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Carbon Storage Requirements in the 45Q Tax Credit

The Internal Revenue Code Section 45Q tax credit is intended to promote investment in carbon capture and sequestration (CCS), a process designed to reduce atmospheric emissions of greenhouse gases (GHGs) from power plants and other industrial sources. Geologic sequestration of carbon dioxide (CO₂), a type of carbon storage, is a process aiming to permanently store the captured gases deep underground. The Section 45Q tax credit can be claimed for the sequestration of carbon oxides that are disposed of through either injection into an underground reservoir for geologic sequestration, injection into aging oil fields for enhanced oil recovery (EOR), or another qualified use. In tax year 2020, Section 45Q provides tax credits of \$31.77 per ton for carbon oxide that is injected for sequestration and \$20.22 per ton for carbon oxide that is stored during enhanced oil recovery (EOR), or used in other qualified industrial processes. These tax credits increase to \$50 and \$35 per ton, respectively, by 2026.

In January 2021, the Internal Revenue Service (IRS) issued a final rule, “Credit for Carbon Oxide Sequestration,” which includes requirements for demonstrating the “secure geological storage” of carbon oxides in underground formations needed to qualify for 45Q tax credits (86 *Federal Register* 4728-4773). Section 45Q and this rule cover a larger set of chemical substances (i.e., carbon oxides) compared to some other federal GHG-related rules, which specifically target CO₂.

Issues for Congress include the clarity of secure geologic storage requirements for CO₂, the long-term status of injected CO₂, and the sufficiency of agency resources for program management, as discussed under “Issues for Congress” below.

Secure Geological Storage in 45Q

Section 45Q tax credits were enacted as part of the Energy Extension and Improvement Act of 2008 (P.L. 110-343, Division B). Section 45Q(f)(2) of the act required the Department of the Treasury, in consultation with the Environmental Protection Agency (EPA), the Department of Energy, and the Department of the Interior, to establish regulations for the secure geological storage of qualified carbon oxide to prevent release into the atmosphere. Further, the provision defined *secure geological storage locations* to include “deep saline formations, oil and gas reservoirs, and unmineable coal seams,” under conditions as determined in regulations. Secure geological storage is required whether the taxpayer is claiming the credit for carbon oxides used as a tertiary injectant and consequently stored during EOR operations or injected into underground formations solely for geologic sequestration.

Connection to EPA’s Greenhouse Gas Reporting Program Requirements

In 2009, IRS Notice 2009-83 provided interim guidance (superseded by the 2021 IRS rule) on specific requirements for secure geological storage, pending issuance of regulations. The guidance established that taxpayers claiming the 45Q tax credits must demonstrate secure geological storage by calculating the amount of CO₂ at the source of capture using methodologies contained in EPA’s 2009 Mandatory Reporting of Greenhouse Gases Rule (40 C.F.R. Part 98). This rule does not regulate GHG emission levels but requires facilities designated as GHG sources to report annual GHG emissions as part of EPA’s Greenhouse Gas Reporting Program (GHGRP) and to follow monitoring, recordkeeping, and verification requirements. Title 40, Part 98, Subparts RR and UU, of the *Code of Federal Regulations*, added to the EPA regulations in 2010, apply to GHG sources associated with the underground injection and sequestration of CO₂.

Subpart RR

Subpart RR applies to facilities with wells that inject CO₂ for long-term geologic sequestration. This includes all wells classified by EPA as Underground Injection Control (UIC) Class VI geologic sequestration wells. The facilities must calculate and report (1) the mass of CO₂ received; (2) the mass of CO₂ injected into the subsurface; (3) the mass of CO₂ produced (mixed with produced oil, gas, or other fluids); (4) the mass of CO₂ emitted by surface leakage; (5) the mass of CO₂ emitted as equipment leakage or vented from surface equipment; (6) the mass of CO₂ sequestered in subsurface geologic formations; and (7) the cumulative mass of CO₂ sequestered since the start of required reporting. Subpart RR also requires facilities to submit a proposed monitoring, reporting, and verification (MRV) plan meeting certain requirements to EPA (**Table 1**). Once approved, EPA issues a final MRV plan.

Table 1. Subpart RR MRV Plan Requirements

- Delineation of the maximum and active monitoring areas
- Identification of potential CO₂ leakage pathways in the maximum monitoring area and the likelihood, magnitude, and timing of surface leakage through these pathways
- Strategy to detect and quantify CO₂ surface leakage
- Strategy to establish the expected baselines for monitoring CO₂ surface leakage
- Considerations intended to be used to calculate site-specific variables in the mass balance equation
- UIC well number, if permitted under the UIC program
- Proposed date to begin collecting data for calculating the total amount of CO₂ sequestered

Source: 40 C.F.R. Part 98, Subpart RR.

From 2016, the first year of reporting, through 2019, the latest year for which GHGRP data are available, five facilities injecting CO₂ have reported CO₂ data to EPA under Subpart RR. This includes one facility in Illinois injecting CO₂ from an industrial source into a saline aquifer, which reported injecting 1,551,431 tons of CO₂ for sequestration, as of 2019. The other reporting facilities injected CO₂ for EOR purposes, with incidental CO₂ storage. Although it is not required for the latter facilities, all of the above facilities have EPA-approved MRV plans.

Subpart UU

Subpart UU applies to GHG source facilities with wells used to inject CO₂ during EOR operations or for any purpose other than geologic sequestration. These facilities are required to report the volume of CO₂ received and its origin (if known). An MRV plan is not required, but facilities may choose to submit a plan. Nearly 130 facilities have reported to EPA under Subpart UU since the first year of required reporting in 2011, including three facilities that received research and development exemptions from Subpart RR reporting. Subpart UU does not require facilities to report the amount of CO₂ sequestered.

Section 45Q Regulations

The 2021 IRS Section 45Q regulations set out requirements for taxpayers to demonstrate “secure geological storage” (26 C.F.R. Part 1, §1.45Q-3). The regulations establish that compliance with relevant provisions of the EPA’s Mandatory Reporting of Greenhouse Gases Rule satisfies the 45Q secure storage demonstration requirements. In addition, §1.45Q-3 requires that carbon oxides also must be injected through a well that complies with applicable EPA UIC regulations to be considered secure geological storage.

The Section 45Q regulations include separate requirements for geologic sequestration and EOR operations. Previous IRS guidance on secure geological storage, issued prior to both the addition of Subparts RR and UU to EPA Mandatory Reporting of Greenhouse Gases regulations in 2010 and EPA’s separate 2010 regulations on underground injection of CO₂ for geologic sequestration, did not distinguish between the two types of injection or GHG sources.

Requirements for Geologic Sequestration

The 2021 IRS regulations require taxpayers seeking the 45Q credit for geologic sequestration of CO₂ to dispose of carbon oxides in secure geological storage so that no qualified carbon oxides escape into the atmosphere. Under these requirements, to meet the conditions of secure geological storage required to qualify for the tax credit, carbon oxide storage must be in compliance with Subpart RR requirements. Therefore, a taxpayer who fulfills Subpart RR requirements for calculating the volume of carbon oxides sequestered and has an EPA-approved MRV plan, along with other applicable Subpart RR provisions, meets the requirements for secure geological storage. All UIC Class VI wells already subject to Subpart RR, so the rule does not add any new requirements for the owners or operators of these wells.

Requirements for Enhanced Oil Recovery

The 2021 regulations establish two options for demonstrating secure geological storage for carbon oxides stored during EOR operations. Taxpayers can meet the requirements by either (1) storing carbon oxides in compliance with Subpart RR requirements or (2) storing carbon oxides in compliance with a standard adopted by the International Organization for Standardization (ISO) and endorsed by the American National Standards Institute (CSA/ANSI ISO 27916:19). According to the Treasury Department, the methodology of this standard is similar to the Subpart RR methodology in that both “require an assessment and monitoring of potential leakage pathways; qualification of inputs, losses and storage through a mass balance approach; and documentation of steps and approaches.” In the preamble to the proposed Section 45Q rule, the department observes that many stakeholders requested flexibility in the requirements and suggested this standard as an alternative for demonstrating secure geological storage.

The regulations also specify that EOR facilities can self-certify carbon oxide volumes claimed for the tax credit if they choose to demonstrate secure geological storage through compliance with Subpart RR. If a facility uses the ISO standard, however, the documentation must be certified annually by a qualified independent engineer or geologist.

Issues for Congress

Many CCS proponents assert that clarity of CO₂ secure storage requirements as to measurement, testing, and verification may lead to increased interest in the 45Q tax credit and further development of CCS projects, which some in Congress see as necessary to meet GHG emissions reduction targets. These requirements also may help the IRS identify improper claims for the 45Q tax credit. Opponents of the tax credit and requirements contend that the credit encourages continued burning of fossil fuels for energy and that the requirements for EOR facilities do not include sufficient testing or validation of CO₂ amounts.

To date, five facilities have reported volumes of CO₂ sequestered under Subparts RR, one of which is required to have an MRV plan. If growth in commercial-scale CCS expands in the coming years, as some anticipate, more facilities throughout the United States may begin to inject CO₂ for sequestration, report CO₂ sequestration data to EPA, and claim the 45Q tax credit. Notwithstanding the regulations discussed above, some stakeholders have expressed concerns about the long-term security of geologic sequestration of CO₂ that could be heightened as both the number of CCS projects and the volume of CO₂ injected increase. Congress may consider expanding oversight of implementation of its directives for 45Q and the GHGRP as part of an overall GHG reporting policy. Congress also may consider whether EPA and the IRS have sufficient resources to effectively manage potential increases in GHG reporting and MRV plans submitted for approval and oversee 45Q tax credit claims and other programmatic needs associated with the new regulations.

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