Utilization of Carbon and Other Energy Gases — Geologic Research and Assessments Project Overview

Introduction

The Utilization of Carbon and Other Energy Gases — Geologic Research and Assessments Project is part of the U.S. Geological Survey (USGS) Energy Resources Program (ERP). A primary goal of the project is to conduct science and produce reports to determine how much additional oil could be produced if carbon dioxide (CO_2) were widely available for enhanced oil recovery (EOR) and to identify the ramifications of CO_2 injection for EOR or for emissions reduction. Some potential impacts of widespread injection of CO_2 that this project addresses include induced seismicity, CO_2 leakage, and environmental risks of storing CO_2 in underground reservoirs. Additionally, this project aims to better characterize and evaluate energy-related gases (such helium, nitrogen, and hydrogen sulfide) and subsurface energy storage resources. If these trace gases could be separated and concentrated from the produced natural gas stream, un-economic natural gas deposits may become a viable part of the national natural gas resource base. Similarly, methane emissions during coal mining and after mine closure are often released to the atmosphere and contribute to greenhouse gases instead of being captured and utilized for energy production. The national electrical grid requires a balance between supply and demand across daily to annual cycles. Subsurface energy storage mechanisms including compressed air or gas, pumped hydroelectric, and geothermal require additional geologic investigations and assessments of available storage resources. To address an all-of-the-above approach, this project works to build improved geologic models needed to describe the distribution and resource-potential of these various energy options.

USGS scientist sampling a natural gas production well for sulfur isotope analysis.

Research Capabilities

The Utilization of Carbon and Other Energy Gases — Geologic Research and Assessments Project receives annual Congressional-appropriated ERP funding that is supplemented by external funding from research grants, or by cooperative research and development and technical assistance agreements with industry and other institutions. With a project research staff of more than 20 geologists, hydrologists, engineers, and data analysts, the following is a list of the project's key research capabilities.

- Geologic energy resource assessments
  - CO_2 enhanced oil recovery (CO_2-EOR)
  - Technically accessible geologic storage resources for CO_2 injection and storage
  - Energy-related natural gases: CO_2, He, N_2, and H_2S
  - Assessment methodology development
- Evaluation of the feasibility of CO_2 mineralization
- Geochemical analyses and stable and noble isotopic analyses of natural gas and produced reservoir fluids
- Microbial analysis of reservoir communities

An outcrop of the Caballos Novaculite, a major reservoir for naturally occurring CO_2 in southwestern Texas.

- Monitoring and evaluation of induced seismicity associated with CO_2 injection projects
- Economics of CO_2 storage resources
- Reservoir engineering, geologic characterization and modeling in support of CO_2-EOR and CO_2 storage resource assessments
- Reactive transport and multiphase flow modeling
- Emissions evaluation of energy-related greenhouse gas from federal land
- Subsurface energy storage resource evaluation
- Coal-mine and abandoned mine methane resource evaluation
- Subsurface seismic and well-log interpretation
- Well site geology

A CO_2 injection well drilled by the Southeast Regional Carbon Sequestration Partnership (sponsored by the Department of Energy) at the Cranfield test site in Mississippi. The well was drilled to test the effectiveness of injecting and storing CO_2 in a deep saline reservoir. Scientists from the USGS participated in the research program.

USGS Technology Transfer

The technology transfer program at the USGS is designed to leverage the research capabilities of USGS scientists with the commercial development potential of the private sector. It encourages the process by which existing knowledge, facilities, or capabilities developed under Federal funding are utilized to fulfill public and private needs. Technology transfer tools such as Cooperative Research and Development Agreements (CRADA), Technical Assistance Agreements (TAA), Facility Use/Service Agreements (FUSA), and patent licenses provide incentives for commercialization and use of USGS developed capabilities and technologies.

Cooperative Research

The Utilization of Carbon and Other Energy Gases — Geologic Research and Assessments Project works with multiple academic, government, non-profit, and industry organizations to conduct cooperative research investigations on various aspects of geologic CO_2 storage, CO_2 utilization in EOR operations, and naturally occurring CO_2 reservoirs. If your organization is interested in forming a cooperative research agreement with the project, please contact any of the USGS project staff listed below.

Inverted funnel used for sampling of a natural gas reservoir seep with a high CO_2 content. Sampling and subsequent geochemical analyses help to evaluate the potential geologic risks associated with CO_2 storage by defining the origin, migration history, and fate of natural CO_2.

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For More Information

For more information about the Utilization of Carbon and Other Energy Gases — Geologic Research and Assessments Project please visit http://go.usa.gov/8X8.

Selected publications from the Utilization of Carbon and Other Energy Gases — Geologic Research and Assessments Project are available at http://go.usa.gov/xZDpz.

Additional information is available on the USGS Energy Resources Program website at https://energy.usgs.gov.

To learn more about how your organization can become involved with the USGS or the Utilization of Carbon and Other Energy Gases — Geologic Research and Assessments Project, visit the USGS Technology Transfer website at https://www.usgs.gov/about/organization/science-support/technology-transfer.

U.S. Department of the Interior
U.S. Geological Survey

Project publications
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