Carbon Sequestration Project Workflows to Reduce Geologic Risk

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Costs for building a new carbon capture-ready coal fired power plant can cost in the billions of dollars which is similar to the cost of offshore platforms used in the extraction of hydrocarbons. This high cost suggests that a potential CCS project would benefit from similar geologic characterization workflows as those used by the hydrocarbon industry in offshore settings. These types of workflows are designed to reduce the geologic uncertainty of a project and therefore decrease the corresponding project risk. The general workflow for a sequestration project should include basin analysis, site (prospect) selection, site delineation, site development, and monitoring of the CO_2 plume. The Mt. Simon Sandstone in the Illinois Basin is used to show the geologic workflow in site selection for CCS projects.

Basin analysis was used to locate areas where the formation was too deep or too thin because of Precambrian topography. Site selection using regional well control and 2D seismic was used to evaluate faulting and seal continuity. The delineation phase of the project begins with drilling the exploratory well, acquisition of 3D seismic and drilling of verification or monitoring wells to understand reservoir compartmentalization and complexities. Reservoir compartmentalization such as those found in the Mt. Simon braided-river depositional system make prediction of the areal extent of the CO_2 plume difficult and complicates the acquisition of pore space rights. During the development and injection phases additional wells may be drilled as monitoring wells and 4D seismic are used to monitor plume migration.