Central Appalachian Basin (CAB) CarbonSAFE Integrated Prefeasibility Study

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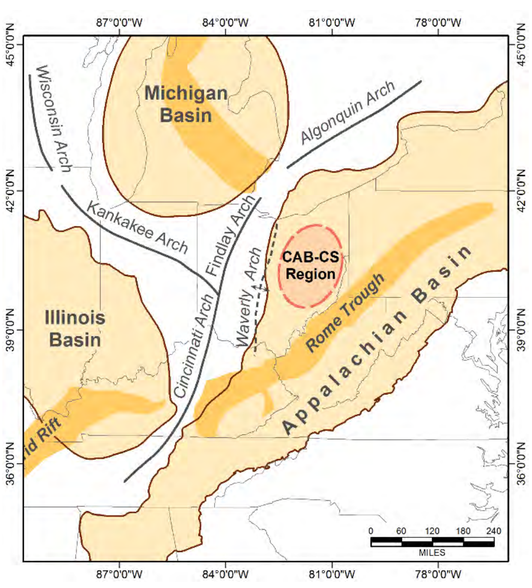
INTRODUCTION

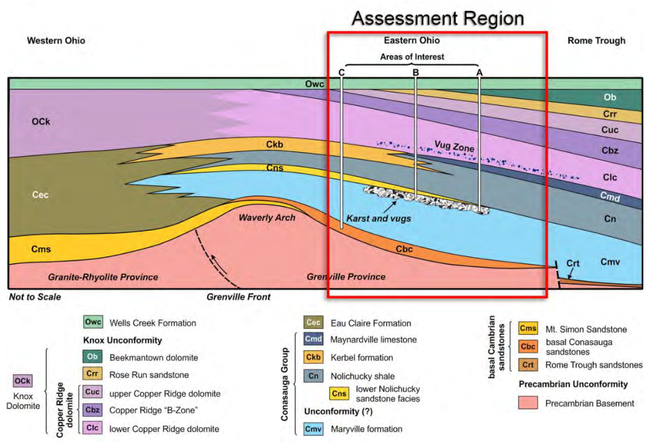
The Central Appalachian Basin is an important area to curb CO_2 emissions to the atmosphere and limit the effects of climate change due to the region's reliance on fossil fuels for power generation, and heavy presence of chemical manufacturing, petrochemical processing, and steel production. The Central Appalachian Basin CarbonSAFE Integrated Prefeasibility Study used existing information to evaluate CO_2 sources, complete a sub-basinal analysis, predict dimensions and infrastructure requirements for commercial scale (>50 million metric tons) CO_2 storage complex, and evaluated the economic feasibility. Two "Selected Areas" co-located near depleted oil and gas fields were identified and a plan was developed to obtain additional characterization data. Economics are challenging, although there is opportunity for associated storage via CO_2-EOR. Overall, CCUS offers an attractive value proposition through its role in developing affordable energy, a cleaner environment, and economic opportunities amenable to this region.

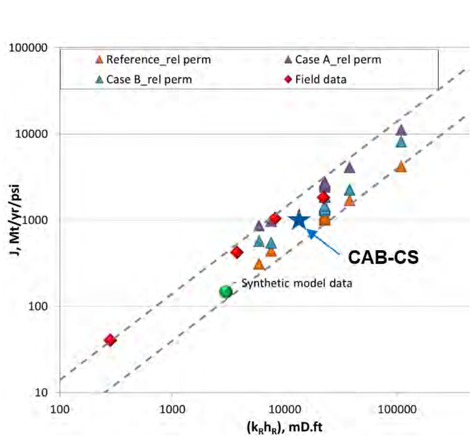
TECHNICAL APPROACH AND RESULTS

Performed sub-basinal analysis and CO_2 source assessment



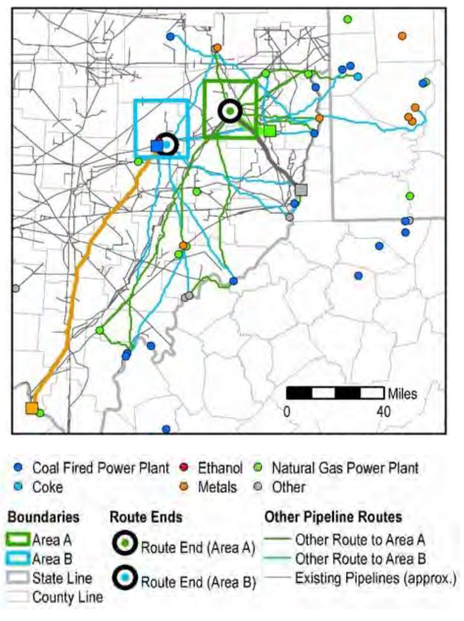
- Gathered existing data for reservoir characterization, caprock/trapping assessment and geohazards assessment
- Created capacity maps and structure contours for Cambrian-Ordovician Units
- Developed capacity estimates for depleted oilfields and production
- Identified deepest USDW formations in Ohio (~ 1,100 ft)
- Found low seismic risk from induced seismicity and regional stress (many UIC wells with no induced seismicity)
- Used Class II brine disposal well data to identify high transmissivity (160,000-500,000 md-ft) and injectivity in Cambrian age vuggy flow zones in A & B areas.





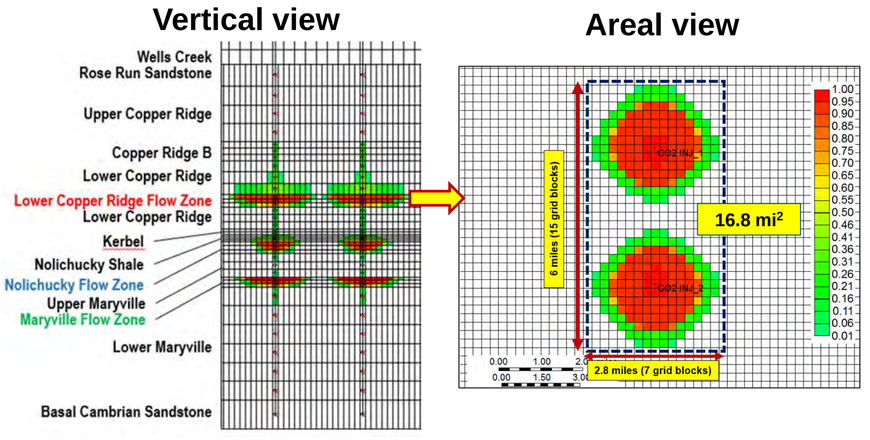
- The CO_2 source assessment identified many large CO_2 point sources:
- 32 coal-fired power plants,
- 8 natural gas combined cycle (NGCC) plants,
- 35 industrial CO_2 sources,
- 2 future ethane cracker plants,
- 10 future natural gas power plants
- 1 planned coke plant

- The project team selected candidates for source-sink scenarios for pipeline routing and down selected six (4 existing and 2 future) for detailed economic analysis.

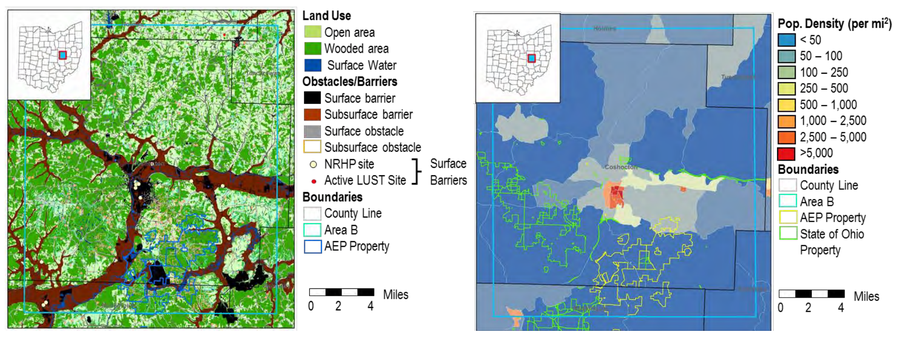


Ran simulations to define dimensions for the CAB-CS complex

- Simulations suggest that a two-well injection system would be adequate, supported by Class II injection operational data.
- The area of review would extend to approximately 17 mi^2.



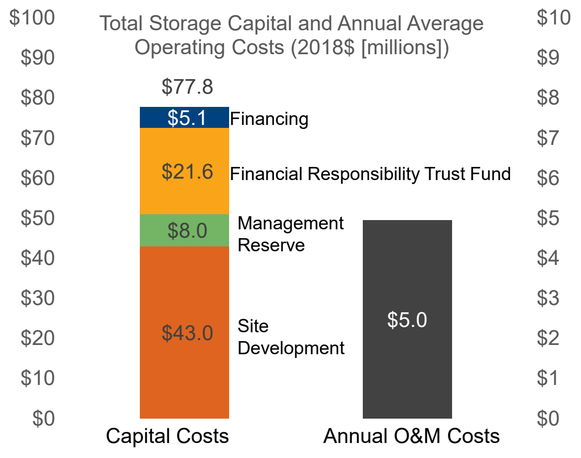
Used results to inform site screening, selection, and characterization planning

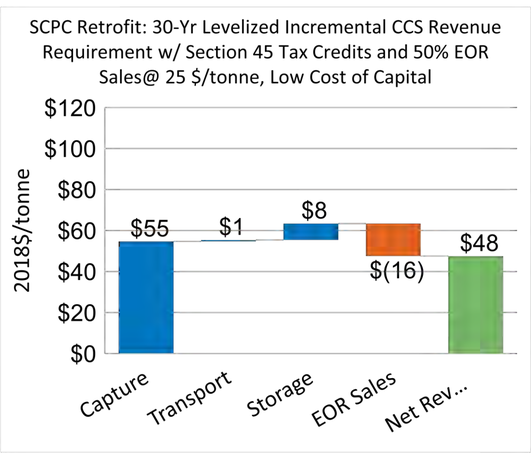


- Various environmental, logistical, market, and socioeconomic features were identified and mapped to determine suitability
- Site in Coshocton County identified with large land tracts, existing deep well for testing, near coal-fired power plant.

Examined project economics

- Financial model considered source type, financing and cost recovery mechanisms.
- Storage not a key cost driver on the overall cost of CCUS
- Revenue from ratepayers or long term Power Purchase Agreement needed for coal and gas retrofit applications, even with 45Q and CO_2 sales
- New conventional NGCC with 100% CO_2 sales coupled with 45Q tax credits and low cost financing could cover capture and transport costs





FUTURE WORK

Although the project was not selected for Phase II funding, the accomplishments of this project are a significant step forward for CCUS

- Promising storage resources within stacked reservoirs offer opportunities to develop CCS in the region
- Many industrial CO_2 sources need viable storage to have capture
- New technologies incorporating affordable carbon capture may spur CCS development

Financial drivers could help with cost gaps

- 45Q and supplements to 45Q
- CO_2-EOR (Ohio is 10th largest oil producing state)

Proving injectivity and storage capacity is next key step

- Existing 2-D and 3-D seismic data and deep wells provide low cost opportunities for future research