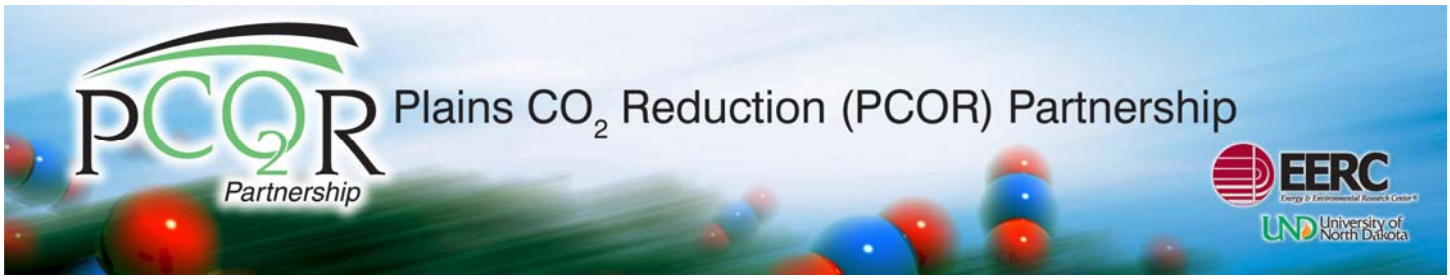


PLAINS CO_2 REDUCTION (PCOR) PARTNERSHIP (PHASE II) – TASK 9 – EVALUATION OF SINK OPTIONS IN THE VICINITY OF EXCELSIOR ENERGY'S PROPOSED IGCC PLANT

2007 Quarter 3 Milestone

Prepared for:

Darin Damiani

U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
PO Box 880, M/S B26-D06
Morgantown, WV 26507-0880

EERC Fund 9197

Prepared by:

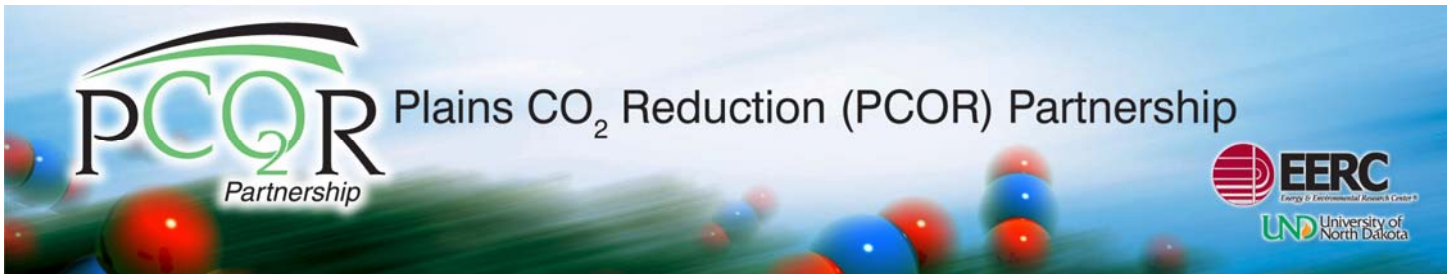
Melanie D. Jensen
Edward N. Steadman

Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

June 2007

DOE DISCLAIMER

EERC DISCLAIMER



PLAINS CO_2 REDUCTION (PCOR) PARTNERSHIP (PHASE II) – TASK 9 – EVALUATION OF SINK OPTIONS IN THE VICINITY OF EXCELSIOR ENERGY'S PROPOSED IGCC PLANT 2007 QUARTER 3 MILESTONE

Melanie D. Jensen, Energy & Environmental Research Center
Edward N. Steadman, Energy & Environmental Research Center

June 2007

The geological sinks that are the most likely to be considered for sequestration of CO_2 from Excelsior Energy's Mesaba integrated gasification combined-cycle plant are ones for which the CO_2 could be sold to defray at least some of the cost of capture, dehydration, compression, and transportation, i.e., oil fields in which CO_2 would be used for enhanced oil recovery (EOR). The most viable EOR opportunities are in the Williston Basin, approximately 300 miles west of the proposed plant location. The cost of capture, dehydration, and compression will remain the same irrespective of which sink location is chosen. To differentiate between regional EOR opportunities, the pipeline infrastructure needed to reach each sink was estimated using a pipeline route and cost model. This information was combined with sink capacity, and the various sink options were ranked.

Pipeline infrastructure needs were estimated using a geographic information system-based model for CO_2 pipeline transport and source–sink matching optimization that was developed at the Massachusetts Institute of Technology (MIT) (Herzog, 2006). The MIT model calculates pipeline diameter, identifies the least cost path connecting a CO_2 source to a given sink, and calculates the total and annualized CO_2 pipeline transportation costs. The model implements 1×1-km obstacle grid layers in which local terrain, crossings, protected areas, and populated places are assigned relative cost factors to determine the least cost route between a single CO_2 source and a geologic sink. For the given route, the length, diameter, pipeline construction cost, annual operations and maintenance cost, and total cost per ton of CO_2 are calculated.

The specific results of the source–geological sink matching are confidential to Excelsior Energy. Six EOR options were examined (three sinks for each of the two potential Mesaba power station locations). Estimated pipeline construction costs ranged from $177 million to $237 million. On a per-ton-CO_2 basis, total pipeline infrastructure cost was estimated to range from about $18/ton to about $24/ton. Based on cost and sink capacity, the most appropriate source–sink matches seem to be those in which about 50 years' worth of CO_2 from the Mesaba plant could be sequestered at a cost of about $21/ton to $24/ton of CO_2.

Reference

Herzog, H., 2006, A GIS-based model for CO_2 pipeline transport and source–sink matching optimization: Presented at the WESTCARB Annual Business Meeting, Phoenix, Arizona, November 2006. Available online at www.westcarb.org/Phoenix_pdfs/finalpdfs-11-08-06/17-Herzog_GIS.pdf.