens has been able to quickly develop our concept into a packaged system which will help pave the way for broad deployment at large scale."*

Siemens business development manager for Integrated Drive Systems, Vincent Morton described the project: *"This has been a great project to develop together with Highview and it is fantastic that it can now become reality. It offers huge potential for large-scale energy storage and Siemens is delighted to be contributing towards the UK's secure energy storage future."*

The first key phase of operation of this versatile energy storage and conversion system includes a closely controlled near-instant export of power to the grid during under-frequency events, while the LAES system ramps up to meet the output requirements. The second phase includes a closely

controlled near instant import of power from the grid during grid over-frequency events, where the electrical power is converted to heat and stored for later use by the LAES system.

The Siemens Simotics FD 'energy' flywheels and the super-capacitors will supply short-term energy storage, whilst the power conversion element will be provided by Sinamics S120, to control the transfer of energy to load banks, super-capacitors, flywheels and the Grid.

LAES is a proven technology after Highview built the world's first Pilot Plant (350kW/2.5MWh) in 2011 which was connected to the grid at SSE's biomass plant in Slough until 2014. The hybrid LAES system will be added to the existing Pre-Commercial Demonstration plant at project partner, Viridor's, Pilsworth landfill gas plant in Bury, Greater Manchester, UK. The project was awarded funding of more than £8 million from the Department of Business, Energy and Industrial Strategy (BEIS) in 2014.

The Pilsworth LAES plant will be commissioned in early 2018 and the hybrid system is expected to be in full operation by summer 2018.

Ends

Note for Editors

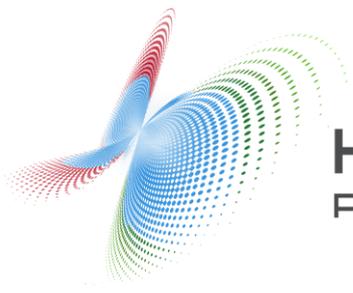
Highview Power Storage is a designer and developer of large-scale energy storage solutions for utility and distributed power systems that use liquid air as the storage medium. Highview designs bespoke Liquid Air Energy Storage (LAES) plants that can deliver from 5MW/15MWh – to more than 200MW/1.2GWh to service the growing multi-billion dollar energy storage market. LAES has been developed using proven components from industry to deliver a pumped-hydro capability without geographical constraints and can be configured to convert waste heat and cold to power. For more information, please visit: www.highview-power.com

How LAES Technology works

The technology works by taking off peak or excess electricity and using it to turn air into a liquid by refrigerating it to -196 degrees centigrade and storing it in insulated tanks at low pressure. When power is required, liquid air is drawn from the tanks and pumped to high pressure. Heat harnessed from the liquefaction process is applied to the liquid air via heat exchangers and an intermediate heat transfer fluid. This produces a high-pressure gas in the form of air that is then used to drive the turbine and create electricity.

Highview's technology draws from established processes from the turbo-machinery, power generation and industrial gas sectors. The components of Highview's processes can be readily sourced from large OEMs and have proven operating life times and performances.

Siemens AG (Berlin and Munich) is a global technology powerhouse that has stood for engineering excellence, innovation, quality, reliability and internationality for more than 165 years. The company is active in more than 200 countries, focusing on the areas of electrification, automation and digitalisation. One of the world's largest producers of energy-efficient, resource-saving technologies, Siemens is a leading supplier of efficient power generation and power transmission solutions and a pioneer in infrastructure solutions as well as automation, drive and software solutions for industry.



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The company is also a leading provider of medical imaging equipment – such as computed tomography and magnetic resonance imaging systems – and a leader in laboratory diagnostics as well as clinical IT. In fiscal 2016, which ended on September 30, 2016, Siemens generated revenue of €79.6 billion and net income of €5.6 billion. At the end of September 2016, the company had around 351,000 employees worldwide. Further information is available on the internet at www.siemens.com

Innovate UK is the UK's innovation agency. It works with people, companies and partner organisations to find and drive the science and technology innovations that will grow the UK economy. For further information visit www.innovateuk.gov.uk

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