Leakage risk assessment of the In Salah CO2 storage project: Applying the Certification Framework in a dynamic context

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Abstract:

The Certification Framework (CF) is a simple risk assessment approach for evaluating CO2 and brine leakage risk at geologic carbon sequestration (GCS) sites. In the In Salah CO2 storage project assessed here, five wells at Krechba produce natural gas from the Carboniferous C10.2 reservoir with 1.7–2% CO2 that is delivered to the Krechba gas processing plant, which also receives high-CO2 natural gas (~10% by mole fraction) from additional deeper gas reservoirs and fields to the south. The gas processing plant strips CO2 from the natural gas that is then injected through three long horizontal wells into the water leg of the Carboniferous gas reservoir at a depth of approximately 1,800 m. This injection process has been going on successfully since 2004. The stored CO2 has been monitored over the last five years by a Joint Industry Project (JIP) – a collaboration of BP, Sonatrach, and Statoil with co-funding from US DOE and EU DG Research. Over the years the JIP has carried out extensive analyses of the Krechba system including two risk assessment efforts, one before injection started, and one carried out by URS Corporation in September 2008. The long history of injection at Krechba, and the accompanying characterization, modeling, and performance data provide a unique opportunity to test and evaluate risk assessment approaches. We apply the CF to the In Salah CO2 storage project at two different stages in the state of knowledge of the project: (1) at the pre-injection stage, using data available just prior to injection around mid-2004; and (2) after four years of injection (September 2008) to be comparable to the other risk assessments. The main risk drivers for the project are CO2 leakage into potable groundwater and into the natural gas cap. Both well leakage and fault/fracture leakage are likely under some conditions, but overall the risk is low due to ongoing mitigation and monitoring activities. Results of the application of the CF during these different state-of-knowledge periods show that the assessment of likelihood of various leakage scenarios increased as more information became available, while assessment of impact stayed the same. Ongoing mitigation, modeling, and monitoring of the injection process is recommended.