

# MRCSP Closing Discussion - Feedback and Path Forward

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## Remaining MRCSP Efforts

- MRCSP work continues until late 2020
- Complete limited monitoring and modeling in Chester 16 and Bagley
- Complete reporting and EDX data archiving
- Continued Technology Transfer:
  - NETL Virtual Atlas Preparation
  - Peer Reviewed Publications and full Bibliography
  - MRCSP Stakeholder Summary Document
  - Final Website Updates + Transfer to New Initiative site; Mailing list

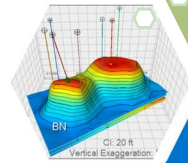
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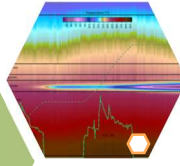
## Final Reporting Structure

- Chester 16 Reef
- Dover 33 Reef
- Bagley Reef
- Charlton 19 Reef

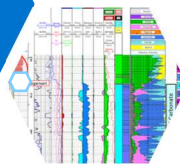


Modeling

Geology



Monitoring



- Phase III Geologic Assessment
- Geo Team Partner Topical Reports
- Reef Trend Regional Assessment
- **Final Technical Report and Papers**

- Monitoring, Reporting, Verification Plan (MRV)
- Life Cycle Assessment
- Borehole Gravity
- Geochemistry
- INSAR
- VSP / DAS-VSP
- Cross Well Seismic
- Microseismic
- Mass Balance Accounting
- Distributed Temperature Sensing (DTS)
- Pressure Analysis
- Pulsed Neutron Capture
- EOR Performance Dashboard

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## MRCSP Accomplishments

- ~1.6M MT net stored under MRCSP monitoring, >2.8M MT stored since start of EOR in 1996
- Completed monitoring at main test bed in late-stage reef
  - Micro-seismic, Post-injection PNC, microgravity, and VSP completed, Post-injection test well drilled and characterized
  - Returned to normal EOR operations, with selected monitoring continued
- Added new EOR reefs with complex geology to monitoring
  - Distributed temperature and Acoustic Monitoring
- Advancements in static and numeric modeling processes
- *MRV Plan and Life-Cycle Analysis completed*
- *Support commercialization with 45Q Partnership by Core Energy, LLC*

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## Lessons Learned

- CO<sub>2</sub> **measurement/accounting** can be performed with high level of confidence in an inter-connected multi-field EOR complex
- Storage potential in **closed reservoirs** evaluated, after active EOR ends – EOR to storage transition
- **Geologic complexity** in reefs affects CO<sub>2</sub> injection, migration, and storage
- **Pressure monitoring** remains the mainstay for managing injection operations and monitoring reservoir response
- **Advanced monitoring** technologies still require testing/validation for confident assessment of plume development in different geologic settings
- **Characterization-monitoring-modeling** loop requires more research for cross-validation over the life-cycle
- A well-developed CO<sub>2</sub>-EOR **regulatory/policy framework** with financial incentives essential for enhanced associated storage

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## MRCSP Status

- MRCSP Large-Scale Test Phase >95% complete with diverse EOR field setting and variety of monitoring options
- All project objectives are on track for attainment
- Field research included a strong combination of characterization, monitoring, and modeling
- Regional characterization helping identify new storage zones and estimate storage resources – setting stage for commercial scale CCS
- Results contribute to developing standards and best practices, NRAP tools, CO<sub>2</sub> capacity estimation tools, and machine learning

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## What's Next – How to build on 16 years of collaboration

- Complete MRCSP – Transition to Regional Initiative
- Develop future collaboration(s)
  - CarbonSAFE and similar projects
  - New private projects spurred by 45Q, California LCFS, RGGI?
  - DOE FOAs and state initiatives
- “Not more of the same”
  - Moving from regional plays to defining early-stage prospects
  - Reducing performance risks through subsurface knowledge
  - Infrastructure analysis and development
  - Support regulatory and policy efforts through technical insights

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## Thanks

Please visit [www.mrcsp.org](http://www.mrcsp.org)

The screenshot shows the MRCSP website homepage. At the top is the MRCSP logo (Midwest Regional Carbon Sequestration Partnership) and a navigation menu with tabs for HOME, ABOUT, PROJECTS, RESOURCES, MEMBERS AREA, and CONTACT US. Below the navigation is a 'WHAT'S NEW' section with three news items: 'Largest Carbon Capture Plant in World to Open in Texas' (October 13, 2016), 'S.3179 - Carbon Capture Utilization and Storage Act' (August 9, 2016), and 'Battelle to Represent MRCSP at International Carbon Capture and Storage Conference' (June 30, 2016). To the right is an 'EXPLORE OUR WEBSITE' section featuring a map of the Midwest region with various project locations marked. Below that is a 'RESOURCES' section with a prominent article titled 'Michigan Basin Project Achievements To Date'. The article text states: 'The Michigan Basin Development Phase project is a CCUS project that is delivering numerous benefits to the environment and to the economy. CCUS projects combine the benefits of carbon STORAGE with the added benefits of carbon UTILIZATION. In EOR, injected carbon dioxide is UTILIZED to help move hydrocarbons through the rock to production wells to enhance oil production. During that process some carbon dioxide remains in the rock and some is recycled through the production well for reinjection. During the past 43 months, the project has STORED 680,687 tons of carbon dioxide and monitored the production of 615,284 barrels of oil.'

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## What's Next – How to build on 15 years of collaboration

- Objectives – “**not more of the same**”
  - Moving from regional plays to defining early-stage prospects
  - Reducing performance risks through subsurface knowledge
- Regional Analysis – Moving from play to early-stage prospects across multiple basins, and storage types (saline, EOR/associated storage); Identify multiple prospects in each basin.
- Regional Infrastructure development – sources, sinks, fairways, economic analysis, regulatory gaps
- Understanding the underlying basement rocks - seismicity risks
- Value based monitoring – mine existing/new data for cost-benefit based monitoring, optimized monitoring for geologic plays
- Stakeholder resource

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## What Remains to be Done?

- Despite MRCSP and RCSP progress, significant gaps remain for large-scale deployment
  - Geologic provinces – Appalachian and Michigan Basins, Cincinnati Arch, east coast, offshore
  - Reservoir types – carbonates, sandstones, others
  - Validate the monitoring with advanced analysis
  - Targeted field and modeling studies
  - CO<sub>2</sub>-EOR/Associated storage – expand Ohio work
  - Economics/infrastructure/regulatory gaps
  - Outreach and technical resources

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