Bell Creek Integrated CO_2 EOR and Storage Project

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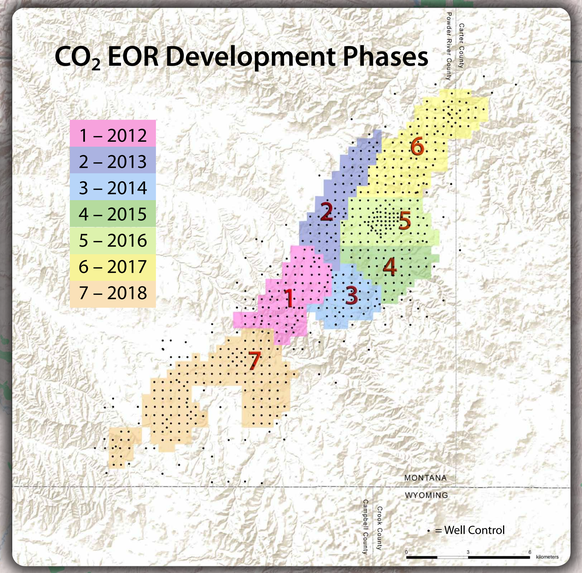
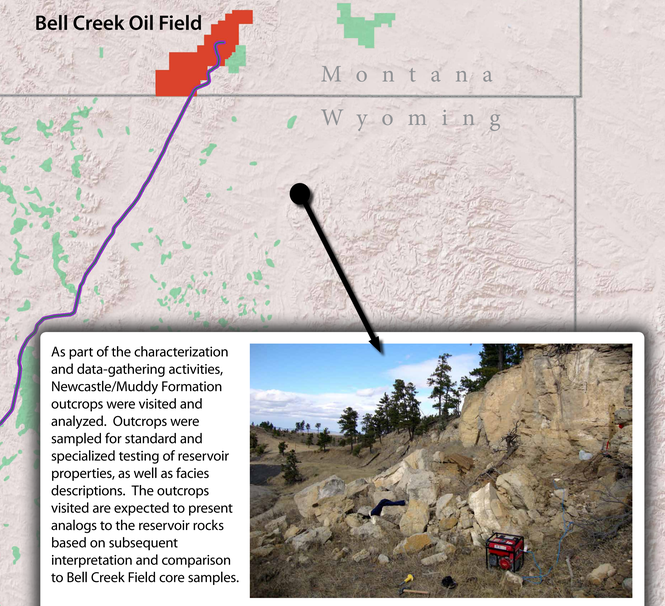
The Plains CO_2 Reduction (PCOR) Partnership is working with Denbury Resources to evaluate the efficiency of large-scale injection of carbon dioxide (CO_2) into the Bell Creek oil field for simultaneous CO_2 enhanced oil recovery (EOR) and long-term CO_2 storage. Discovered in 1967, the Bell Creek Field in southeastern Montana has produced approximately 133 million barrels (MMbbl) of oil from the Cretaceous Muddy Sandstone Formation. Encompassing 21,771 acres, with more than 450 current or past producing wells, the Bell Creek Field is one of the most significant oil fields in Montana. The original oil in place (OOIP) for the field was estimated to be approximately 353 MMbbl of oil. Through primary production (solution gas drive), waterflooding, and two micellar-polymer pilot tests, about 37.5% of the OOIP has been produced, leaving an estimated 220 MMbbl of oil in the reservoir. CO_2 flooding has been selected to recover an estimated 35 MMbbl of incremental oil, while simultaneously storing large volumes of CO_2 in the deep subsurface, reducing carbon emissions to the atmosphere.

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 pipeline approximately 232 miles 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 delivery to the project site at injection-ready pressure. The CO_2 will then be injected through multiple injection wells into the Muddy Formation at a depth of approximately 4500 feet.

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.

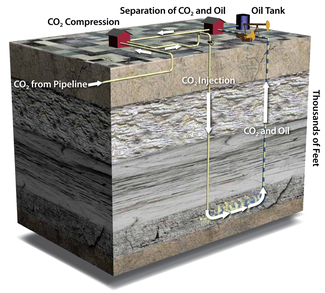
The Bell Creek Integrated CO_2 EOR and Storage Project combines the proven techniques of CO_2 EOR with the characterization and monitoring that will demonstrate effective carbon storage. The result is a new standard for safe and practical geologic CO_2 EOR to CO_2 storage operations.





As part of the characterization and data-gathering activities, Newcastle/Muddy Formation outcrops were visited and analyzed. Outcrops were sampled for standard and specialized testing of reservoir properties, as well as facies descriptions. The outcrops visited are expected to present analogs to the reservoir rocks based on subsequent interpretation and comparison to Bell Creek Field core samples.

CO_2 EOR is a tertiary recovery method which capitalizes on CO_2's properties as a solvent to remove incremental oil from the reservoir. In the process, a portion of the CO_2 is reproduced which is then recompressed and recycled, while the remainder is safely stored in the reservoir.



Simplified illustration of a CO_2 flood EOR project. Injected CO_2 thins the oil and pushes it toward oil-producing wells.

The PCOR Partnership, one of seven regional partnerships funded by the U.S. Department of Energy's National Energy Technology Laboratory Regional Carbon Sequestration Partnership Program, is managed by the EERC at the University of North Dakota in Grand Forks, North Dakota.

Bell Creek Project Benefits

30+ million barrels
of incremental oil

. . . millions of tons of CO_2 safely in storage