Integrating CO_2 EOR and CO_2 Storage in the Bell Creek Oil Field

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ABSTRACT

The Plains CO_2 Reduction Partnership is working with Denbury Resources to evaluate the efficiency of large-scale injection of carbon dioxide (CO_2) into the Bell Creek oil field for simultaneous CO_2 enhanced oil recovery (EOR) and long-term CO_2 storage. Discovered in 1967, the Bell Creek Field in southeastern Montana has produced approximately 132 million barrels (MMbbl) of oil from the Cretaceous Muddy Sandstone Formation. The original oil in place (OOIP) for the field was estimated to be approximately 350 MMbbl of oil. Through primary and secondary production, about 37.5% of the OOIP has been produced, leaving an estimated 218 MMbbl of oil in the reservoir. It is estimated that CO_2 flooding will produce an additional 35 MMbbl of incremental oil, while simultaneously storing large volumes of CO_2 in the deep subsurface.

Approximately 50 million cubic feet of CO_2 a day will be captured at the ConocoPhillips Lost Cabin gas-processing plant in central Wyoming and transported via a 232-mile pipeline to the Bell Creek Field. Plans are under way to build compression facilities adjacent to the Lost Cabin gas plant to compress the CO_2 from 50 to 2200 psi, allowing for injection-ready pressures at the project site. The CO_2 will then be injected through multiple injection wells into the Muddy Formation at a depth of approximately 4500 feet.

A baseline CO_2 monitoring program is currently under development to establish preinjection CO_2 concentrations at the surface and in the shallow subsurface. Additionally, pressure and fluid saturations will be measured in the reservoir to establish preinjection conditions, so that repeat measurements can be used to better quantify the amount and location of the injected CO_2.

The Bell Creek integrated CO_2 EOR and storage project provides a unique opportunity to develop a set of cost-effective monitoring techniques for large-scale (>1 million tons a year) storage of CO_2 in a mature oil field with EOR. The results of the Bell Creek project will provide insight regarding the impact of large-scale CO_2 injection on sink integrity, monitoring techniques, and regional applicability of implementing successful CO_2 storage projects within the context of EOR.