BURNS McDONNELL

CASE STUDY / **CO2 PIPELINE FRONT-END ENGINEERING DESIGN**

DESIGNING A COST-EFFICIENT SYSTEM TO REDUCE POWER PLANT CARBON IMPACTS

To keep its fossil-fueled generation plant productive in the near term, Minnkota Power Cooperative needed a way to reduce environmental impacts. It sought preliminary design work and a turnkey cost estimate to assess the feasibility of adding a carbon capture and sequestration system.

IDENTIFYING AN EFFICIENT SOLUTION TO REDUCE ENVIRONMENTAL IMPACTS

Front-end engineering design (FEED) for the pipelines and facilities was developed in support of adding a carbon capture and sequestration system.

PROJECT STATS

CLIENT
Minnkota Power Cooperative

LOCATION
Oliver County, North Dakota

COMPLETION DATE
May 2021

99%
PURE CO_2 STREAM

16"
0.500 W.T. X-65 PIPE

3
METER STATIONS

CHALLENGE

Minnkota Power Cooperative is an electrical generation and transmission cooperative providing power to member rural electric cooperatives in North Dakota and Minnesota. North Dakota is one of the country's top coal-producing states, mining approximately 30 million tons every year, leaving the state at odds with national trends moving away from the use of fossil fuels due to the high volume of jobs dependent on the industry. Minnkota needed to find ways for its existing generation to meet planned end-of-life targets while reducing CO_2 emissions, reducing their environmental impacts. As a result, the cooperative made plans to construct a carbon capture and sequestration (CCS) system at the Milton R. Young Power Plant in Oliver County, North Dakota, which would capture and compress CO_2 from the plant exhaust streams and inject it into subsurface formations in the vicinity.

To determine financial feasibility, the utility required a FEED study for the pipeline system that would deliver the CO_2 to the injection locations.

Burns & McDonnell was selected based on its extensive experience with pipeline and development of carbon capture projects.

SOLUTION

For the FEED, we performed preliminary design and construction bid evaluation and an engineer-procure-construct (EPC) lump sum price for the scope of the project, which included two CO_2 pipelines and three metering and regulation (M&R) stations. This work was necessary for the utility to proceed with permitting of the project as well as deciding on the next phase of the project development.

The preliminary design included:

- CO_2 dispersion study.
- Materials selection and fracture mitigation.
- Mechanical, civil and electrical design for the pipelines and facilities.
- Route selection and constructability evaluation for two 16-inch CO_2 pipelines extending approximately 6 miles.

- One M&R station at the plant's CCS facility and two M&R stations at the injection well pads.

The pipeline routes included horizontal directional drilling crossing and road boring, as well as additional design and safety considerations due to the pipeline route traversing a coal mining area. Additionally, we prepared cost estimates by obtaining quotes for materials, equipment and construction services, and coordinated with other contractors involved in the CCS project.

RESULTS

Our extensive background in pipeline work helped us develop a cost-efficient FEED solution that could win permitting approval, allowing flexibility for further refinement in the detailed design phase. We leveraged knowledge obtained from other engineer-procure-construct (EPC) endeavors to obtain reliable quotes for routing, procurement and construction services, all of which informed a detailed cost estimate. Minnkota obtained a clear picture of future costs, project risks and schedule if it decides to proceed with construction of the CCS system at the plant.

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24007-CPF-0921