

## **Geologic CO2 Sequestration: Outlook for Injection**

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**DOE 4<sup>th</sup> Annual CCS Conference**

**May 5, 2005**





# Major Challenges Implementing CCS

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- **Scale & Storage Timeframe**
- **Risk Assessment**
  - **Subsurface Behavior of CO<sub>2</sub> (buoyancy, changes in pH)**
  - **Leakage Pathways & Impacts**
  - **Well Integrity**
- **Liability**
- **Long-Term Monitoring of CO<sub>2</sub>**
- **Regulatory Uncertainty**
- **Public Perception**



# What Can EPA Bring To CCS Effort?

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- ◆ **Co-ordination and support to DOE research activities and the Administration's policy on Carbon Capture and Storage**
- ◆ **Expertise in Underground Injection Control**
- ◆ **Assessment of risks to public health and the environment**
- ◆ **Providing additional research and training opportunities to interested parties**
- ◆ **Playing a role in public outreach and acceptance of CCS implementation**



# Statutory Framework

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- ◆ **SAFE DRINKING WATER ACT (UIC Program)**
  - ◆ **STATE OIL AND GAS AUTHORITY**
  - ◆ **NATURAL GAS STORAGE LAWS**
  - ◆ **OTHER FEDERAL OR STATE ENVIRONMENTAL LAWS**
  - ◆ **LOCAL GOVERNMENT AUTHORITIES**
- Some or all of these considerations may come into play when large scale geologic sequestration is implemented



# Regulatory Framework

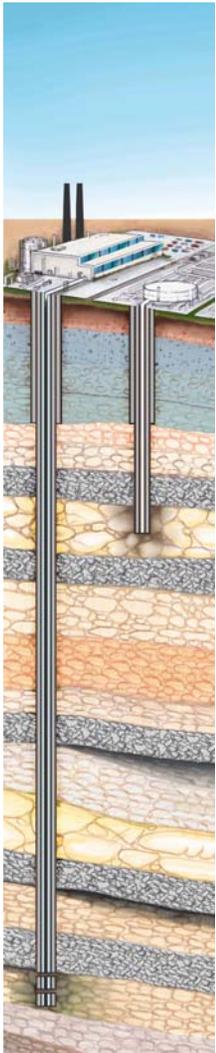
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- ◆ Generic UIC regulations exist today
- ◆ But CCS-specific regulations are embryonic
- ◆ International discussions, DOE and the Regional Partnerships are talking, IOGCC has ideas but we all may be in a “wait and see” mode
- ◆ Because market forces may drive approaches for standards: carbon taxes, emissions trading, and voluntary programs
- ◆ But we believe that biggest considerations for regulatory agencies are scale, **risk**, and **outreach**

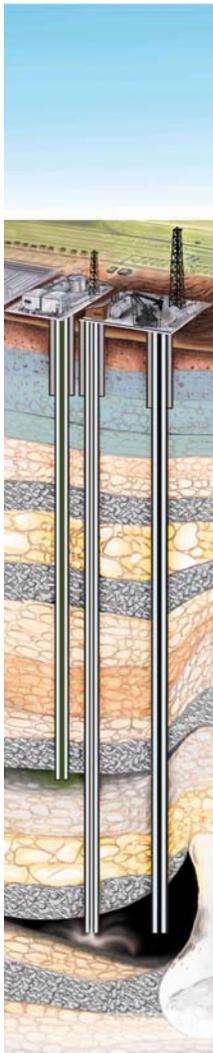


# UIC Program Well Classes

**Class I**



**Class II**



**Class III**

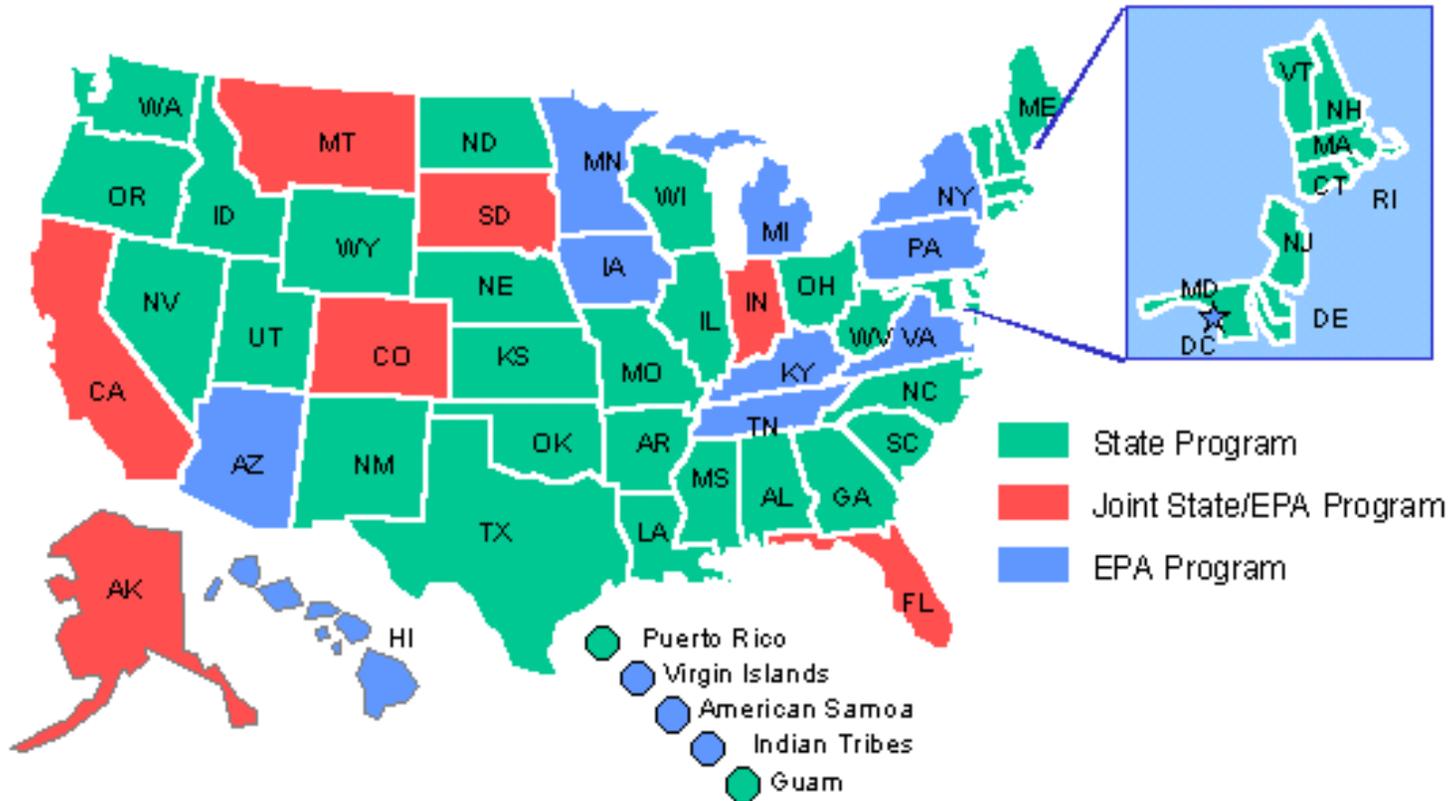


**Class V**





# State and EPA UIC Programs



**States, tribes, and local governments may have more stringent requirements than federal rules**



# Why EPA Needs To Be Involved: Risk and Public Health Concerns

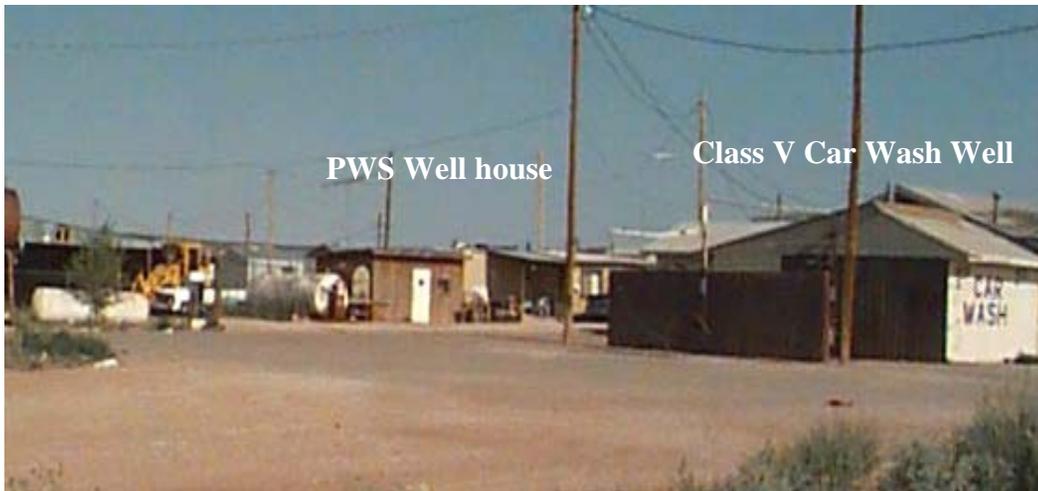
- ◆ Nature of some injected fluids may pose a risk to ground water quality and public health if managed improperly.
- ◆ Deep Class I and Class II wells must be properly sited, operated and constructed to avoid contaminating USDWs.

## Class V Wells:

Are numerous & may be in close proximity to PWS or private wells;

Inject a wide range of fluids;

Inventory, location & injectate data is incomplete.





# ALL Risks Need To Be Addressed

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## ◆ OPERATIONAL RISKS

1. Facility construction and operation
2. Human health exposure and impacts

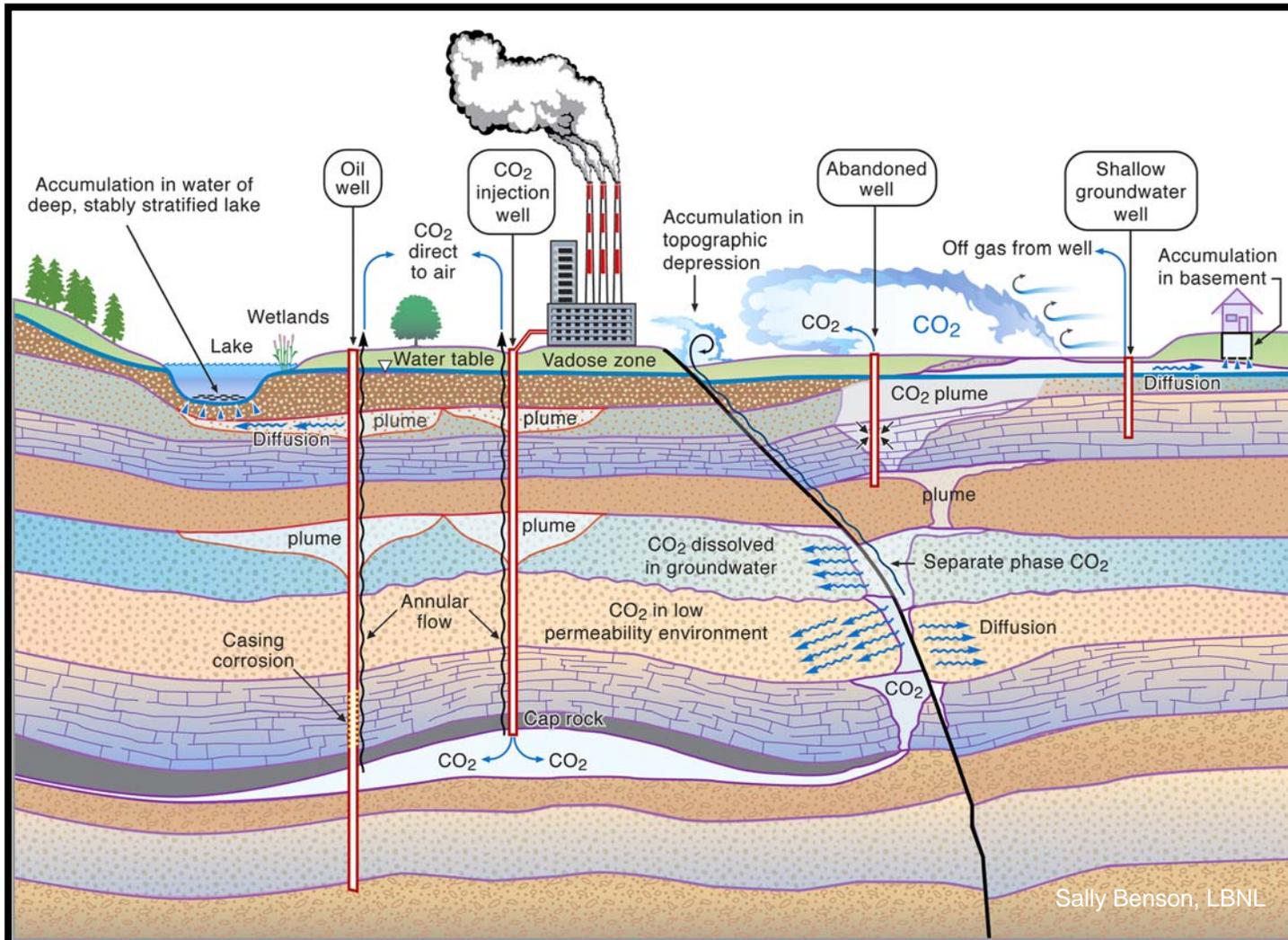
## ◆ LOCAL RISKS

1. Releases of CO<sub>2</sub> by various mechanisms
2. Ground heave or seismic activity
3. Removing land from future uses

## ◆ GLOBAL RISKS

1. Increased concentration of GHGs in atmosphere
2. Impact on climate

# Leakage Pathways & Impacts



- Long-term behavior of CO<sub>2</sub> in subsurface is not fully understood

- Well-bore & abandoned well integrity is a major concern

- Hazard depends on nature and circumstances, not volume

- Lake Nyos, Cameroon - 2 MMtCO<sub>2</sub> in 1 hour

- Mammoth Mt, CA - 530 tCO<sub>2</sub>/day



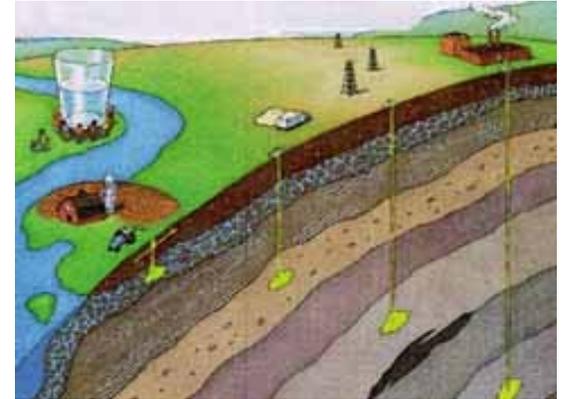
# EPA Efforts: OW & OAR Collaboration

## Office of Water/OGWDW

- ◆ SDWA Authority
- ◆ UIC Expertise
- ◆ Communication with States

## Office of Air and Radiation/OAP

- ◆ Lead on Climate Strategy & Policy
- ◆ Point of Contact for Interagency Cooperation (DOE, USGS, State Dept., etc.)
- ◆ Greenhouse Gas Inventory, including Geo Seq
- ◆ Risk Assessment





# EPA Efforts: GS Workgroup

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- ◆ Officially tiered by EPA in August 2004
- ◆ Improve internal EPA Coordination of CCS activities
- ◆ Monitor domestic and international developments
- ◆ Identify research needs to address environmental concerns
- ◆ Risk assessment
- ◆ Identify policy or guidance supporting CCS
- ◆ Develop EPA position on CCS
- ◆ Consistent communication to industry and public
- ◆ Participate in and support DOE's efforts



# More EPA Efforts: GS Workgroup Update

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- ◆ **Internal EPA Workgroup includes 25+ members from several Offices including Regions**
- ◆ **Monthly meetings and calls; first major in-person meeting May 5-6, 2005 in DC**
- ◆ **Will discuss roles and responsibilities by smaller issue groups: technical, regulatory, risk assessment, and outreach**
- ◆ **Efforts to facilitate EPA participation in conferences and meetings have been successful**
- ◆ **Interacting with key players: DOE, States, IOGCC, Ground Water Protection Council, others**



# EPA Geologic Sequestration Workgroup

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- **Working group contacts:**

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# Additional EPA GS Efforts

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- ◆ **Coordination with CSLF and IPCC International Activities continues**
- ◆ **London Convention/London Protocol interaction via OWOW (ocean disposal concerns)**
- ◆ **Air and Water Cross-Office meetings**
- ◆ **CO<sub>2</sub> Geologic Sequestration modeling workshop in April (Houston, TX) attracted 60+ participants**
- ◆ **CO<sub>2</sub> Injection Training for EPA/State Staff**
- ◆ **Risk-related work via GWPC and LBNL**
- ◆ **Participate at DOE 4<sup>th</sup> Annual CCS Conference**



# Public Perception of CCS

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- ◆ **Public Perception is a key element in the equation**
- ◆ **Will it become a victim of NIMBY?**
- ◆ **Although environmental groups seem to be positive; EPA has found that injection wells eventually evoke emotional reactions by the public**
- ◆ **Additional feedback is needed via DOE Regional Partnerships and other outreach activities**
- ◆ **Substantive outreach effort, perhaps supported by EPA may play a very important role in public acceptance of CCS implementation**



# Some Closing Thoughts

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- **Carbon sequestration is a key part of US climate policy and *regulated* Carbon Capture & Storage may play a significant role in mitigating climate change.**
- **Several UIC permits have been issued for the first projects, but permitting has not specifically dealt with unique environmental, health, and safety issues associated with large volume CCS.**
- **We all need to collaboratively address local and global risks that could endanger water supplies and which could hinder efforts to mitigate climate change**



# DOE Regional Partnerships

