

Project Summary

The goal of this project is to design, secure permits for, build, and operate a large-scale, sorbent-based, carbon capture system (CCS) pilot at a coal fired power generation facility. The project is organized into 4 distinct phases with go/no-go decision points between each phase. Over the course of the entire project, we plan to design (Phase 1), secure permits (Phase 2), build (Phase 3), and operate (Phase 4) a large-scale CCS pilot at the Wyoming Integrated Test Center (ITC) site located adjacent the Dry Fork Station power plant located near Gillette, WY. The proposed large-scale CCS pilot system will separate carbon from a slipstream of the Dry Fork Station flue gas and validate the carbon capture efficiency at >90% (threshold) and >95% (objective) with a CO₂ product purity > 95% under actual exhaust gas conditions.

In Phase I, the only portion of the project current funded, TDA and its partners will complete a front-end engineering design (FEED) study for a commercial-scale, advanced carbon capture system capable of processing up to 23 MW (roughly 200,000 metric tons per year or MTPY) net CO₂ with 90+% carbon capture efficiency and 95+% CO₂ purity. The host site, the Wyoming ITC, is situated adjacent Basin Electric's Dry Fork Station (DFS) power generating facility. DFS is a coal-fired power plant rated at roughly 405 MW (net) that currently releases roughly 2.7 million MTPY of CO₂. TDA plans to install and test the carbon capture pilot at a dedicated, pre-existing test bay that was designed and constructed specifically by the Wyoming ITC for large-scale CCS demos.

In the past, TDA engineers and scientists have worked with several test centers and commercial companies (the National Carbon Capture Center in Wilsonville, Alabama, the Wyoming ITC in Gillette, Wyoming, the Energy and Environmental Research Center in Grand Forks, North Dakota, Sinopec (China), and the Technology Centre Mongstad in Mongstad, Norway) to demonstrate and advance point source carbon capture technologies. These projects all required TDA to design for and meet complicated compliance requirements stemming from federal, state, and local laws. In addition, many host sites impose additional site-specific requirements that must be met. During our international projects, TDA has been responsible for customs clearance and worker visas where necessary while also designing for and following international standards, which may differ from or conflict with US/North American standards. These projects only temporarily integrated into existing facilities but reduced the facilities emissions while they were in operation.

For this project, we have begun the stakeholder engagement process, and we are actively pursuing feedback from the local and regional community. Please contact communitybenefits@tda.com for more information, to schedule a meeting with project members or to provide project feedback. Also, project information, including this report, will be available at TDA's community benefits website: <https://tda.com/community-benefits/>.

Social Characterization Assessment

Geographically, the Wyoming ITC is located at 12460 N. Highway 59, Gillette, Wyoming. Figure 1 shows a map of the nearby geographic area with the black circle showing a 5-mile radius around the proposed demonstration site. The Wyoming ITC lies among rolling hills on the DFS grounds. DFS has a coal-fired boiler, and for this project we plan that roughly 5.5% of the flue gas will be supplied to TDA's carbon capture pilot plant. DFS is owned by Basin Electric Power Cooperative (BEPC) and the Wyoming Municipal Power Agency (WMPA). The operations of Wyoming ITC are funded by the State of Wyoming, Tri-State Generation & Transmission, and the National Rural Electric Cooperatives Association. DFS lies just off Wyoming Highway 59, roughly 4 miles East of the intersection with U.S. Highway 14, which is roughly 7 miles North of the intersection with US interstate 90. DFS is

surrounded by coal mines including the Dry Fork Mine, the Rawhide Mine, the Eagle Butte Coal Mine and the Buckskin Mine. A chemical manufacturer, Atlas Carbon, is also nearby. Just off of Highway 14 on the Western edge of the 5-mile radius, there is a small residential and commercial region which includes several businesses (Pro Line Machining, Baysinger's Custom Paint & Auto Body, National Belt Services of Wyoming, Arthun Equine Services, and the NE Wyoming Regional Airport). The two closest tribal reservations are the Northern Cheyenne Indian Reservation (140 miles Northwest of the planned site) and the Crow Reservation (210 miles Northwest of the planned site).

TDA's plans to install and test the large pilot CCS at the Wyoming ITC's Large Test Center, which is a dedicated test pad measuring 360' x 360' (Figure 2). The planned pilot plant design does not require any water input from the plant during normal operation, but the plant is expected to generate roughly 20 gpm of wastewater which will be returned to DFS for processing in their treatment plant. The CCS pilot design is expected to require roughly 7,000 kW of electrical power, which will power all of the components (compressors, pumps, etc.) used in the carbon capture demonstration. The electrical power is expected to come from the adjacent DFS power plant—due to the nature and timeline of the demonstration, the pilot plant demo will not impact the cost of electricity coming from DFS. Traffic during pilot construction, operation, and decommissioning is expected to travel along the existing highways and interstates named above. Workers are expected to commute from Gillette and the surrounding communities including Antelope Valley-Crestview, Moorcroft, Adon, Oshoto, Weston, Wildcat, Echeta, Pleasantdale, and other surrounding communities.

DFS lies in EPA's EJScreen Blockgroup 560050007022 with a population of 1,830. 85% of residents speak English at home (586 households total), 49% are white, 51% are Hispanic and 97% of houses are owner occupied. Only 16% of the community are low income, 51% are people of color, 11% have disabilities, \$20,351 is the per capita

income and 50% have less than a high school education. Environmental justice and supplemental indexes were high for the Blockgroup (>90th percentile in state) including 96% for Particulate Matter

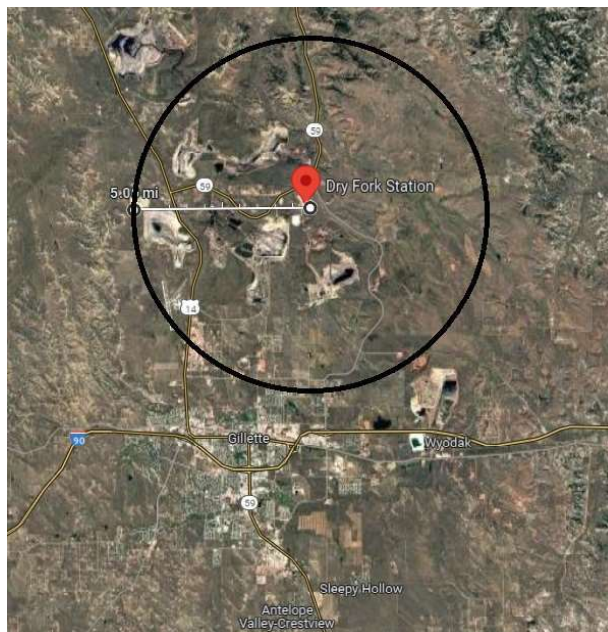


Figure 1. Map showing Dry Fork Station north of Gillette, Wyoming. Black circle shows a 5-mile radius.



Figure 2. Layout of Dry Fork Station (DFS). Red square is the Large Test Center (project site) and the green square is the six pilot bays at Wyoming ITC.

2.5, 98% for Toxic Releases to Air, 94% for Wastewater Discharge and 98% for Drinking Water Non-Compliance. When referring to sites reporting to the EPA, the Blockgroup contains 8 water dischargers, 2 air pollution and 1 toxic release inventory. There are 0 schools, 0 hospitals and 0 places of worship. There are no American Indian Reservations, no Justice40 disadvantaged communities but the block does contain an EPA IRA disadvantaged community. The nearest Justice 40 (CEJST) disadvantaged communities are nearby counties Carter County, Montana (climate change, energy), Big Horn County, Montana (climate change, energy, health, legacy pollution), Rosebud County, Montana (climate change, energy, housing, legacy pollution, water and wastewater) and Niobara County, Wyoming (climate change, energy, legacy pollution).

Conceptually, the CCS pilot at DFS would join other sorbent-based CCS demonstrations globally. RTI International and Norcem carried out a solid sorbent CCS demonstration at a cement plant in Brevik, Norway (RTI 2013). Kawasaki Heavy Industries has demonstrated a 5 t-CO₂/day system and is planning a 40 t-CO₂/day scale moving bed system at the Maizuru Power Plant of Kansai Electric Power Co (Nishibe 2022). ADA Environmental Solutions (ADA) has demonstrated a 1 kW slipstream pilot using solid sorbents (Sjostrom 2011). SRI International with ATMI and Linde demonstrated a 0.5 Mwe slipstream pilot using carbon sorbents (Hornbostel 2015). Other technologies also exist for removing CO₂ from flue gas including solvent-based and membrane technologies.

Initial Stakeholder Analysis Summary

Using information from the Social Characterization Assessment, a list of stakeholders was identified (Table 1). We identified stakeholders from each sector and sketched out possible members of the Community Advisory Board (CAB). We will invite candidates as shown in Table 1 to join the CAB and are also seeking nominations from the community (to nominate CAB members contact us at communitybenefits@tda.com). At this early stage in the project, we know of no existing community support for and/or opposition to this project. As the project develops, we will gather information about project support and opposition by routine web searches and feedback surveys at public engagement events. Table 1 shows the stakeholders for the CCS pilot at DFS.

Table 1. Stakeholders, Sectors and Levels of Engagement.

Stakeholder	Sector	Anticipated Level of Engagement
Dry Fork Station	Industry	Test Site
Wyoming Integrated Test Center	Industry	Test Site
Basin Electric Power Cooperative (BEPC)	Industry	Active public participant
Wyoming Municipal Power Agency (WMPA)	Industry	Active public participant
Northern Cheyenne Tribe	Tribal communities	Active public participant
Crow Tribe	Tribal communities	Active public participant
Nearby HOAs	Concerned member of public	Active public participant
Nearby low-income housing	Disadvantaged communities	Active public participant

Stakeholder	Sector	Anticipated Level of Engagement
Nearby businesses	Business	Active public participant
Nearby schools	Education	Active public participant
Wyoming Community Colleges and Universities	Education	Advisory committee
City of Gillette – mayor’s office	Government	Advisory committee
City of Gillette – parks and open spaces	Government	Active public participant
Gillette Planning Services Division	Community planning	Advisory committee
Campbell County Public Health	Public health and safety	Active public participant
State of Wyoming – governor’s office	Government	Active public participant
Federal senator and representative’s office	Government	Active public participant
State senator and representative’s office	Government	Active public participant
Technical experts	Industry	Active public participant
SLB	Industry	Active public participant
Unions	Industry	Active public participant
Environmental groups	Environmental NGOs	Active public participant
Tribal leaders	Tribal communities	Active public participant
Wyoming public	Concerned members of the public	Active public participant
Office of Clean Energy Demonstrations (OCED)	Government	Advisory committee

Stakeholder Map

Figure 3 shows a pre-engagement assessment of stakeholder interest. As we contact stakeholders, we will revise the stakeholder map.

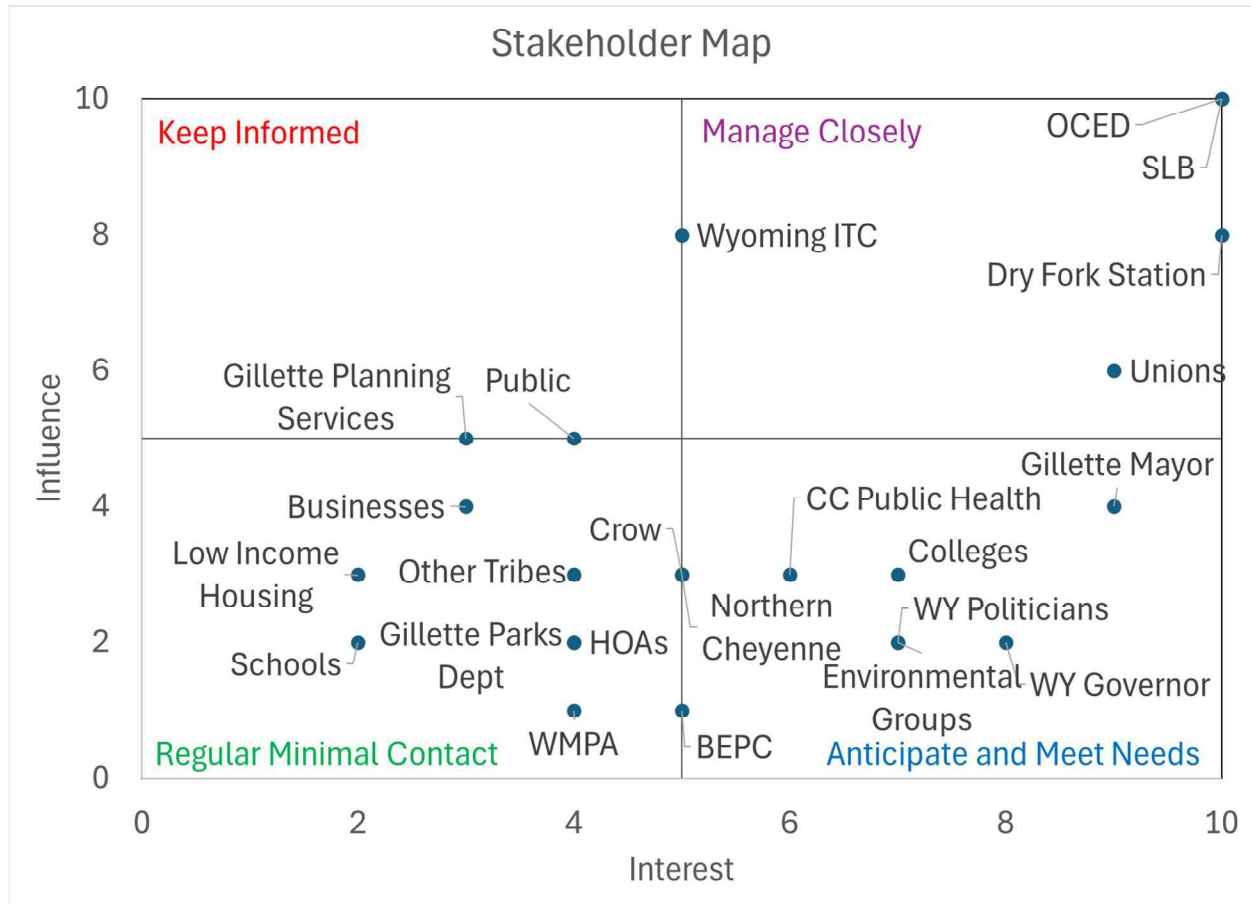


Figure 3. Stakeholder Map for the CCS Pilot at DFS.

References

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RTI (2013). "Advanced Solid Sorbent CO₂ Capture Demonstration at Norcem's Cement Plant." Retrieved October 2, 2024, from <https://www.rti.org/brochures/advanced-solid-sorbent-co2-capture-demonstration-norcems-cement-plant>.

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