



Clearly Establish Criteria to Access 45Q Tax Credit

Executive Summary

Section 45Q provides a credit to a taxpayer that captures carbon dioxide (CO₂) at a qualified facility for the purpose of disposition and/or use of CO₂ for intentional or associated secure geological storage within the United States. This program, which began under the Energy Improvement and Extension Act of 2008 (amended 2009), provides a tax credit for each ton of CO₂ securely stored underground. The credit applies differently to the two methods of CO₂ storage: (1) CO₂ enhanced oil recovery (EOR) operations, which involve the use of CO₂ to facilitate the extraction of additional oil and result in associated, secure storage of the CO₂ in the oil field (known as “**Associated Storage**”)¹; and (2) disposal operations that involve the intentional storage of CO₂ in geologic formations, such as deep saline aquifers, and do not involve oil or gas extraction (known as “**Intentional Storage**”). The credit was originally set at \$10 per metric ton of CO₂ stored through Associated Storage and \$20 per metric ton of CO₂ stored through Intentional Storage, with both credits to be adjusted annually for inflation. In 2018, Congress expanded and extended the tax credit over a 10-year period to \$35/ton for Associated Storage and \$50/ton for Intentional Storage. Both the original statute and the 2018 legislation require the Department of Treasury (Treasury), in consultation with other federal agencies, to establish regulations for determining secure geological storage. As amended in 2009, Section 45Q(d)(2) requires the following:

“The Secretary [of Treasury], in consultation with the Administrator of the Environmental Protection Agency, the Secretary of Energy, and the Secretary of the Interior, shall establish regulations for determining adequate security measures for the geological storage of carbon dioxide . . . such that the carbon dioxide does not escape into the atmosphere.”²

IRS Guidance to Taxpayers: In November 2009, the Internal Revenue Service (IRS) issued Notice 2009–83, providing “*interim guidance, pending the issuance of regulations, relating to the credit for carbon dioxide (CO₂) sequestration under section 45Q of the Internal Revenue Code.*” Specifically, the notice “*provides guidance on determining eligibility for the credit and the amount of the credit, as well as rules regarding adequate security measures for secure geological storage of CO₂.*” The IRS Notice advises taxpayers to follow certain environmental regulations and guidelines depending on the type of storage (Associated or Intentional) to satisfy section 45Q’s requirement of secure geological storage: the Intergovernmental Panel on Climate Change Guidelines (IPCC), the U.S. Environmental Protection Agency’s (EPA) Underground Injection Control (UIC) Program regulations for CO₂ injection wells, and the EPA greenhouse gas (GHG)

¹ Injected CO₂ streams vary in purity.

² Language in the § 45Q tax credit as amended in early 2018 regarding this rulemaking requirement is identical. Bipartisan Budget Act of 2018, Pub. L. 115-123 § 41119.

Reporting Rules.³ To date, the IRS has yet to establish regulations for determining secure geological storage, as directed by Congress in 2008, as amended in 2009. This has led to confusion, uncertainty, and controversy in the application of the 45Q tax credit.

EPA Rulemaking: In December 2010, the EPA issued a final rule “to require GHG monitoring and reporting from facilities that conduct geologic sequestration [*i.e.*, Intentional Storage] of carbon dioxide and all other facilities that conduct injection of carbon dioxide [*i.e.*, Associated Storage].”⁴ The preamble of the rule states: “*As clarified in the IRS guidance, taxpayers claiming the section 45Q tax credit must follow the appropriate UIC requirements. The guidance also clarifies that taxpayers claiming section 45Q tax credit must follow the MRV procedures that are being finalized under 40 CFR part 98, Subpart RR in this final rule.*”⁵ Some have interpreted these two sentences to mean that under the IRS Notice, Associated Storage is only considered secure if a taxpayer reports under Subpart RR. This interpretation misreads the IRS Notice and incorrectly relies on the preamble to a finalized EPA rule.

Congress should define “secure geological storage” with reporting and monitoring obligations commensurate with risks associated with specific operations — *i.e.*, Subpart RR reporting / Class VI permitting for Intentional Storage and Subpart UU reporting / Class II permitting for Associated Storage. Bills by Senator John Hoeven (S. 1663) and Representative Kevin Cramer (H.R. 4857) would clarify these important operational distinctions and set a deadline for Treasury to conduct such a rulemaking. If Congress does not act, the Treasury should establish this clarity through regulation, as required by law.

Background on the 45Q Tax Credit

Section 45Q was enacted by the Energy Improvement and Extension Act of 2008 and amended by the American Recovery and Reinvestment Tax Act of 2009. As amended, in 2009, it provides a credit for capturing CO₂ and disposing of the CO₂ in secure geological storage within the United States in accordance with the terms below:

- A credit of \$20 per metric ton of CO₂ that is captured by a taxpayer at an industrial facility and disposed of in secure geological storage (*i.e.*, Intentional Storage)
- A credit of \$10 per metric ton of CO₂ that is captured by a taxpayer at an industrial facility and used as a tertiary injectant in an enhanced oil or gas recovery project, and disposed of in secure geological storage (*i.e.*, Associated Storage)
- A cap on the amount of credit claimed of 75,000,000 metric tons of CO₂ whether claimed for Intentional Storage or Associated Storage
- A requirement that the “*The Secretary [of Treasury], in consultation with the Administrator of the Environmental Protection Agency, the Secretary of Energy, and the Secretary of the*

³ Notice 2009-83 § 5.02(b), 2009-44 I.R.B. 588 (Nov. 2, 2009).

⁴ Mandatory Reporting of Greenhouse Gases: Injection and Geologic Sequestration of Carbon Dioxide, 75 Fed. Reg. 75060 (December 1, 2010).

⁵ *Id.* at 75064.

Interior, shall establish regulations for determining adequate security measures for the geological storage of carbon dioxide . . . such that the carbon dioxide does not escape into the atmosphere.”

In February of 2018, Congress passed Public Law 115-123, which in Section 41119 expanded and extended the 45Q tax credit. The bill extended the 45Q tax credit for secure geological storage of CO₂, and expanded the tax credit for Intentional and Associated Storage. Additionally, the bill extended the 45Q tax credit to direct air capture and non-EOR utilization of CO₂. As enacted, the 2018 statute:

- Gradually increases the tax credit over a 10 year period to \$35/ton for Associated Storage and \$50/ton for Intentional Storage
- Applies the credit for a 12-year period beginning on the date *new* carbon capture equipment is originally placed in service at a qualified facility
- Requires that to be eligible for the credit, construction of new carbon capture equipment begin before January 1, 2024
- Establishes minimum capture requirements for categories of facilities to receive the tax credit
- Allows the tax credit to be transferred to the party that disposes of, uses, or utilizes the CO₂ (*e.g.*, through Intentional or Associated Storage)
- Repeats the requirement that the IRS, after consultation with EPA, DOE and Interior, promulgate regulations defining “secure geological storage”

IRS Guidance to Taxpayers

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⁶ Notice 2009-83 § 5.02(b).

EPA GHG Reporting Rulemaking

In the 2009 IRS Notice, the IRS made reference to a forthcoming EPA rulemaking related to its GHG Reporting Program. The Notice states “A taxpayer claiming the § 45Q credit must use the methodology, inputs, and equations in the Reporting Rule (or any successor rule) to calculate the amount of CO₂ measured at the source of capture.”

In December 2010, the EPA issued a final rule “to require GHG monitoring and reporting from facilities that conduct geologic sequestration [*i.e.*, Intentional Storage] of carbon dioxide and all other facilities that conduct injection of carbon dioxide [*i.e.*, Associated Storage].”⁷ As originally proposed, the Subpart RR source category consisted of “all wells that inject CO₂ into the subsurface, including wells for geologic sequestration or for any other purpose.”⁸ The final rule, however, distinguished between Intentional and Associated Storage as different operational pathways to achieving secure geological storage and therefore established two source categories — those conducting Intentional Storage must report under Subpart RR of the GHG Reporting Rule, and those conducting Associated Storage (EOR) must report under Subpart UU.

The preamble of the rule states: “*As clarified in the IRS guidance, taxpayers claiming the section 45Q tax credit must follow the appropriate UIC requirements. The guidance also clarifies that taxpayers claiming section 45Q tax credit must follow the MRV procedures that are being finalized under 40 CFR part 98, Subpart RR in this final rule.*” This misreads the IRS Notice. The 2009 IRS Notice notes that, at the time, EPA was in the process of finalizing UIC Program rules and planned to propose new GHG reporting rules related to geological storage. The Notice advises taxpayers seeking to claim the 45Q tax credit to follow the appropriate GHG reporting and UIC Program requirements once they are finalized. As discussed above, the new GHG reporting rules related to geological storage were subsequently finalized in December 2010 and included both Subparts RR and UU. In accordance with the IRS Notice, the taxpayer should report under whichever rule is applicable to the type of CO₂ storage being utilized. For Associated Storage, the applicable GHG reporting rule is Subpart UU. Yet EPA’s preamble misinterprets the IRS Notice to find that Associated Storage is only considered secure if a taxpayer reports under Subpart RR.

Furthermore, preamble language does not have the effect of law or have binding effect on an agency that did not issue the rule — in this case, the IRS. Furthermore, reliance on the preamble is misplaced because it ignores the clear mandate of section 45Q(d)(2) (now carried forward as section 45Q(f)(2)) that Treasury settle the issue through regulations written in consultation with multiple other agencies.

EPA Underground Injection Control (UIC) Rulemaking

In the 2009 IRS Notice, the IRS also made reference to a proposed EPA rulemaking under its UIC Program to establish a new well class with new federal requirements to permit the injection of CO₂ for the purpose of Intentional Storage. The rulemaking resulted in the establishment of a new class of injection well used for Intentional Storage (Class VI) and maintained the existing class of

⁷ Mandatory Reporting of Greenhouse Gases: Injection and Geologic Sequestration of Carbon Dioxide, 40 C.F.R. pt. 146.24 (2018).

⁸ 75 Fed. Reg 18600 (proposed Section 98.440(a)).

injection well results in Associated Storage (Class II). The IRS Notice further stated that once the new UIC Program rules were finalized, any taxpayer claiming the section 45Q credit who is covered by the new program rules must follow the requirements of the *relevant* permit (*i.e.*, Class II or Class VI).

Considerations for the Issuance of New 45Q Regulations or Clarifying Legislation

As stated in the 2009 IRS Notice, the IRS and Treasury “expect that the [45Q] regulations will incorporate the rules set forth in this notice.” With the adoption of these regulations or clarification provided through legislation, taxpayers will be provided the clarity to invest in carbon capture and storage projects instead of facing confusion, uncertainty, and controversy in the application of the 45Q tax credit.

As policy makers consider the establishment of legislation or regulations for determining adequate security measures for the geological storage of CO₂, they should recognize that different paths of secure geological storage incur inherently different risks. Additionally, policy makers should also consider existing complementary regulations and economic drivers that mitigate these risks.

Overview of Existing EPA Regulations

EPA has regulations in place to assure protection of underground sources of drinking water by requiring adequate security measures for geological storage of injected CO₂. It also has regulations in place to require accounting and reporting on the disposition of CO₂.

Underground Injection Control (UIC) Program: The UIC Program consists of six classes of injection wells. Each well class is based on the type and depth of the injection activity, and the potential for that injection activity to result in endangerment of underground sources of drinking water (USDWs). Associated Storage wells (*i.e.*, EOR wells) are regulated under Class II of the UIC Program. Intentional Storage wells are regulated under Class VI.

EPA GHG Reporting Program: The Program requires reporting of GHG data and other relevant information from large GHG emission sources, fuel and industrial gas suppliers, and CO₂ injection sites in the United States.⁹ In the final 2010 rule, EPA distinguished the requirements for Intentional and Associated Storage — Subpart RR for the purpose of geological storage (*i.e.*, Intentional Storage) and Subpart UU for any other CO₂ injection (*i.e.*, Associated Storage) — acknowledging the inherent operational and risk differences, as well as the decades of experience and observation safely and securely storing CO₂ through Associated Storage.

Associated Storage (EOR) Requirements

- **Class II Well Requirements:** The UIC Class II Program has been in existence for several decades and has successfully permitted thousands of injection wells across the country for oil, gas and CO₂. EPA estimates there are approximately 180,000 Class II Wells currently in operation. The Class II requirements are consistent with the program’s directive to

⁹ 40 C.F.R. pt. 98.2 (2018).

protect human health, safety, and the environment. Specific requirements for Class II wells include:

- Casing and cementing of wells to prevent movement of fluids into or between underground sources of drinking water
 - Logging and testing to assure proper drilling and construction
 - Information regarding fluid pressure, estimated fracture pressure, and physical and chemical characteristics of the injection zone
 - Limitations on injection pressure
 - Regular observation of injection pressure, flow rate, and cumulative volume of injections
 - Monitoring of injection fluids
 - Periodic demonstration of mechanical integrity of the well
 - Establishment of an Area of Review (AoR)¹⁰
 - Recordkeeping and reporting
 - Closure requirements including cementing and plugging specifications
- **EPA GHG Reporting Requirements:** *Subpart UU* — The owner or operator of Class II wells into which CO₂ is injected is required to report information on the mass of CO₂ received for Associated Storage. In addition to the requirements of Subpart UU, operations resulting in Associated Storage are required to report under the following regulations for the sale of CO₂ and the potential above surface emissions to the atmosphere. *Note: the cumulative amount injected is covered under Class II.*
 - Subpart PP – reporting of the amount of CO₂ that is placed into commerce (e.g., CO₂ sales/supply)
 - Subpart W – reporting of CO₂ and methane emissions from equipment leaks and venting; and CO₂, methane, and nitrous oxide emissions from flaring and combustion
 - Subpart C – reporting of the CO₂ equivalent of emissions from fuel combustion sources

During the continuous closed-loop recycle process, the injected CO₂ that is not trapped in the oil reservoir returns to the surface with the produced oil and water during the oil extraction process. That CO₂ is separated and then reinjected along with replacement CO₂

¹⁰ AoR (Area of Review) is the area designated around the injection well to identify and control any abnormal pressure buildup during the life of the injection project (see 40 C.F.R. pt.146.3 (2018)).

(used to maintain pressure equilibrium) until the operation ceases, at which time virtually all the injected CO₂ remains trapped in the formation.

Taken together, Class II, Subparts UU, PP, W and C, provide the regulatory certainty required to document secure Associated Storage and are “adequate security measures for the geological storage of carbon dioxide” to meet the requirements of 45Q.

Intentional Storage Requirements

- **Class VI Well Requirements:** *Class VI:* Due to the unique nature of underground injection of CO₂ for the purposes of long-term storage, in 2010, EPA developed the Class VI Program for Intentional Storage of CO₂. Specific requirements for Class VI wells include:
 - Geological storage site characterization
 - Requirements for the construction and operation of the wells to prevent fluid movement into unintended zones
 - Development, implementation, and periodic update of a series of project-specific plans to guide the management of project
 - 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
 - Testing and monitoring of the mechanical integrity of the injection well, ground water monitoring, and tracking of the location of the injected CO₂
 - Post-injection monitoring and site care
 - Financial responsibility requirements
- **EPA GHG Reporting Requirements:** *Subpart RR* — In addition to Class VI requirements, the owner or operator of Intentional Storage operations is required to develop and implement an EPA approved site-specific monitoring, reporting, and verification (MRV) plan and report the following information:
 - Mass of CO₂ received, injected into the subsurface and produced
 - Mass of CO₂ emitted by surface leakage
 - Mass of CO₂ emissions from equipment leaks and vented emissions of CO₂ from surface equipment Mass of CO₂ sequestered in subsurface formations
 - Cumulative mass of CO₂ reported as sequestered

Class VI and Subpart RR requirements are tailored for the specific risk profile (increased volumes and pressures) of Intentional Storage.

Subpart RR Reporting is Not Appropriate for Associated Storage

Some have suggested that Subpart RR is the appropriate reporting standard for Associated Storage. While many agree that Subpart RR may be appropriate for Intentional Storage operations, requiring Subpart RR for Associated Storage is misguided. EPA has acknowledged that Subpart RR does not apply to Associated Storage operations unless the operator elects to submit an MRV plan.¹¹

Subpart RR requirements are not commensurate with the limited risks of CO₂ injection in oilfields resulting in Associated Storage. In oil and gas wells, CO₂ is injected into formations known to be secure because they have contained hydrocarbons over geologic time. CO₂ injection is balanced by removal of oil, which promotes a pressure equilibrium within the formation, and limits migration of CO₂ and brine away from the subsurface volume originally occupied by the hydrocarbon accumulation. As EPA has recognized, “CO₂ storage associated with Class II wells is a common occurrence and CO₂ can be safely stored where injected through Class II-permitted wells for the purpose of enhanced oil or gas-related recovery.”¹² Other experts concur on this point (See Addendum). By contrast, in Intentional Storage operations, CO₂ may be injected without the removal of fluids, which can result in increased pressure that may lead to movement of CO₂ and brine at significant distances away from the injection site. This, in addition to the lack of operating and observational experience with Intentional Storage, is a main basis for Subpart RR’s requirements for Intentional Storage and why they are not appropriate for Associated Storage.

CO₂ Used for Associated Storage is a Valuable Commodity

Oil and gas operators who inject CO₂ in the subsurface have an interest in assuring the CO₂ remains securely contained. Because CO₂ is a valuable commodity, they utilize continuous reservoir management / monitoring techniques to contain the CO₂, rather than allow it to escape into the atmosphere.

Operators are also likely to receive CO₂ from multiple industrial and natural sources of CO₂ and may inject the CO₂ at multiple injection sites. The recipient of CO₂ has significant economic, contractual, and regulatory incentives to verify the amount received and injected.

Subpart RR for Associated Storage is Misaligned with State Mineral, Property, and Resource Conservation Laws

Requiring CO₂ emissions monitoring and reporting for an undefined period of time and under an undefined set of requirements to demonstrate secure geological storage after oil production ceases, as Subpart RR does, is not consistent with oil and gas law. These requirements conflict with state resource conservation and mineral property law, as well as oil lease and unit operating agreements, which require oil producers to end their surface occupation once resource production ends.

¹¹ 40 C.F.R. pt. 98.440 (2018).

¹² Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Generating Units, 80 Fed. Reg. 64510, at 64585 (Oct. 23, 2015).

The entity capturing the CO₂ for injection and receiving the 45Q tax credit may or may not be the same entity that injects the CO₂ resulting in Associated Storage. Where they are not the same entity, the CO₂ supplier may have no access to the property and equipment of the user.

Subpart RR for Associated Storage is Misaligned with Current Industry Practices and Contractual Relationships

EOR operational practices do not lend themselves to a Subpart RR reporting. In many instances, the entity capturing the CO₂ and receiving the 45Q tax credit will not be the same entity that injects the CO₂ for EOR purposes. An entity capturing CO₂ may supply to multiple users. By the same token, an EOR operator may take CO₂ from multiple sources of both anthropogenic and non-anthropogenic CO₂ and inject into multiple injection sites. Where the supplier and user(s) are not all the same entity, the CO₂ supplier has no access to the property or equipment of the user. In addition, current off-take agreements do not contemplate the user supplying the type of information required by Subpart RR to the supplier, nor is it needed due to the significant financial incentive the user has to ensure it receives and injects all of the CO₂ per the off-take agreement. Therefore, it is not practical to satisfy the requirements of Subpart RR reporting due to multi-owner complexity of supply chain, terms of CO₂ offtake agreements, and inconsistency with oil / gas leasing practices.

Requiring Subpart RR reporting across the EOR supply chain will inhibit the CO₂ capturing facility's ability to access 45Q tax credits. Capturing the CO₂ is the very action policy makers are trying to incentivize and thus, Subpart RR reporting does not support CCS development.

Summary

Congress or the Treasury Department need to act to ensure durability and certainty, as well as to incentivize carbon capture through access to the 45Q tax credits. Congress should define "secure geological storage" with reporting and monitoring obligations commensurate with risks associated with specific operations — *i.e.*, Subpart RR reporting / Class VI permitting for Intentional Storage and Subpart UU reporting / Class II permitting for Associated Storage. Bills by Senator John Hoeven (S. 1663) and Representative Kevin Cramer (H.R. 4857) would clarify these important operational distinctions and set a deadline for Treasury to conduct such a rulemaking. If Congress does not act, the IRS should establish this clarity through regulation, as required by law. **Subpart UU, taken together with the requirements of Subparts PP, W, and C, as well as the Class II UIC permitting requirements applicable to Associated Storage, provide "adequate security measures for the geological storage of carbon dioxide" to meet the requirements of 45Q.**

Addendum

Experts Have Stated that CO₂ Stored Through Associated Storage Meets the “Secure Geological Storage” Requirements of 45Q

Giving further evidence that CO₂ injection resulting in Associated Storage is securely, geologically stored, several experts have opined on the more than 40 years of Associated Storage experience in the U.S.

- “All of the injected CO₂ is retained within the subsurface formation after a project has ended or recycled to subsequent projects.” US DOE’s *Carbon Dioxide Enhanced Oil Recovery Untapped Domestic Energy Supply and Long Term Carbon Storage Solution* 17 (March 2010), available at <https://www.netl.doe.gov/File%20Library/Research/Oil-Gas/publications/brochures/CO2-EOR-Primer-2017.pdf>.
- “It is assumed that a maximum of one percent of the stored CO₂ eventually migrates to the surface and is released to the atmosphere over a 100-year monitoring period. This conservative assumption is consistent with other NETL reports on carbon capture and storage and is used to bracket the current range of potential loss until measurement data from operating storage sites can validate this loss factor. There is no measured data to currently support an expected migration of 1.0% of the CO₂ to the atmosphere. In our model, a 0% loss rate is equally probable. Geologic formations with a potential loss rate greater than 1% would be considered infeasible for CO₂-EOR operations. The expected parameter value for the model (0.5%) was selected as the midpoint between the maximum leakage rate of 1% and no leakage from the formation.” Cooney, et al. “Evaluating the Climate Benefits of CO₂ Enhanced Oil Recovery Using Life Cycle Analysis,” *Environ. Sci. Technol.* 2015, 49, 7491–7500.
- “Losses through leaks are considered non-zero but below measurement error and negligible (for reasons enumerated below) At that facility, losses of CO₂ from flow lines, pumps, through the separation process, and as a result of deliberate venting during workover and repair were assessed and found to be less than 1% of the annual purchased volumes—a small percentage relative to other sources of error. Faltinson and Gunter (2011) reported similar relative amount of fugitive emissions in the 1–2% range for fields in the Permian Basin.” Choi, et al. “CO₂ recycling accounting and EOR operation scheduling to assist in storage capacity assessment at a U.S. gulf coast depleted reservoir,” *International Journal of Greenhouse Gas Control* 18 (2013) 474–484.
- Alcalde et al. have recently published a comprehensive numerical analysis of CO₂ storage security and leakage to the atmosphere. They conclude that: “Overall our findings indicate that geological storage of CO₂ is a secure, resilient and feasible option for climate mitigation even when applying pessimistic values for input parameters and in poorly regulated storage scenarios.” (June 2018) available at: <https://www.nature.com/articles/s41467-018-04423-1.pdf>
- The Carbon Sequestration Leadership Forum, Final Report by the CSLF Task Force on Technical Challenges in the Conversion of CO₂ -EOR Projects to CO₂ Storage Projects 58

(September 2013) states that “greater than 90-95%” and “almost all of the purchased CO₂ is retained (stored) in the reservoir.” Note: CSLF is a government-to-government initiative, including the EU and 22 member nations (e.g., the United States).

- A frequently cited example is research by the University of Texas Bureau of Economic Geology’s Gulf Coast Carbon Center on the SACROC oil field, where CO₂ has been injected for EOR since 1972, which has found no evidence of CO₂ leakage:
<http://www.beg.utexas.edu/gccc/sacroc.php>