

Motivation/Challenges

- Primary recovery of natural gas from unconventional formations may leave significant quantities of unrecovered gas in place. CO₂ injection may offer a means to stimulate improved hydrocarbon recovery while geologically storing CO₂ from the atmosphere
- Implementation of CO₂ injection for improved recovery will require development of alternative field development strategies

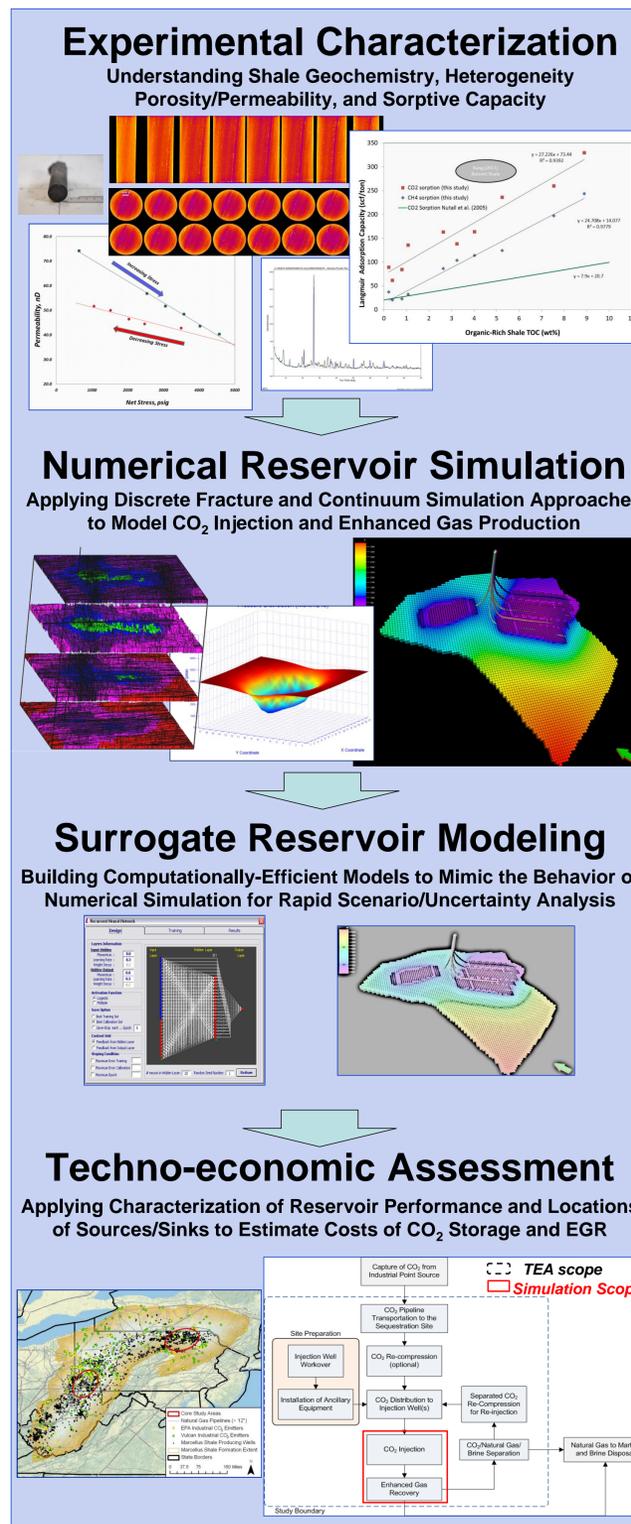
Technology/Capability Overview

To better understand potential for improved natural gas recovery and geologic storage through CO₂ injection, researchers are developing robust assessment based on:

- Characterizing key physical/chemical properties of organic-rich shales influencing enhanced gas recovery (EGR) potential,
- Modeling fluid flow in fractured shale to develop simulations of CO₂ storage in, and enhanced gas recovery from, organic-rich shale formations that are depleted through primary production
- Developing surrogate reservoir models that mimic the performance of computationally-expensive simulations for application in rapid scenario/uncertainty analysis
- Assessing the economic viability of those storage resources through screening-level techno-economic assessment

Industry Significance

- CO₂ injection into hydrocarbon-bearing shale formations may offer a means to stimulate incremental oil and gas production from under-producing or depleted fields
- Informed development of alternate injection strategies can help to improve incremental recovery and understand potential economic benefit



Benefits to Partner

- CO₂ injection in economic shale formations is seen as a relatively high risk proposition; Current research is focused toward characterizing uncertainties associated with this operational scenario to better understand risks/benefits
- Surrogate reservoir models offer an accurate and computationally fast means to evaluate these alternative field development strategies
- Tool coupling characterization of reservoir performance and surface operations is in development and will be available for rapid scenario evaluation

Opportunity

- Seeking industry collaboration to validate models and demonstrate viability of CO₂ storage and enhanced gas recovery in shale formations
- Seeking industry collaboration to refine characterization of matrix and fracture network (data and rock samples)

Development Status

- Experimental characterization of CO₂/shale interactions in progress
- Developing simulation approaches to predict CO₂ injectivity, capacity, pressure response, and improved gas production rates and compositions
- Building framework for preliminary techno-economic assessment based on probabilistic assessment of reservoir performance

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