CARBON STORAGE IN THE ILLINOIS BASIN REGION: PROJECT EXPERIENCES

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In Decatur and throughout the Illinois Basin, the ISGS has demonstrated Safe and Effective storage.

The pieces have come together
Accomplishments: Illinois Basin – Decatur Project

- Captured, transported, stored, and monitored 1 million tonnes of CO$_2$ from biofuel production in an onshore Saline Reservoir
- Executed FOAK monitoring, verification, and accounting (MVA) program
- Met and exceeded all technical and non-technical challenges
- Successful Class VI permitting
- Conducted microseismic monitoring and interpretation
- Developed International collaborations
- Laid foundations for multiple projects
- Build international, national, and regional capacity
- Stakeholder engagement strategy built trusted relationships
- Created comprehensive data set
Multiple Projects Build Framework for CCUS Research and Commercialization

Illinois Industrial Sources CCS

Illinois Basin - Decatur Project

ADM Facility

Richland Community College

NSEC

CCS1

VW1

GM1

Class VI permit issued Feb 2015

GM2

CCS2

VW2

Class VI permit issued Dec 2014

~800 meters

North
Illinois Basin – Decatur Project
- Large-scale demonstration
- Volume: 1 million tonnes
- Injection period: 3 years
- Injection rate: 1,000 tonnes/d
- Compression capacity: 1,100 tonnes/day

Contribution:
- Geologic and Social Site Characterization
- Reservoir Modeling and Risk Assessment
- MVA Development and Engineering Design
- Stakeholder Engagement

Status:
- Post-injection monitoring ends April 2020
- Conceptual site model and history matching

Illinois Industrial CCS Project
- Industrial-scale demonstration
- Volume: up to 5 million tonnes
- Injection period: 3 years (or longer)
- Injection rate: 3,000 tons/d
- Compression capacity: 2,200 tonnes/day

Contribution:
- Commercial-scale up surface and subsurface
- Intelligent Monitoring
- Class VI permitting

Status:
- Injection Began April 7, 2017
- Optimization of capture process
- ~2,400,000 (as of June 2021)
IBDP Monitoring Program

Comprehensive risk-based program with research, regulatory, and operational objectives

- (20+ techniques); 11+ years
  - 2 years pre-injection (2009-2011)
  - 3 years during injection (2011-2014)
  - 6 years post-injection (2014-2020)

Primary monitoring networks

- Microseismic
- Deep groundwater
- Shallow groundwater
- Soil gas

Collected/analyzed

- 1,434 shallow (< 100 m) groundwater samples
- 188 deep (100-2,200 m) groundwater samples
- 755 soil gas samples
Permitting

All Six Class VI permits have been issued in Illinois, only two are in use:

- CCS1 – Archer Daniels Midland (IBDP)
  - Post-injection site care (PISC)
- CCS2 – Archer Daniels Midland (Industrial Sources)
  - Full operations permit, 10-year PISC
- FutureGen 2.0 - 4 permits issued, withdrawn when ARRA funding expired

- Permitting has been rate-limiting step for both Illinois projects
  - Projects tied together for monitoring purposes
  - 3 years to issue permit, 3 years to receive permission to inject
- Key issue: Uncertainty lies between issuance of final permit and authorization to inject – up to 3 years
- Accelerate timing of permitting
  - Better than current 18 months (Illinois longer)
  - Impacts ability to realize 45Q tax credit
Decatur by the numbers (IBDP + ICCS):

- 3+ million tonnes CO₂ stored from biofuels
- More than 16,000 feet meters of drilled wells
- More than 800 feet of collected core
- Near-surface groundwater monitoring efforts have resulted in more than 60,000 analyses
- For basin-scale modeling, we will use 1,020,000 CPU-hours of XSEDE supercomputing resources.
- More than 1,700 visitors from 29 countries have been to IBDP and ICCS
- More than 100 people from at least 10 organizations have worked together to make these projects a success
Key Learnings

- Geology is critical and will always remain key factor
- Induced seismicity in basement formations is not a given
- Iterative scientific investigation allows for advancement and economy of scale
- Baseline environmental assessments are critical
- Unanticipated results provide insights into improvements that benefit all projects
- Incorporate technology changes into life cycle of project
- Occom’s Razor applies to CCUS
- Scientific and engineering timeframe not aligned with policy
- Pilot and demonstration projects provide critical insights
- Policy drivers are necessary to facilitate commercialization
- Regulatory, legal, and social factors are critical and require significant time investment
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