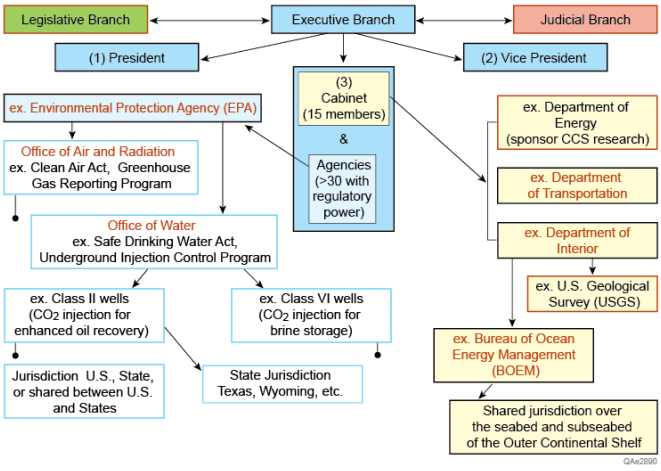
Outreach, Training, Policy, and Regulation: Domestic Efforts

Project Description

The Gulf Coast Carbon Center provides technical support to United States policy makers and regulators who are involved with carbon capture and sequestration. Our efforts between 2011-2014 can be generally categorized into two main areas of focus: onshore and offshore.

Of the many U.S. groups conducting research on geologic storage of CO_2, a few have successfully communicated results in outreach forums (e.g. STORE, Olson et al. [2013]) and there is much industry experience in CO_2 injection. But more work is needed to fully and accurately inform policy makers, regulators, and public entities about CCS facts, both in the U.S. and internationally. (See topic on International Efforts in this theme.)



U.S. governmental entities involved in CCS

Status Quo of Onshore Efforts

The U.S. Environmental Protection Agency (EPA) regulates subsurface injection of CO_2 under two different sets of laws: the Underground Injection Control (UIC) program in the Safe Drinking Water Act and the Clean Air Act (CAA) Mandatory Greenhouse Gas Reporting program.

The multiple sets of EPA regulations and guidance documents pertain to CO_2 injection via wells used for

(1) enhanced oil recovery (EOR) (Class II well rules)

(2) saline storage (Class VI well rules), and

(3) transitioning from Class II to Class VI.

Controversy exists over whether CO_2 trapped during EOR should count as sequestration or if Class II operators should ever have to apply for a Class VI well permit.

Status Quo of Offshore Efforts

The OCS is that portion of the offshore seaward of State submerged lands (shoreline to either 3 leagues [Texas and west coast of Florida] or three nautical miles offshore) out to the edge of the international exclusive economic zone (EEZ), which is 200 nmi from shore.

No one in the U.S. is injecting CO_2 in geologic strata below U.S. State waters or the Outer Continental Shelf (OCS) yet, and no regulations for offshore CCS exist. However, GCCC is leading team to provide technical guidance to the U.S. Department of Interior (DOI), Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) who are planning for future regulation of CCS on the OCS. For State submerged lands in Texas, the EPA currently has jurisdiction for Class VI wells, and the Railroad Commission of Texas, who already regulates all oil and gas operations in State waters, will also regulate future CO_2 EOR (Class II wells).

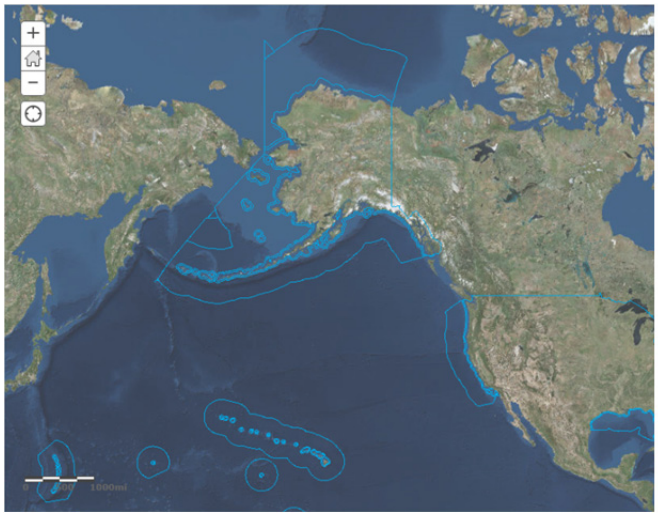
Onshore CCS Technical Guidance

GCCC researchers have provided technical guidance on CCS monitoring to the following entities.

- Through a funded research project (Hovorka et al., 2014), GCCC addressed three concepts for designing a realistic CO_2 monitoring program for the EPA. (For more on this work, see the Monitoring Methods Optimization Theme, Site Specific Monitoring Topic.)
  - Identification of low probability material impacts, which are threshold values of measurement determined by modeling failure scenarios to identify the most sensitive variables.
  - Identification of site-specific tool sensitivity
  - Assessment of noise and repeatability of measurements, especially for pressure and geochemistry, and also especially in a dynamic setting, such as a CO_2 EOR site.
- Through public comment on proposed regulations and guidance documents. GCCC researchers provided comments to EPA on the following topics.
  - Class VI well rules and guidance. For example, we questioned the assumption that if CO_2 migrates to underground sources of drinking water (USDWs), contamination from trace metals such as arsenic, lead, and zinc will likely occur. GCCC researchers also submitted comments questioning the simple approach of measuring pH in groundwater to detect whether or not CO_2 leakage has occurred.
  - Guidance for rules requiring Class II well operators to apply for a Class VI permit if they want to claim CO_2 sequestration, which is known as Class II to Class VI transition. For example, we questioned the assumption that transition from EOR to pure sequestration will automatically increase risk to USDWs.
- Through numerous published papers showing results that address issues in EPA regulations, GCCC provided technical information to regulators as well as the research community
  - Yang et al. (2014) conclude that the presence or absence of carbonate minerals in the matrix of potable aquifers controls mineral dissolution, and pH buffering such that pH alone may not be diagnostic of CO_2 leakage. It also suggests methods for realistically detecting potential leakage of CO_2 to groundwater.
  - Nicot et al. (2013) applied the Certification Framework methodology and assessed cement bond logs of plugged and abandoned wells in the Cranfield CO_2 EOR field in Mississippi. Findings include a low probability of leakage of CO_2 and an even lower chance of brine leakage to USDWs.
  - Romanak et al. (2012) showed that pH would not be a reliable indicator of CO_2 leakage to drinking water resources overlying the SACROC oilfield in west Texas, but that dissolved inorganic carbon measurements could be indicative of leakage. Regardless, no evidence of leakage of CO_2 to USDWs at SACROC was found.

Offshore CCS Technical Guidance

GCCC had provided technical guidance to the BOEM in their effort to formulate regulations for offshore geologic storage of CO_2 below the OCS. The National Oceanic Partnership Program funds this research through the BOEM. BOEM and its sister agency, BSEE, were formerly combined as the Minerals Management Service, and regulate U.S. offshore oil and gas activities on the OCS.



Extent of U.S. EEZ
Source: ArcGIS, U.S. Maritime Limits and Boundaries

- Products (end date June 2015) include a Literature Database, a Best Management Practices document, and a report on Data Gap Analysis (e.g. Smyth et al., 2014). The team, led by GCCC includes geoscientists, engineers, and lawyers from academia (UT Austin BEG, Texas A&M Corpus Christi, Harte Research Institute for Gulf of Mexico Studies), industry (Wood Group Mustang and Wood Group JP Kenny, and Det Norske Veritas), and State government (The Texas General Land Office). The scope of work includes transport, injection, and monitoring of CO_2, and analysis of existing BSEE/BOEM regulations.
- BSEE/BOEM (with overlapping sets of regulations) have jurisdiction to regulate offshore oil and gas operations, including secondary and tertiary oil recovery, on the OCS for resource recovery only. If CO_2 EOR operators want to claim CO_2 emission reduction credits in the future, offshore monitoring requirements need to be established.
- According to the Energy Policy Act of 2005, DOI interpreted that they should have jurisdiction over offshore CCS that utilizes CO_2 generated from coal-fired power plants. The GCCC-led project team thinks existing statute can be more broadly applied to offshore CCS if (1) pore space is considered a natural resource and (2) repurposing existing platforms and other oil and gas infrastructure can be considered as preventing waste or conserving natural resources on the OCS.
- Existing BSEE/BOEM regulations that are most applicable to future CCS on the OCS are in a section on activities related to renewable energy and alternative uses of the existing facilities on the OCS. If future CCS will be regulated under these rules, modifications will be needed to address exploration, drilling, CO_2 injection and monitoring.
- GCCC is taking the same approach as with onshore monitoring of CO_2, which is that deep monitoring is most critical. Shallow subsurface/sub-seafloor or surface/seafloor monitoring is important, but we consider early detection of potential CO_2 migration from an injection zone to be of higher value.

Selected Citations

Nicot, J. -P., Oldenburg, C. M., Houseworth, J., and Choi, Jong-Won, 2013, Analysis of potential leakage pathways at the Cranfield, MS, U.S.A., CO_2 sequestration site: International Journal of Greenhouse Gas Control, v. 18, p. 388-400.

Olson, H. C., Olson, J., Bryant, Steve, Lake, L. W., Bommer, P., Romanak, Katherine, Hovorka, S. D., Smyth, R. C., and Williams, I., 2013, Meeting the grand challenge for future carbon management engineers and scientists: Stimulating workforce capacity through teacher professional development: Energy Procedia, v. 37, p. 7265-7272.

Romanak, K. D., Smyth, R. C., Yang, C., Hovorka, S. D., Rearick, M., and Lu, J., 2012, Sensitivity of groundwater systems to CO_2: application of a site-specific analysis of carbonate monitoring parameters at the SACROC CO_2-enhanced oil field: International Journal of Greenhouse Gas Control, v. 5, no. 1, p. 142-152.

Smyth, Rebecca C., Thomas, Paul G., III, Heiligenstein, Christopher, 2014, Concerning offshore geologic storage of carbon dioxide in the U.S.A.: GHGT12 http://www.ghgt.info/index.php/Content-GHGT12/ghgt-12-overview.html.

Yang, C., Dai, Z., Romanak, K. D., Hovorka, S. D., and Treviño, R. H., 2014, Inverse modeling of water-rock-CO_2 batch experiments: potential impacts on groundwater resources at carbon sequestration sites: Environmental Science and Technology, v. 48, no. 5, p. 2798–2806, doi: 10.1021/es4041368.

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