DECISION TO INCORPORATE RAMGEN COMPRESSION TECHNOLOGY INTO THE BELL CREEK PROJECT

Plains CO_2 Reduction (PCOR) Partnership Phase III
Task 6 – Milestone M41

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BACKGROUND

The Plains CO_2 Reduction (PCOR) Partnership is one of seven Regional Carbon Sequestration Partnerships competitively awarded by the U.S. Department of Energy National Energy Technology Laboratory in 2003 as part of a national plan to mitigate greenhouse gas emissions. The PCOR Partnership is led by the Energy & Environmental Research Center at the University of North Dakota and includes stakeholders from the public and private sectors. The PCOR Partnership region includes all or part of nine U.S. states and four Canadian provinces.

Phase III, the development phase, is a 10-year effort (2007–2017) that extends the characterization (Phase I) and validation (Phase II) phases. The Phase III efforts of the PCOR Partnership include two large-volume demonstration tests, one of which is in Canada (the Ft. Nelson project) and one that is in the United States (the Bell Creek project). The demonstration tests focus on injecting carbon dioxide (CO_2) into deep geologic formations for CO_2 storage.

Many different aspects of carbon capture and storage (CCS) will be evaluated during the demonstrations, ranging from CO_2 capture, compression, and pipeline transport to injection, recycle, and monitoring, verification, and accounting.

RAMGEN COMPRESSION TECHNOLOGY AND THE BELL CREEK PROJECT

It was hoped that Ramgen's shockwave compression technology could be incorporated into the Bell Creek demonstration test to provide a real-world test bed for the compressor. The Ramgen compression technology applies ramjet engine concepts in a stationary compressor application called the Rampressor. The Rampressor features a rotating disk that operates at the high peripheral speeds necessary to achieve supersonic effect in a stationary environment. Ramgen's shock compression technology represents a significant advancement in the state of the art for all compressor applications and, specifically, for CO_2 compression. It can achieve exceptionally high compression efficiency at very high single-stage compression ratios. As a result, the Rampressor requires a smaller footprint and it contains fewer stages, meaning that it should have lower capital and operating costs while still meeting the compression needs during CCS.

Two opportunities for implementation were identified: compression of the CO_2 (or a portion of the CO_2) leaving the Lost Cabin gas-processing facility and recompression of the recycle CO_2 stream at the Bell Creek Field. The first opportunity, compression at the Lost Cabin

fenceline, was not feasible because a compressor had already been installed at that location that had the capability to compress all of the CO_2 produced by the plant. The second opportunity appeared to be the better option and was briefly explored.

Unfortunately, the Rampressor development, although far along, is not at a stage at which it can be reasonably implemented during the Bell Creek project prior to the end of the PCOR Partnership Phase III work. There is still work to be done on the integration of Stage 1 and Stage 2 of the system as well as further rigorous testing of the integrated, multistage compressor system.

CONCLUSION

Incorporation of the Ramgen compression technology into the Bell Creek demonstration project is premature. It is possible that the technology could be demonstrated at other enhanced oil recovery projects in the future but it is not possible to do so under Task 6.