An Assessment of Carbon Storage Parameters in Unused Reservoirs: A Case Study in Central Oman

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Abstract

The global plans and actions to embrace cleaner energy resources continue evolving to achieve the aspired net- zero goal. While the energy consuming industries continue to grow and expand around the globe, the sustainability of these developments is the cornerstone. As of the EIA, Carbon Capture Utilization and Storage (CCUS) is the only and the best array of technologies that can materially store CO2 and effectively contribute to reduce the emissions of the heavy industries. In Oman, CCUS is considered one of the main decarbonization technologies to reduce emissions and achieve the aspired net-zero goal by 2050 especially for the hard-to-abate sectors that produce intensive admissions. By which the required capacity from CCUS is 6 to 7 Mt CO2e per year (Mtpa) by 2050.

Upon the comprehensive literature review there is an obvious lack of assessment of geological properties in relation to carbon storage potential and the risking range of the key parameters is not well established. Hence, this study aims to analyze the important reservoir parameters such as lithology, thickness and porosity that impact the carbon storage capacity based on a real case study in central Oman for the first time.

The study area located in central Oman at the western edge of South Oman Salt Basin (SOSB) and includes 16 well penetrations and 3D seismic coverage. First of all, a risking matrix is developed for the main reservoir parameters using literature review. Then potential reservoir and seal pairs were identified and described using wells data including depth, thickness, stratigraphy, lithology, and porosity. The reservoir-seal pairs were then assessed using the developed matix. After that, the storage capacity is calculated and the impact of the main parameters; thickness, net-to-gross and porosity on carbon storage capacity is examined.

The results of the evaluation showed three potential reservoir-seal pairs and ranked them based on the developed risking matrix and the corresponding storage capacity is calculated. That have revealed and ranked the important parameters that should be taken into consideration in the preliminary assessment of reservoirs for carbon storage and offered a reference case study and a risking basis for future site assessments for subsurface carbon storage.