



Midwest Geological  
Sequestration Consortium

# Carbon Capture and Storage from Biofuels: Deployment in the Central United States

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# Strategic pathway to commercial CCUS in Illinois Basin



IBDP: 1 MT



ICCS: 3 - 5.5 MT



CarbonSAFE: >50 MT



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# Bioenergy CCS from Ethanol

- Biofuel production from corn
- Compression/dehydration of 99.9% pure CO<sub>2</sub> to remove water
- Injection at ~2100 meters beneath facility
- 2 km pipeline from capture to storage
- Serial compression facilities to reach full volume for both projects
- Funded by US Department of Energy
- In-kind from State of Illinois, ADM, and Schlumberger

# Current CCUS Projects in Decatur, IL USA



## 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

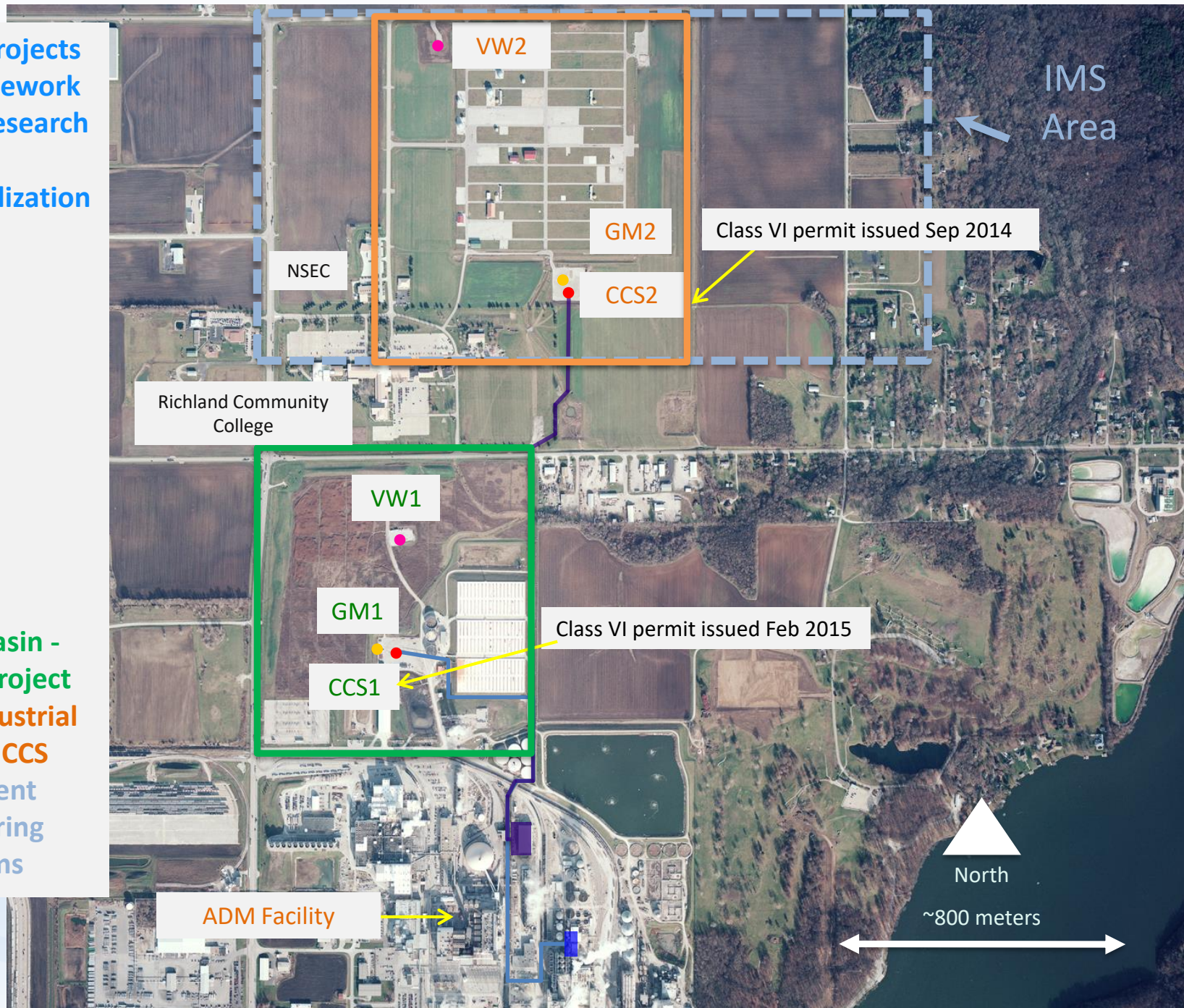
### Status:

- Injection Began April 7, 2017
- Optimization of capture process
- Eligible for 45Q tax credits



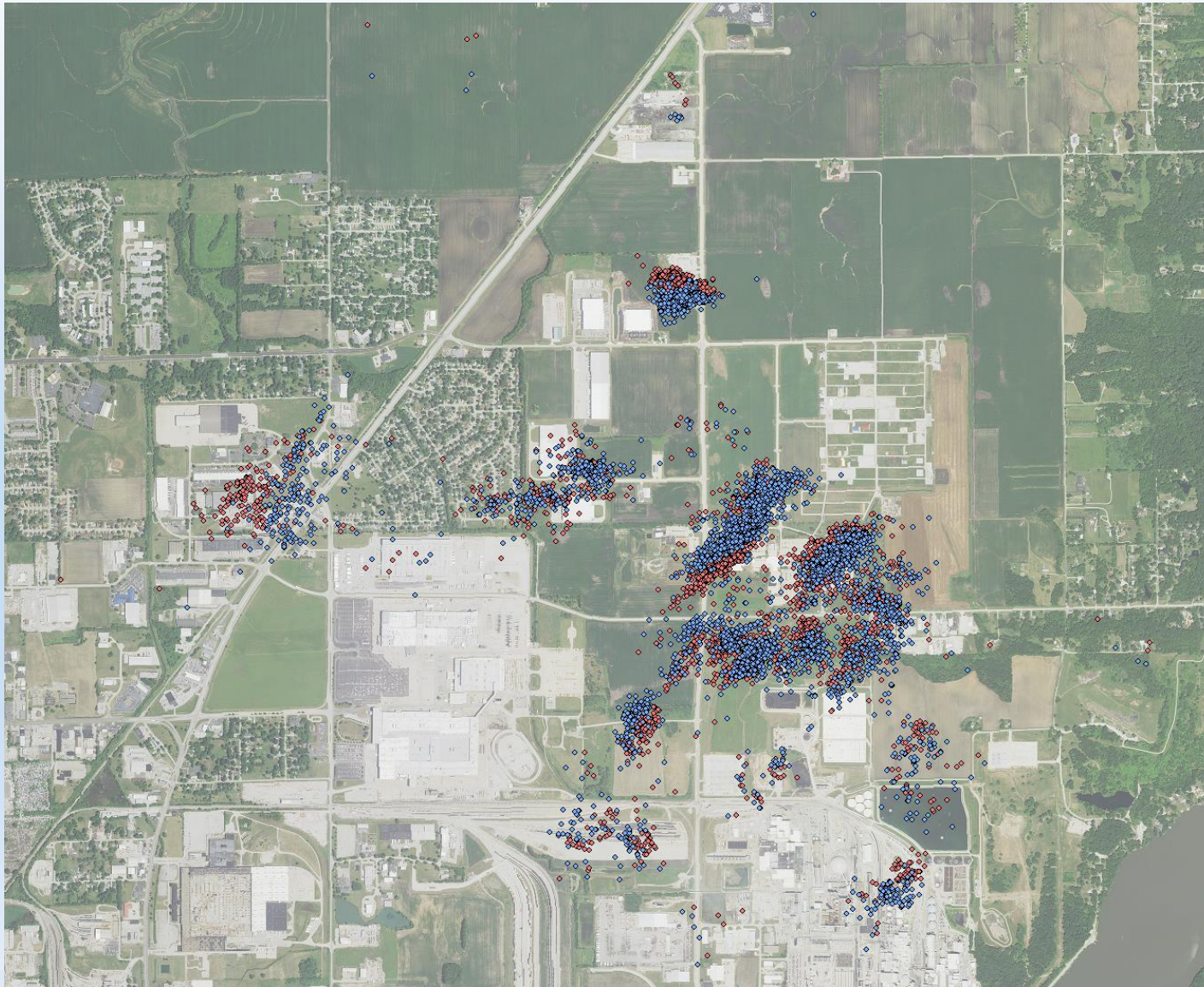
Multiple Projects  
Build Framework  
for CCUS Research  
and  
Commercialization

Illinois Basin -  
Decatur Project  
Illinois Industrial  
Sources CCS  
Intelligent  
Monitoring  
Systems





## IBDP Microseismic Event Catalogues 2017 (RED) vs 2018 (BLUE)



# Environmental Monitoring Framework

**Near Surface**

**Deep Subsurface**

**Atmos.**

**Soil and  
vadose  
zone**

**Shallow  
ground  
water**

**Above  
seal**

**Injection  
zone**

**Eddy  
covariance**

**Meteorological  
conditions**

**Ambient CO<sub>2</sub>**

**Tunable diode  
laser for CO<sub>2</sub>**

**CIR aerial  
imagery**

**InSAR and GPS**

**Soil gases**

**Soil CO<sub>2</sub> flux**

**Tunable diode  
laser for CO<sub>2</sub>**

**Geophysical  
surveys**

**Geochemical  
sampling**

**P/T monitoring**

**Geophysical  
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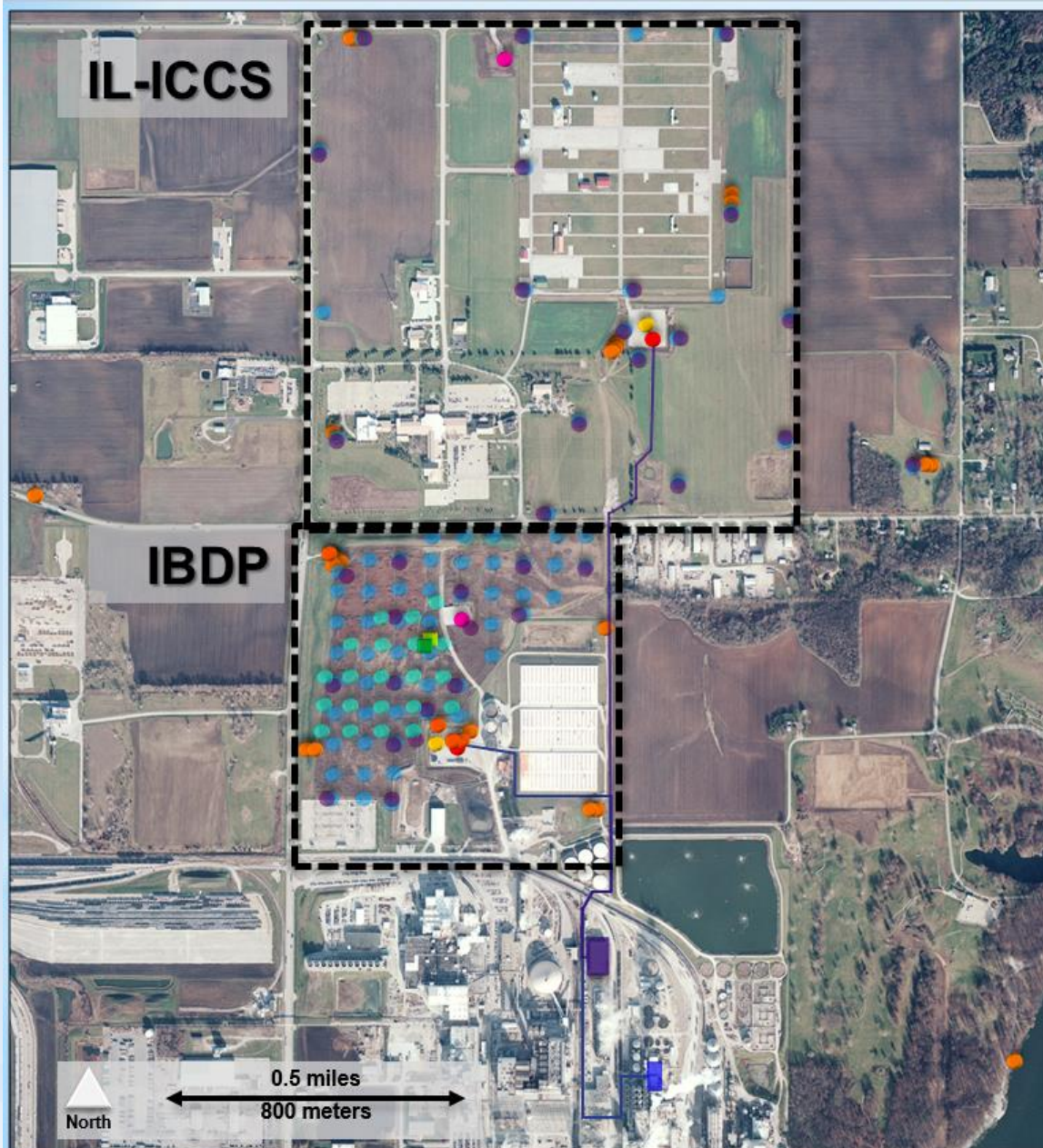
**Geochemical  
sampling**

**P/T monitoring**



# Monitoring Summary

- Injection wells (2)
- Verification wells (2)
- Geophysical wells (2)
- Compliance wells (4)
- Research wells (24)
- Soil gas points (35)
- Soil flux points (145)
- Eddy covariance station (1)
- Continuous GPS station (1)
- InSAR artificial reflectors (21)





# What We've Learned:

- Carbon capture and storage from biofuel sources in deep saline reservoirs is viable can be conducted safely
- Site characterization is critical component in risk reduction and mitigation
- Research and scale-up demonstration projects can lead directly to industrial-scale or commercial-scale projects
- The Mt. Simon Sandstone is a viable and important deep saline storage resource for the US
- Establishment of an MVA baseline is critical to characterize site and reduce project risk, but needs to be revisited on a regular basis
- Permitting can be time intensive and should not be underestimated as a potential project risk
- Tax credits will generate increased interest and can spur deployment
- The simple solution is usually best

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