STUDY DETERMINES TECHNICAL AND ECONOMIC REQUIREMENTS FOR CARBON TRANSPORT AND STORAGE

The Wabash Valley Resources facility proves capable of storing a large volume of CO_2 while remaining economically viable.

DEVELOPING A WORLD-CLASS CO_2 CAPTURE FACILITY

Projected to Store 60 Million Tonnes of CO_2 Over 30 Years

The University of Illinois evaluated the technical and economic feasibility of transporting CO_2 from dozens of regional point sources (ethanol plants and hydrogen production facilities) to a potential commercial-scale geologic storage complex beneath the Wabash Valley Resources (WVR) facility near Terre Haute, IN, where planned hydrogen production is expected to produce CO_2 that will be stored on-site. **This work supports the transition to a low-carbon economy by assessing the technical and economic requirements for large-scale carbon transport and storage facilities and regional hubs**.

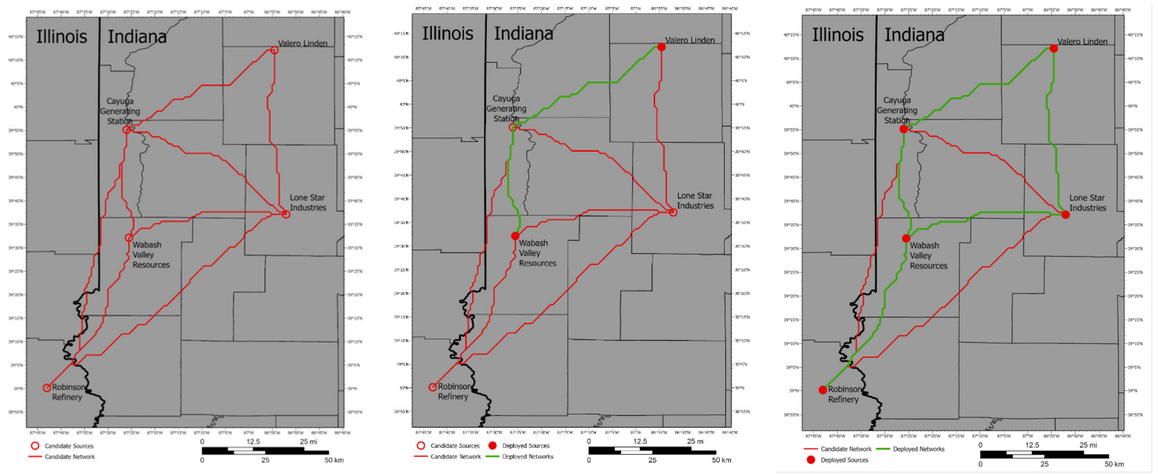
Two cases were assessed based on the assumed maximum injection rates of the WVR storage facility.

The first case assumes the maximum injection rate of the storage facility at WVR is 2.0 Mtonnes per year (MMTA) using two wells, each injecting 1.0 MMTA. Scenarios with total capture amounts ranging from 0.5 to 2.0 MMTA in increments of 0.1 MMTA were created.

The second case assumes the maximum injection rate of the storage facility can equal the total capturable CO_2 of all six sources, for a total of 8.23 MMTA, using wells at an injection rate of 1.0 MMTA.

WVR FACILITY IS PROJECTED TO STORE CO_2 FROM ALL NEARBY SOURCES

Both cases only consider the WVR and Valero Linden Plant (VLP) for capture facilities. The VLP is considered economically advantageous at low- and average-cost scenarios; however, it has a low annual capturable amount of 0.36 MMTA, requiring WVR to be deployed for all annual capture rates.



Left: Candidate sources and pipeline network for SimCCS Gateway simulations. The storage facility is located at WVR and stores all captured CO_2 of all scenarios. Cayuga Generating Station Units 1 and 2 coincide. Center: All capture facilities and pipeline networks deployed throughout the Case 1 scenarios. Right: All capture facilities and pipeline networks deployed throughout the Case 2 scenarios.

Reference: https://www.sciencedirect.com/science/article/abs/pii/S1364815218300185

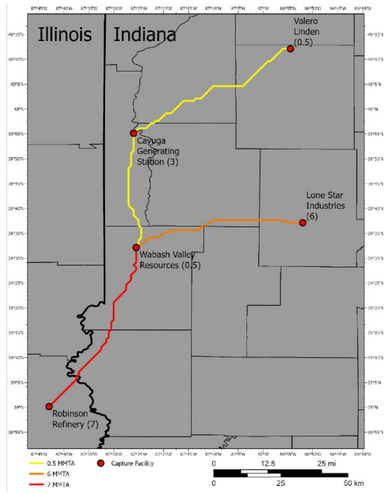
OPTIMAL HUB LOCATION IDENTIFIED

Both cases were analyzed for a carbon capture and storage hub at WVR. Both cases assume a 30-year project period and a 0.1 capital recovery factor. They also use the same six capture facilities, candidate pipeline networks, and costs associated with each respective capture facility. Each scenario considered a **low, average, and high capture cost** that was applied to all capture facilities.

Capture Facility	Sector	Total Emissions (MMTA)	Capturable Emissions (MMTA)	Capture Cost ($/tCO$_2$)		
				Low	Average	High
Wabash Valley Resources	Hydrogen	1.82	1.82	25	26	27
Cayuga Generating Station – Unit 1	Power Generation - Coal	1.91	1.72	46	56	60
Cayuga Generating Station – Unit 2	Power Generation - Coal	2.19	1.97	46	56	60
Lone Star Industries	Cement	1.01	0.91	40	56	75
Robinson Refinery	Refineries	1.63	1.47	43	56	68
Valero Linden Plant	Ethanol	0.36	0.36	12	17	33

Summary of capture facility input parameters for simulations.

OPTIMAL HUB LOCATION



Order of deployment of capture facilities and pipeline network for high capture cost scenarios. Number in parentheses next to capture facility names denotes the lowest annual project capture amount where the respective facility is utilized. The value provided at Cayuga Generation Station is for Unit 1; Unit 2 is utilized beginning at 4 Mtonnes per year. Color of pipeline networks denotes the lowest annual project capture amount where the respective pipeline is utilized.

Yellow: 0.5 MMTPA
Orange: 3 MMTPA
Red: 4 MMTPA

The WVR site was shown to be an ideal storage hub after optimizing pipeline networks and deployment scenarios for carbon capture and storage using SimCCS Gateway. This simulation suggests a total unit cost to capture, transport, and store CO_2 of $22.20 to $58.44 per tonne of CO_2 depending on capture costs and injection rates.

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