Results of LBNL research in GCS are reported in over 160 peer-reviewed journal publications.

Support for LBNL's research on GCS comes mostly (>80%) from the U.S. Department of Energy (DOE), with additional support from the Carbon Capture Project (an industry consortium), the U.S. Environmental Protection Agency (EPA), and various other sources. Our largest research projects include:

1. GEO-SEQ: (part of our Consolidated Sequestration Research Project): research in support of demonstration programs occurring in the Otway Basin, Australia, and Krechba Gas Field, In Salah, Algeria;

2. Zero Emissions Research and Technology (ZERT): fundamental studies of near-surface monitoring and leakage detection, relative permeability and trapping, and development and applications of simulation capabilities for CO_2 migration;

3. Regional Carbon Sequestration Partnerships (RCSP's): field, modeling, and laboratory support for WESTCARB, SECARB, MGSC, and BigSky Phase III projects;

4. National Risk Assessment Program (NRAP) (collaboration with four other national laboratories): research related to risk, namely well-bore integrity, groundwater impacts, monitoring, natural leakage pathways, and systems modeling;

5. U.S. EPA: research on potential effects on groundwater of large-scale CO_2 injection;

6. Carbon Capture Project (CCP, an industry consortium): risk-based certification framework, and monitoring technologies.

For more information, please visit our website at:

http://esd.lbl.gov/research/programs/gcs/

or contact:

Curtis M. Oldenburg, GCS Program Head
cmoldenburg@lbl.gov

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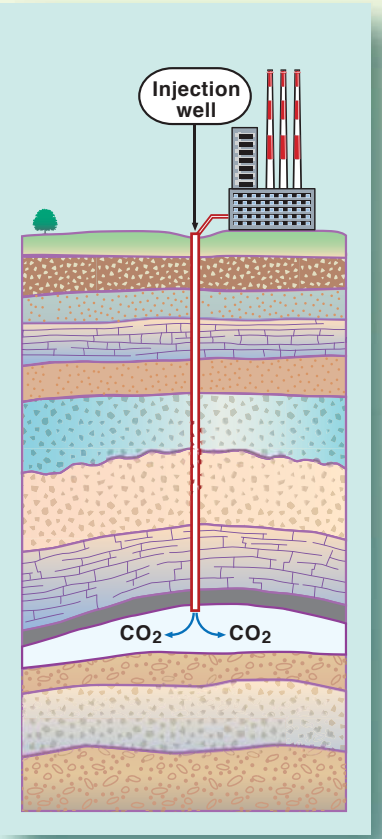
Geologic Carbon Sequestration Program
Lawrence Berkeley National Laboratory
Earth Sciences Division
Berkeley, California 94720

Geologic Carbon Sequestration Program



Lawrence Berkeley National Laboratory

Earth Sciences Division

ESD EARTH SCIENCES DIVISION

Geologic Carbon Sequestration Program

Geologic Carbon Sequestration (GCS) refers to the last step in the process of Carbon Capture and Storage (CCS) in which CO_2 is captured from large industrial point sources, transported to injection wells, and injected deep underground for effectively permanent sequestration from the atmosphere.

LBNL's GCS Program mission is to develop the knowledge and understanding of CO_2 injection, storage, migration processes, impacts, and monitoring to inform and guide the safe and effective implementation of geologic carbon sequestration.

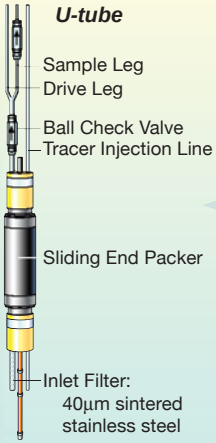
LBNL has been working on GCS for over ten years using lab, field, and simulation approaches to investigate key issues associated with GCS including:

1. Capacity, trapping mechanisms, and permanence;
2. Monitoring and verification using geophysical (e.g., seismic) and surface detection methods;
3. Enhanced hydrocarbon recovery options;
4. Leakage and seepage;
5. Impacts on the environment including groundwater, induced seismicity, and the near-surface;
6. Risk-based assessment and certification;
7. Injection field studies including fluid sampling at in situ conditions and seismic monitoring;
8. Performance prediction (LBNL develops the TOUGH reservoir simulation codes).

Berkeley Lab

ESD Earth Sciences Division

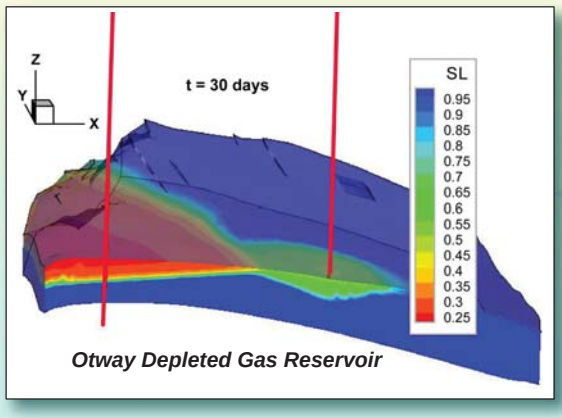
Fluid Sampling



LBNL maintains unparalleled expertise in

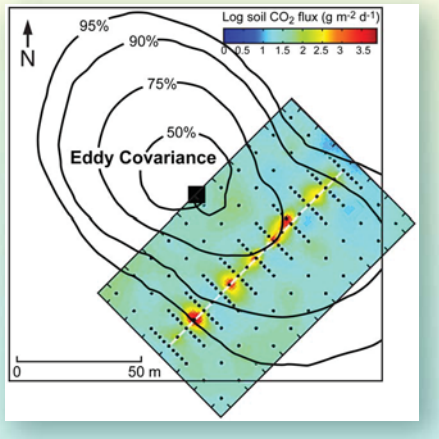
1. **Fluid sampling** (e.g., U-tube sampler and related analytical chemistry equipment for downhole in situ fluid sampling
2. **Field monitoring** (e.g., crosswell and surface seismic, thermal perturbation sensing, eddy covariance, and accumulation chamber);
3. **Laboratory measurements** (e.g., CT scanner, Synchrotron X-ray microtomography, Split-Hopkinson resonant seismic cell, and high pressure flow equipment);
4. **Modeling and Simulation** (e.g., developers of the TOUGH codes used world-wide for CO_2 storage simulation, including TOUGHREACT and TOUGH-FLAC).

Modeling and Simulation

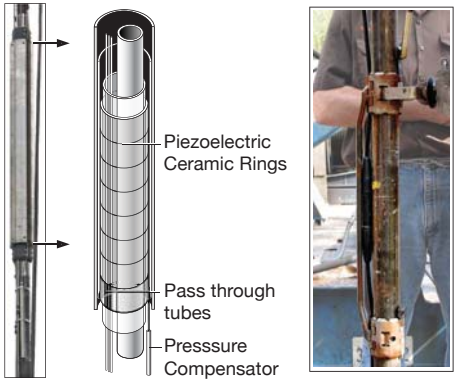


Otway Depleted Gas Reservoir

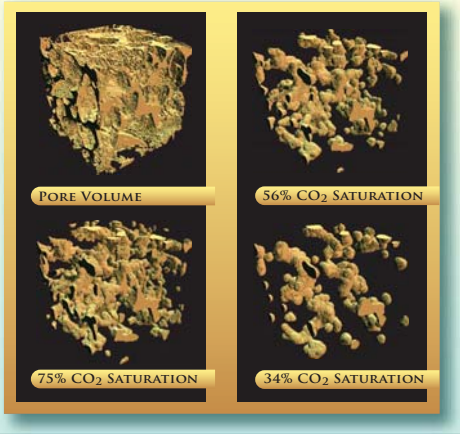
Surface Monitoring



Subsurface Monitoring



Piezo-Tube Seismic Source

Tubing-Deployed Hydrophone Sensor

Pore-Scale Visualization