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“Antelope Valley CO₂ Capture Demonstration Project FEED Study”

Submitted by: Basin Electric Power Cooperative

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PARTICIPANTS

<u>Sponsor</u>	<u>Cost Share</u>
Basin Electric Power Cooperative	\$ 3,500,000
NDIC	\$ 2,700,000
Total Cost	\$ 6,200,000
Project Schedule – 24 Months	Project Deliverables
Contract Date – 12/12/08	Status Reports:
Start Date - 12/1/08	3/31/10 (✓); 6/30/10 (✓); 9/30/10 (✓)
Completion Date – 12/20/10	Final Report: 12/20/10 (✓)

OBJECTIVE / STATEMENT OF WORK

Basin Electric Power Cooperative (Basin Electric) is conducting a Front End Engineering Design (FEED) study for a post-combustion carbon dioxide (CO₂) capture project at the Antelope Valley Station (AVS). The project being considered would capture 90% of the CO₂ in about one-fourth of the flue gas stream from AVS Unit 1 yielding approximately 1,000,000 short tons of CO₂ annually. This would be accomplished by diverting flue gas from downstream of the existing induced draft fans into a polishing flue gas desulfurization (FGD) system using ammonia to capture existing sulfur dioxide. Then the flue gas would pass through the mixed amine CO₂ capture system before returning to the existing stack.

STATUS

March 31, 2010:

The FEED study contractual start date was February 9, 2010. As expected in the first phase of an engineering study, there has been a large amount of information gathering and transmitting from Basin Electric to Doosan Babcock. Representatives from Doosan Babcock, HTC Purenergy, and Burns & McDonnell were in the Bismarck (ND) offices and on site at AVS and Dakota Gasification Company, both at Beulah, ND, for several days during the first week of March. The analysis of the interconnections to the existing facilities required, the options being considered, and the challenges associated with integrating these systems together is under way.

July 31, 2010:

Engineering design is approaching completion with less than 10% remaining. The final design review and Hazard Identification meetings were held the week of July 12th. The completion of design enabled all requests for quotations of equipment to be sent out in June and as a result most of the suppliers have replied with proposals to Doosan. The request for quotation for construction was sent to two potential general contractors on June 30th. These two companies are working diligently to provide the most attractive proposal to Doosan which is due the first week of August.

September 21, 2010:

A presentation of progress to date on the FEED study was made to the Lignite Technology Development Workgroup. Basin Electric Power Cooperative representatives indicated that the study was nearing completion with the draft of the final report from Doosan expected by the end of September. After review and analysis by Basin personnel a final report will be made available to the Lignite Research Council.

Final Report Received December 23, 2010:

The final Carbon Capture FEED study report details the findings of the estimated \$282.5 million capital cost and a parasitic load of approximately 37.5 MW for the capture and compression of 120 MW slip stream. However, the total cost to Basin Electric could be as much as \$500 million when considering additional costs such as:

1. Risk and Guarantee Cost,
2. Environmental Permitting and NEPA Process,
3. CO₂ Sequestration Including Monitoring, Verification and Accounting,
4. Modifications to the Existing Boiler and Steam Turbine,
5. Interest During Construction, and
6. Basin Electric Power Cooperative Owner Cost.

Depending upon the assumed cost of power that is applied to estimate the economic impact of the parasitic load, the cost of capture and compression has been estimated to range between \$50 to \$60 per ton of CO₂. With the all in cost of this project described above, it is projected that the cost to capture and sequester will range from \$65 to \$75 per ton of CO₂.

On December 14th, the Basin Electric Power Cooperative Board of Directors chose to place the Antelope Valley Station CO₂ capture demonstration project on hold until the economic and regulatory viability of such a venture can be recognized.