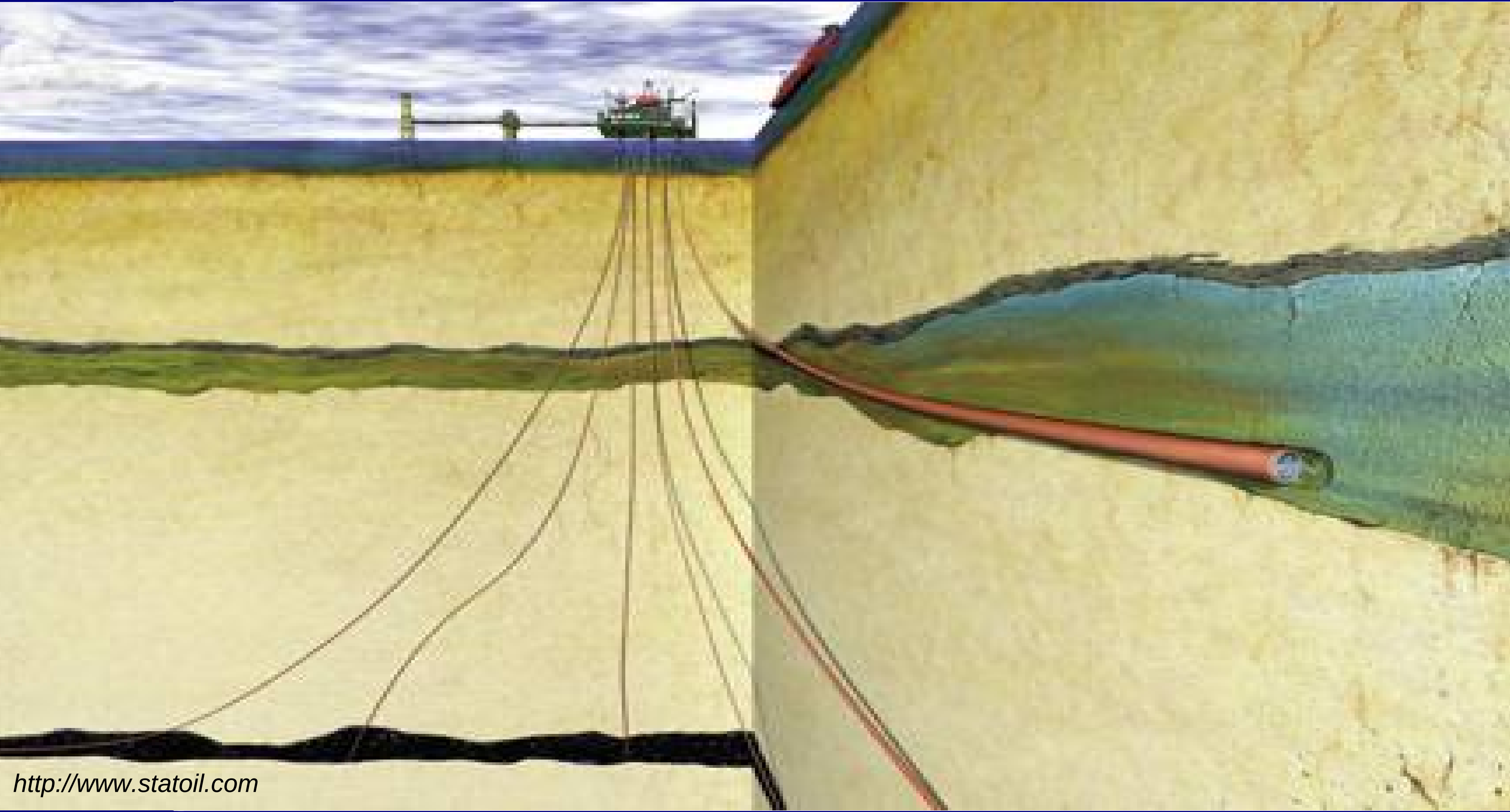
EPA Efforts on Carbon Dioxide Capture and Storage



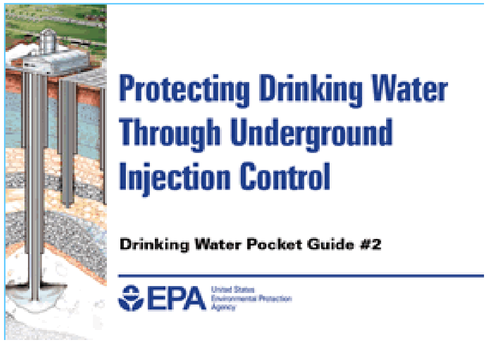
http://www.statoil.com

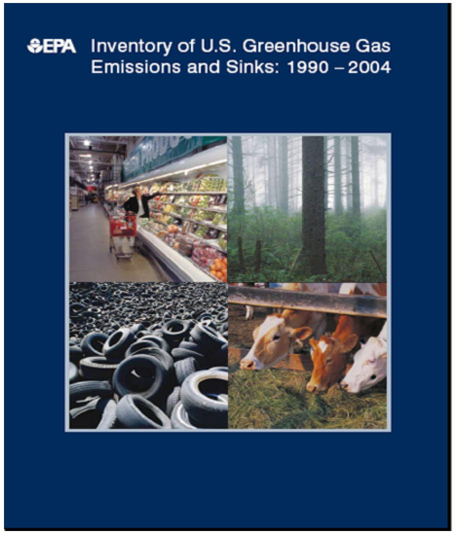
Overview

- Carbon Capture and Storage (CCS) is key to reducing GHG emissions.
  - Allows continued use of coal
  - Could mitigate substantial CO_2 emissions
  - U.S. has significant storage capacity
- There are key factors that will enable widespread deployment.
  - Costs must be reasonable
  - Commercial and large-scale projects must be demonstrated
  - Public must accept the technology and have confidence that it is safe
- Significant resources have been invested to support commercialization of CCS and there are many policy proposals to push CCS deployment.
- EPA will play an important role in ensuring the success of CCS.
  - Evaluating risks and developing technically sound regulations
  - Keeping up with DOE's accelerated R&D schedule and the rapid pace of commercialization

EPA Responsibilities

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





EPA Geologic Sequestration Workgroup

- Official EPA Workgroup created in August 2004
- Approximately 30 members from HQ Offices, EPA Regions, and EPA National Labs
- Collaborative effort led by OAR and OW to:
  - Create an expert EPA team to ensure broad range of environmental concerns are addressed during R & D
  - Develop positive working relationships with DOE, industry, and other stakeholders
  - Collect data from ongoing/planned DOE projects to meet EPA obligations (e.g. SDWA, UNFCC)
  - Encourage critical R&D and provide flexibility for pilot projects
  - Integrate R&D and regulatory efforts up-front to minimize future burden on EPA and the regulated community
  - Raise awareness of EPA programs and influence public acceptance

Research and Outreach

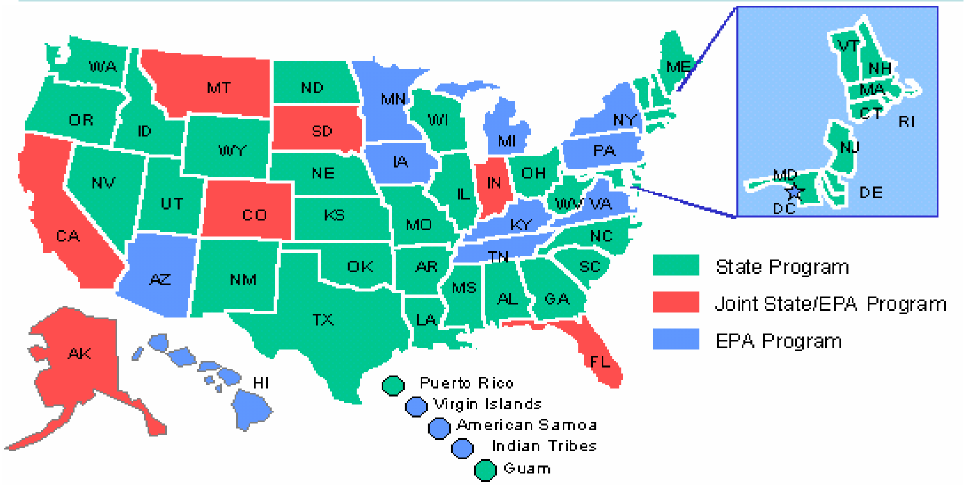
- OW and OAR are cooperating with DOE/NETL in addressing technical challenges and any potential risks to underground sources of drinking water and public health and safety
- OGWDW, OAP and DOE/NETL have leveraged their funds to have Lawrence Berkeley National Lab conduct critical research on modeling CO_2 interaction with ground water and assessing large volume impacts to ground water flow and displacement of native formation waters (potential 3-year project)
- EPA has continued to conduct outreach meetings with electric utilities, the oil and gas industry, and NGOs to assure that all parties are aware of EPA initiatives related to geologic sequestration and climate change projects

Regulatory Framework

> *"With appropriate site selection…, a monitoring program…, a regulatory system, and the appropriate use of remediation methods…, the local health, safety and environmental risks of geological storage would be comparable to risks of current activities..."*

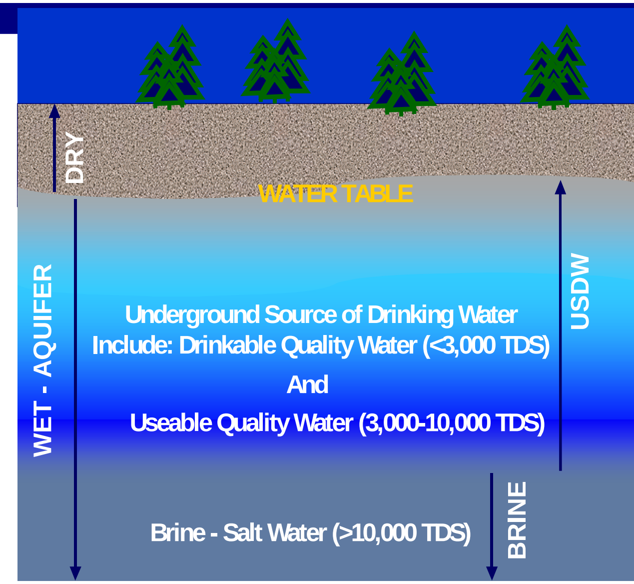
-Summary for Policymakers, IPCC Special Report on CCS

Underground Injection Control (UIC) Program



UIC General Overview

- SDWA requires EPA to develop minimum federal regulations for state and tribal Underground Injection Control (UIC) Programs to ***protect underground sources of drinking water***
- USDW are defined as aquifers or portions of aquifers that:
  - have sufficient quantity of ground water to supply a public water system and
  - contain fewer than 10,000 mg/l or ppm total dissolved solids

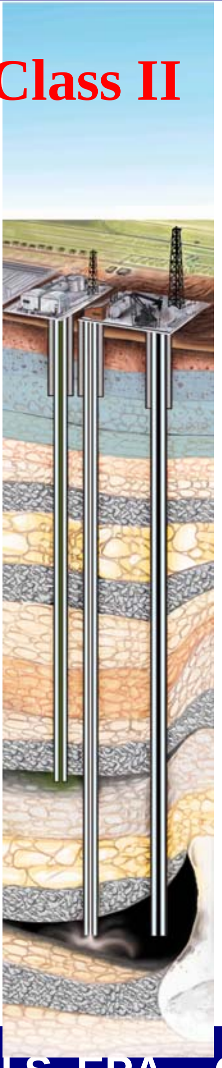


- 33 states have primary enforcement authority (primacy); EPA directly implements the program in 10 states; 7 split programs
- Primacy States can be more stringent than the minimum federal regulations
- KEY CONCEPT: SDWA provides EPA and States with flexibility to establish effective Class II oil and gas programs (Section 1425)

SDWA and UIC Program Background

- SDWA (1974) requires EPA to develop minimum federal requirements for state and tribal Underground Injection Control (UIC) Programs to protect underground sources of drinking water (USDWs)
- The UIC Program regulates injection of ALL fluids – liquid, gas, or slurry
- The Program covers injection of wastes and commodities (e.g. liquid hydrocarbons, drinking water)
  - Manage a large universe of wells and diverse waste streams
  - U.S. facilities produce billions of gallons of hazardous, industrial, and municipal waste annually
  - ~1 trillion gallons of oil field brine are injected annually
- Only exemptions for natural gas storage and hydraulic fracturing
- SDWA provides existing framework for CO_2 injection
  - Class II Enhanced Oil and Gas wells use CO_2 floods in current operations

UIC WELL CLASSES



GS under the SDWA: Which Well Class?

- Class I – technically sophisticated, stringently regulated injection wells with detailed siting, monitoring, and closure requirements. Examples:
    - Florida municipal wastewater injection (high volumes)
    - Industrial fluids injected beneath USDWs (more typical)
    - Hazardous waste wells (long storage times)
- Class II – wells used by oil and gas operators for waste fluid disposal, enhanced recovery (ER), and hydrocarbon storage (*may* be appropriate for CO_2 storage in depleted reservoirs)
- Class III and IV – very unlikely options (mining & banned)
- Class V – initial GS pilot projects permitted as Class V experimental wells (new sub-class for commercial operations?)
- Potential Class VI – new class of injection wells with guidance/regulations tailored to match technical specifics and degree of risks associated with geologic sequestration of CO_2

Class V Experimental Technology Well Guidance

- EPA GS Workgroup developed draft guidance for assisting DI and Primacy programs in issuing Class V experimental well permits (ER can be permitted as Class II wells)
- Completion of this guidance enlisted support from states as co-regulators
- In the guidance, EPA encourages permit-writers (EPA and States) to share information as they issue permits
- EPA will informally track projects and permit requirements as pilot projects move forward

Next Steps

- DOE pilots will produce much information over next 4 years on CO_2 injection to better inform EPA efforts for large-scale projects
- Creation of a management framework could take place during the pilot projects and mesh with DOE Roadmap for technology to be ready for commercial scale projects by 2012
- This allows an effort, and pace, commensurate with available resources that will be informed by ongoing R&D to address GS risk, safety, and implementation issues