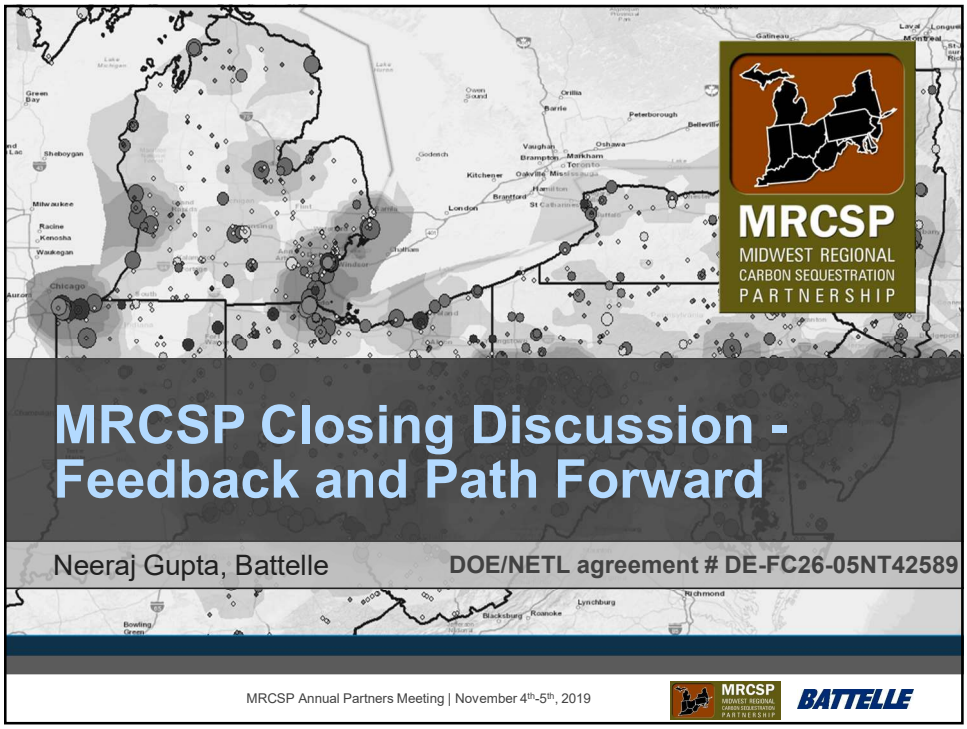
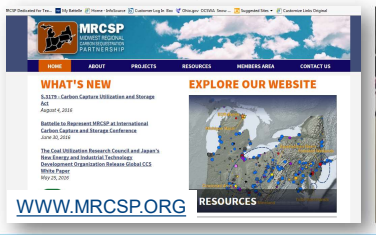


1

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

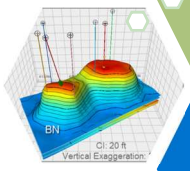


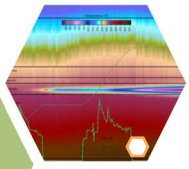
MRCSP Annual Partners Meeting | November 4th-5th, 2019
BATTELLE

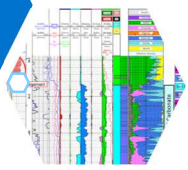
2

Final Reporting Structure

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







Modeling

Monitoring

Geology

- 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

3

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_2 **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_2 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_2-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_2 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

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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_2-EOR/Associated storage – expand Ohio work
  - Economics/infrastructure/regulatory gaps
  - Outreach and technical resources

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