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Visualizing the Surface Infrastructure Used to Move 2 MtCO₂/year from the Dakota Gasification Company to the Weyburn CO₂ Enhanced Oil Recovery Project: Version of July 1, 2009

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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 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.

KEY WORDS: carbon dioxide capture and storage; Dakota Gasification Facility, Weyburn-Midale oil field; CO₂ pipeline; CO₂ 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

- Dakota Gasification Company. 2009. "CO₂ Pipeline" webpage.
http://www.dakotagas.com/Gas_Pipeline/CO2_Pipeline/index.html
- Myria Perry and Daren Eliason. 2004 "CO₂ Recovery and Sequestration at Dakota Gasification Company Paper presented at Western Fuels Symposium and Gasification Technology Conference. Billings, Montana. October 12-14. 2004.

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.