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Assessment and Site Selection for CO2 Sequestration in Kuwait

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ABSTRACT

A CO2 storage feasibility study was carried out for Kuwait. The objective was to identify the best location (saline aquifer) for CO2 storage and potential future re-use. The potential storage sites had to meet a number of criteria. The study started with a country-wide screening for storage options. The outcome of this phase suggested that storage sites should focus on Cretaceous formations (depth range of 2 – 3 km) with generally good permeability. A shortlist of the potential sites contained mostly undeveloped fields. In these areas interference with oil production activities is minimum and the well-related containment risk is relatively low. The Kra Al-Maru Trend was for a detailed site characterization study. This is a shallow closure (~30 m) situated West of the Burgan trend and holds a number of undeveloped oil fields. A detailed assessment was conducted of various storage related aspects such as: storage capacity, feasible injection rates, containment (quality of the caprock, integrity of the wells in the area). A detailed model of the Cretaceous interval was constructed using 3D seismic and well data. Other aspects were analyzed, such as injection and reservoir pressure, geochemical interaction between the CO2 and brine, reservoir matrix, caprock and wells. The integrity of legacy wells in the area was analyzed from well logs and information about well completions. The behavior of the CO2 in the targeted reservoirs (Wara, Burgan and the Zubair Fm) during and after injection was modelled with a reservoir simulator. The simulations provided information on the storage capacity and injection rates that can be accommodated in the reservoirs. The CO2 plume will not migrate away from the injection site, providing the option for later back production. The Ahmadi shale is likely to provide a secure seal, with additional, deeper shale formations providing barriers to upward migration of CO2 injected in the reservoirs. The conclusion is that the Kra Al-Maru Trend offers excellent storage opportunities; the area could hold, for example, the CO2 that is currently generated by the Doha power plant for a period of 40 years. Finally, a monitoring plan for the injection site was developed. Potential CO2 migration paths were analyzed and surface uplift due to injection was predicted. The study was completed with a preliminary design of the storage site. An injection test is to be performed to validate storage capacity, injection rates and caprock quality.