INTEGRATED CARBON CAPTURE AND STORAGE FOR KANSAS (ICKAN):

Ethanol CO_2 Capture and Transportation Cost Analysis

Dane McFarlane and Martin Dubois

Scenario 1: Fifteen Nebraska and Kansas ethanol plants to Kansas oilfields

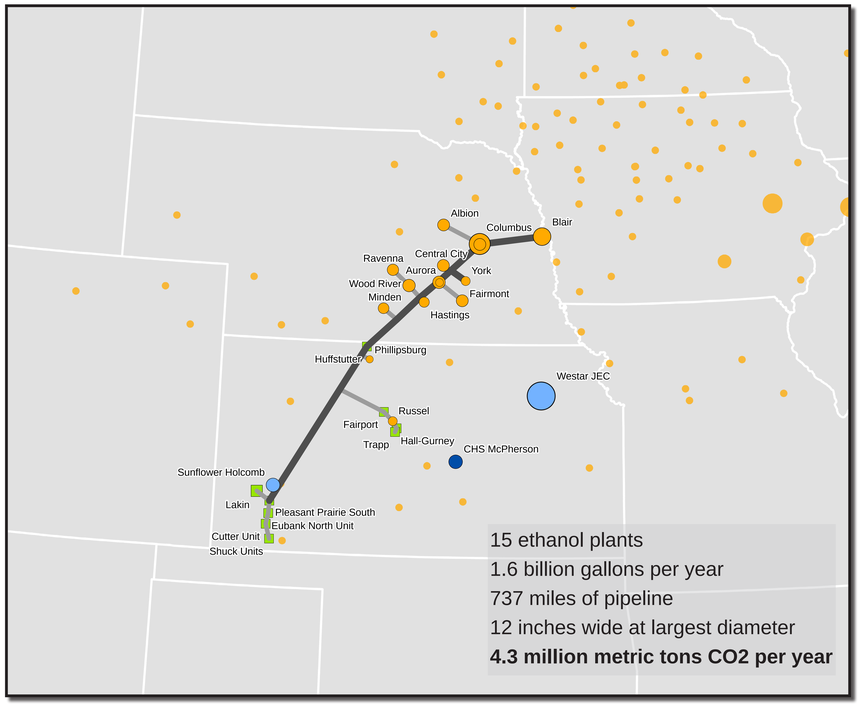


Table 1: Scenario 1 Costs and Required CO_2 Price

	Plant Capture	Pipeline Transport	Total	Required CO_2 Price for 10% ROI	$ / metric ton	$ / mcf
CapEx	$364	$842	$1,006	Without 45Q	$42	$2.19
Annual OpEx	$37	$16	$52	With 45Q	$14	$0.75

$ million

ICKAN Project Cost Analysis

As part of the Integrated Carbon Capture and Storage for Kansas (ICKAN) project, the Great Plains Institute (GPI) and Improved Hydrocarbon Recovery, LLC, (IHR) collaborated with the Kansas Geological Survey to create a number of illustrative scenarios for carbon capture from a variety of industrial and energy sources.

Presented here are two of those scenarios:

1. An efficiently planned, regional-scale pipeline system that would connect 15 of the larger ethanol plants in Nebraska and Kansas to transport CO2 to multiple oilfields in Kansas.
2. A large-scale multistate pipeline network that connects 34 of the largest ethanol plants throughout the Midwest to a trunk pipeline that would link up with existing pipelines in the Permian Basin.

GPI and IHR utilized the National Energy Technology Laboratory's (NETL) CO2 Transport Cost Model, modified by GPI for this application, to calculate capital and operating costs of CO2 pipelines in each scenario.

Economic Analysis Assumptions

- 10% ROI
- 2 year construction period
- 20 year operational life
- Not inflation adjusted
- Capture 90% of CO2 from each ethanol Plant

Read More:
This work was featured in a recent white paper released by the State CO2-EOR Deployment Work Group and the Great Plains Institute. While this paper was published before the passage of recent 45Q tax credit legislation, the primary economics and modeling remain the same.

Find the paper on GPI's website **betterenergy.org**:
http://www.betterenergy.org/wp-content/uploads/2017/12/Capturing-and-Utilizing-CO2-from-Ethanol.pdf

Scenario 2: Large scale Midwestern pipeline network to Permian Basin

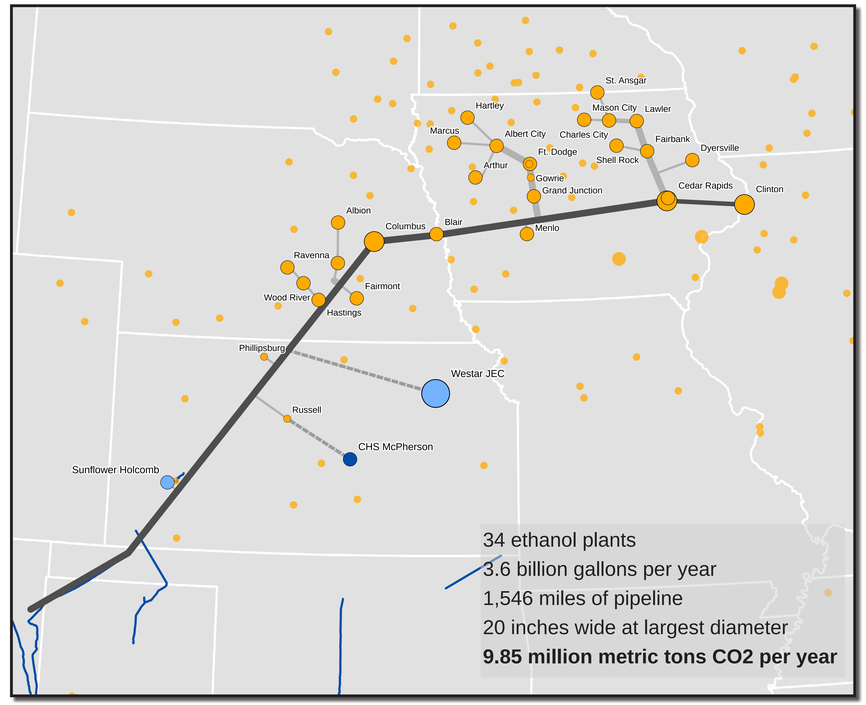


Table 2: Scenario 1 Costs and Required CO_2 Price

	Plant Capture	Pipeline Transport	Total	Required CO_2 Price for 10% ROI	$ / metric ton	$ / mcf
CapEx	$809	$1,857	$2,667	Without 45Q	$47	$2.46
Annual OpEx	$85	$47	$131	With 45Q	$19	$1.03

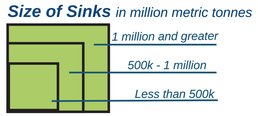
$ million

Network Infrastructure - Map Key

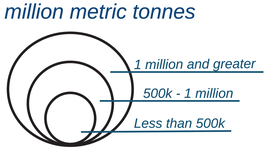
Pipelines by Volumetric Flow *in million metric tonnes*

- *Less than 2 million*
- *2 million - 6 million*
- *6 million and greater*

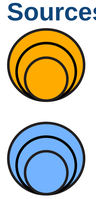
Size of Sinks *in million metric tonnes*



Size of Source *in annual million metric tonnes*



Electric & Ethanol CO_2 Sources by Volume



References

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