Injection Strategies to Optimize Lower Quality Reservoirs for Large-Scale CCS

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Background/Objectives. CONSOL Energy Inc. is leading a project to design an advanced carbon-negative power plant that runs on waste coal and biomass. Due to this power plant design, characterization of CO_2 storage potential takes place for the CCS project in the Central Appalachian Basin. This study area includes Southwest Pennsylvania and Northern West Virginia. The CO_2 storage system must be designed in order to inject and monitor up to 2-3 million metric tonnes of CO_2 each year for 20 years. We must analyze geotechnical parameters and model subsurface storage zones for the CONSOL PFBC site in some of the following geologic rock formations of interest: Devonian Sands, Huntersville, Oriskany Sandstone, Medina Group/Tuscarora Sandstone, and Cambro-Ordovician formations.

Approach/Activities. There are only a handful of brine injection wells core data in the region, but no core data near the proposed site. There is a sparsity of data in this area which makes the screening analysis of potential CCS storage targets difficult. We have tackled these difficult challenges by running scoping simulations (using well log data that are readily available) to get a sense of injectivity (cumulative injection) in these low to medium permeability profile rocks.

Results/Lessons Learned. The biggest challenge with this project is finding a viable CCS site that can store 40-60 million tonnes over a 20-year timespan. Due to the previously discussed lower quality reservoirs that are found in the CONSOL PFBC study area, we must develop and test many different injection strategies to reach the goal of 2 to 3 million tonnes of injected CO_2, per year, for 20 years. Some of these injection strategies could include wellfield design spacing, horizontal wells, reservoir stimulation, stacked injection formations, brine production, etc. These scoping simulations that are being developed have been the best way to test for optimization of the storage potential in these lower quality reservoirs.