February 5, 2021

Comments of the Energy Advance Center

Re: Needed Changes to Treasury/IRS Form 8933 and IRS Instructions for Form 8933 in aftermath of the January 13, 2021 Publication of Final Section 45Q regulations pertaining to the Section 45Q Credit for Carbon Oxide Sequestration (26 CFR Part 1) (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 to improve U.S. economic and energy security. The EAC membership represents leading CCUS project participants involved across the entire CCUS value chain. EAC members operate over 50% of existing CO_2 pipeline transportation infrastructure in the United States, capture about 7 million tonnes of CO_2 per year, and are among the largest users of anthropogenic CO_2 in enhanced oil recovery operations. See www.EAC02.org.

In light of Treasury/IRS's issuance of final Section 45Q tax credit regulations on January 13, 2020 (86 Fed. Reg. 4728, January 15, 2021), EAC is providing these comments on two matters relating to Form 8933, the form that taxpayers utilize to report on their qualification for the 45Q tax credit: 1. the content of Treasury/IRS Form 8933 itself; and 2. the "Draft Instructions for Form 8933". The Office of Management and Budget (OMB) has solicited these public comments on Form 8933 as part of its review of a much broader array of proposed amendments to many other Treasury/IRS forms. (See, 86 Fed. Reg. 2035, 2040, January 11, 2021).

I. Form 8933 needs to reflect the changes in the 45Q regulations made effective on January 13, 2021.

The final regulations on Section 45Q adopted material changes in the regime for qualification for the Section 45Q tax credit which did not exist prior to January 13, 2021, especially pertaining to the role that ANSI-ISO 27916:2019 (ISO 27916) plays as a basis for a taxpayer to qualify an enhanced oil recovery (EOR) project for the tax credits. In the preamble to the January 13, 2021 final 45Q regulations, Treasury/IRS made repeated acknowledgements that "The IRS is contemplating making additional changes to the Form 8933 to take these final regulations into account." 86 Fed. Reg 4756 et seq. Given the numerous amendments to the 45Q regulations adopted by the January 13 final regulation package, that acknowledgment by Treasury/IRS is certainly both understandable and necessary. EAC further notes though that on October 27, 2020, Treasury/IRS published "Draft Instructions for Form 8933" for public comment (See, 85 Fed. Reg.69687-69696, November 3, 2020). In the preface to those Draft Instructions, Treasury/IRS stated:

> This is an early release draft of an IRS tax form, instructions, or publication, which the IRS is providing for your information. **Do not file draft forms** and do **not** rely on draft forms, instructions, and publications for filing. We do **not** release draft forms until we believe we have incorporated all changes (except when explicitly stated on this coversheet). However, unexpected issues occasionally arise, **or legislation is passed**—in this case, we will post a new draft of the form to alert users that changes were made to the previously posted draft. Thus, there are never any changes to the last posted draft of a form and the final revision of the form. Forms and instructions generally are subject to OMB approval before they can be officially released, so we post only drafts of them until they are approved. Drafts of instructions and publications usually have some changes before their final release. [Emphasis added.]

Analogous to the admonition in the above quotation regarding changes required as a result of intervening legislation, final rules interpreting legislation that are issued in the intervening time frame should and must trigger similar considerations for proposed draft IRS forms and instructions. Obviously, and without doubt, public comment on either Form 8933 as it existed prior to publication of the January 13, 2021 final 45Q regulations or on the "Draft Instructions for Form 8933" published for comment on November 3, 2020 could not reflect any changes in the final Section 45Q regulations that were only articulated for the first time in the proposed 45Q regulations published for comment on June 2, 2020 and codified in the final January 13, 2021 regulations published in the Federal Register on January 15, 2021. However, on January 28, 2021, Treasury/IRS published on its website what is characterized as final "2020 Instructions for

Form 8933", which note the issuance of final 45Q regulations on January 15, 2021 that differ from provisions of the proposed rules which eventuated into the final rules. The January 28, 2021 final "2020 Instructions for Form 8933" incorporated verbatim elements of the "Draft Instructions for Form 8933" that were published for public comment on November 3, 2020 noted above.

Having now seen the final Section 45Q regulations and the "2020 Instructions for Form 8933--both serially released by Treasury/IRS in January 2021--EAC is now in position to offer here these comments on changes in Form 8933 and in the accompanying instructions for Form 8933.

II. Form 8933 needs to reflect the proper role of EPA's Subpart UU in qualifying for certification for the 45Q tax credit:

In EAC's August 3, 2020 comments on the proposed 45Q regulatory package, which are incorporated herein by reference, EAC anticipated that Treasury/IRS would have to make substantial changes in Form 8933 to clarify the appropriate role that EPA Subpart UU and its related reporting requirements of EPA's Greenhouse Gas Reporting Program (GHGRP) must play within the Section 45Q tax credit regime and, in turn, how to accommodate the use of ISO 27916 in that regime to reflects its mass balance accounting formulation. In its comments in the 45Q rulemaking proceeding, EAC specifically identified the need to make changes in the then-existing Form 8933 to allow for clear identification of all elements required for qualifying EOR operations for 45Q tax credits through the various independent pathways being countenanced by Treasury/IRS in its proposed rule: 1. by EOR operations conducted under EPA Subpart UU and documented as being in conformance with ISO 27916; or 2. by EOR operations conducted under an EPA-approved MRV plan under Subpart RR. Such modifications are appropriate to clarify the rules underlying 45Q and to eliminate any misunderstanding that EOR operations that complied with EPA Subpart UU regulations ever had to also had to have an EPA approved MRV plan or comply with Subpart RR. In its comments EAC explained as follows:

> **"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_2 sources and emissions to the EPA. EPA reviews data received from suppliers of CO_2 and EOR operators and determines if all the CO_2, 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_2 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_2 Using Existing GHG Reporting Tools" regarding anthropogenic CO_2 control efficiency, which supports the approach as suggested in the illustrative Form 8933 offered in Appendix A."

See August 3, 2020 Comments of the Energy Advance Center in Reg-112339-19, at page 3.

As indicated in the language quoted above from EAC's August 3, 2020 comment, EAC respectfully submitted two items as appendices to its comments: the first, Appendix A, being a modified Form 8933 to illustrate how that form would need to be amended to reflect the reporting related to EOR operations relying on Subpart UU/ISO 27916 for certification (Work Sheet Part I and Part II and Schedule A); EOR operations relying on Subpart RR/MRV plan certification (Work Sheet Part III and Schedule B); and non-EOR saline injections plans relying on Subpart RR/MRV plan certification (Work Sheet Part IV and Schedule B); and the second, Appendix B, a whitepaper describing in detail the appropriate construction of EPA's Subpart RR and Subpart UU for purposes of "pre-Balanced Budget Act" (Pre-BBA) EOR projects. It should be noted that Appendix A incorporated all the relevant data involved in the GHGRP regime, including the reports reflected in Subpart PP (CO_2 supplied to particular EOR projects from production process units and extracted from production wells) and Subpart W (emissions from project equipment) of that EPA regime. We have attached hereto for OMB's ease of reference the above-identified Appendix A and Appendix B.

The design of the Work Sheets and Schedules A and B of Appendix A for the first time synchronized the population of Form 8933 with the very same data reported to EPA under its GHGRP, thus enhancing in a comprehensive manner the understanding and transparency of how the information collected by the EPA GHGRP regime and the 45Q tax credit related to one another in a verifiable manner, with both being submitted under oath by the taxpayer thus providing the appropriately desirable credibility of the information.

This analysis in Appendix A and Appendix B was available to Treasury/IRS in its deliberations on the Section 45Q rulemaking that eventuated in the final rules made effective January 13, 2021 and published in the Federal Register on January 15, 2021. More importantly though, EAC emphasizes that in the preamble to the January 13, 2021 final regulations, Treasury/IRS clearly agreed with EAC's legal analysis of the applicability of Subpart UU and the inapplicability of Subpart RR with regard to Pre-BBA EOR credits for EOR operations that complied with Subpart UU. In particular, EAC cites the following discussion in the preamble:

> "The International Organization for Standardization (ISO) standard for carbon dioxide capture, transportation, and geological storage has been endorsed by the American National Standards Institute (ANSI) and the CSA Group (CSA). CSA/ANSI ISO 27916:2019, "Carbon Dioxide Capture, Transportation and Geological Storage—Carbon Dioxide Storage Using Enhanced Oil Recovery (CO_2-EOR) (hereafter referred to as CSA/ANSI ISO 27916:2019) was developed for the purpose of quantifying and documenting the total carbon dioxide that is stored in association with EOR. In general, reporting under CSA/ANSI ISO 27916:2019 uses mass balance accounting, has established reporting and documentation requirements, and includes requirements for documenting a monitoring program and a containment assurance plan.
>
> Subpart RR and CSA/ANSI ISO 27916:2019 both provide for methods of accounting for qualified carbon oxide, expressly providing for mass balance accounting, which recognizes the fungibility of carbon dioxide." 86 Fed. Reg. at 4733.

The Treasury/IRS preamble further recognized that EOR operators do not have to comply with Subpart RR if they have complied with Subpart UU and in so doing EOR operators complying with Subpart UU can use ISO 27916 to certify their compliance for purpose of qualifying for the Section 45Q tax credit:

> "The proposed regulations allowed CSA/ANSI ISO 27916:2019 as an alternative to subpart RR for UIC Class II wells using qualified carbon oxide for EOR, but did not allow standards set by states as an alternative to subpart RR. In addition, the proposed regulations did not provide for an alternative to subpart RR reporting for UIC Class VI wells because all UIC Class VI wells are already subject to subpart RR reporting requirements. A taxpayer that reported volumes of carbon oxide to the EPA pursuant to subpart RR may self-certify the volume of carbon oxide claimed for purposes of section 45Q. Alternatively, if a taxpayer determined volumes pursuant to CSA/ANSI ISO 27916:2019, the taxpayer may prepare documentation as outlined in CSA/ANSI ISO 27916:2019 internally, but such documentation must be provided to a qualified independent engineer or geologist, who then must certify that the documentation provided, including the mass balance calculations as well as information regarding monitoring and containment assurance, is accurate and complete." 86 Fed Reg at 4740. [Emphasis added].

The Treasury/IRS's recognition of the different EPA regulatory requirements for EOR operators under Subpart UU as opposed to Subpart RR was further illustrated in the preamble as follows:

> "Facilities that inject carbon dioxide underground for the purposes of enhanced oil (EOR) and gas recovery or any other purpose other than geologic sequestration are required to report basic information on carbon dioxide received for injection under 40 CFR part 98 subpart UU (Injection of Carbon Dioxide source category, referred to as "subpart UU"). At present, the EPA generally does not require facilities that conduct EOR to report under subpart RR. However, the owner or operator may choose to opt in to subpart RR. For both subparts RR and UU, annual reports are submitted under 40 CFR part 98 to the EPA's GHGRP and undergo verification by the EPA. Non-confidential data from these reports are published on the EPA's website." See Id at 4753-4754. [Emphasis added].

The gravamen of the various portions of language from the preamble noted above is that Treasury/IRS recognized that: 1. EOR operators complying with Subpart UU did not have to qualify as well under Subpart RR; and 2. EOR operators complying with Subpart UU were to qualify for the Section 45Q tax credit certification using ISO 27916 as an independent source of documentation and certification from Subpart RR. It is for this very reason that EAC advised Treasury/IRS in its August 3, 2020 comments on the Section 45Q regulations that appropriate changes were needed in Form 8933.

EAC has not seen any revisions to the actual Form 8933 that may be currently before OMB that were made by Treasury/IRS to conform Form 8933 to the provisions of the final Section 45Q regulations issued on January 13, 2021. We would hope that what OMB currently has before it for its review accommodates the recommendations that EAC offered to Treasury/IRS in Appendix A of our August 3, 2020 comments on the Section 45Q proposal and the proper role that qualification of an EOR project under EPA Subpart UU plays in the Section 45Q regime as described in detail in Appendix B to those comments. However, we do know that Treasury/IRS promulgated on January 28, 2021, their "2020 Instructions for Form 8933" and those 2020 Instructions continue to include legally invalid language regarding how EOR operations conducted in accord with Subpart UU are to complete Form 8933. EAC will discuss that issue in Section III of these comments below. We therefore would urge OMB to examine the EAC's suggested changes reflected in Appendix A and the authoritative explication of the differences between EPA Subpart UU and Subpart RR in Appendix B of our August 3, 2020 comments which are both attached hereto for ease of OMB's reference. The changes in Form 8933 suggested by EAC in Appendix A accomplish the objectives necessitated by the final 45Q regulations issued on January 13, 2021 in a comprehensive manner and EAC urges OMB to require their adoption in any revised Form 8933.

III. EAC's concerns regarding the Proposed "Draft Instructions for Form 8933" published on November 3, 2020 and the "2020 Instructions for Form 8933" promulgated on January 28, 2021:

Given the significant changes required in Form 8933 by operation of the final 45Q regulations issued on January 13, 2021, it is not clear what may be the status within OMB's current review process of either the proposed "Draft Instructions for Form 8933" released for public comment by Treasury/IRS on November 3, 2020 ("Draft Instructions") or the "2020 Instructions for Form 8933" promulgated by Treasury/IRS dated January 28, 2021. We observe that the comment period for those proposed Draft Instructions closed on January 4, 2021, eleven days before the publication of the final 45Q regulations themselves. To the extent that Treasury/IRS may have forwarded to OMB for its review the proposed "Draft Instructions for Form 8933" package without change, or has since then forwarded the now promulgated January 28, 2021 "2020 Instructions for Form 8933"--or perhaps even forwarded both to OMB for review-- EAC is very concerned that the instructions incorrectly and prejudicially state that:

> "For taxpayers claiming a credit for a facility placed in service before February 9, 2018, the following applies.
>
> - Secure geological storage requires approval by the U.S. Environmental Protection Agency (EPA) of a Monitoring, Reporting, and Verification Plan (MRV Plan) submitted by the operator of the storage facility or tertiary injection project.
>
> - The annual amount of carbon oxide claimed for the credit must be consistent with amounts reported to the EPA under its Greenhouse Gas Reporting Program, subpart RR." 85 Fed. Reg. 68956 (October 30, 2020) and 85 Fed. Reg. 69687, November 3, 2020 [Emphasis added].

As recognized by Treasury itself, the underlined language in the quotation above is simply incorrect as a matter of law, at least to the extent that it cannot apply to EOR projects that comply with EPA Subpart UU both prior to the recognition of ISO 27916:2019 in the January 13, 2021 final 45Q regulations and thereafter. As indicated below, under then-applicable and relevant guidance at the time, including IRS Notice 2009-83, Subpart UU-compliant EOR projects never had to report to EPA under Subpart RR, yet they qualify in every way with the statutory requirements of Section 45Q.

A. The Draft Instructions for Form 8933 and the "2020 Instructions for 8933" are both legally incorrect in their reference to the need for Subpart UU-compliant EOR projects to have an EPA-Approved MRV Plan and to comply with Subpart RR:

For seven years prior to the IRS's release of the 2016 version of Form 8933, the IRS instructed taxpayers to follow the 2009 Guidance on "secure geological storage" which relied upon the Intergovernmental Panel on Climate Change (IPCC) framework and subsequent EPA GHG reporting rules "to the extent applicable." However, the 2016 Form 8933 inserted changed language purporting to require an EPA-approved MRV plan and compliance with subpart RR. This change was not noticed in the Federal Register. Rather IRS made an express representation in releasing the revised Form 8933 in 2015 that "no changes" were being made to the form. The October 27, 2020 Draft Instructions repeated those erroneous references to an EPA-approved MRV plan and Subpart RR.

Indeed, the October 27, 2020 Draft Instructions erroneously cite Notice 2009-83, 2009-44 I.R.B. 588, for the authority on the reporting and recordkeeping requirements associated with the limitation on credits available under former section 45Q(a) (as in effect before February 9, 2018) and sections 45Q(a)(1) and (2). Nowhere in Notice 2009-83 is subpart RR or an MRV plan cited or referenced for reporting and recordkeeping; only subpart PP for producers of carbon oxide is cited. For reporting requirements under Notice 2009-44, the taxpayer must provide annual reports per Section 6 of the Notice as illustrated below:

> **"SECTION 6. REPORTING REQUIREMENTS**
> .01 *Annual Reports*. A taxpayer that has claimed the § 45Q credit on a tax return must submit an annual report to the Service containing the following information:
> (a) The name, address, and taxpayer identification number of the reporting taxpayer, and all parties with which the taxpayer contractually ensures the secure geological storage of the CO_2;
> (b) The name and location of the qualified facilities at which the CO_2 was captured;
> (c) The amounts (in metric tons) of qualified CO_2 for the taxable year that has been taken into account for purposes of claiming the § 45Q credit;
> (d) Any changes in the information included in prior annual reports submitted under section 6.01 of this notice, including adjustments to the amount (in metric tons) of qualified CO_2 taken into account for purposes of the § 45Q credit in prior taxable years; and
> (e) A declaration, applicable to the report and any accompanying documents, signed by a person currently authorized to bind the taxpayer in these matters, in the following form: "Under penalties of perjury, I declare that I have examined this report, including accompanying documents, and to the best of my knowledge and belief, the facts presented in support of this report are true, correct, and complete.'"

As demonstrated by the above-quoted language, the prior formal guidance in Notice 2009-83 never required subpart RR, or even referenced subpart RR, for reporting requirements for secure geologic storage. Indeed, in its 2019 invitation for comments, IRS expressly recognized that "IRS Form 8933 adds regulatory requirements for Class II UIC permit holders (enhanced oil recovery operations) who are not currently required to get an EPA-approved MRV plan." Notice 2019-32, "Request for Comments on Credit for Carbon Oxide Sequestration", Bulletin No. 2019–21, at 1189 (May 20, 2019) (Section 3.01)). The IRS repeated this point in its notice of proposed rulemaking underlying the January 2021 final 45Q rule, again recognizing that Form 8933's instruction that UIC Class II permit holders must also obtain an EPA-approved MRV Plan creates an additional burden" on Class II permit holders. 85 Fed. Reg. at 34055.

The subpart RR language was first included in the Form 8933 instructions in the revision of the form for tax year 2016, and, appeared without a clear indication as to the authority under which it was included. The revision for tax year 2016 Form 8933 instructions also added a reference to underlying aspects of subpart RR, specifically calling for an EPA-approved site-specific MRV Plan submitted by the operator. An MRV plan is an integral part of subpart RR, but again there is no clear indication under what authority the MRV language was added to the Form 8933 instructions because MRV references are again not found anywhere in formal guidance such as Notice 2009-83. The statements in the Form 8933 instructions about an MRV plan and requiring subpart RR were not accurate when initially adopted in 2016 and still are not accurate today in the aftermath of the January 2021 final 45Q regulations, as a matter of formal guidance and underlying law. While designed to assist taxpayers, instructions to tax forms must reflect underlying statute and guidance, and are not the appropriate means to develop policy or create new guidance and standards that are not supported by formal Treasury/IRS guidance or underlying statutory authority.

Subpart UU reporting for EOR was always entirely sufficient for reporting based on prior formal guidance of Notice 2009-83 and the language of the 45Q statute itself prior to January 13, 2021; and now, under the January 13, 2021 final rules pertaining to the Section 45Q tax credit, subpart UU unquestionably provides a fully satisfactory reporting methodology, equivalent to Subpart RR in terms of mass balance accounting, when prepared in conformance with the ISO 27916:2019 standard and verified by an independent third party, as required by the final rule.

The references to subpart RR and to an EPA-approved MRV that were again included in the October 27, 2020 Draft Instructions for Form 8933, and have now been reiterated in the January 28, 2021 "2020 Instructions for Form 8933", do not accurately reflect the prior guidance in

Notice 2009-83 or the language of the 45Q statute itself; and those references clearly do not reflect the currently applicable Section 45Q requirements and regulations, including the development of the ISO 27916 standard in 2019, that became effective January 13, 2021 upon the finalization of the current 45Q rules published on January 15, 2021.

B. Relief Recommended: OMB Must Modify the "Draft Instructions for Form 8933"

To correct the errors of law discussed above and to properly reflect current and prior guidance and the current regulatory and ultimately governing 45Q statutory authority, the discussion of Secure Geologic Storage in the instructions for Form 8933 must be revised to: (1) entirely remove the language in the first bullet point stating "Secure geological storage requires approval by the U.S. Environmental Protection Agency (EPA) of a Monitoring, Reporting, and Verification Plan (MRV Plan) submitted by the operator of the storage facility or tertiary injection project"; and (2) remove the reference in the second bullet point to "subpart RR" for facilities placed in service before February 9, 2018. Treasury/IRS then needs to redraft the instructions to properly account for Subpart UU and ISO 27916:2019 for EOR projects complying with those authorities. Further, until the above recommendations are incorporated into revised and corrected instructions for Form 8933, an authoritative statement from OMB/Treasury/IRS should be provided to taxpayers indicating that the 2020 instructions to Form 8933 have inaccuracies which need correction and those inaccuracies are not binding on taxpayers in their use of Form 8933.

For the reasons articulated above, EAC urges OMB to rectify this error in any revised language used in the actual Form 8933 and in any instructions to taxpayers that accompany Form 8933.

Respectfully submitted,

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EACo2
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Appendix 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_2 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	

A	Company Name	Taxpayer Company Name					
B	Company Address	Taxpayer Company Address					
	City, State, ZIP Code						
C	Company Contact	Taxpayer Company Contact					
Part I	**CO_2 Supplied (from Subpart PP)**						
1	EPA GHGRR ID # for Subpart PP			######			
2	EPA GHGRR Facility Name			*Facility Name*			
3	Tonnes of CO_2 as reported in Subpart PP, 98.426.f.10 (supplied to EOR)						100,000
4	Tonnes of CO_2 as reported in Subpart PP, 98.426.f.11 (supplied to geologic storage)						50,000
Part II	**CO_2 Supplied to EOR Projects (from Line 14 on Schedule A)**						
	Company Name	Facility Name		Net Tonnes of CO_2 Associated Storage			
5a			**5a**	47,000			
5b			**5b**				
5c			**5c**				
5d			**5d**				
5e			**5e**				
6	Sum of lines 5a through 5e						47,000
7	Multiply Line 6 by $35						$1,645,000
Part III	**CO_2 Supplied to EOR Projects Reporting Subpart RR (from Line on 10 Schedule B)**						
	Company Name	Facility Name		Net Tonnes of CO_2 Storage			
8a			**8a**	48,000			
8b			**8b**				
8c			**8c**				
8d			**8d**				
8e			**8e**				
9	Sum of lines 8a through 8e						48,000
10	Multiply Line 9 by $35						$1,680,000
Part IV	**CO_2 Supplied to Saline Injection Reporting Subpart RR (from Line on 15 Schedule B)**						
	Company Name	Facility Name		Net Tonnes of CO_2 Storage			
11a			**11a**	49,000			
11b			**11b**				
11c			**11c**				
11d			**11d**				
11e			**11e**				
12	Sum of lines 11a through 11e						49,000
13	Multiply Line 12 by $50						$2,450,000
Part V	**Total Amount of 45Q Tax Credit**						
14	Total for EOR Projects (Add line 10 to line 7)						$3,325,000
15	Total for Saline Injection (from line 13)						$2,450,000
16	Add line 15 to line 14						$5,775,000

Instructions for Form 8933W	
Line	**Instruction**
A	Taxpayer official company name
B	Taxpayer's mailing address
C	Taxpayer's point of contact
Part I	This section identifies the source and amount of CO_2 being claimed in this filing
1	The taxpayer's facility ID# used for reporting Subpart PP in the EPA Greenhouse Gas Reporting Rule (GHGRR)
2	The taxpayer's facility name used for reporting Subpart PP in the EPA Greenhouse Gas Reporting Rule (GHGRR)
3	Report the amount of CO_2 supplied to EOR operations as required by Subpart PP, 98.426.f.10
4	Report the amount of CO_2 supplied to geologic storage operations as required by Subpart PP, 98.426.f.11
Part II	This section summarizes multiple EOR operations that may have received a portion of the CO_2 begin claimed in this filing. The values for each of these rows are derived from a separate Schedule A filed for each EOR operation
5a-5e	List the EOR Company Name, Facility Name, and the amount of CO_2 stored in association with the EOR Operation. This numerical value can be found on Line 14 on Schedule A
6	Sum of lines 5a-5e represents the total net amount of CO_2 stored in association with the EOR operation
7	45Q establishes a $35 credit for each tonne of CO_2 stored in an EOR operation. This line calculates that total amount by multiplying $35 times Line 6.
Part III	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_2 begin claimed in this filing. The values for each of these rows is derived from a separate Schedule B filed for each EOR operation.
8a-8e	List the EOR Company Name, Facility Name, and the amount of CO_2 stored in association with the EOR Operation. This numerical value can be found on Line 10 on Schedule B.
9	Sum of lines 8a-8e represents the total net amount of CO_2 stored in association with the EOR operation
10	45Q establishes a $35 credit for each tonne of CO_2 stored in an EOR operation. This line calculates that total amount by multiplying $35 times Line 9.
Part IV	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_2 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.
11a-11e	List the geologic storage operations Company Name, Facility Name, and the amount of CO_2 stored. This numerical value can be found on Line 15 on Schedule B.
12	Sum of lines 11a-11e represents the total net amount of CO_2 stored in association with the saline injection operation
13	45Q establishes a $50 credit for each tonne of CO_2 stored via saline injection. This line calculates that total amount by multiplying $50 times Line 12.
Part V	This section calculates the total tax credit eligible to be claimed by totaling the credit amount derived from the tonnes of CO_2 stored in association with and EOR operation and stored via saline injection.
14	This line totals the credit amount of CO_2 stored in association with an EOR operation (add line 10 to line 7)
15	This line totals the credit amount of CO_2 stored via saline injection form line 13
16	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)

A	Company Name	Company Name
B	Company Address	Company Address
	City, State, ZIP Code	
C	Company Contact	Company Contact
D	Taxpayer Name	Taxpayer Company Name

Part I	**CO_2 Received by EOR Project (from Subpart UU)**		
1	EPA GHGRR ID # for Subpart UU	######	
2	EPA GHGRR Facility Name	*Facility Name*	
3	Tonnes of CO_2 reported via Subpart UU for facility named on line 2		100,000
4	Tonnes of CO_2 reported via Subpart UU received from Taxpayer listed on line D		50,000
Part II	**CO_2 Emissions from Equipment (from Subpart W)**		
5	EPA GHGRR ID # for Subpart W	######	
6	EPA GHGRR Basin Name	*Basin Name*	
7	Tonnes of CO_2 emissions reported for basin	4,000	
8	Tonnes of CO_2 reported for facility named on line 2 **only**	3,000	
9	Tonnes of CO_2 reported for facility named on line 2 **only** from combustion sources	1,000	
10	Tonnes of CO_2 vented (subtract Line 9 from line 8)		2,000

Part III	**CO_2 Emissions from Surface Leakage**				
11	Source #	Source Description	Tonnes Released		
	1	*Source 1*	**11a**	400	
	2	*Source 2*	**11b**	600	
			11c		
			11d		
			11e		
12	Total of lines 11a through 11e				1,000

Part IV	**Net CO_2 Storage Associated with the EOR Project**	
13	Add line 10 and line 12	3,000
14	Net CO_2 Associated Storage (subtract line 13 from line 4)	47,000

Part V	**Demonstration of Secure Geologic Storage**		
15	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?	☒	Yes
		☐	No
16	If the answer to line 16 was 'No', you cannot complete this form. Please instead complete Form 8933B.		

Instructions for Form 8933A	
Line	**Instruction**
A	Official company name
B	Company mailing address
C	Company point of contact
D	Taxpayer official company name
Part I	This section identifies the EOR operation that received the CO_2 from the taxpayer being claimed in this filing
1	The EOR company's facility ID# used for reporting Subpart UU in the EPA Greenhouse Gas Reporting Rule (GHGRR)
2	The EOR company's facility name used for reporting Subpart UU in the EPA Greenhouse Gas Reporting Rule (GHGRR)
3	Report the total amount of CO_2 reported by Subpart UU, 98.476a-b for the facility named on line 2
4	Report the amount of CO_2 received from taxpayer only. This value is included in the number reported in Line 3, but is based on commercial custody transfer meters.
Part II	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_2 that is directly emitted to the atmosphere as part of the normal course of operations of the EOR facility and wells. This section excludes CO_2 emissions generated as a result of combustion activities that are reported under Subpart W, since those emissions are not comprised of CO_2 captured by the taxpayer.
5	The EOR company's facility ID# used for reporting Subpart W in the EPA Greenhouse Gas Reporting Rule (GHGRR)
6	The EOR company's basin name used for reporting Subpart W in the EPA Greenhouse Gas Reporting Rule (GHGRR)
7	Report the total amount of CO_2 reported under Subpart W, 98.236 for the entire basin named on line 6
8	Report the total amount of CO_2 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_2 is being injected (if different than the basin total).
9	Report the total amount of CO_2 derived from combustion sources reported under Subpart W, 98.236.z only for the facility named on line 2.
10	Subtract Line 9 from Line 8 to show the amount of CO_2 reported under Subpart W that is attributed from direct emissions of CO_2 at the facility injecting the taxpayer's CO_2
Part III	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_2. EPA recognizes that CO_2 storage is a common occurrence and CO_2 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.
11a-11b	Enter a numeric sequence and source description for each event that lead to surface leakage and include the mass of CO_2 released during that event following equation RR-10 of Subpart RR, 98.443.e
12	Total of lines 11a-11b to represent the total amount of CO_2 released to the surface via leakage events
Part IV	This section produced a net mass of CO_2 injected after netting the total mass received by losses from emission and surface leakage events
13	Add line 10 and line 12 to determine total the amount of CO_2 emissions from equipment and surface leakage
14	Subtract line 13 from line 14 to represent the amount of net CO_2 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
Part V	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.
15	Check Yes if an EOR Operations Management Plan was in place. Check No if an alternative was used.
16	Directs the taxpayer to 8933B

Schedule B (Form 8933B)

Secure Geologic Storage (Subpart RR)

A	Company Name	Company Name
B	Company Address	Company Address
	City, State, ZIP Code	
C	Company Contact	Company Contact
D	Taxpayer Name	Taxpayer Company Name

Part I **CO_2 reported in Subpart RR**

1	EPA GHGRR ID # for Subpart RR	######	
2	EPA GHGRR Facility Name	*Facility Name*	
3	Did this facility actively produce oil, natural gas, or other fluids?	☒ Yes (Complete Part II) ☐ No (Complete Part III)	

Part II **Net CO_2 Storage (Equation RR-11 – EOR Project)**

4	Tonnes of CO_2 injected			50,000
5	Tonnes of CO_2 produced	0		
6	Tonnes of CO_2 emitted by surface leakage	0		
7	Tonnes of CO_2 emitted from equipment leaks and vented emissions (injection)	500		
8	Tonnes of CO_2 emitted from equipment leaks and vented emissions (production)	1,500		
9	Sum of lines 5 through 8			2,000
10	Net CO_2 Storage (subtract line 9 from line 4)			48,000

Part III **Net CO_2 Storage (Equation RR-12 – Saline Aquifer)**

11	Tonnes of CO_2 injected			
12	Tonnes of CO_2 emitted by surface leakage			
13	Tonnes of CO_2 emitted from equipment leaks and vented emissions (injection)			
14	Sum of lines 12 and 13			
15	Net CO_2 Storage (subtract line 14 from line 11)			

Part IV **Demonstration of Secure Geologic Storage**

16	Was an EPA approved MRV Plan in effect at the location named on line 2 during the claim period?	☒	Yes
		☐	No
17	If the answer to line 16 was 'No', you cannot complete this form. Please instead complete Form 8933A.		

Instructions for Form 8933B	
Line	**Instruction**
A	Official company name
B	Company mailing address
C	Company point of contact
D	Taxpayer official company name
Part I	This section identifies the EOR operations who opted into Subpart RR reporting or the saline injection operation that received the CO_2 from the taxpayer being claimed in this filing
1	The company's facility ID# used for reporting Subpart RR in the EPA Greenhouse Gas Reporting Rule (GHGRR)
2	The EOR company's facility name used for reporting Subpart RR in the EPA Greenhouse Gas Reporting Rule (GHGRR)
3	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.
Part II	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_2 injected after accounting for emission due to equipment and surface leakage.
4	Report the total amount of CO_2 injected reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2I}) for the facility named on line 2
5	Report the total amount of CO_2 produced reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2P}) for the facility named on line 2
6	Report the total amount of CO_2 emitted from surface leakage reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2E}) for the facility named on line 2
7	Report the total amount of CO_2 emitted from equipment leaks and vented emissions from injection well systems reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2FI}) for the facility named on line 2
8	Report the total amount of CO_2 emitted from equipment leaks and vented emissions from production well systems reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2FP}) for the facility named on line 2
9	Add lines 5 through 8 to determine the total amount of CO_2 emissions from equipment and surface leakage
10	Subtract line 9 from line 4 to represent the amount of net CO_2 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
Part III	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_2 injected after accounting for emission due to equipment and surface leakage.
11	Report the total amount of CO_2 injected reported by Subpart RR, 98.443.f.2 (RR-12, CO_{2I}) for the facility named on line 2
12	Report the total amount of CO_2 emitted from surface leakage reported by Subpart RR, 98.443.f.2 (RR-12, CO_{2E}) for the facility named on line 2
13	Report the total amount of CO_2 emitted from equipment leaks and vented emissions from injection well systems reported by Subpart RR, 98.443.f.2 (RR-12, CO_{2FI}) for the facility named on line 2
14	Add lines 12 and 13 to determine the total amount of CO_2 emissions from equipment and surface leakage
15	Subtract line 14 from line 11 to represent the amount of net CO_2 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
Part IV	This section provides assurance that an EPA approved MRV Plan was in effect at the facility, whereby processes to ensure geologic storage is maintained.
16	Check Yes if an MRV Plan was in place. Check No if an alternative was used.
17	Directs the taxpayer to 8933A

Schedule B (Form 8933B)

Secure Geologic Storage (Subpart RR)

A	Company Name	EOR Company Name
B	Company Address	Saline Injection Company Address
	City, State, ZIP Code	
C	Company Contact	Saline Injection Company Contact
D	Taxpayer Name	Taxpayer Company Name

Part I **CO_2 reported in Subpart RR**

1	EPA GHGRR ID # for Subpart RR	######	
2	EPA GHGRR Facility Name	*Facility Name*	
3	Did this facility actively produce oil, natural gas, or other fluids?	☐ Yes (Complete Part II) ☒ No (Complete Part III)	

Part II **Net CO_2 Storage (Equation RR-11 – EOR Project)**

4	Tonnes of CO_2 injected			
5	Tonnes of CO_2 produced			
6	Tonnes of CO_2 emitted by surface leakage			
7	Tonnes of CO_2 emitted from equipment leaks and vented emissions (injection)			
8	Tonnes of CO_2 emitted from equipment leaks and vented emissions (production)			
9	Sum of lines 5 through 8			
10	Net CO_2 Storage (subtract line 9 from line 4)			

Part III **Net CO_2 Storage (Equation RR-12 – Saline Aquifer)**

11	Tonnes of CO_2 injected			50,000
12	Tonnes of CO_2 emitted by surface leakage	0		
13	Tonnes of CO_2 emitted from equipment leaks and vented emissions (injection)	1,000		
14	Sum of lines 12 and 13			1,000
15	Net CO_2 Storage (subtract line 14 from line 11)			49,000

Part IV **Demonstration of Secure Geologic Storage**

16	Was an EPA approved MRV Plan in effect at the location named on line 2 during the claim period?	☒	Yes
		☐	No
17	If the answer to line 16 was 'No', you cannot complete this form. Please instead complete Form 8933A.		

Instructions for Form 8933B	
Line	**Instruction**
A	Official company name
B	Company mailing address
C	Company point of contact
D	Taxpayer official company name
Part I	This section identifies the EOR operations who opted into Subpart RR reporting or the saline injection operation that received the CO_2 from the taxpayer being claimed in this filing
1	The company's facility ID# used for reporting Subpart RR in the EPA Greenhouse Gas Reporting Rule (GHGRR)
2	The EOR company's facility name used for reporting Subpart RR in the EPA Greenhouse Gas Reporting Rule (GHGRR)
3	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.
Part II	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_2 injected after accounting for emission due to equipment and surface leakage.
4	Report the total amount of CO_2 injected reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2I}) for the facility named on line 2
5	Report the total amount of CO_2 produced reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2P}) for the facility named on line 2
6	Report the total amount of CO_2 emitted from surface leakage reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2E}) for the facility named on line 2
7	Report the total amount of CO_2 emitted from equipment leaks and vented emissions from injection well systems reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2FI}) for the facility named on line 2
8	Report the total amount of CO_2 emitted from equipment leaks and vented emissions from production well systems reported by Subpart RR, 98.443.f.1 (RR-11, CO_{2FP}) for the facility named on line 2
9	Add lines 5 through 8 to determine the total amount of CO_2 emissions from equipment and surface leakage
10	Subtract line 9 from line 4 to represent the amount of net CO_2 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
Part III	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_2 injected after accounting for emission due to equipment and surface leakage.
11	Report the total amount of CO_2 injected reported by Subpart RR, 98.443.f.2 (RR-12, CO_{2I}) for the facility named on line 2
12	Report the total amount of CO_2 emitted from surface leakage reported by Subpart RR, 98.443.f.2 (RR-12, CO_{2E}) for the facility named on line 2
13	Report the total amount of CO_2 emitted from equipment leaks and vented emissions from injection well systems reported by Subpart RR, 98.443.f.2 (RR-12, CO_{2FI}) for the facility named on line 2
14	Add lines 12 and 13 to determine the total amount of CO_2 emissions from equipment and surface leakage
15	Subtract line 14 from line 11 to represent the amount of net CO_2 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
Part IV	This section provides assurance that an EPA approved MRV Plan was in effect at the facility, whereby processes to ensure geologic storage is maintained.
16	Check Yes if an MRV Plan was in place. Check No if an alternative was used.
17	Directs the taxpayer to 8933A

EACO2
Energy Advance Center

Appendix B:

White Paper: Calculating EOR Control Efficiency for Anthropogenic CO_2 Using Existing GHG Reporting Tools

August 1, 2020

Abstract

This white paper proposes a solution for mass balance accounting for anthropogenic sources of CO_2 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_2 used in EOR operations that provides sufficient transparency in the amount of anthropogenic CO_2 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_2 volumes covered by the program are ultimately injected.

Background

CO_2 EOR Infrastructure

The utilization of CO_2 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_2 EOR floods, the CO_2 used in the process is sourced from natural deposits of CO_2. Through the years, a mature infrastructure has been developed to produce, transport, inject, and recycle CO_2 for EOR operations, thereby creating an immediate opportunity for capture and utilization of anthropogenic sources of CO_2 in and around areas of this established infrastructure. For all practical purposes for operations, the origin of the CO_2 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_2 recycle and injection process matures, more and more of the CO_2 inherently remains in the geologic formation being targeted for oil production. At the end of the life of the EOR project, the CO_2 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_2 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_2 capture, this would include the tracking of the amount of CO_2 captured and the disposition of that CO_2 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_2 storage in EOR is a common occurrence and CO_2 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_2 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)."[1]

There are several relevant subparts of 40 CFR part 98 that require reporting of greenhouse gas (CO_2) emissions related to the elements included in EOR operations using anthropogenic sources of CO_2 (Subpart PP, Subpart UU, and Subpart W).

Subpart PP

"Subpart PP requires Suppliers of CO_2 to report the mass of CO_2 captured from production process units and extracted from production wells, and the mass of CO_2 that is imported and exported."[2]

In the context of this discussion, Suppliers would include all sources of CO_2 that would be captured and delivered by an anthropogenic source to an EOR operation. In addition, all Suppliers of natural sources of CO_2 used in an EOR operation would also be required to report.

Subpart UU

"All facilities that inject CO_2 underground must report basic information on the amount of CO_2 received for injection."[3] "The subpart UU source category comprises a well or group of wells that inject CO_2 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." [3]

In the context of this discussion, EOR operators are required to report the mass of CO_2 received for injection. In industry vernacular this would generally be the equivalent of the 'purchased' CO_2 as opposed to the 'recycled' CO_2.

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."[4]

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_2 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_2) and all other facilities that inject CO_2 underground to report greenhouse gas (GHG) data to EPA annually." [5]

In the context of this discussion, geologic sequestration operators are required to report the mass of CO_2 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_2-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_2 (and optionally the anthropogenic portion of the CO_2) that is stored in association with CO_2-EOR. The document recognizes that CO_2-EOR is principally an oil recovery operation. Associated with this oil recovery, however, safe and long term CO_2 storage occurs. The absence of an accepted standard for demonstrating the safe, long-term containment of CO_2 in association with CO_2-EOR and documenting the quantity of associated stored CO_2 constitutes one of the barriers to the increased use of anthropogenic CO_2 in CO_2-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_2 stored in association with CO_2-EOR." [6]

Solution

This paper presents a solution to the need to provide clear, regulatory supported methodology for accounting for anthropogenic sources of CO_2 used in EOR operations that provides sufficient transparency in the amount of anthropogenic CO_2 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_2 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:

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

However, there is a relatively small amount of CO_2 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:

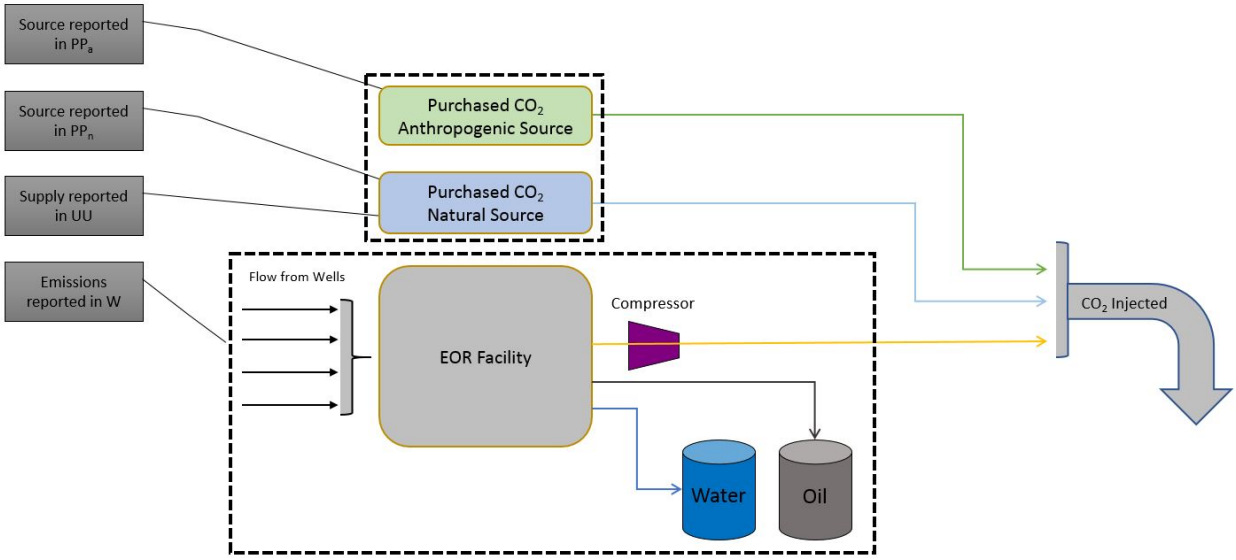
$$\textbf{Net Utilization = Supply (PP) – Emissions (W)}$$

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:

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

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_2 delivered to the EOR operation from any source while also quantifying the amount of CO_2 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_2 that ultimately gets injected in the EOR process → Net Utilization.

The following steps yield a resulting percentage of the net utilization of anthropogenic CO_2 injected in a hypothetical EOR example:

1. Verify that the amount of anthropogenic CO_2 received by an EOR operation ≥ the amount of anthropogenic CO_2 delivered by a supplier on the same system.

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

2. Determine the amount of anthropogenic CO_2 (% $Injection_a$) as a percentage of the total amount of CO_2 [Injection (UU)] received from all sources.

$$\%\ Injection_a = \Sigma\ Supply\ (PP)_a \div Injection\ (UU) * 100$$

3. Determine the prorated amount of CO_2 emitted (W_a) at the EOR operation reporting in Subpart W by multiplying the amount of % $Injection_a$ by the total emissions reported in Subpart W.

$$W_a = \%\ Injection_a * Emissions\ (W)$$

4. Divide the W_a result by the amount of anthropogenic supply [Supply Σ Supply $(PP)_a$] received to determine the Net Utilization of anthropogenic CO_2.

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_2 (tonnes)
Anthropogenic Source	PP_a	1,000,000
Natural Source	PP_n	2,000,000
EOR Operations	UU	3,000,000
EOR Operations	W (CO_2 emissions)	1,000

Step	Formula	Inputs	Result
1	Injection (UU) ≥ Σ Supply $(PP)_a$	3,000,000 ≥ 1,000,0000	True
2	% Injection_a = Σ Supply (PP_a) ÷ Injection (UU) *100	1,000,000 ÷ 3,000,000 * 100	33.33%
3	W_a = % Injection_a * Emissions(W)	33.33% * 1,000	333
4	Net Utilization = $(1 - [W_a \div \Sigma \text{ Supply } (PP_a)]) * 100$	(1 – (333 ÷ 1,000,000)) *100	**99.97%**

As in the example above, the same methodology could be used to represent total CO_2 when the sources are comprised of natural, anthropogenic, or a combination of both:

Source	Subpart	CO_2 (tonnes)
Anthropogenic Source	PP_a	1,000,000
Natural Source	PP_n	2,000,000
EOR Operations	UU	3,000,000
EOR Operations	W (CO_2 emissions)	1,000

Step	Formula	Inputs	Result
1	Injection (UU) ≥ Σ Supply (PP_{a+n})	3,000,000 ≥ 3,000,0000	True
2	% Injection = Σ Supply (PP_{a+n}) ÷ 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 = $(1 - [W \div \Sigma \text{ Supply } (PP_{a+n})]) * 100$	(1 – (1,000 ÷ 3,000,000)) * 100	**99.97%**

The result represents the amount of CO_2 that ultimately remains underground after accounting for the pro-rated amount of CO_2 emissions lost as emissions through operations. Due to the small amounts of CO_2 emissions relative to the amount of CO_2 processed by the EOR operation, the Net Utilization results are likely to be > 95%. If supply consists of anthropogenic CO_2 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 efficicency.

Net Utilization = Control Efficiency

The resulting emissions after applying applicable contol 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_2. Where other programs rely on these calculations for funding, tax credits, etc. based on amounts of CO_2 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[1] describes how existing EPA processes support the verification of data, the reporing 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)."*[1]

"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) 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."[1]

Conclusion

EOR provides a proven, existing infrastructure that is capable of supporting capture, transportation, and injection of CO_2. Anthropogenic sources of CO_2 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_2 can be calculated and applied to various incentive programs aiming to promote the capture of anthropogenic CO_2 to minimize CO_2 emissions.

Equivalent Demonstration and Documentation of CO_2 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_2 containment assurance inherent to the EOR hydrocarbon recovery process.

References

Foot Note	References
1	https://www.epa.gov/sites/production/files/2014-09/documents/ghgrp-overview-factsheet.pdf
2	https://www.epa.gov/sites/production/files/2015-07/documents/pp_information_sheet.pdf
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