Background on USEPA Efforts on Carbon Dioxide Capture and Storage

Overview

Carbon dioxide capture and storage (CCS) is a potentially significant technology for reducing CO_2 emissions to the atmosphere. For more than a decade, the U.S. Department of Energy (DOE) has led federal efforts on research, development, and deployment of CCS technologies. USEPA has a smaller, but also important, role in the ultimate deployment of this technology. USEPA is responsible for ensuring that underground injection of CO_2 is conducted in a manner that is protective of underground sources of drinking water (USDWs) and human health in accordance with section 1421(d)(2) of the Safe Drinking Water Act (SDWA). USEPA is also responsible for reviewing and commenting on environmental impact statements under the National Environmental Policy Act (NEPA). As DOE moves forward with its R&D program and CCS pilot projects, USEPA is focused on these responsibilities:

- Providing guidance on permitting CO_2 injection wells for pilot-scale projects
- Identifying technical and regulatory issues and developing an appropriate management framework for permitting
- Evaluating risks to human health and the environment
- Incorporating CCS into the national GHG Inventory

Key USEPA Work Areas

The research topics listed below are directly related to USEPA program responsibilities. DOE-sponsored and industry-sponsored research will help develop data and tools to address these issues. USEPA will aggregate/analyze the information generated from those efforts and initiate new research in priority areas as needed. Focus areas may include:

Evaluating risks to human health and the environment

- Potential impacts of CO_2 injection on human health and the environment including potential impacts of CO_2 injection on ground water and drinking water
- Potential for regional ground water impacts including possible fluid displacement and pressure impacts
- Evaluating conduits for potential CO_2 leakage and mitigation, including faults and abandoned wells

Providing guidance on permitting CO_2 injection wells for pilot-scale projects

- Determining the appropriate level of information needed to issue experimental well permits (e.g. identifying the appropriate level of site characterization)

- Addressing post-injection procedures to properly plug experimental wells
- Developing the framework and tools that will be necessary during the permitting process to assess operational and environmental risks

Identifying technical and regulatory issues associated with commercial projects

- Determining the appropriate "area of review" to characterize the surface and subsurface around the well
- Developing a framework for permitting multiple projects within a single basin to avoid potential adverse impacts of multiple injection projects on the target or surrounding formations.
- Identifying criteria for siting and operation in order to avoid the potential for small and/or large-scale CO_2 releases
- Evaluating remediation technologies that could be used to address post-injection leaks or unintended movement of CO_2
- Determining appropriate measurement, monitoring, and verification (MMV) strategies to demonstrate CO_2 behaves as predicted in the subsurface
- Identifying appropriate techniques and materials to construct, operate, plug, and abandon injection wells
- Evaluating potential of non-CO_2 constituents in the CO_2 stream being sequestered (allowable levels)

Current USEPA Efforts

On March 1, 2007, USEPA issued permitting guidance to assist USEPA and State regulators in evaluating applications for geologic sequestration pilot projects and setting appropriate permit conditions for these projects to protect drinking water and public health. The permitting guidance also encourages communication, information gathering, and data sharing that will help inform a nationally consistent management approach for commercial implementation of CCS projects.

In addition to the permitting guidance for CCS pilot projects, USEPA is conducting research with DOE and sponsoring several workshops to identify additional research needs and options for developing risk management strategies. The following workshops have been sponsored by USEPA over the past 2 years:

- **Subsurface Geologic Modeling Capabilities**: Houston, Texas, April 2005
- **Risk Assessment, Analysis, and Management**: Portland, OR, September 2005
- **International Conference on Site Characterization**: Lawrence Berkeley Lab, CA, March 2006

- **State Regulator's Workshop on CO_2 Data and Research Needs**: San Antonio, TX, January 24, 2007
- **Well Construction and Mechanical Integrity**: Albuquerque, NM: March 14, 2007
- **Determining the "Area of Review" and Abandoned Well Workshop**: Washington, DC, Planned for July 10-11, 2007
- **Financial Responsibility and Risk Analysis**: Tentative Workshop planned for Sept./Oct. 2007

USEPA has also begun to develop a framework to assess risks in order to ensure that injection is protective of underground sources of drinking water and human health. The vulnerability framework will assist in the following efforts:

- Developing a management framework that would minimize risk in site selection, consider risk management and monitoring needs, and identify appropriate remediation plans if a leakage was to occur;
- Determining potentially sensitive areas in order to screen potential projects or identify areas with increased need for monitoring or risk management tools;
- Identifying technical issues related to vulnerability;
- Providing information on the potential variation in cost of geologic sequestration due to differences in monitoring and risk management needs.

Finally, USEPA is working to incorporate CCS into the U.S. GHG Inventory which is submitted under the United Nations Framework Convention on Climate Change. USEPA is currently evaluating how to accurately account for emissions and reductions related to the capture, transport, and geologic sequestration of CO_2.

Additional Resources

For additional information, please visit EPA websites at www.epa.gov/climatechange/emissions/co2_geosequest.html and http://www.epa.gov/OGWDW/uic/wells_sequestration.html. You can also contact Anhar Karimjee in EPA's Office of Air and Radiation at phone: (202) 343-9260 or e-mail: karimjee.anhar@epa.gov or Bruce Kobelski in EPA's Office of Water at phone: (202) 564-3888 or e-mail: kobelski.bruce@epa.gov.