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Project CAES Larne – An Exploration Program For Compressed Air Energy Storage In Northern Ireland

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Abstract

Gaelectric Energy Storage Ltd is developing a Compressed Air Energy Storage (CAES) facility near Larne, Northern Ireland. Bulk energy storage such as CAES can optimise the value of intermittent renewable energy sources by time-shifting energy and in addition can provide valuable ancillary services to the grid.

CAES Larne is likely to be the first such facility in Europe since Huntorf, and the first that is optimised to facilitate the integration of high levels of wind energy on the grid. CAES Larne has been designated as a Project of Common Interest by the European Commission.

This paper outlines the opportunity identified by Gaelectric for CAES in Northern Ireland and describes an exploration methodology that the project is employing to define storage capacity in a bedded salt deposit and to select future cavern locations, configuration and layout.

The CAES facility will use caverns to be created in bedded salt within the Mercia Mudstone Group (MMG) of Triassic age. Salt mining and brine winning have been conducted in the region since at least the mid-1800s. Historical drilling has indicated up to 400m thickness of salt with minor mudstone in the Larne Halite Member (LHM) within the MMG.

The exploration program addresses a number of challenges presented by the local geology. The region is covered by a layer of Palaeogene basalt flows which typically attenuates seismic waves, resulting in data of variable quality. Dolerite intrusions are also present locally and must be identified and avoided in the cavern planning program. The LHM within which caverns are to be developed contains numerous mudstone beds. The thickness and salt content of the LHM appears to be variable and controlled by faults, which also require a step-back distance for cavern development.

To date, the exploration program has involved gravity, seismic and magnetic surveys. A diamond drilling program is now in progress which will involve various wireline geophysical techniques to define the storage capacity for the CAES facility. This drilling programme is to be part funded by Project SPIRE, a joint initiative between University of Ulster and Dundalk Institute of Technology which aims to determine the energy storage technologies best suited to meeting the needs of the Cross-Border Territory (Ireland-Northern Ireland). Project SPIRE is funded by the European Union's INTERREG IVA Programme which is managed by the Special EU Programmes Body.

Key words: Bedded Salt Deposits, Cavern Design, Compressed Air Energy Storage (CAES), Drilling. GPR (Ground Penetrating Radar), Geology, Seismic.