

**Solution Mining Research Institute Fall 2022 Conference**  
**Chester, United Kingdom, 26-27 September 2022**

**Development of underground 3D model of bedded Permian salt for operator in East Yorkshire, UK to support integrity management of existing cavern assets and to meet the Net Zero future.**

Christopher McMichael

Atkins, Glasgow, Scotland

Co-authors: Fritz Wilke (Atkins), Jamie Slingsby (SSE), Silvan Hoth  
(Equinor), Farideh Sarikhany (Equinor)  
Sven Wille (DEEP.KBB)

**Abstract**

As part of a joint venture with Equinor, SSE operates nine gas storage caverns at its Aldbrough site in East Yorkshire, UK. During the leaching process challenges were realised on some of the caverns, which were not expected from the initial geological understanding and were typically attributed to the presence on non-halite salt (carnallite and kieserite) within the bedded Permian Zechstein Group salt layer. Although these challenges were overcome and all caverns successfully entered operation, they have left a legacy which has impacted ongoing operations and future planning.

As SSE and Equinor seek to meet the net zero challenge through the conversion of the existing natural gas storage assets to low carbon alternatives such as hydrogen it has become essential that the historical challenges are now better understood and addressed accordingly. This provides a challenge for operator decision making where the scale of such a risk can significantly impact commercial decisions. To support the case for cavern development the risks identified on the existing facility must be understood to mitigate their impact on the new development, minimising the potential cost for cavern development as well as the potential repercussions for the life of the facility.

To facilitate and support current operational and future life project decisions and ensure these are made from an informed position SSE & Equinor have invested in the development of a 3D geological model of the Aldbrough gas storage cavern field. The 3D model has been developed using advanced software and historical well data, such as well logs and cores to investigate and describe the layering of the bedded Zechstein Group salt with emphasis on the non-halite salt deposits around the Aldbrough site. This geological mapping in conjunction with the interpretation of 2D seismic reflection data traversing the Aldbrough area, suggests, that although bedded, the individual salt layer thickness and related dip direction vary significantly. Understanding these geometric relations is necessary to predict the presence of non-halite bearing salt deposits and hence the placement of future caverns.

**Key words:** bedded salt deposits, carnallite, gas storage, geology, modelling, salt caverns, United Kingdom.