Gulf Coast Resource Accelerator: A Field Lab for the Energy Transition

Vision: CCS is a low-margin business—viability depends on controlling costs, but that is difficult in a new industry with little track record, significant subsurface uncertainty, cautious regulators and a skeptical public. Concerns about CO_2 migration, fault stability and legacy well integrity lead to oversized leases, conservative injection plans and costly remediation operations. Public ignorance and regulatory reference to historic science-focused pilot projects lead to protest, long permitting times and gold-plated monitoring plans.

We envision a dedicated field laboratory and a joint industry/academic/government consortium to probe the limits of common uncertainties, establish safe operating margins and prove the effectiveness of fit-for purpose monitoring. Otway, CAMI and the Cranfield SECARB Early Test show the value of long-term test sites, and offer models for governance and project design, but their results are specific to their local geology, the issues of their stakeholders, and the small scale of injection. A Gulf Coast site is needed to address current issues at commercial scale in the heterogeneous, unconsolidated, synclinal reservoirs of the Gulf Coast. **The prize is accelerated project development, reduced costs, and a focus on the subsurface elements that matter for sustained risk reduction.**

Objectives: Priorities and experimental design will be determined by project participants. At a high level, we believe they include the following:

- Assessment of legacy well risk and validation of tools to assure zonal isolation
- Delimiting Area of Review (AoR) and managing conflict with other subsurface uses
- Predicting CO_2 plume stabilization
- Development and validation of cost-effective monitoring tools and processes
- Characterizing and managing faults and fractures
- Promoting CCS and accelerating public acceptance

Elements of a successful field site:

- Representative Gulf Coast faulted, deltaic reservoirs in a syncline or monoclinal setting
- A handful of legacy wells with varying construction standards
- Leased pore space and access to water, power, fuels and CO_2 at commercial scale
- Vehicle access suitable for visiting government leaders, policymakers, school groups and public

Joint Industry-Academic-Government Partnership: We believe that broad partnership and clear governance are needed to maximize actionable insight, minimize cost and ensure safe operation. Key elements include:

- Research coordination team to organize and align experimental design and sequencing
- Industry steering board and road stakeholder input on experimental design
- Regulatory buy-in for permitting experimental injection and adopting the learnings
- Competent operator comfortable with experimentation
- Mechanism for collaboration with service providers, tool vendors and other stakeholders
- In-depth analysis of data and publication of results in peer-reviewed literature

Next Steps: Although the concept has been in discussion for years, the insights are needed now, and the time has come to move forward with currently available partners.

- Assemble interested parties to create a detailed proposal
- Define governing structure, identify a site, and secure funding
- Site characterization, experimental design and permitting

Register Interest: Scan the QR code, or click here, and complete the form

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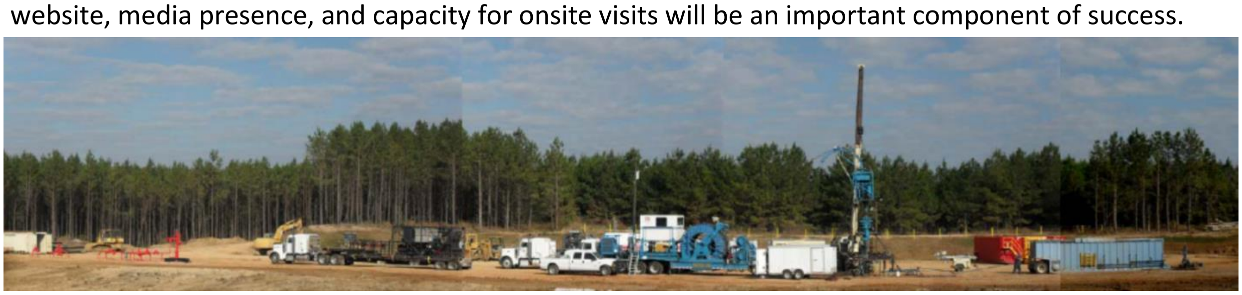
Details of Objectives:

- **Assessment of legacy well risk and validation of tools to assure zonal isolation:** The Gulf Coast has >1 million legacy wells, including ones that have limited cement over the injection zone, wildcats that were never cased, and wells that have limited records or questionable plug and abandonment (P&A). Can natural creep effectively seal an open hole over decades? If so, how can that be assured? If well isolation fails, what methods are most effective at detecting leakage to various zones at depth, to USDW, to the surface or surface waters? We envision a series of experiments, perhaps using water or air to test the integrity of various legacy wells and validate monitoring tools and approaches.
- **Delimiting Area of Review (AoR) and managing conflict with other subsurface uses**: Modeling pressure propagation requires many assumptions about rock properties and boundary conditions, including rock compressibility, fault transmissibility, and diffusion of pressure into confining zones and interbedded muds. Field-scale experiment is needed to develop and test predictive assumptions about pressure propagation to calibrate AoR delineation and reduce risk that commercial injection is curtailed by pressure interference. Conceptually, a test injection into a reservoir compartment too small for commercial development might allow fast responses to moderate amounts of fluids.
- **Predicting CO_2 plume stabilization:** Many projects are injecting into synclines, without a well-defined trap. Accurate models of plume stabilization are needed to secure pore space, define the AoR and minimize or transfer long-term liability. Invasion Percolation (IP) and continuum models predict very different CO_2 migration. Core floods and sand tank experiments generate insight, and Frio and Otway have provided small-scale field confirmation, but further up-scaled validation is needed. Injection of smaller amounts of CO_2 for shorter durations can be considered because this reduces the area of viscous-dominated flow and allows capillary processes to become dominant quickly and results in stabilization during the project time frame.
- **Development and validation of cost-effective monitoring tools and processes:** While we have many tools already, a number of advances are needed to balance the regulatory requirement for effective monitoring with the attention to costs required by project economics. These include 1) robust above-zone/multi-zone tools for pressure, conductivity and other signals; 2) low-cost "sentinel" tools to confirm ongoing isolation of legacy wells; 3) improved leakage screening for aqueous systems, such as groundwater, surface water and marine waters; 4) parsimonious geophysics to monitor plume spread as needed to assure conformance.
- **Characterizing and managing faults and fractures**: Much work has been done on faults for hydrocarbon exploration, but it remains poorly calibrated and uncertain. Fault-based tests are needed to evaluate 1) cross-fault connectivity versus closed pressure or plume boundaries; 2) up - or along-fault preferred migration that threatens retention, and; 3) geomechanical issues that create seismicity risk.
- **Promoting CCS and accelerating public acceptance**: Public skepticism and outright fears are key barriers to growing CCS. A successful field lab offers a platform for education and familiarization of members of the public, from government leaders and visiting dignitaries to school groups and members of the public. A website, media presence, and capacity for onsite visits will be an important component of success.



Cranfield test site, ~2012. The GCCC has spent over 20 years developing field trials, generating commercially relevant insights, and building deep working relationships with industry, regulators, policy makers, national labs, academia and the public. We have helped pave the way for the industry now rising, and we look forward to helping it mature.