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Wyoming CarbonSAFE: advancing commercialization of low-carbon energy technologies in fossil-rich Wyoming

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Abstract

Wyoming's Powder River Basin (PRB) is the most prolific coal producer and exporter in the United States and the State of Wyoming's largest oil-producing basin. In addition to being a leading energy producer, the PRB is the site of research programs whose aim is to develop and integrate low-carbon technologies into existing fossil fuel energy industries. Much of the PRB's low-carbon research is focused around Dry Fork Station (DFS), which is the newest coal-fired power station in the western US. Currently, DFS hosts five carbon capture projects, including pilot-scale capture projects that utilize different capture technologies and a full front-end engineering and design (FEED) study, a commercial CO_2 pipeline for nearby CO_2-enhanced oil recovery industry, and is also co-located with the Wyoming Integrated Test Center, which is a host facility for unconventional carbon utilization research (i.e. flue gas carbon-to-products innovations). DFS is also the host site for the Wyoming CarbonSAFE project. Wyoming CarbonSAFE, funded by the Department of Energy/National Energy Technology Laboratory, is a multi-phased program (currently in Phase II) whose core objective is developing and validating storage sites within a complex capable of storing 50 million metric tonnes of CO_2 over a 30 year project period using carbon capture, utilization and storage (CCUS). This paper will provide an overview of the project to-date, showing that CarbonSAFE goals are achievable with respect to geologic, environmental, regulatory, CO_2 source and economic conditions, and why the State of Wyoming offers one of the more favourable environments to advance the commercialization studies.

In 2019, the project team designed and completed a ~10,000 foot stratigraphic test well just south of DFS. From this well, the team collected over 600 feet of core, fluid samples from target injection zones, and a full petrophysical log suite. In addition, legacy 2D seismic lines were acquired and a 3D seismic survey has been designed for acquisition in spring of 2020. The objective of these field activities has been to identify and characterize target storage reservoirs and associated caprock within a DFS-focused storage complex. This complex has three reservoirs that could meet commercial injection goals, and over 4000 feet of associated caprock. Simulations of site performance suggest that using all three reservoirs for stacked injection provides the most effective storage strategy, and would necessitate up to three sites within the greater complex to meet final project injection goals. Other work within this project includes the development of a business-case around proximal fields with CO_2-enhanced oil recovery potential and existing tax credits, assessment of regulatory conditions, including pore space ownership and Class VI

injection well permitting requirements, implementation of a robust public outreach program, and surface site characterization activities that have focused on environmental factors. In the PRB and at DFS, the State of Wyoming and other entities have made carbon management a priority of its future energy industry by providing a regulatory and business framework that is favourable to advancing these technologies. These endeavours will become more realistic with the successful implementation of Wyoming CarbonSAFE, and its ability to secure and validate commercial-scale CCUS at the centre of Wyoming's premier low-carbon research efforts.

Keywords: Geologic Storage, CCUS, Carbon Capture, Class VI wells, Wyoming, CO2-EOR