

Abandonment of Salt Caverns: Technical Aspects and Beyond

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Abstract

For over 60 years, salt caverns have been successfully used to store energy sources such as natural gas and oil. Due to the development of the state of the art and technical measures such as recompletions, the originally planned operating time could be extended in many cases. Since especially the “new” technical standards – and therefore the current state of the art – put its focus on the whole life cycle of salt caverns, this now also includes the abandonment phase. Besides considering the construction and operating phase, safe operation and safety for employees, the public, property and the environment shall be ensured including abandonment.

By this future requirement the current design, construction and operation is already affected and needs to be considered at its early stages. This has an effect on every life cycle phase and each relevant discipline, such as geology, geomechanics, well design, drilling, solution mining etc. One of several focuses is on long-term integrity in the abandonment phase. Paired with the development of new simulation tools, a review of the geological setting and a re-assessment of the boundary conditions with regard to long-term integrity is an essential aspect. Modern 3D modeling provides useful methods to display and investigate the geological structure and in particular to enhance the understanding of spatial correlations of the underground. 3D modeling can be a valuable tool for identifying any potential for optimization of the abandonment process especially with regard to the long-term integrity of the location.

In addition to technical considerations, legal or social aspects can also arise in relation to the abandonment of salt caverns. Beside the operator, possible other stakeholders, such as authorities requiring compliance with legal and regulatory frameworks, general public (e.g. local residents, organizations etc.) or other companies wishing to initiate follow-up projects at the same location, can affect the operating environment. Alternative options for abandonment, e.g. backfilling of salt caverns, can affect other areas of law such as environmental law. As a result, beside the mining authorities other authorities may become part of the approval process. Local residents may express interest in being informed or criticize and reject the abandonment for various reasons (“not in my backyard”). Thus the abandonment procedure not only contains technical-rational constraints, but needs to oblige political and public interests.

This leads to the necessity to consider technical aspects as well as non-technical aspects in the planning of abandonment. The development and implementation of a holistic abandonment concept which includes technical considerations supplemented by location-specific aspects concerning law, policy, public and other ensures a successful and efficient procedure. This paper gives an overview including the following aspects:

- Planned vs. effective operation time
- Abandonment: part of the whole life cycle
- Long-term integrity during abandonment: 3D modeling as a supporting tool
- Non-technical aspects: need to oblige political and public interests
- Parts of holistic abandonment concept.

Key words: salt caverns, cavern abandonment

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