Visualizing the Surface Infrastructure Used to Move 2 MtCO$_2$/year from the Dakota Gasification Company to the Weyburn CO$_2$ Enhanced Oil Recovery Project: Version of July 1, 2009

JJ Dooley

July 2009
DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information,
P.O. Box 62, Oak Ridge, TN 37831-0062;
ph: (865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov

Available to the public from the National Technical Information Service,
U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161
ph: (800) 553-6847
fax: (703) 605-6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/ordering.htm

This document was printed on recycled paper.

(9/2003)
ABSTRACT: Google Earth Pro has been employed to create an interactive flyover of the world’s largest operational carbon dioxide capture and storage project. The visualization focuses on the transport and storage of 2 MtCO$_2$/year which is captured from the Dakota Gasification Facility (Beula, North Dakota) and transported 205 miles and injected into the Weyburn oil field in Southeastern Saskatchewan.

KEY WORDS: carbon dioxide capture and storage; Dakota Gasification Facility, Weyburn-Midale oil field; CO$_2$ pipeline; CO$_2$ storage; enhanced oil recovery; climate change; Google Earth.
Google Earth Pro (Version 5.0.11337.1968) has been employed to create an interactive flyover of the world’s largest operational carbon dioxide capture and storage project. The visualization focuses on the transport and storage of 2 MtCO₂/year which is captured from the Dakota Gasification Facility (Beula, North Dakota) and transported 205 miles and injected into the Weyburn oil field in Southeastern Saskatchewan. The visualization uses best available data for the pipeline route and for the placement of the 12 shut off valves. The placement of these aspects of this facility’s infrastructure are not precise and are meant to be illustrative. Likewise the placement of the four overlaid pictures showing actual infrastructure within the Weyburn field are not precise and are used here for illustrative purposes.

The purpose of this visualization is to demonstrate what a real world, operational power production facility that captures about 2 MtCO₂/year looks like. The visualization shows that the CO₂ pipeline traverses productive farm lands, unmanaged lands, travels near towns, crosses a lake and a river, and an international boundary. This pipeline has been in operation for nearly a decade. It has been operating safely. The pipeline has built in safety devices (i.e., the 12 “main line valves”) which would allow segments of the pipeline to be quickly isolated if there were ever a leak. The visualization also shows that once the CO₂ is delivered in Canada it is injected into the Weyburn oil field where the injected CO₂ is used to stimulate additional oil production. A full suite of measurement, monitoring and verification technologies is employed to track the injected CO₂. The four overlaid pictures in the visualization show what the end of the CO₂ pipeline looks like when it gets to Canada, a small structure to protect a CO₂ injector well, an oil production pump, and a field level CO₂ pipeline node. None of these are large facilities and none prevent the surrounding farmland from being used to grow crops.

The point of this visualization is twofold: (1) Carbon dioxide capture and storage (CCS) is not a hypothetical technology that might exist at some point in the future. It exists today. (2) The application of CCS does not preclude other activities from happening at the surface nor does it create hazards that require large tracts of land to be marked as off limits.
Data Sources

Information on the 205 mile CO₂ pipeline that transports the CO₂ was derived from


The areal extent of the portion of the Weyburn oil field that is using CO₂-driven enhanced oil recovery is from:
- Personal communication of ESRI shape files delineating the boundaries of the portion of the Weyburn oil field using CO₂-EOR. Steve Whittaker, PhD, PGeo, Senior Project Manager, Petroleum Technology Research Centre, Regina, Canada. June 18, 2009.

Information on production and injection wells within the Weyburn field are from:

- Water production / withdrawal wells within the Weyburn field. Data were downloaded from Saskatchewan Oil & Gas Information server June 25 2009. http://www.infomaps.gov.sk.ca/website/SIR_Oil_And_Gas_Wells/viewer.htm
- Oil production wells within the Weyburn Field. Data were downloaded from Saskatchewan Oil & Gas Information server June 25 2009. http://www.infomaps.gov.sk.ca/website/SIR_Oil_And_Gas_Wells/viewer.htm
- CO₂ Injector Wells within the Weyburn Field Data were downloaded from Saskatchewan Oil & Gas Information server June 25 2009. http://www.infomaps.gov.sk.ca/website/SIR_Oil_And_Gas_Wells/viewer.htm
- Water Injector Wells within the Weyburn Field Data were downloaded from Saskatchewan Oil & Gas Information server June 25 2009. http://www.infomaps.gov.sk.ca/website/SIR_Oil_And_Gas_Wells/viewer.htm

Picture credits.

- Picture of Terminal Point of the Dakota to Weyburn CO₂ pipeline courtesy of David Hawkins. Photo taken November 19, 2002. All other photos were taken by JJ Dooley on November 19, 2002.