Salt storage the solution: Adavale Basin

GLEN GILL Future GAS2012 SPEAKER

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Major onshore gas exporting regions located in developed countries have a network of underground gas storage facilities, with capacity to both store gas and re-deliver gas into the grid in order to provide the necessary security of supply. The development of these facilities will be an important development for the natural gas industry in Queensland, with the ramp-up of the many proposed CSG-to-LNG projects in the state.

Gas storage facilities utilise either high-quality depleted reservoirs that have been converted into gas storage facilities, or large salt cavern pressure-vessels that have been solution–mined into underground rock salt deposits of sufficient depth and thickness.

Salt cavern storage can easily meet demand by solution mining additional caverns at any given site, and unlike many depleted reservoir storage facilities, gas produced from salt caverns is exactly the same quality as that injected into the cavern, as salt is inert with respect to hydrocarbons.

The production of onshore CSG from South East Queensland has introduced a number of challenges to Australia's gas industry. One of those challenges is the construction and operation of sufficient underground gas storage facilities to ensure a low cost and reliable delivery of gas to these capital-intensive LNG export projects.

Various project operators have, and continue to search for, new gas storage facilities to be integrated as part of a project's overall development, as is the case with Santos' proposed $15.2 billion Gladstone LNG Project and the associated Roma Underground Gas Storage project. Similarly, AGL's Silver Springs Gas Storage Project is intended to serve some or all of the gas storage requirements for QGC's proposed $15 billion Queensland Curtis LNG Project.

While AGL, Santos and others are currently attempting to convert depleted gas reservoirs located in the Bowen and Surat basins into suitable gas storage facilities, the ability of these depleted reservoirs to perform adequately is yet to be demonstrated.

Another attractive gas storage option for any or all of the proposed CSG-to-LNG project owners could be provided by the high-quality Boree Salt deposit located in the southern portion of the Adavale Basin.

Salt has many unique characteristics that are desirable and sought after for hydrocarbon storage. While salt caverns are yet to be made in Australia for this purpose, they are commonly found overseas in most other OECD countries because of their excellent hydrocarbon containment and hydrocarbon-cycling characteristics.

Rock salt is essentially impermeable when subjected to the pressures commonly encountered in underground gas storage caverns. Most naturally-occurring rock salt deposits exhibit compressive strengths that exceed that of structural concrete.

Another extremely desirable mechanical characteristic of rock salt is its tendency to flow or creep when subjected to moderate stress differentials across the salt. This desirable deformation characteristic enables salt to be self-healing, if and when, a fracture might develop near an underground salt cavern due to any tectonic activity.

Solution-mined excavations in salt have occurred since the 1800s. Petroleum companies realised in the late 1940s that solution-mined salt caverns were ideal for the temporary storage of large quantities of LPG and natural gas liquids.

The use of such caverns for the temporary storage of gas commenced in the early 1970s but depleted reservoirs were the storage container of choice until the liberalisation of gas industries in the 1980s in North America, and a decade later in Europe. Salt caverns became very popular due to their much higher cycling performance characteristics, which more than compensated for their higher development cost on a per working gas capacity basis. Salt domes located at depths ranging from 300 m to 3,000 m below the surface are sought after in particular because large caverns can be easily, economically and predictably excavated in such salt deposits through solution mining.

Innovative Energy Consultancy's staff have considerable experience in the development and operation of high-performance gas storage facilities overseas, and in anticipation of the gas storage requirements of the CSG-to-LNG projects located in South East Queensland, three years ago the company leased a large mineral exploration permit (EPM 17010) that covers 280 square kilometres of what is considered to be the most attractive portion of the Boree Salt deposit for the development of a high-performance low-cost salt cavern hydrocarbon storage field.

A scoping study recently performed by a consortium of Canadian-based salt cavern development experts confirmed from existing seismic and well data from a well located south of Blackall, Queensland, that the Boree Salt is a world-class salt deposit that appears to be suitable for the low-cost development of large salt caverns for gas storage application. The very pure and 500 m thick salt found 2,000 m below the surface is nearly ideal for the solution mining of large high-performance gas storage caverns.

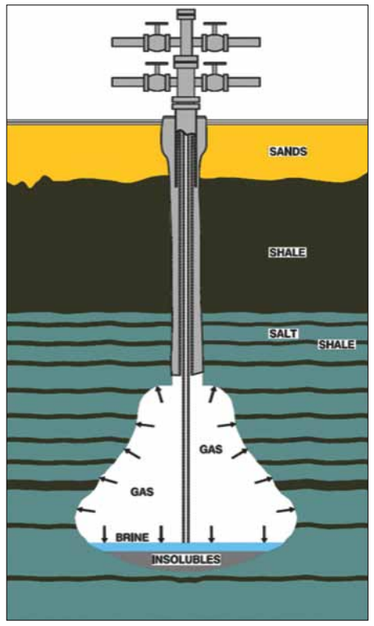
At this stage it is anticipated that each salt cavern conservatively solution – mined to a depth of only 215 m and a diameter of only 80 m could contain 7.5 PJ of maximum working gas capacity, and a maximum withdrawal rate exceeding 500 terrajoules per day (TJ/d) from a single withdrawal well.

The Boree salt deposit is very large, thereby easily accommodating the development of a multiple cavern storage field linked to a centralised compression facility and a large-diameter pipeline that would interconnect with the many proposed CSG feedstock pipelines terminating at Gladstone, Queensland. The proven superior gas storage qualities associated with such a salt deposit is attractive and while the Boree Salt is located west of Gladstone, it remains within the economic reach of providing gas storage services to these gas export projects. Gas storage facilities have proven to be an integral part of the unconventional gas supply chain and they also play a major role in the reliable exporting of onshore gas from developed countries.

The upstream sector of the petroleum industry in North America and Europe has relied on salt cavern hydrocarbon storage facilities preferentially to underground storage facilities that utilise depleted reservoirs due to the flexibility, high performance and greater integrity associated with salt cavern storage facilities. Eastern Australia in general, and South East Queensland in particular, requires large new open-access gas storage facilities in order to accomplish the goals of the gas industry and the Boree Salt can play a role in that regard.

Glen Gill will be speaking at the FutureGAS Conference and Exhibition to be held in Brisbane from 27–29 March 2012.

Register here to become a delegate and see Glen's presentation in full: www.futuregas.com.au/register



Schematic for a Single Gas Storage Salt Cavern.