The Aquistore Project: Commercial-Scale CO_2 Storage in a Saline Aquifer in Saskatchewan, Canada

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Carbon capture and storage (CCS) represents a likely component in international strategies to reduce greenhouse gas emissions. Coal-burning power plants are a primary target for this technology. The Aquistore Project, located near Estevan, Saskatchewan, is one of the first integrated commercial-scale CO_2 storage projects in the world that is designed to demonstrate CO_2 storage in a deep saline aquifer. Starting in 2014, CO_2 captured from the nearby Boundary Dam coal-fired power plant will be transported via pipeline to the storage site and to nearby oil fields for enhanced oil recovery. At the Aquistore site, the CO_2 will be injected into a brine-filled sandstone formation at ~3300 m depth using the deepest well in Saskatchewan. The suitability of the geological formations that will host the injected CO_2 has been predetermined through 3D characterization using high-resolution 3D seismic images and deep well information. These data show that 1) there are no significant faults in the immediate area of the storage site, 2) the regional sealing formation is continuous in the area, and 3) the reservoir is not adversely affected by knolls on the surface of the underlying Precambrian basement.

A key element of the Aquistore research program is the further development of methods to monitor the security and subsurface distribution of the injected CO_2. A permanent areal seismic monitoring array has been deployed which comprises 630 geophones installed at 20 m depth on a 2.5x2.5 km regular grid. The objective of this array is to test “sparse array” seismic imaging and to provide continuous passive monitoring for injection-related microseismicity. A network of surface tiltmeters and GPS stations has been deployed which in conjunction with InSAR analysis will be used to monitor injection-related surface deformation. Other methods that are being tested include downhole electromagnetic methods and time-lapse gravity monitoring. Deployment of a fibre-optic DAS (distributed acoustic sensor) system is being tested as an alternative to the costly downhole deployment of conventional geophones.