



Underground Injection Control (UIC) Program Requirements for Geologic Sequestration of Carbon Dioxide Final Rule

In November 2010, the Administrator of the Environmental Protection Agency (EPA) signed the *Federal Requirements Under the Underground Injection Control (UIC) for Carbon Dioxide (CO₂) Geologic Sequestration (GS) Wells*, Final Rule, as authorized by the Safe Drinking Water Act (SDWA). The final rule establishes new federal requirements for the underground injection of carbon dioxide for the purpose of long-term underground storage, or geologic sequestration, and a new well class – Class VI – to ensure the protection of underground sources of drinking water (USDWs) from injection related activities.

Why is the geologic sequestration rule needed?

The capture and injection of CO₂, produced by human activities, for long-term storage is one of a portfolio of options that can reduce CO₂ emissions to the atmosphere and help to mitigate climate change. Ensuring that GS is performed in a manner that is protective of underground sources of drinking water (USDWs) supports the Administration's goal to facilitate the commercial development of safe, affordable, and broadly deployable "carbon capture and storage," or CCS technologies.

While the elements of the final rule are based on the existing regulatory framework of EPA's Underground Injection Control (UIC) Program, the requirements are tailored to address the unique nature of CO₂ injection for GS. The relative buoyancy of CO₂, its corrosivity in the presence of water, the potential presence of impurities in captured CO₂, its mobility within subsurface formations, and large injection volumes anticipated at full scale deployment warrant specific requirements tailored to this new practice.

What is geologic sequestration?

GS is the process of injecting CO₂ captured from an emission source (e.g., a power plant or industrial facility) into deep subsurface rock formations for long-term storage.

CO₂ is captured from flue gas produced by fossil-fueled power plants or industrial facilities, typically compressed to convert it from a gaseous state to a supercritical fluid, and transported to the sequestration site, usually by pipeline. The CO₂ is then injected into a deep subsurface rock formation through a Class VI well, using new technologies that have been informed by several decades of experience in oil and gas recovery and storage.

When injected in an appropriate receiving formation, CO₂ is sequestered by a combination of physical and geochemical trapping processes. Naturally-occurring CO₂ deposits have been physically and geochemically trapped in geologic formations for millions of years.

The United States has CO₂ storage potential in onshore and offshore deep saline formations, depleted oil and gas fields, and deep, unmineable coal seams. These formations are present

across the country and 95 percent of the 500 largest stationary sources in the nation that emit CO₂ are within 50 miles of a candidate CO₂ storage reservoir.

Who will be affected by the final rule?

The final rule applies to owners or operators of wells that will be used to inject CO₂ into the subsurface for the purpose of long-term storage. It will also affect state agencies that choose to administer the Class VI Program in their state. The rule is voluntary and does not require any entity to capture and/or sequester CO₂.

What does the final rule require?

The elements of the final GS rule build upon the existing UIC Program regulatory framework, with modifications to address the unique nature of CO₂ injection for GS, including:

- Geologic site characterization to ensure that GS wells are appropriately sited;
- Requirements for the construction and operation of the wells that include construction with injectate-compatible materials and automatic shutoff systems to prevent fluid movement into unintended zones;
- Requirements for the development, implementation, and periodic update of a series of project-specific plans to guide the management of GS projects;
- Periodic re-evaluation of the area of review around the injection well to incorporate monitoring and operational data and verify that the CO₂ is moving as predicted within the subsurface;
- Rigorous testing and monitoring of each GS project that includes testing of the mechanical integrity of the injection well, ground water monitoring, and tracking of the location of the injected CO₂ using direct and indirect methods;
- Extended post-injection monitoring and site care to track the location of the injected CO₂ and monitor subsurface pressures until it can be demonstrated that USDWs are no longer endangered;
- Clarified and expanded financial responsibility requirements to ensure that funds will be available for corrective action, well plugging, post-injection site care, closure, and emergency and remedial response;
- A process to address injection depth on a site-specific basis and accommodate injection into various formation types while ensuring that USDWs at all depths are protected;
- Considerations for permitting wells that are transitioning from Class II enhanced recovery (ER) to Class VI that clarify the point at which the primary purpose of CO₂ injection transitions from ER (i.e., a Class II well) to long-term storage (i.e., Class VI).

The Class VI requirements are designed to promote transparency and national consistency in permitting of GS projects while also allowing flexibility, where appropriate. Many components of the rule provide flexibility by allowing the permitting authority discretion to set certain permit criteria that are appropriate to local geologic settings.

What is EPA's timeframe for implementing this regulation?

Under section 1421(b), SDWA mandates that EPA develop minimum Federal requirements for state UIC primary enforcement responsibility, or primacy, programs to ensure protection of USDWs. In order to implement the UIC Program, states must apply to EPA for primacy approval. EPA will allow independent primacy for Class VI wells and will accept applications from states for independent primacy under section 1422 of the SDWA for managing UIC GS projects under Class VI.

States will have 270 days following final promulgation of the GS rule to submit a complete primacy application that meets the requirements of the *Code of Federal Regulations* under 40 CFR 145.22 or 145.32. If a state chooses not to submit a complete application during the 270-day period, or EPA has not approved a Class VI program, then EPA will establish a Federal UIC Class VI program in that state after the 270-day application period closes. If a state submits a primacy application after the 270-day deadline and the application is approved, EPA will publish a subsequent notice of the approval. States may not issue Class VI permits until their Class VI UIC Programs are approved. During the first 270-days and prior to EPA approval of a Class VI primacy application, states with existing SDWA Section 1422 primacy programs may issue permits.

States without existing Section 1422 primacy programs must direct all Class VI GS permit applications to the appropriate EPA Region. EPA Regions will issue permits using existing authorities and well classifications (e.g., Class I or Class V), as appropriate.

How did EPA consult with stakeholders in evaluating GS and developing the final GS requirements?

EPA conducted extensive coordination to engage stakeholders. The Agency has convened seven stakeholder workshops since 2005 to discuss various technical issues associated with GS and convened two public stakeholder meetings in December 2007 and February 2008 to identify and discuss questions relevant to the effective management of CO₂ GS. Each workshop was attended by more than 200 stakeholders representing a broad range of interests including state, local and tribal governments; industry; public interest groups; and the general public.

EPA also worked closely with four state co-regulators affiliated with the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission. EPA has coordinated with the Department of Energy, the lead U.S. Agency conducting GS field research, to monitor the progress of pilot GS projects and inform the rulemaking process. The Agency considered hundreds of public comments submitted in response to the proposed GS rule (73 FR 43492; July 25, 2008) and a supplemental Notice of Data Availability and Request for Comment (74 FR 44802; August 31, 2009).

How much will the final rule cost?

EPA estimates the total incremental annual cost associated with the implementation of the final rule to be \$38.1 million and \$31.7 million using 3 percent and 7 percent discount rates, respectively. The costs attributed to the rulemaking (costs associated with the sequestration but not the capture or transport of CO₂) represent less than 3 percent of the total cost of carbon capture and storage.

How can I get more information?

The final rule and supporting information are available on EPA's Web site at http://water.epa.gov/type/groundwater/uic/wells_sequestration.cfm. The rulemaking docket includes more extensive supporting information and EPA's responses to all public comments at www.regulations.gov (docket I.D.: EPA-HQ-OW-2008-0390). For additional information, contact the Safe Drinking Water Hotline toll free Monday through Friday, 10:00 am to 4:00 pm eastern time (except federal holidays) at 1-800-426-4791.