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A UNIQUE ASPECT OF STORING NATURAL GAS IN OFFSHORE SALT CAVERNS

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Abstract

An offshore natural gas storage facility may have the storage caverns located a great distance from the compressor. In high latitudes, and if the distance between the compressor and the cavern is great, this could potentially result in low-temperature gas being injected into the cavern. As the gas expands during withdrawal, the gas is further cooled such that the volume of withdrawn gas is limited by the formation of natural gas hydrates.

The Gateway Project will use salt caverns located about 25 kilometers (15 miles) off the northwest coast of England to store natural gas. The Gateway caverns will be connected to an onshore compressor via a pipeline lying on the seabed. The average monthly seabed temperature of the seawater at this site ranges from 6 to 15 degrees Celsius (43 to 59 degrees Fahrenheit). Heat transfer modeling indicates that the gas will exit the pipeline and be injected at the wellhead near the temperature of the seawater.

A minimum gas withdrawal temperature of 5 degrees Celsius (41 degrees Fahrenheit) at the wellhead is a Gateway Project design requirement intended to limit the formation of natural gas hydrates. At certain times of the year, gas will be injected at temperatures approaching the minimum recommended wellhead temperature, thereby increasing the likelihood of wellhead gas withdrawal temperatures being lower than the specified minimum. The subject of this paper is a description and the results of a thermal modeling effort undertaken to predict working gas volumes for various injection-gas temperatures for an assumed gas service cycle.

Key words: computer modeling, gas storage, United Kingdom, caverns, gas storage, bedded salt