



August 3, 2020

Comments of the Energy Advance Center

Re: Treasury/IRS Proposed Amendments to Income Tax Regulations (26 CFR Part 1)

Regarding the Section 45Q Credit for Carbon Oxide Sequestration

(Reg-112339-19)

The Energy Advance Center (“EAC”) is a voluntary association of energy and energy-related organizations dedicated to advancing the development and deployment of carbon capture, utilization and storage (“CCUS”) to achieve a cleaner energy profile and improve U.S. economic and energy security. The EAC membership – ConocoPhillips Company, Denbury Resources Inc., Exxon Mobil Corporation, Kinder Morgan, Inc., and Mitsubishi Heavy Industries America, Inc. – represents leading CCUS project participants involved across the entire CCUS value chain. EAC members operate over 50% of existing CO<sub>2</sub> pipeline transportation infrastructure in the United States, capture about 7 million tonnes of CO<sub>2</sub> per year, and are among the largest users of anthropogenic CO<sub>2</sub> in enhanced oil recovery operations.

The EAC thanks the Department of the Treasury (“Treasury”) and the Internal Revenue Service (“IRS” or “Service”) for the opportunity to submit comments on the proposed regulations (“proposed regulations” or “Prop. Treas. Reg.”) on the Internal Revenue Code Section 45Q tax credit (the “Section 45Q Credit” or the “Credit”) published in the Federal Register on June 2, 2020. Section 45Q represents a significant opportunity to both enhance the deployment of CCUS projects and foster innovation in capture and storage technology. Such advancements would allow CCUS to mature as both a tool for mitigating greenhouse gas emissions and unlocking new domestic energy resources. We anticipate that when promulgated in final form, these Section 45Q regulations will provide the regulatory certainty needed to induce and facilitate significant investment in CCUS projects as well as accelerate widespread application of CCUS in the scope and scale Congress anticipated in enacting the Section 45Q Credit. As such, promulgating the final Section 45Q regulations will have very positive implications for creation of new manufacturing jobs, enhancement of US energy security and our nation’s environmental leadership. With so much potential benefit to the nation at stake, EAC strongly urges Treasury to

proceed expeditiously in its consideration of the public comments and finalization of the Section 45Q regulations. To that end, EAC respectfully submits the following comments and recommendations for Treasury/IRS's consideration.

**I. EAC Strongly Supports the Proposal to Provide Multiple Pathways for Demonstrating Secure Geological Storage:**

EAC applauds Treasury's proposal to provide multiple pathways for taxpayers to demonstrate Secure Geological Storage ("SGS") as a fundamental enhancement of the Section<sup>1</sup> 45Q regime that offers singularly valuable legal certainty and economic incentive for widespread investment in CCUS projects. EAC's specific comments and recommendations on the proposed regulations' SGS provisions are:

**A. Multiple Pathways**

EAC supports the decision to allow multiple pathways for demonstrating SGS and agrees with the Treasury's recognition that requiring Enhanced Oil Recovery ("EOR") operations to report under Greenhouse Gas Reporting Program ("GHGRP") subpart RR for purposes of claiming the Section 45Q tax credit is burdensome, conflicts with state resource conservation laws, industry practices and commercial arrangements. EAC supports the decision to allow CSA/ANSI ISO 27916:19 (ISO 27916:2019, IDT) ("ISO Standard 27916:2019" or "ISO Standard") as an alternative for meeting the requirements for secure geological storage and agrees that ISO Standard 27916:2019 addresses safe, long-term containment and monitoring of CO<sub>2</sub> stored in association with a qualified enhanced oil or natural gas recovery project. EAC agrees that information used to document and demonstrate monitoring and containment assurance under that ISO Standard, including mass balance calculations, should be appropriately certified as accurate and complete.

In addition, we support Treasury's conclusion to allow, but not require, EOR operators to report under subpart RR for Class II Underground Injection Control Program ("UIC") wells when qualified carbon dioxide is used as a tertiary injectant in a qualified enhanced oil or natural gas recovery project.

**B. Third-Party Certification**

In allowing use of the CSA/ANSI ISO 27916:19 Standard for SGS certification, however, such certification under that ISO Standard should not be more burdensome than that required of taxpayers reporting under GHGRP subpart RR. Consistent with subpart RR reporting, certification that a taxpayer claiming credit pursuant to ISO Standard 27916:2019 should be a one-time event based upon the project's physical or contractual manner of use of CO<sub>2</sub> as a tertiary injectant in a qualified enhanced oil or natural gas recovery project. In addition to allowing certification by an independent qualified engineer or geologist, a company's

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<sup>1</sup> Unless otherwise provided, all references to sections are to the Internal Revenue Code of 1986 as amended and in effect (the "Code"); all references to regulations are to Treasury regulations promulgated under the Code.

Professional Engineer in good standing should be included as a person qualified to provide the ISO Standard 27916:2019 certification. We emphasize that a Professional Engineer holds a professional license, which entails the possession of suitable technical qualifications for making such certifications as well as the additional obligation to comport with ethical standards, including the responsibility to the public above any obligation to the engineer's employer. (See, National Society of Professional Engineers Code of Ethics, [nspe.org/resources/ethics/code-ethics](http://nspe.org/resources/ethics/code-ethics)). In that regard, allowing the Professional Engineer to be employed by the taxpayer increases the certifying engineer's detailed understanding of the project and how the project complies with ISO Standard 27916:2019. Annual confirmation by the credit claimant on Form 8933 that the project is being executed pursuant to the certified ISO Standard 27916:2019 (subject to IRS audit, recapture and potential penalty) should be sufficient for subsequent years.

### **C. Adjustments to Form 8933**

In order to provide adequate documentation that the IRS may rely upon as materially correct and verifiable, EAC believes changes will be required to Form 8933. The GHGRP requires annual reporting of CO<sub>2</sub> sources and emissions to the EPA. EPA reviews data received from suppliers of CO<sub>2</sub> and EOR operators and determines if all the CO<sub>2</sub>, whether placed into commerce or injected, is accounted for and if not, EPA contacts the relevant party. By utilizing existing, required information which is reported via the EPA Greenhouse Gas Reporting Tool and placing that information on the tax form, an effective means to report mass balance accounting for anthropogenic sources of CO<sub>2</sub> can be efficiently utilized for purposes of Section 45Q Credit documentation. EAC respectfully submits as Appendix A to these comments a modified Form 8933 as an illustration of how this additional information might be reported by the taxpayer. In addition, EAC is submitting as Appendix B hereto a White Paper entitled "Calculating EOR Control Efficiency for Anthropogenic CO<sub>2</sub> Using Existing GHG Reporting Tools" regarding anthropogenic CO<sub>2</sub> control efficiency, which supports the approach as suggested in the illustrative Form 8933 offered in Appendix A.

## **II. EAC Recommendations Regarding the Proposed Recapture Provisions**

Prop. Treas. Reg. §1.45Q-5 deals with the issue of recapture of the Credit. EAC offers the following comments and recommendations regarding the recapture issue:

### **A. Use of LIFO**

EAC supports the decision to use LIFO to determine which Credits are subject to recapture due to a recapture event.

### **B. Statute of Limitations/Look-Back period**

EAC remains supportive of limiting the look-back period to 3 years to be consistent with the statute of limitations for the IRS to initiate an audit of a tax year, making the provision similarly situated with respect to other tax credits containing recapture provisions. Providing for a 3-year look-back improves tax and financial statement certainty for taxpayers claiming the Section 45Q

Credit, and reduces the cost associated with tax equity transactions, thereby reducing the cost of CCUS projects and making the Section 45Q Credit more efficient and effective in inducing widespread investment in those projects. In contrast, a 5-year look-back period will increase the cost of otherwise viable projects. Given that the statute and the proposed 45Q regulations are specifically intended to provide enhanced economic incentive for widespread application of CCUS technology, a 3-year look-back would be the more favorable approach to increase investment in CCUS projects.

### **C. Qualified Re-Use of Stored Carbon Oxide**

Prop. Treas. Reg. § 1.45Q-5(h) provides that the recapture rules apply to the intentional removal of qualified carbon oxide. In the case of the intentional removal of securely stored qualified carbon oxide and the re-use of that same qualified carbon oxide in a manner whereby it subsequently continues to be securely captured, utilized or stored, such that the total net release is zero, the final regulations should take a net approach and no recapture should be required in such secure reuse situations. This net approach is consistent with Prop. Treas. Reg. § 1.45Q-5(g)(1) which provides no recapture will have been deemed to have occurred if the leaked amount of qualified carbon oxide does not exceed the amount of qualified carbon oxide disposed.

### **D. Exceptions from Recapture Events**

With respect to recapture events, EAC recommends clarifying the “limited exceptions” to a recapture event to exclude those events not within the control of the taxpayer claiming the Section 45Q tax credit. Prop. Treas. Reg. § 1.45Q-5(i) excludes from the definition of a recapture event, those events “not related to the selection, operation, or maintenance of the storage facility, such as volcanic activity or terrorist attack.” EAC supports replacing the phrase “volcanic activity” with a more inclusive list reflecting reasonably foreseeable events and calamities outside of the control of the taxpayer, such as “natural disasters, including but not limited to flood, drought, earthquake, volcanic eruption, landslide, hurricane, cyclone, typhoon, tornado, as well as war, civil disturbance, terrorist act, military action, epidemic, pandemic, famine, and action of a governmental authority.” EAC further recommends replacing the term “terrorist attack” with the phrase “the negligent or intentional acts of a third-party.” Amending the limited exceptions reflected in the proposed regulation in such suggested manner generally aligns this recapture section with events typically described as *force majeure* events in commercial contracts.

### III. EAC Recommendations Regarding Definitional Terms

EAC offers the following comments and recommendations regarding several of the definitional terms contained in the proposed regulations:

#### A. Prop. Treas. Reg. § 1.45Q-2 Definition of Industrial Facility re: natural CO<sub>2</sub>-bearing deposits.

Section 45Q creates a credit when Qualified Carbon Oxide (“Qualified CO<sub>2</sub>”) is captured using Carbon Capture Equipment (“CCE”) placed in service at a Qualified Facility and that Qualified CO<sub>2</sub> is either disposed of in SGS or used as a tertiary injectant in a Qualified EOR Project and then disposed of in SGS.<sup>2</sup> But, in the proposed regulations, Treasury introduces a new exclusionary rule. This rule would disallow a 45Q Credit to a facility producing a commercial product other than CO<sub>2</sub> through a manufacturing process that also captures comingled CO<sub>2</sub> because of the content of the underlying natural gas deposit.<sup>3</sup>

##### i. Background on Qualified Facility Definition

The term “Qualified Facility” means any “Industrial Facility”<sup>4</sup> which captures a threshold amount of “Qualified CO<sub>2</sub>” in any given year.<sup>5</sup> In Notice 2009-83, the Service determined that an “Industrial Facility” refers to a facility that produces a CO<sub>2</sub> stream from a fuel combustion source, manufacturing process, or fugitive CO<sub>2</sub> emission source that, absent capture and disposal, would otherwise be released into the air.<sup>6</sup> In the same determination, the Service also excluded any facility that produces CO<sub>2</sub> from CO<sub>2</sub> production wells at natural CO<sub>2</sub>-bearing formations from the definition of industrial facility.<sup>7</sup>

After the publication of Notice 2009-83, several members of Congress, seeking to resolve subsequent uncertainty generated by the exclusion, provided comments asking that Treasury clarify the definition of “Qualified Facility”. The legislators requested that Treasury align the term with congressional intent by limiting the exclusion only to CO<sub>2</sub> that is extracted for its standalone value.<sup>8</sup>

The term “Qualified CO<sub>2</sub>” means any carbon dioxide which is captured from an “industrial source” that “would otherwise be released into the atmosphere as an industrial emission of greenhouse gas, and is measured at the source of capture and verified at the point of disposal or injection.”<sup>9</sup>

In sum, a “Qualified Facility” is an “Industrial Facility” that produces (and captures) a CO<sub>2</sub> stream from, among other things, a manufacturing process. The captured CO<sub>2</sub> is also Qualified CO<sub>2</sub>. Nonetheless, in the proposed 45Q regulations, Treasury introduces a contrary new

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<sup>2</sup> Section 45Q(a).

<sup>3</sup> Prop. Treas. Reg. § 1.45Q-2(d)(1).

<sup>4</sup> The term “Industrial Facility” is not affirmatively defined in the statute.

<sup>5</sup> Section 45Q(d).

<sup>6</sup> IRS Notice 2009-83, 3.02(a).

<sup>7</sup> IRS Notice 2009-83, 3.02(b).

<sup>8</sup> [INFO 2011-0083](#) (Boren-Oklahoma, Lankford-Oklahoma) [INFO 2011-0085](#) (Hutchison-Texas)

<sup>9</sup> Section 45Q(c).

requirement that leads to a result where even when a facility captures a CO<sub>2</sub> stream from a manufacturing process that results in a commercially valuable commodity other than the CO<sub>2</sub>, that CO<sub>2</sub> stream may not be qualified for the Credit because of the content of the underlying natural gas deposit.<sup>10</sup>

- ii. **EAC recommends that, consistent with the clear intent of Congress as well as in the interests of practicality and clarity, Treasury should establish a bright-line rule providing that when a facility produces and captures a CO<sub>2</sub> stream from a Prop. Treas. Reg. 1.45Q-2(d)(3) “Manufacturing Process” (CO<sub>2</sub> is not the exclusive commercial product), it is *per se* an “Industrial Facility.”**

In Prop. Treas. Reg. § 1.45Q-2(d)(1), Treasury creates an exclusionary rule stating that the term “Industrial Facility” does not include a facility that produces CO<sub>2</sub> from natural CO<sub>2</sub>-bearing formations. The proposed regulation offers a nominal safe harbor in that a natural gas deposit that contains less than 10% CO<sub>2</sub> is not considered natural CO<sub>2</sub>-bearing, but otherwise leaves the determination whether a formation is natural CO<sub>2</sub>-bearing to the “facts and circumstances.” To be consistent with the expressed legislative intent<sup>11</sup> underlying Section 45Q, any “Qualified Carbon Oxide”, with the narrow exception of such carbon oxide being captured solely for its standalone value, should be eligible for the credit.

EAC is supportive of the policy purpose of this language, which should be to exclude CO<sub>2</sub> produced exclusively for the value of such CO<sub>2</sub>. Existing formations that produce CO<sub>2</sub> solely for the purposes of EOR contain > 95% CO<sub>2</sub>. It is unlikely that any formation containing < 90% CO<sub>2</sub> would be produced solely for the value of the CO<sub>2</sub>. Formations with high CO<sub>2</sub> concentrations but less than 90% are produced primarily because of the value of the remaining hydrocarbon and other valuable components. The CO<sub>2</sub> is a by-product of such production. A 90% CO<sub>2</sub> threshold would make more sense as demarcation for a “natural CO<sub>2</sub> bearing formation.” Such a threshold would also be consistent with the U.S. Department of Transportation, Pipeline Hazardous Materials Safety Administration (“PHMSA”) definition of CO<sub>2</sub> contained in 49 CFR § 195.2: “Carbon dioxide means a fluid consisting of more than 90 percent carbon dioxide molecules compressed to a supercritical state.”

EAC recommends Treasury expressly provide a practical bright-line rule stating that a facility that produces a byproduct CO<sub>2</sub> stream from a manufacturing process is *per se* an “Industrial Facility” without regard to whether the CO<sub>2</sub> was produced from a deposit of natural gas that contains greater than 10% carbon dioxide by volume. This approach is consistent with the statute and the clear legislative intent. Such rule would provide taxpayers with certainty in navigating the complex investment decisions and contractual arrangements necessary to undertake the

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<sup>10</sup> Prop. Treas. Reg. § 1.45Q-2(d)(1).

<sup>11</sup> “Congressional intent of section 45Q was not to exclude CO<sub>2</sub> captured from high content natural gas stream, but rather to exclude CO<sub>2</sub> that a taxpayer extracts from the earth for its standalone value. Therefore, in the application of Section 45Q, the guidance should not exclude natural gas and oil wells that the taxpayer drills solely for the purposes of extracting natural gas and oil merely because the produced hydrocarbons are found in ‘natural CO<sub>2</sub> bearing formations’” *supra*, note 8.

activity Congress seeks to incentivize with the Section 45Q Credit. In addition, it would be a more administrable rule for the Service.

Such a bright line rule is also consistent with the example provided in Prop. Treas. Reg. § 1.45Q-2(d)(4), which is used to explain the term “manufacturing process.” In the example, Taxpayer B extracts CO<sub>2</sub> and methane from a reservoir that contains equal parts of each gas. After separating the gas streams, Taxpayer B sells the CO<sub>2</sub> for use in EOR projects and reinjects most of the methane. Because CO<sub>2</sub> is the only product sold for profit or used for a commercial purpose, Treasury concludes that this is not a manufacturing process within the meaning of paragraph (d)(3) and thus, the CO<sub>2</sub> is not qualified.<sup>12</sup> Therefore, because the gas separation does not constitute a manufacturing process, the facility cannot be an industrial facility and thus the captured CO<sub>2</sub> cannot be “Qualified CO<sub>2</sub>.”<sup>13</sup>

But, assume a reasonably predictable variation of the above scenario: Assume Taxpayer B sells the methane (meaning now both CO<sub>2</sub> and methane are sold for profit or used for a commercial purposes) and thus Taxpayer B’s process constitutes a manufacturing process. Treasury introduces an additional layer of uncertainty and complexity not present in the statute by requiring Taxpayer B to determine the “facts or circumstances” that could preclude the facility from being an “Industrial Facility” because of the composition of the underlying natural gas deposit.

Given the vast array of fact patterns that can exist, Treasury should provide a more administrable rule that primarily focuses on the commercial nature of the relevant gas streams in determining what a manufacturing process is. The end-result should be predictability and certainty that when the CO<sub>2</sub> stream is captured as a by-product from a manufacturing process, the facility is *per se* an “Industrial Facility” and only CO<sub>2</sub> that is extracted solely for its standalone value is excluded from claiming the Credit.

**B. Prop. Treas. Reg. § 1.45Q-2(h)(5) Definitions may improperly exclude Carbon Oxide from being “Qualified CO<sub>2</sub>” when injected in oil reservoirs for EOR projects that are not “Qualified.”**

**i. Background on “Qualified CO<sub>2</sub>”**

Under Section 45Q(a), a taxpayer is entitled to the credit when it captures Qualified CO<sub>2</sub> using CCE placed in service at a qualified facility and either disposes it in SGS (including in a Qualified EOR project<sup>14</sup>) or utilizes it in the manner specified in Section 45Q(f)(5). Given the

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<sup>12</sup> Prop. Treas. Reg. §§ 1.45Q-2(d)(3); (d)(4).

<sup>13</sup> “Qualified CO<sub>2</sub>” is any CO<sub>2</sub> captured from an industrial source. Prop. Treas. Reg. §1.45Q-2(a)(1)(i). An industrial source of CO<sub>2</sub> is an emission from an “Industrial Facility”. Prop. Treas. Reg. § 1.45Q-2(d)(2). An “Industrial Facility” is, *inter alia*, a facility that produces a carbon oxide stream from a manufacturing process. Prop. Treas. Reg. §1.45Q-2(d).

<sup>14</sup> The term Qualified EOR project has the same meaning given the term by Section 43(c)(2), by substituting “crude oil or natural gas” for “crude oil” in subparagraph (A)(i). Section 45Q(e)(2).

operation of the “Bipartisan Budget Act of 2018”, Public Law 115-123 (“BBA”), the amount of the Credit depends on the date the CCE was placed in service (whether pre-BBA or post-BBA) as well as the end-use of the Qualified CO<sub>2</sub>. Taxpayers with Qualified CO<sub>2</sub> meeting the requirements of Section 45Q(a)(1) and (3) can claim higher value credits than under Section 45Q(a)(2) and Section 45Q(a)(4). Section 45Q(a)(1) and (3) each contain precisely drafted cross-references which carve-out two identified end-uses described in Section 45Q(a)(2)(B)(i)/(4)(B) (tertiary injectant in a Qualified EOR reservoir) and Section 45Q(a)(2)(B)(ii)/(4)(B)(ii) (subsection 45Q(f)(5) utilization) from the higher value credit.

The term Qualified CO<sub>2</sub> means any carbon dioxide which is captured from an industrial source that would otherwise be released into the atmosphere as an industrial emission of greenhouse gas or lead to such release, and is measured at the source of capture and verified at the point of disposal, injection, or utilization.<sup>15</sup> The statute does not limit the eligible carbon dioxide based on manner in which the qualified CO<sub>2</sub> is eventually disposed, injected, or utilized. In the preamble to the proposed regulations, Treasury states:

The Treasury Department and the IRS agree that the statutory definition of qualified carbon oxide is clear due to the broad acceptance and use of the term by industry participants, environmental groups, and stakeholders. Therefore, the proposed regulations generally conform to the statutory definition of qualified carbon oxide.

The term SGS is not defined by statute and previous guidance only referred taxpayers to applicable EPA regulations. But the term is now defined in these proposed regulations. Similar to the credit values, the applicable standard for SGS depends on the end-use. When it is used as a tertiary injectant in a Qualified EOR project, it is disposed in SGS when it is stored in compliance with applicable requirements under 40 CFR Part 98 subpart RR or under ISO Standard 27916:2019.<sup>16</sup> When it is not used as a tertiary injectant in a Qualified EOR project, it is disposed in SGS when it is stored in compliance with 40 CFR Part 98 subpart RR.<sup>17</sup>

In sum, the Credit is available when Qualified CO<sub>2</sub> is stored in SGS. Both the value of the Credit and the standard for SGS depend on the end-use of the qualified CO<sub>2</sub>. Nonetheless, the proposed regulations provide that otherwise eligible volumes under Section 45Q(c) cease being Qualified CO<sub>2</sub> when used in an EOR project that is not qualified.

**ii. Consistent with the statutory text of Section 45Q, Treasury should strike Prop. Treas. Reg. § 1.45Q-2(h)(5) to avoid excluding Carbon Oxide volumes from being “Qualified CO<sub>2</sub>.”**

Excluding volumes from being Qualified CO<sub>2</sub> when used in an EOR project that is not qualified conflicts with Section 45Q(c). As described above, Section 45Q treats Qualified CO<sub>2</sub> differently based on its end-use for purposes of determining the amount of credit available via the statutory mechanisms in Section 45Q(a). There is no similar statutory mechanism in Section 45Q(c) or

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<sup>15</sup> Section 45Q(c).

<sup>16</sup> Prop. Treas. Reg. § 1.45Q-3(b)(2).

<sup>17</sup> Prop. Treas. Reg. § 1.45Q-3(b)(1).

elsewhere to disqualify otherwise eligible volumes from being considered Qualified CO<sub>2</sub> based on their end-use or otherwise.<sup>18</sup> Rather, when a taxpayer uses Qualified CO<sub>2</sub> in an EOR project that is not qualified, it simply remains within the default rule governing Section 45Q(a)(1) and (3), instead being redirected to the Section 45Q(a)(2)(B)/(4)(B) end-use carve-outs. Therefore, Prop. Treas. Reg. § 1.45Q-2(h)(5) conflicts with the plain language of Section 45Q(c) as the statutory test does not take into account the end-use of the CO<sub>2</sub> when determining which volumes constitute “Qualified CO<sub>2</sub>”.

In the same paragraph of its proposed regulations, Treasury also concludes that CO<sub>2</sub> injected into an oil reservoir that is not a Qualified EOR project cannot be treated as SGS. While that may not directly conflict with the statute, Treasury has not provided any reason as to why an EOR project that is not qualified is any less secure as a storage site than one that is qualified when the two projects follow the same standards. Treasury should strike Prop. Treas. Reg. § 1.45Q-2(h)(5) from the final regulations.

### **C. Proposed § 1.45Q-1(g) Installation of Additional Carbon Capture Equipment.**

#### **i. Background on Prop. Treas. Reg. § 1.45Q-1(g)**

Under Section 45Q(b)(2)(A)(ii) and Prop. Treas. Reg. § 1.45Q-1(g)(1), existing qualified facilities installing additional CCE must split volumes between pre- and post-BBA equipment, based on a formula including “the total amount of carbon dioxide capture capacity of the CCE in service at such facility on February 8, 2018.” The installation of additional CCE occurs when the taxpayer either physically modifies or adds additional equipment that increases the capacity of the existing equipment.<sup>19</sup> Qualified carbon oxide deemed attributable to post-BBA expansion will be eligible for a Section 45Q(a)(4) credit. The amount eligible for the Section 45Q(a)(4) credit is determined by taking the excess of qualified carbon oxide captured in a taxable year (the minuend) and subtracting the total amount of carbon dioxide capture capacity of the CCE in service at such facility as of the day before the BBA’s enactment (the subtrahend). Notably, neither the statute nor the proposed regulations affirmatively define the methodology for measuring such “carbon dioxide capture capacity.”

Treasury should provide greater legal certainty on this issue necessary to reliably guide potential investment decisions, including the expansion of currently existing qualified facilities via the installation of additional CCE, by clarifying the definition of “carbon dioxide capture capacity.” In making such clarification, EAC urges Treasury to recognize that the determination must be guided by engineering fundamentals. To this end, EAC recommends that the quantification of the amount of the existing capture capacity that is installed should be determined by a competent engineering analysis of the facility, whether conducted internally within or externally for the taxpayer, before the modification of the qualified facility.

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<sup>18</sup> While Section 45Q(f)(1) provides that credit is available only for volumes captured and disposed, utilized within the United States, it does not remove foreign volumes from being defined as “Qualified Carbon Oxide.” Section 45Q(c).

<sup>19</sup> Prop. Treas. Reg. § 1.45Q-1(g)(2).

- ii. **In clarifying the definition of “carbon dioxide capture capacity,” Treasury should issue guidance that ensures the Current Year Carbon Oxide Captured<sup>20</sup> and the Carbon Capture Capacity<sup>21</sup> are measured symmetrically.**

There are at least two challenging incongruities in the statute relating to this issue. First, Section 45Q(b)(2)(A)(i) specifically measures “qualified carbon oxide”, a defined term in Section 45Q(c)(1). Conversely, Section 45Q(b)(2)(A)(ii) measures “carbon dioxide capture capacity”, which could arguably be defined more expansively than qualified carbon dioxide. Next, there is a distinction between the units of time used for measurement purposes. The taxpayer must calculate the Current Year Carbon Oxide Captured annually. Conversely, the carbon dioxide capture capacity is determined on a single day, February 8, 2018. A strict reading of the statute and the proposed regulations reveals no affirmative guidance providing that such calculation of capacity should be determined on an annual basis. Nonetheless, for methodological consistency, given that the Current Year Carbon Oxide Captured is an annual calculation, the carbon dioxide capture capacity should be calculated on an annual basis as well.

As described in Prop. Treas. Reg. § 1.45Q-1(g)(2), operating existing CCE above its capacity does not constitute the installation of new CCE. This conclusion acknowledges that the appropriate measure of carbon dioxide capture capacity is less than its theoretical limitation. Moreover, capacity should also include adjustments attributable to operating both the CCE as well as the underlying industrial facility throughout the year. The total amount of carbon captured at the qualified facility will implicitly reflect the maintenance, facility downtime, and turn-arounds necessary to operate both the industrial facility and the CCE. Such amount of captured carbon will also reflect external limitations inherent in operating the industrial facility such as seasonal fluctuations in outdoor temperature. By providing these adjustments, Treasury can remove incremental uncertainty when making investment decisions as to which volumes will be eligible for the new credit.

Accordingly, EAC believes the Treasury should make the following adjustments to Prop. Treas. Reg. § 1.45Q-1(g)(4). First, move the examples to a new paragraph § 1.45Q-1(g)(5). Next, insert the following language into Prop. Treas. Reg. § 1.45Q-1(g)(4):

“Carbon Dioxide Capture Capacity”. The term carbon dioxide capture capacity is the capability (metric tons per year) to capture carbon dioxide less the annualized typical constraints with the industrial facility and carbon capture equipment. For purposes of this paragraph Prop. Treas. Reg. § 1.45Q-1(g)(4), annualized typical constraints means the quotient of the total amount of all regular maintenance, scheduled or unscheduled facility downtime, seasonal fluctuations in outdoor temperature, and turn-arounds associated with both the industrial facility and carbon capture equipment occurring in the 60 months prior to the day before the date of the enactment of the Bipartisan Budget Act of 2018 divided by 5.

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<sup>20</sup> The total amount of qualified carbon oxide captured for the taxable year under Section 45Q(b)(2)(A)(i).

<sup>21</sup> Under Section 45Q(b)(2)(A)(ii).

**IV. Treasury Should Ensure the Required Contractual Provisions in Prop. Treas. Reg. § 1.45Q-1(h) Align with Risk Allocation and Limitations on Damages Typical of Most Commercial Arrangements.**

Treasury should amend Prop. Treas. Reg. § 1.45Q-1(h)(2)(i) to eliminate its inconsistency with the allowance of liquidated damages in Prop. Treas. Reg. § 1.45Q-1(h)(2)(iii)(B). Treasury should clarify that the prohibition on damage caps is applicable only in the aggregate and parties can limit damages on a per unit basis. Without harmonizing these two provisions, Treasury would be driving away most (perhaps all) reasonably prudent commercial parties from participating in such agreements due to the risk of unlimited damages.

**V. Treasury Should Clarify Provisions of the “80/20” Rule for Upgraded Qualified Facilities or Carbon Capture Equipment in Prop. Treas. Reg. § 1.45Q-2(g) to Provide Enhanced Investment and Innovation in CCUS Projects.**

Prop. Treas. Reg. § 1.45Q-2(g)(5) formally adopts the “80/20” rule for upgraded qualified facilities or CCE.<sup>22</sup> If the fair market value of used components (numerator) does not exceed 20% of the qualified facility or CCE’s total value<sup>23</sup> (denominator), such equipment or CCE will be deemed placed in service after that date. The denominator includes all properly capitalized costs of a new qualified facility or CCE. Further, the denominator may (at the election of the taxpayer) include the cost of new equipment for a pipeline owned and used exclusively by that taxpayer to transport carbon oxide captured from that taxpayer’s qualified facility that would otherwise be emitted into the atmosphere.

The EAC welcomes and supports the inclusion of this rule in the proposed regulations. Such inclusion will likely result in investors enhancing their deployment of CCUS projects and their adopting greater innovation in capture and storage technology.<sup>24</sup> The EAC offers the following suggestions to provide additional certainty and incentive for investment decisions which will further unleash the flow of capital into CCUS projects, generating associated clean energy and manufacturing jobs as the national economy recovers from the 2020 COVID pandemic.

**A. Treasury should treat independent functioning process trains as a “unit of carbon capture equipment.”**

While Treasury references a “unit of carbon capture equipment” in the examples provided in 1.45Q-2(g)(5) as well as in the recapture provisions in 1.45Q-5(g), no definition or methodology to determine the unit is provided. The determination of a unit of carbon capture equipment is included in two critical calculations: (1) the 80/20 rule and (2) the volumes of qualified carbon oxide eligible for the expanded 45Q credit under Section 45Q(b)(2).

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<sup>22</sup> 80/20 rule was first introduced in Rev. Rul. 94-31.

<sup>23</sup>The total of the FMV of used components and the cost of the new components of property.

<sup>24</sup> Preamble to Proposed Regulations, Section 2.C.

Prop. Treas. Reg. § 1.45Q-2(c) defines CCE as all equipment necessary to capture and/or process carbon oxide until the carbon oxide is transported for disposal, injection or utilization. Similarly, Treasury should provide that each independently-functioning process train constitutes an individual unit of carbon capture equipment. Such definition is consistent with the examples in Prop. Treas. Reg. § 1.45Q-1(g)(4) where each unit of carbon capture equipment has the ability to individually capture, process, and treat the qualified carbon oxide up to the point of transportation without depending on the other units of carbon capture equipment. Treasury should also clarify that an asset utilized in a Prop. Treas. Reg. § 1.45Q-2(d)(3) manufacturing process (e.g. CO<sub>2</sub> is not the exclusive commercial product) is not CCE.

**B. Treasury should provide guidance that the Fair Market Value (“FMV”) of the used property should be calculated as of the start of construction and use “Replacement Cost New” minus new physical depreciation to value the assets.**

In Section 45Q(b)(2)(A)(ii), the determination of volumes eligible for the higher credit is based on a formula including “the total amount of carbon dioxide capture capacity of the CCE in service at such facility on February 8, 2018.” Given that the purpose of the “80/20” rule is to permit taxpayers to qualify for the new credit by allowing them to deem qualified facilities or CCE containing used equipment as placed in service after the BBA, Treasury should permit taxpayers to value that used property as of the start of construction. In order to simplify the administration of the rule and add certainty to investment decisions, Treasury should provide that taxpayers can value their property using the “Replacement Cost New” methodology with adjustments for Physical Depreciation.<sup>25</sup>

Despite Prop. Treas. Reg. § 1.45Q-2(c)(3) affirmatively excluding pipelines and other assets used in the transportation of captured carbon oxide from the definition of CCE, Prop. Treas. Reg. § 1.45Q-2(g)(5) relaxes this exclusion solely for the purposes of the 80/20 rule. The proposed regulations provide that the denominator in the 80/20 rule may also include other costs necessary to achieve the policy goals of Section 45Q such as new equipment for a pipeline used exclusively by the taxpayer to transport carbon oxides captured from that taxpayer’s Qualified Facility that would otherwise be emitted into the atmosphere. As such, EAC recommends Treasury provide that other similar costs such as those attributable to any disposal well used exclusively by the taxpayer as necessary for achieving the same underlying policy goals be included in the denominator for purposes of the 80/20 rule.

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<sup>25</sup> Replacement Cost New Less Depreciation (RCNLD) is a Generally Accepted Valuation Principle which values property based on the cost of building an exact replica of the property then adjusting that cost for the physical depreciation of the existing facility.

EAC appreciates this opportunity to provide its views on these very important proposed regulations. We are available to answer any questions.

Respectfully submitted,

Energy Advance Center

*George D. Baker*

George D. Baker,  
Williams & Jensen PLLC  
Counsel for Energy Advance Center



**Attachment A:**  
**45Q Tax Credit Application/Form 8933**

The following modification of Form 8933 and related schedules provides a possible solution to quantify the tax credit based on multiple scenarios. The illustration would facilitate reporting of information, which is already reported via the EPA Greenhouse Gas Reporting Tool, as an effective means to report mass balance accounting for anthropogenic sources of CO<sub>2</sub> for purposes of a taxpayer's Section 45Q credit documentation.

## 45Q Tax Credit Application

The following example tax estimate form and schedules provide a possible solution to quantify the tax credit based on multiple scenarios:

(Form 8933W)		45Q Estimated Tax Worksheet	
<b>A</b>	Company Name	Taxpayer Company Name	
<b>B</b>	Company Address	Taxpayer Company Address	
	City, State, ZIP Code		
<b>C</b>	Company Contact	Taxpayer Company Contact	
<b>Part I CO<sub>2</sub> Supplied (from Subpart PP)</b>			
<b>1</b>	EPA GHGRR ID # for Subpart PP	#####	
<b>2</b>	EPA GHGRR Facility Name	Facility Name	
<b>3</b>	Tonnes of CO <sub>2</sub> as reported in Subpart PP, 98.426.f.10 (supplied to EOR)		100,000
<b>4</b>	Tonnes of CO <sub>2</sub> as reported in Subpart PP, 98.426.f.11 (supplied to geologic storage)		50,000
<b>Part II CO<sub>2</sub> Supplied to EOR Projects (from Line 14 on Schedule A)</b>			
	Company Name	Facility Name	Net Tonnes of CO <sub>2</sub> Associated Storage
<b>5a</b>			47,000
<b>5b</b>			
<b>5c</b>			
<b>5d</b>			
<b>5e</b>			
<b>6</b>	Sum of lines 5a through 5e		47,000
<b>7</b>	Multiply Line 6 by \$35		\$1,645,000
<b>Part III CO<sub>2</sub> Supplied to EOR Projects Reporting Subpart RR (from Line on 10 Schedule B)</b>			
	Company Name	Facility Name	Net Tonnes of CO <sub>2</sub> Storage
<b>8a</b>			48,000
<b>8b</b>			
<b>8c</b>			
<b>8d</b>			
<b>8e</b>			
<b>9</b>	Sum of lines 8a through 8e		48,000
<b>10</b>	Multiply Line 9 by \$35		\$1,680,000
<b>Part IV CO<sub>2</sub> Supplied to Saline Injection Reporting Subpart RR (from Line on 15 Schedule B)</b>			
	Company Name	Facility Name	Net Tonnes of CO <sub>2</sub> Storage
<b>11a</b>			49,000
<b>11b</b>			
<b>11c</b>			
<b>11d</b>			
<b>11e</b>			
<b>12</b>	Sum of lines 11a through 11e		49,000
<b>13</b>	Multiply Line 12 by \$50		\$2,450,000
<b>Part V Total Amount of 45Q Tax Credit</b>			
<b>14</b>	Total for EOR Projects (Add line 10 to line 7)		\$3,325,000
<b>15</b>	Total for Saline Injection (from line 13)		\$2,450,000
<b>16</b>	Add line 15 to line 14		\$5,775,000

### Instructions for Form 8933W

Line	Instruction
<b>A</b>	Taxpayer official company name
<b>B</b>	Taxpayer's mailing address
<b>C</b>	Taxpayer's point of contact
<b>Part I</b>	This section identifies the source and amount of CO <sub>2</sub> being claimed in this filing
<b>1</b>	The taxpayer's facility ID# used for reporting Subpart PP in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>2</b>	The taxpayer's facility name used for reporting Subpart PP in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>3</b>	Report the amount of CO <sub>2</sub> supplied to EOR operations as required by Subpart PP, 98.426.f.10
<b>4</b>	Report the amount of CO <sub>2</sub> supplied to geologic storage operations as required by Subpart PP, 98.426.f.11
<b>Part II</b>	This section summarizes multiple EOR operations that may have received a portion of the CO <sub>2</sub> begin claimed in this filing. The values for each of these rows are derived from a separate Schedule A filed for each EOR operation
<b>5a-5e</b>	List the EOR Company Name, Facility Name, and the amount of CO <sub>2</sub> stored in association with the EOR Operation. This numerical value can be found on Line 14 on Schedule A
<b>6</b>	Sum of lines 5a-5e represents the total net amount of CO <sub>2</sub> stored in association with the EOR operation
<b>7</b>	45Q establishes a \$35 credit for each tonne of CO <sub>2</sub> stored in an EOR operation. This line calculates that total amount by multiplying \$35 times Line 6.
<b>Part III</b>	This section summarizes multiple EOR operations that have opted into Subpart RR reporting under the GHGRR that may have received a portion of the CO <sub>2</sub> begin claimed in this filing. The values for each of these rows is derived from a separate Schedule B filed for each EOR operation.
<b>8a-8e</b>	List the EOR Company Name, Facility Name, and the amount of CO <sub>2</sub> stored in association with the EOR Operation. This numerical value can be found on Line 10 on Schedule B.
<b>9</b>	Sum of lines 8a-8e represents the total net amount of CO <sub>2</sub> stored in association with the EOR operation
<b>10</b>	45Q establishes a \$35 credit for each tonne of CO <sub>2</sub> stored in an EOR operation. This line calculates that total amount by multiplying \$35 times Line 9.
<b>Part IV</b>	This section summarizes multiple geologic storage operations that have reported via Subpart RR reporting under the GHGRR that may have received a portion of the CO <sub>2</sub> begin claimed in this filing. The values for each of these rows is derived from a separate Schedule B filed for each saline injection operation.
<b>11a-11e</b>	List the geologic storage operations Company Name, Facility Name, and the amount of CO <sub>2</sub> stored. This numerical value can be found on Line 15 on Schedule B.
<b>12</b>	Sum of lines 11a-11e represents the total net amount of CO <sub>2</sub> stored in association with the saline injection operation
<b>13</b>	45Q establishes a \$50 credit for each tonne of CO <sub>2</sub> stored via saline injection. This line calculates that total amount by multiplying \$50 times Line 12.
<b>Part V</b>	This section calculates the total tax credit eligible to be claimed by totaling the credit amount derived from the tonnes of CO <sub>2</sub> stored in association with and EOR operation and stored via saline injection.
<b>14</b>	This line totals the credit amount of CO <sub>2</sub> stored in association with an EOR operation (add line 10 to line 7)
<b>15</b>	This line totals the credit amount of CO <sub>2</sub> stored via saline injection form line 13
<b>16</b>	This line totals lines 14 and line 15 and represents the total amount of the tax credit available for this filing

**Schedule A  
(Form 8933A)**

**Secure Geologic Storage CSA / ANSI ISO 27916:19)**

<b>A</b>	Company Name	Company Name		
<b>B</b>	Company Address	Company Address		
	City, State, ZIP Code			
<b>C</b>	Company Contact	Company Contact		
<b>D</b>	Taxpayer Name	Taxpayer Company Name		
<b>Part I CO<sub>2</sub> Received by EOR Project (from Subpart UU)</b>				
<b>1</b>	EPA GHGRR ID # for Subpart UU	#####		
<b>2</b>	EPA GHGRR Facility Name	Facility Name		
<b>3</b>	Tonnes of CO <sub>2</sub> reported via Subpart UU for facility named on line 2	100,000		
<b>4</b>	Tonnes of CO <sub>2</sub> reported via Subpart UU received from Taxpayer listed on line D	50,000		
<b>Part II CO<sub>2</sub> Emissions from Equipment (from Subpart W)</b>				
<b>5</b>	EPA GHGRR ID # for Subpart W	#####		
<b>6</b>	EPA GHGRR Basin Name	Basin Name		
<b>7</b>	Tonnes of CO <sub>2</sub> emissions reported for basin	4,000		
<b>8</b>	Tonnes of CO <sub>2</sub> reported for facility named on line 2 <b>only</b>	3,000		
<b>9</b>	Tonnes of CO <sub>2</sub> reported for facility named on line 2 <b>only</b> from combustion sources	1,000		
<b>10</b>	Tonnes of CO <sub>2</sub> vented (subtract Line 9 from line 8)	2,000		
<b>Part III CO<sub>2</sub> Emissions from Surface Leakage</b>				
<b>11</b>	Source #	Source Description	Tonnes Released	
	1	Source 1	<b>11a</b>	400
	2	Source 2	<b>11b</b>	600
			<b>11c</b>	
			<b>11d</b>	
			<b>11e</b>	
<b>12</b>	Total of lines 11a through 11e			1,000
<b>Part IV Net CO<sub>2</sub> Storage Associated with the EOR Project</b>				
<b>13</b>	Add line 10 and line 12			3,000
<b>14</b>	Net CO <sub>2</sub> Associated Storage (subtract line 13 from line 4)			47,000
<b>Part V Demonstration of Secure Geologic Storage</b>				
<b>15</b>	Was an EOR Operations Management Plan conforming to CSA / ANSI ISO 27916:19 in effect at the location named on line 2 during the claim period?			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<b>16</b>	If the answer to line 16 was 'No', you cannot complete this form. Please instead complete Form 8933B.			

### Instructions for Form 8933A

Line	Instruction
<b>A</b>	Official company name
<b>B</b>	Company mailing address
<b>C</b>	Company point of contact
<b>D</b>	Taxpayer official company name
<b>Part I</b>	This section identifies the EOR operation that received the CO <sub>2</sub> from the taxpayer being claimed in this filing
<b>1</b>	The EOR company's facility ID# used for reporting Subpart UU in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>2</b>	The EOR company's facility name used for reporting Subpart UU in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>3</b>	Report the total amount of CO <sub>2</sub> reported by Subpart UU, 98.476a-b for the facility named on line 2
<b>4</b>	Report the amount of CO <sub>2</sub> received from taxpayer only. This value is included in the number reported in Line 3, but is based on commercial custody transfer meters.
<b>Part II</b>	This section summarizes emissions associated with the EOR operation reported under Subpart W of the GHGRR. The purpose of this section is to identify the amount of CO <sub>2</sub> that is directly emitted to the atmosphere as part of the of the normal course of operations of the EOR facility and wells. This section excludes CO <sub>2</sub> emissions generated as a result of combustion activities that are reported under Subpart W, since those emissions are not comprised of CO <sub>2</sub> captured by the taxpayer.
<b>5</b>	The EOR company's facility ID# used for reporting Subpart W in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>6</b>	The EOR company's basin name used for reporting Subpart W in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>7</b>	Report the total amount of CO <sub>2</sub> reported under Subpart W, 98.236 for the entire basin named on line 6
<b>8</b>	Report the total amount of CO <sub>2</sub> reported under Subpart W, 98.236 only for the facility named on line 2. This value is included in the number reported in Line 7, but reflects the specific EOR operation (facility) where the taxpayer's CO <sub>2</sub> is being injected (if different than the basin total).
<b>9</b>	Report the total amount of CO <sub>2</sub> derived from combustion sources reported under Subpart W, 98.236.z only for the facility named on line 2.
<b>10</b>	Subtract Line 9 from Line 8 to show the amount of CO <sub>2</sub> reported under Subpart W that is attributed from direct emissions of CO <sub>2</sub> at the facility injecting the taxpayer's CO <sub>2</sub>
<b>Part III</b>	This section summarizes sources of surface leakage associated with the EOR operations that are not included in Subpart W emissions reporting. These sources primarily represent other (uncommon) mechanical upset events that could lead to a surface release of CO <sub>2</sub> . EPA recognizes that CO <sub>2</sub> storage is a common occurrence and CO <sub>2</sub> can be safely stored where injected in EOR permitted wells under the UIC Class II program for the purpose of oil or gas related recovery. (US EPA Office of Water Memorandum April 23, 2015; 80 Fed. Reg. at 64585). The UIC Program Requirements prescribed in 40 CFR, Subchapter D, Sections 144-146 is a comprehensive national system of regulation rather than relying on case by case individual MVR plan submittal and approval. The UIC program establishes requirements for site characterization free of known open faults and fractures, area of review, well construction (siting, materials, isolation, well logs etc.), operations (operating pressure limits, record keeping), mechanical integrity testing, monitoring, reporting of injection pressures and volumes, including verification regulations for all Class II injection well operations, and closure (plugs, cement, etc.). The UIC program provides for protection of underground sources of drinking water by requiring safe installation and operation of wells with an emphasis on containment. This same containment assurance emphasis inherently provides for prevention of leakage to the atmosphere.
<b>11a-11b</b>	Enter a numeric sequence and source description for each event that lead to surface leakage and include the mass of CO <sub>2</sub> released during that event following equation RR-10 of Subpart RR, 98.443.e
<b>12</b>	Total of lines 11a-11b to represent the total amount of CO <sub>2</sub> released to the surface via leakage events
<b>Part IV</b>	This section produced a net mass of CO <sub>2</sub> injected after netting the total mass received by losses from emission and surface leakage events
<b>13</b>	Add line 10 and line 12 to determine total the amount of CO <sub>2</sub> emissions from equipment and surface leakage
<b>14</b>	Subtract line 13 from line 14 to represent the amount of net CO <sub>2</sub> injected for associated storage. This is the value that will be transferred to the 45Q tax credit form in lines 5a-5e for this EOR operation
<b>Part V</b>	This section provides assurance that the EOR operation followed an EOR Operations Management Plan that conformed to either CSA / ANSI ISO 27916:19 whereby processes to ensure geologic containment is maintained.
<b>15</b>	Check Yes if an EOR Operations Management Plan was in place. Check No if an alternative was used.
<b>16</b>	Directs the taxpayer to 8933B

**Schedule B  
(Form 8933B)**

**Secure Geologic Storage (Subpart RR)**

<b>A</b>	Company Name	Company Name	
<b>B</b>	Company Address	Company Address	
	City, State, ZIP Code		
<b>C</b>	Company Contact	Company Contact	
<b>D</b>	Taxpayer Name	Taxpayer Company Name	
<b>Part I CO<sub>2</sub> reported in Subpart RR</b>			
<b>1</b>	EPA GHGRR ID # for Subpart RR	#####	
<b>2</b>	EPA GHGRR Facility Name	Facility Name	
<b>3</b>	Did this facility actively produce oil, natural gas, or other fluids?	<input checked="" type="checkbox"/>	Yes (Complete Part II)
		<input type="checkbox"/>	No (Complete Part III)
<b>Part II Net CO<sub>2</sub> Storage (Equation RR-11 – EOR Project)</b>			
<b>4</b>	Tonnes of CO <sub>2</sub> injected		50,000
<b>5</b>	Tonnes of CO <sub>2</sub> produced	0	
<b>6</b>	Tonnes of CO <sub>2</sub> emitted by surface leakage	0	
<b>7</b>	Tonnes of CO <sub>2</sub> emitted from equipment leaks and vented emissions (injection)	500	
<b>8</b>	Tonnes of CO <sub>2</sub> emitted from equipment leaks and vented emissions (production)	1,500	
<b>9</b>	Sum of lines 5 through 8		2,000
<b>10</b>	Net CO <sub>2</sub> Storage (subtract line 9 from line 4)		48,000
<b>Part III Net CO<sub>2</sub> Storage (Equation RR-12 – Saline Aquifer)</b>			
<b>11</b>	Tonnes of CO <sub>2</sub> injected		
<b>12</b>	Tonnes of CO <sub>2</sub> emitted by surface leakage		
<b>13</b>	Tonnes of CO <sub>2</sub> emitted from equipment leaks and vented emissions (injection)		
<b>14</b>	Sum of lines 12 and 13		
<b>15</b>	Net CO <sub>2</sub> Storage (subtract line 14 from line 11)		
<b>Part IV Demonstration of Secure Geologic Storage</b>			
<b>16</b>	Was an EPA approved MRV Plan in effect at the location named on line 2 during the claim period?	<input checked="" type="checkbox"/>	Yes
		<input type="checkbox"/>	No
<b>17</b>	If the answer to line 16 was 'No', you cannot complete this form. Please instead complete Form 8933A.		

### Instructions for Form 8933B

Line	Instruction
<b>A</b>	Official company name
<b>B</b>	Company mailing address
<b>C</b>	Company point of contact
<b>D</b>	Taxpayer official company name
<b>Part I</b>	This section identifies the EOR operations who opted into Subpart RR reporting or the saline injection operation that received the CO <sub>2</sub> from the taxpayer being claimed in this filing
<b>1</b>	The company's facility ID# used for reporting Subpart RR in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>2</b>	The EOR company's facility name used for reporting Subpart RR in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>3</b>	Line 3 determines if Part II or Part III should be completed based on the type of operations. If the operation is an EOR facility that opted into Subpart RR reporting, then Part II is required. If the operation is a saline injection facility, the Part III is required.
<b>Part II</b>	This section summarizes emissions associated with the EOR operation that opted in to reporting under Subpart RR of the GHGRR. This section follows equation RR-11 defined in Subpart RR, 98.443.f.1 and is used to identify the net amount of CO <sub>2</sub> injected after accounting for emission due to equipment and surface leakage.
<b>4</b>	Report the total amount of CO <sub>2</sub> injected reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2i</sub> ) for the facility named on line 2
<b>5</b>	Report the total amount of CO <sub>2</sub> produced reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2p</sub> ) for the facility named on line 2
<b>6</b>	Report the total amount of CO <sub>2</sub> emitted from surface leakage reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2e</sub> ) for the facility named on line 2
<b>7</b>	Report the total amount of CO <sub>2</sub> emitted from equipment leaks and vented emissions from injection well systems reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2fi</sub> ) for the facility named on line 2
<b>8</b>	Report the total amount of CO <sub>2</sub> emitted from equipment leaks and vented emissions from production well systems reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2fip</sub> ) for the facility named on line 2
<b>9</b>	Add lines 5 through 8 to determine the total amount of CO <sub>2</sub> emissions from equipment and surface leakage
<b>10</b>	Subtract line 9 from line 4 to represent the amount of net CO <sub>2</sub> injected for associated storage. This is the value that will be transferred to the 45Q tax credit form in lines 8a-8e for this EOR operation
<b>Part III</b>	This section summarizes emissions associated with the saline injection operation reporting under Subpart RR, 98.443.f.2 of the GHGRR. This section follows equation RR-12 defined in Subpart RR and is used to identify the net amount of CO <sub>2</sub> injected after accounting for emission due to equipment and surface leakage.
<b>11</b>	Report the total amount of CO <sub>2</sub> injected reported by Subpart RR, 98.443.f.2 (RR-12, CO <sub>2i</sub> ) for the facility named on line 2
<b>12</b>	Report the total amount of CO <sub>2</sub> emitted from surface leakage reported by Subpart RR, 98.443.f.2 (RR-12, CO <sub>2e</sub> ) for the facility named on line 2
<b>13</b>	Report the total amount of CO <sub>2</sub> emitted from equipment leaks and vented emissions from injection well systems reported by Subpart RR, 98.443.f.2 (RR-12, CO <sub>2fi</sub> ) for the facility named on line 2
<b>14</b>	Add lines 12 and 13 to determine the total amount of CO <sub>2</sub> emissions from equipment and surface leakage
<b>15</b>	Subtract line 14 from line 11 to represent the amount of net CO <sub>2</sub> injected for associated storage. This is the value that will be transferred to the 45Q tax credit form in lines 11a-11e for this EOR operation
<b>Part IV</b>	This section provides assurance that an EPA approved MRV Plan was in effect at the facility, whereby processes to ensure geologic storage is maintained.
<b>16</b>	Check Yes if an MRV Plan was in place. Check No if an alternative was used.
<b>17</b>	Directs the taxpayer to 8933A

**Schedule B  
(Form 8933B)**

**Secure Geologic Storage (Subpart RR)**

<b>A</b>	Company Name	EOR Company Name	
<b>B</b>	Company Address	Saline Injection Company Address	
	City, State, ZIP Code		
<b>C</b>	Company Contact	Saline Injection Company Contact	
<b>D</b>	Taxpayer Name	Taxpayer Company Name	
<b>Part I CO<sub>2</sub> reported in Subpart RR</b>			
<b>1</b>	EPA GHGRR ID # for Subpart RR	#####	
<b>2</b>	EPA GHGRR Facility Name	Facility Name	
<b>3</b>	Did this facility actively produce oil, natural gas, or other fluids?	<input type="checkbox"/> Yes (Complete Part II)	
		<input checked="" type="checkbox"/> No (Complete Part III)	
<b>Part II Net CO<sub>2</sub> Storage (Equation RR-11 – EOR Project)</b>			
<b>4</b>	Tonnes of CO <sub>2</sub> injected		
<b>5</b>	Tonnes of CO <sub>2</sub> produced		
<b>6</b>	Tonnes of CO <sub>2</sub> emitted by surface leakage		
<b>7</b>	Tonnes of CO <sub>2</sub> emitted from equipment leaks and vented emissions (injection)		
<b>8</b>	Tonnes of CO <sub>2</sub> emitted from equipment leaks and vented emissions (production)		
<b>9</b>	Sum of lines 5 through 8		
<b>10</b>	Net CO <sub>2</sub> Storage (subtract line 9 from line 4)		
<b>Part III Net CO<sub>2</sub> Storage (Equation RR-12 – Saline Aquifer)</b>			
<b>11</b>	Tonnes of CO <sub>2</sub> injected		50,000
<b>12</b>	Tonnes of CO <sub>2</sub> emitted by surface leakage	0	
<b>13</b>	Tonnes of CO <sub>2</sub> emitted from equipment leaks and vented emissions (injection)	1,000	
<b>14</b>	Sum of lines 12 and 13		1,000
<b>15</b>	Net CO <sub>2</sub> Storage (subtract line 14 from line 11)		49,000
<b>Part IV Demonstration of Secure Geologic Storage</b>			
<b>16</b>	Was an EPA approved MRV Plan in effect at the location named on line 2 during the claim period?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<b>17</b>	If the answer to line 16 was 'No', you cannot complete this form. Please instead complete Form 8933A.		

### Instructions for Form 8933B

Line	Instruction
<b>A</b>	Official company name
<b>B</b>	Company mailing address
<b>C</b>	Company point of contact
<b>D</b>	Taxpayer official company name
<b>Part I</b>	This section identifies the EOR operations who opted into Subpart RR reporting or the saline injection operation that received the CO <sub>2</sub> from the taxpayer being claimed in this filing
<b>1</b>	The company's facility ID# used for reporting Subpart RR in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>2</b>	The EOR company's facility name used for reporting Subpart RR in the EPA Greenhouse Gas Reporting Rule (GHGRR)
<b>3</b>	Line 3 determines if Part II or Part III should be completed based on the type of operations. If the operation is an EOR facility that opted into Subpart RR reporting, then Part II is required. If the operation is a saline injection facility, the Part III is required.
<b>Part II</b>	This section summarizes emissions associated with the EOR operation that opted in to reporting under Subpart RR of the GHGRR. This section follows equation RR-11 defined in Subpart RR, 98.443.f.1 and is used to identify the net amount of CO <sub>2</sub> injected after accounting for emission due to equipment and surface leakage.
<b>4</b>	Report the total amount of CO <sub>2</sub> injected reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2i</sub> ) for the facility named on line 2
<b>5</b>	Report the total amount of CO <sub>2</sub> produced reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2p</sub> ) for the facility named on line 2
<b>6</b>	Report the total amount of CO <sub>2</sub> emitted from surface leakage reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2E</sub> ) for the facility named on line 2
<b>7</b>	Report the total amount of CO <sub>2</sub> emitted from equipment leaks and vented emissions from injection well systems reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2FI</sub> ) for the facility named on line 2
<b>8</b>	Report the total amount of CO <sub>2</sub> emitted from equipment leaks and vented emissions from production well systems reported by Subpart RR, 98.443.f.1 (RR-11, CO <sub>2FIP</sub> ) for the facility named on line 2
<b>9</b>	Add lines 5 through 8 to determine the total amount of CO <sub>2</sub> emissions from equipment and surface leakage
<b>10</b>	Subtract line 9 from line 4 to represent the amount of net CO <sub>2</sub> injected for associated storage. This is the value that will be transferred to the 45Q tax credit form in lines 8a-8e for this EOR operation
<b>Part III</b>	This section summarizes emissions associated with the saline injection operation reporting under Subpart RR, 98.443.f.2 of the GHGRR. This section follows equation RR-12 defined in Subpart RR and is used to identify the net amount of CO <sub>2</sub> injected after accounting for emission due to equipment and surface leakage.
<b>11</b>	Report the total amount of CO <sub>2</sub> injected reported by Subpart RR, 98.443.f.2 (RR-12, CO <sub>2i</sub> ) for the facility named on line 2
<b>12</b>	Report the total amount of CO <sub>2</sub> emitted from surface leakage reported by Subpart RR, 98.443.f.2 (RR-12, CO <sub>2E</sub> ) for the facility named on line 2
<b>13</b>	Report the total amount of CO <sub>2</sub> emitted from equipment leaks and vented emissions from injection well systems reported by Subpart RR, 98.443.f.2 (RR-12, CO <sub>2FI</sub> ) for the facility named on line 2
<b>14</b>	Add lines 12 and 13 to determine the total amount of CO <sub>2</sub> emissions from equipment and surface leakage
<b>15</b>	Subtract line 14 from line 11 to represent the amount of net CO <sub>2</sub> injected for associated storage. This is the value that will be transferred to the 45Q tax credit form in lines 11a-11e for this EOR operation
<b>Part IV</b>	This section provides assurance that an EPA approved MRV Plan was in effect at the facility, whereby processes to ensure geologic storage is maintained.
<b>16</b>	Check Yes if an MRV Plan was in place. Check No if an alternative was used.
<b>17</b>	Directs the taxpayer to 8933A



Attachment B:

# **White Paper: Calculating EOR Control Efficiency for Anthropogenic CO<sub>2</sub> Using Existing GHG Reporting Tools**

**August 1, 2020**

## **Abstract**

This white paper proposes a solution for mass balance accounting for anthropogenic sources of CO<sub>2</sub> in an Enhanced Oil Recovery (“EOR”) operation utilizing existing, required information reporting via the U.S. Environmental Protection Agency (“EPA”) Greenhouse Gas Reporting Tool. Such a solution would allow this methodology to be independently utilized by third parties for various environmental or financial purposes outside of the traditional and regulated EOR production process.

## **Problem Statement**

Currently, there is no clear, regulatory supported methodology for accounting for anthropogenic sources of CO<sub>2</sub> used in EOR operations that provides sufficient transparency in the amount of anthropogenic CO<sub>2</sub> that is captured, transported, and that is ultimately incidentally stored underground in the process. As a result, programs such as the Section 45Q tax credit do not have an existing framework to use for qualifying applicants to demonstrate that anthropogenic CO<sub>2</sub> volumes covered by the program are ultimately injected.

## **Background**

### **CO<sub>2</sub> EOR Infrastructure**

The utilization of CO<sub>2</sub> for enhanced oil recovery is not new to the oil & gas industry and has been demonstrated through several decades to be an effective means of recovering existing, stranded deposits of oil. In the majority of CO<sub>2</sub> EOR floods, the CO<sub>2</sub> used in the process is sourced from natural deposits of CO<sub>2</sub>. Through the years, a mature infrastructure has been developed to produce, transport, inject, and recycle CO<sub>2</sub> for EOR operations, thereby creating an immediate opportunity for capture and utilization of anthropogenic sources of CO<sub>2</sub> in and around areas of this established infrastructure. For all practical purposes for operations, the origin of the CO<sub>2</sub> molecule does not alter the nature of the design and operations nor does it change the risk profile of any existing EOR operation. As the CO<sub>2</sub> recycle and injection process matures, more and more of the CO<sub>2</sub> inherently remains in the geologic formation being targeted for oil production. At the end of the life of the EOR project, the CO<sub>2</sub> that was injected through the life of the project is trapped by the same geologic features that securely trapped the hydrocarbons for millions of years.

### **Government Incentive Programs**

Government agencies such as the Department of Energy and Department of the Treasury have instituted programs to incentivize capture of anthropogenic CO<sub>2</sub> by providing loans, grants, and/or tax incentives to help overcome economic hurdles for capture technologies in existing industries. Paramount to any government funded program is the ability to provide transparent, repeatable data to ensure the objectives of the program are being met. In the case of anthropogenic CO<sub>2</sub> capture, this would include the tracking of the amount of CO<sub>2</sub> captured and the disposition of that CO<sub>2</sub> at the end of the process. This can be accomplished in a number of ways.

### **Environmental Regulations**

Like other oil and gas activities, an EOR operation is subject to a series of existing, common environmental regulations at both the Federal and State levels. Surface discharges of wastewater are regulated by EPA’s National Pollution Discharge Elimination System (“NPDES”) program and usually administered by the state via primacy from EPA. Air emissions, included greenhouse gases, are regulated by the Clean Air Act and usually administered by state via

primacy from EPA. Most EOR operations are also subject to EPA's Spill Prevention Control and Countermeasures ("SPCC") regulations providing for release containment and emergency response measures.

### **Underground Injection Control (UIC) Regulations**

All injection wells used in the operations are regulated under the Safe Drinking Water Act ("SDWA") UIC Class II well program. The UIC program prescribed in 40 CFR, Subchapter D, Sections 144-146 is a comprehensive national system of regulation that establishes requirements for site characterization free of known open faults and fractures, area of review, well construction (siting, materials, isolation, well logs etc.), operations (operating pressure limits, record keeping), mechanical integrity testing, monitoring, reporting of injection pressures and volumes, including verification regulations for all Class II injection well operations, and closure (plugs, cement, etc.). The UIC program provides for protection of underground sources of drinking water by requiring safe installation and operation of wells with an emphasis on containment. This same containment assurance emphasis inherently provides for prevention of leakage to the atmosphere. The UIC program is either administered by the EPA or by the states via primacy where state oil and gas regulations are required to be at least equal to or more stringent than federal requirements.

The UIC program, by design, provides a superior mechanism to case-by-case plans like those required under GHGRP Subpart RR's monitoring, reporting, and verification ("MRV") requirement. Unlike MRV Plans that require EPA to approve a plan submitted by the operator, the UIC programs address subsurface containment and multiple stages of the operation starting with the siting and installation of new wells, well integrity testing, fluid injection monitoring, and abandonment requirements. These are prescribed and enforced via regulation for EOR operations. EPA has recognized since 2015 that CO<sub>2</sub> storage in EOR is a common occurrence and CO<sub>2</sub> can be safely stored where injected in EOR permitted wells under the UIC Class II program for the purpose of oil or gas related recovery. (US EPA Office of Water Memorandum April 23, 2015; 80 Fed. Reg at 64585).

### **EPA's Greenhouse Gas Mandatory Reporting Rule**

"On October 30, 2009, the U.S. Environmental Protection Agency (EPA) published a rule (40 CFR Part 98) for the mandatory reporting of greenhouse gases (GHG) from sources that in general emit 25,000 metric tons or more of carbon dioxide equivalent per year in the United States. Smaller sources and certain sectors such as the agricultural sector and land use changes are not included in the Greenhouse Gas Reporting Program. Implementation of 40 CFR Part 98 is referred to as the Greenhouse Gas Reporting Program (GHGRP). 40 CFR part 98 applies to direct greenhouse gas emitters, fossil fuel suppliers, industrial gas suppliers, and facilities that inject CO<sub>2</sub> underground for sequestration or other reasons. Reporting is at the facility level except for certain suppliers of fossil fuels and industrial greenhouse gases. Because suppliers are facilities or entities that supply certain products (e.g., fossil fuels or certain industrial gases) into the economy that, when combusted, released, or oxidized, result in GHG emissions, the emissions do not take place at the suppliers' reporting location but instead are distributed throughout the country and used. The emissions reporting requirements for direct emitting facilities are specified in 98.3(c)(4) and the GHG reporting requirements for suppliers are specified in 98.3(c)(5)."<sup>1</sup>

There are several relevant subparts of 40 CFR part 98 that require reporting of greenhouse gas (CO<sub>2</sub>) emissions related to the elements included in EOR operations using anthropogenic sources of CO<sub>2</sub> (Subpart PP, Subpart UU, and Subpart W).

## **Subpart PP**

“Subpart PP requires Suppliers of CO<sub>2</sub> to report the mass of CO<sub>2</sub> captured from production process units and extracted from production wells, and the mass of CO<sub>2</sub> that is imported and exported.”<sup>2</sup>

In the context of this discussion, Suppliers would include all sources of CO<sub>2</sub> that would be captured and delivered by an anthropogenic source to an EOR operation. In addition, all Suppliers of natural sources of CO<sub>2</sub> used in an EOR operation would also be required to report.

## **Subpart UU**

“All facilities that inject CO<sub>2</sub> underground must report basic information on the amount of CO<sub>2</sub> received for injection.”<sup>3</sup> “The subpart UU source category comprises a well or group of wells that inject CO<sub>2</sub> into the subsurface, including Underground Injection Control (UIC) Class II wells used to enhance oil and gas recovery and wells receiving a geologic sequestration research and development (R&D) exemption from subpart RR. Facilities that report under subpart RR for a well or group of wells are not required to report under subpart UU for that well or group of wells.”<sup>3</sup>

In the context of this discussion, EOR operators are required to report the mass of CO<sub>2</sub> received for injection. In industry vernacular this would generally be the equivalent of the ‘purchased’ CO<sub>2</sub> as opposed to the ‘recycled’ CO<sub>2</sub>.

## **Subpart W**

“Each owner or operator of onshore petroleum and natural gas production wells and related equipment reports under subpart W the combined emissions for all wells that they own or operate within each hydrocarbon basin. Emissions from stationary and portable fuel combustion equipment are reported under “Subpart W” of the GHGRP.”<sup>4</sup>

In the context of this discussion, emissions associated with the operations of all phases of the EOR process would be included in Subpart W. While the rule requires reporting at a basin level, the emission calculations are based on equipment at each facility located within each basin. The emissions factors and methodologies are prescribed in the rule and are applicable to various sources of CO<sub>2</sub> emissions related to the overall operations.

## **Subpart RR**

“On November 22, 2010, the U.S. Environmental Protection Agency (EPA) issued a final rule that requires facilities that conduct geologic sequestration of carbon dioxide (CO<sub>2</sub>) and all other facilities that inject CO<sub>2</sub> underground to report greenhouse gas (GHG) data to EPA annually.”<sup>5</sup>

In the context of this discussion, geologic sequestration operators are required to report the mass of CO<sub>2</sub> received for injection as well as various losses to the surface and subsurface. Additionally, an EPA-approved site-specific monitoring, reporting and verification (MRV) plan must be developed and implemented.

## **CSA/ANSI ISO 27916:19**

The International Organization for Standardization published this standard in 2019 and is titled: *Carbon dioxide capture, transportation and geological storage — Carbon dioxide storage using enhanced oil recovery (CO<sub>2</sub>-EOR)*. This standard was adopted in its entirety by the American National Standards Institute (ANSI) “This document applies to quantifying and documenting the

total CO<sub>2</sub> (and optionally the anthropogenic portion of the CO<sub>2</sub>) that is stored in association with CO<sub>2</sub>-EOR. The document recognizes that CO<sub>2</sub>-EOR is principally an oil recovery operation. Associated with this oil recovery, however, safe and long term CO<sub>2</sub> storage occurs. The absence of an accepted standard for demonstrating the safe, long-term containment of CO<sub>2</sub> in association with CO<sub>2</sub>-EOR and documenting the quantity of associated stored CO<sub>2</sub> constitutes one of the barriers to the increased use of anthropogenic CO<sub>2</sub> in CO<sub>2</sub>-EOR operations. The purpose of this document is to remove that barrier and thereby facilitate the exchange of goods and services related to the increased use and emissions reductions through associated storage by providing methods for demonstrating the safe, long-term containment of, and determining the quantity of CO<sub>2</sub> stored in association with CO<sub>2</sub>-EOR.”<sup>6</sup>

## Solution

This paper presents a solution to the need to provide clear, regulatory supported methodology for accounting for anthropogenic sources of CO<sub>2</sub> used in EOR operations that provides sufficient transparency in the amount of anthropogenic CO<sub>2</sub> that is captured, transported, and ultimately incidentally stored underground in the process. The basis for the solution is to use existing, required reporting via the EPA's GHGRP and EPA's reporting tool (e-GRRT) to provide the necessary information to conduct a mass balance calculation that ultimately can account for the supply, injection, and emissions of anthropogenic CO<sub>2</sub> in an EOR operations. The core mathematical equation and the corresponding GHG Subpart for a single supply source are quite simple and are as follows:

$$\text{Injection (UU)} = \text{Supply (PP)}$$

However, there is a relatively small amount of CO<sub>2</sub> emissions that occur through the normal operation in the EOR process, not dissimilar to most industrial processes. Emissions are reported under Subpart W in the GHGRP and are quantified using EPA's approved and required emission calculation methodologies applicable to the various sources of emissions. This provides a solution for calculating Net Utilization and can be represented as follows:

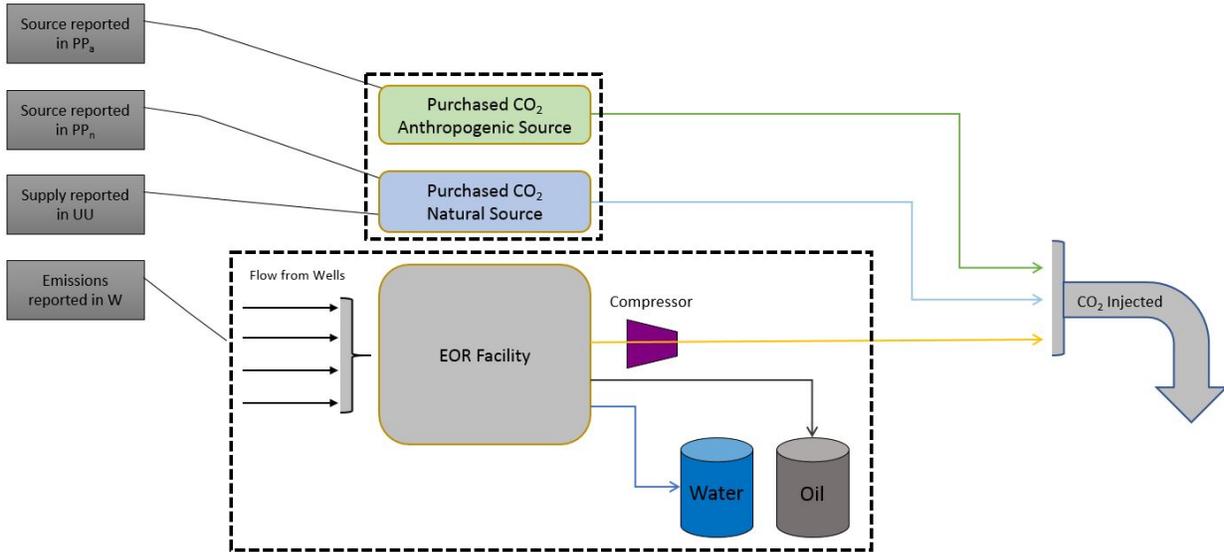
$$\text{Net Utilization} = \text{Supply (PP)} - \text{Emissions (W)}$$

In most EOR applications, the commercial operation may require supply from natural sources and possibly multiple anthropogenic sources. In that scenario, the formula is as follows:

$$\text{Net Utilization} = \Sigma \text{Supply (PP)}_{n+a} - \text{Emissions (W)}$$

*Where n = natural sources, a = anthropogenic sources*

## Simplified EOR Process Flow – Subpart W, UU, and PP



The EPA's GHGRP provides for adequate accounting for each of the elements of the equation and can be used to quantify the mass balance of CO<sub>2</sub> delivered to the EOR operation from any source while also quantifying the amount of CO<sub>2</sub> emitted as a result of normal operations from sources such as blowdowns and fugitives.

Since all suppliers are required to report volumes via Subpart PP, all EOR operators are required to report volumes received via Subpart UU, and volumes emitted are required by Subpart W, it is possible to develop a prorated calculation relative to each anthropogenic source that can yield a result of a percentage of anthropogenic CO<sub>2</sub> that ultimately gets injected in the EOR process → Net Utilization.

The following steps yield a resulting percentage of the net utilization of anthropogenic CO<sub>2</sub> injected in a hypothetical EOR example:

1. Verify that the amount of anthropogenic CO<sub>2</sub> received by an EOR operation ≥ the amount of anthropogenic CO<sub>2</sub> delivered by a supplier on the same system.

$$\text{Injection (UU)} \geq \Sigma \text{ Supply (PP)}_a$$

2. Determine the amount of anthropogenic CO<sub>2</sub> (% Injection<sub>a</sub>) as a percentage of the total amount of CO<sub>2</sub> [Injection (UU)] received from all sources.

$$\% \text{ Injection}_a = \Sigma \text{ Supply (PP)}_a \div \text{Injection (UU)} * 100$$

3. Determine the prorated amount of CO<sub>2</sub> emitted (W<sub>a</sub>) at the EOR operation reporting in Subpart W by multiplying the amount of % Injection<sub>a</sub> by the total emissions reported in Subpart W.

$$W_a = \% \text{ Injection}_a * \text{Emissions (W)}$$

4. Divide the W<sub>a</sub> result by the amount of anthropogenic supply [Supply Σ Supply (PP)<sub>a</sub>] received to determine the Net Utilization of anthropogenic CO<sub>2</sub>.

$$\text{Net Utilization} = (1 - [W_a \div \Sigma \text{ Supply (PP)}_a]) * 100$$

Here is an example using theoretical values to illustrate the calculation process:

Source	Subpart	CO <sub>2</sub> (tonnes)
Anthropogenic Source	PP <sub>a</sub>	1,000,000
Natural Source	PP <sub>n</sub>	2,000,000
EOR Operations	UU	3,000,000
EOR Operations	W (CO <sub>2</sub> emissions)	1,000

Step	Formula	Inputs	Result
1	Injection (UU) ≥ Σ Supply (PP) <sub>a</sub>	3,000,000 ≥ 1,000,000	True
2	% Injection <sub>a</sub> = Σ Supply (PP) <sub>a</sub> ÷ Injection (UU) * 100	1,000,000 ÷ 3,000,000 * 100	33.33%
3	W <sub>a</sub> = % Injection <sub>a</sub> * Emissions(W)	33.33% * 1,000	333
4	Net Utilization = (1 - [W <sub>a</sub> ÷ Σ Supply (PP) <sub>a</sub> ]) * 100	(1 - (333 ÷ 1,000,000)) * 100	<b>99.97%</b>

As in the example above, the same methodology could be used to represent total CO<sub>2</sub> when the sources are comprised of natural, anthropogenic, or a combination of both:

Source	Subpart	CO <sub>2</sub> (tonnes)
Anthropogenic Source	PP <sub>a</sub>	1,000,000
Natural Source	PP <sub>n</sub>	2,000,000
EOR Operations	UU	3,000,000
EOR Operations	W (CO <sub>2</sub> emissions)	1,000

Step	Formula	Inputs	Result
1	Injection (UU) ≥ Σ Supply (PP) <sub>a+n</sub>	3,000,000 ≥ 3,000,000	True
2	% Injection = Σ Supply (PP) <sub>a+n</sub> ÷ Injection (UU) * 100	3,000,000 ÷ 3,000,000 * 100	100.00%
3	W = % Injection * Emissions(W)	100.00% * 1,000	1,000
4	Net Utilization = (1 - [W ÷ Σ Supply (PP) <sub>a+n</sub> ]) * 100	(1 - (1,000 ÷ 3,000,000)) * 100	<b>99.97%</b>

The result represents the amount of CO<sub>2</sub> that ultimately remains underground after accounting for the pro-rated amount of CO<sub>2</sub> emissions lost as emissions through operations. Due to the small amounts of CO<sub>2</sub> emissions relative to the amount of CO<sub>2</sub> processed by the EOR operation, the Net Utilization results are likely to be > 95%. If supply consists of anthropogenic CO<sub>2</sub> from multiple sources, then the same calculation can be used to determine a supplier-specific net utilization by using the Subpart PP volumes for each source and calculating the pro-rated Subpart W volumes from the EOR facility.

In many ways, this approach is similar in principle to how EPA applies control efficiencies to air emissions control devices such as combustion flares and vapor recovery units. In each of those examples, various calculations based on performance data, engineering design, and other factors are used to calculate the resulting control efficiency.

## Net Utilization = Control Efficiency

The resulting emissions after applying applicable control efficiencies are incorporated in both state and federal air permitting programs across multiple industries in the United States today. It is at least plausible to apply the same approach to the application of an EOR operation to injection of anthropogenic CO<sub>2</sub>. Where other programs rely on these calculations for funding, tax credits, etc. based on amounts of CO<sub>2</sub> captured and injected, the model described here provides a mechanism to identify and calculate the relevant values to apply to those programs' intent.

By using the EPA's GHGRP as a basis for all of the values used in this model, existing, regulated processes are used to derive the necessary values to determine the Control Efficiency. Further, the EPA process is transparent to the public and all of the values reported are readily accessible through various EPA reports and disclosures.

The following statement from EPA's Greenhouse Gases Reporting Program Implementation Fact Sheet<sup>1</sup> describes how existing EPA processes support the verification of data, the reporting tools that are publically available, and the concept that these data is expected to be used in other programs.

*"Data Verification – The GHGRP provides electronic verification of annual reports. Prior to submission, there are multiple checks built into e-GGRT that provide data validation for reporters. After submission, EPA electronically verifies the data through the use of statistical, algorithm, range, and other verification checks. When needed, EPA conducts direct follow-up with facilities concerning potential data quality issues. Any violation of the requirements of 40 CFR Part 98 ("Greenhouse Gas Reporting Program") is a violation of the Clean Air Act, including section 114 (42 U.S.C. 7414)."*<sup>1</sup>

*"Data Publication – EPA publishes the publicly available data from the GHGRP. The publication tool called FLIGHT (Facility Level Information on Green House gas Tool) was developed anticipating use by the public. It features an easy to use/easy to understand format. Examples of simple searches include searches by state, by facility, by gas, by industry grouping, by range of emissions. In addition, EPA's ENVIROFACTS ([www.epa.gov/enviro](http://www.epa.gov/enviro)) data base includes GHG data which will allow users to conduct more analysis and to search for and download specific data elements of interest and to cross-reference GHG data with data collected from facilities regulated by other EPA programs."*<sup>1</sup>

## Conclusion

EOR provides a proven, existing infrastructure that is capable of supporting capture, transportation, and injection of CO<sub>2</sub>. Anthropogenic sources of CO<sub>2</sub> that are captured and utilized in an EOR operation can be accounted for using the existing EPA GHGRP reporting requirements. By using the Control Efficiency provided by the EOR operation (recommended at 95%), a net utilization of captured anthropogenic CO<sub>2</sub> can be calculated and applied to various incentive programs aiming to promote the capture of anthropogenic CO<sub>2</sub> to minimize CO<sub>2</sub> emissions.

### Equivalent Demonstration and Documentation of CO<sub>2</sub> Secure Geological Storage

Various applications of existing federal air and water protection regulations (Safe Drinking Water Act Underground Injection Control Program Class II and Class VI; Clean Air Act Greenhouse Gas Reporting Program Subparts UU, PP, W, RR (and C if applicable) provide a substantial and workable framework that result in functionally equivalent pathways to demonstrate and document 45Q's requirement of secure geologic storage for credit award purposes. Depending on the type of project, (EOR resulting in associated storage or, dedicated Deep Saline Storage) differing legal and operational requirements will dictate different applications and combinations of these existing provisions. In the case of EOR, the utilization of the newly published ISO 27916:2019 performance standard adds a clear and transparent means within these established regulatory programs to quantify and document operational processes and

procedures that demonstrate CO<sub>2</sub> containment assurance inherent to the EOR hydrocarbon recovery process.

## References

Foot Note	References
1	<a href="https://www.epa.gov/sites/production/files/2014-09/documents/ghgrp-overview-factsheet.pdf">https://www.epa.gov/sites/production/files/2014-09/documents/ghgrp-overview-factsheet.pdf</a>
2	<a href="https://www.epa.gov/sites/production/files/2015-07/documents/pp_information_sheet.pdf">https://www.epa.gov/sites/production/files/2015-07/documents/pp_information_sheet.pdf</a>
3	<a href="https://www.epa.gov/sites/production/files/2015-07/documents/uuinformationsheet.pdf">https://www.epa.gov/sites/production/files/2015-07/documents/uuinformationsheet.pdf</a>
4	<a href="https://www.epa.gov/ghgreporting/ghgrp-and-oil-and-gas-industry">https://www.epa.gov/ghgreporting/ghgrp-and-oil-and-gas-industry</a>
5	<a href="https://www.epa.gov/sites/production/files/2016-11/documents/san_5835_factsheet_8-31-16_formatted.pdf">https://www.epa.gov/sites/production/files/2016-11/documents/san_5835_factsheet_8-31-16_formatted.pdf</a>
6	<a href="https://www.iso.org/standard/65937.html">https://www.iso.org/standard/65937.html</a>