N. Hunter Johnston
202 429 6404
hjohnston@steptoe.com

1330 Connecticut Avenue, NW
Washington, DC 20036-1795
202 429 3000 main
www.steptoe.com

Steptoe

August 3, 2020

*Via Federal eRulemaking Portal at www.regulations.gov*

Internal Revenue Service
CC:PA:LPD:PR (REG-112339-19), Room 5203
P.O. Box 7604
Ben Franklin Station
Washington, DC 20044

Re: REG- REG-112339-19 (Proposed Regulations on Credit for Carbon Oxide Sequestration)

To Whom It May Concern:

We write, on behalf of our client Loci Controls, Inc., to provide comments in response to the Notice of Proposed Rulemaking, Credit for Carbon Oxide Sequestration, issued June 2, 2020 (the "**Proposed Regulations**").[1] We appreciate the work of staff at the Department of the Treasury and Internal Revenue Service ("**IRS**") (hereinafter collectively referred to as "**Treasury**") to produce the Proposed Regulations and prioritize guidance that will facilitate the use of section 45Q tax credits to incentivize the capture and sequestration, use in enhanced oil recovery ("**EOR**"), or utilization of qualified carbon oxides in order to prevent the adverse consequences of climate change.

Founded in 2013, Loci Controls has developed automated landfill gas collection control technology that increases landfill gas collection and reduces harmful $CO_2$ and methane emissions from landfills. Loci Controls's automated landfill gas collection control system uses solar-powered measurement sensors mounted directly on each collection well at a landfill and uses cloud-based algorithms and analytics to make frequent, small flow adjustments to each collection well to optimize the gas collection process. Based on an independent, peer-reviewed study, Loci Controls's automated landfill gas collection system resulted in a 13% – 24% increase in landfill gas captured (and, correspondingly, emissions reduced) compared to industry standard manual well-field tuning.

[1] 85 Fed. Reg. 34,050 (June 2, 2020).

We applaud the approach that Treasury has taken on a number of key issues. In particular, guidance on the recapture of section 45Q credits; the requirements for a contract that ensures capture and sequestration, use, or utilization; and the election under section 45Q(f)(3)(B) will help provide taxpayers with the certainty they need in order to take advantage of these tax credits.

We also applaud the initial framework for utilization of qualified carbon oxides that was included in the Proposed Regulation. Most importantly, the Proposed Regulations recognize that "all greenhouse gas emissions are taken into account under" a lifecycle analysis ("**LCA**") that is used to measure the utilization of qualified carbon oxides.[2] Furthermore, the adoption of International Organization for Standardization standard 14044:2006, "Environmental management—Life cycle assessment—Requirements and Guidelines" (the "**ISO LCA Standard**") will help ensure the integrity of section 45Q.[3] However, we write to request guidance on certain important questions that were left open in the Proposed Regulations, including LCA standards and the definition of a commercial market, as well as clarification of certain other provisions in the Proposed Regulations.

We appreciate your consideration of the recommendations discussed below and look forward to the issuance of final regulations that will facilitate much-needed investment in equipment to reduce greenhouse gas emissions. If you have any questions, please do not hesitate to contact us at: N. Hunter Johnston, hjohnston@steptoe.com; Lisa M. Zarlenga, lzarlenga@steptoe.com; John E. Cobb, jcobb@steptoe.com.

Sincerely,

N. Hunter Johnston

cc: Hon. David Kautter, Assistant Secretary (Tax Policy), Department of the Treasury
Hon. Charles Rettig, Commissioner, Internal Revenue Service
Krishna P. Vallabhaneni, Tax Legislative Counsel, Department of the Treasury
Hannah Hawkins, Deputy Tax Legislative Counsel, Department of the Treasury
Michael J. Desmond, Chief Counsel, Internal Revenue Service
Holly Porter, Associate Chief Counsel (Passthroughs & Special Industries), Internal Revenue Service
David A. Selig, Senior Counsel (Passthroughs & Special Industries), Internal Revenue Service
Maggie Stehn, Attorney (Passthroughs & Special Industries), Internal Revenue Service
Anne (Idsal) Austin, Principal Deputy Assistant Administrator for the Office of Air and Radiation, Environmental Protection Agency

[2] *Preamble to the Proposed Regulations*, 85 Fed. Reg. at 34,056.

[3] *See* Prop. Treas. Reg. § 1.45Q-4(c)(2).

Mark DeFigueiredo, Climate Change Division, Office of Atmospheric Programs, Environmental Protection Agency
Emily Snyder, Branch Chief, Systems Tools and Materials Management Branch, Center for Environmental Solutions and Emergency Response, Environmental Protection Agency
Steven Winberg, Assistant Secretary for Fossil Energy, Department of Energy
Anhar Karimjee, Physical Scientist, Department of Energy
Sarah Forbes, Physical Scientist, Office of Fossil Energy, Department of Energy

## I. Executive Summary

Section 45Q of the Internal Revenue Code, as enhanced and expanded by the Bipartisan Budget Act of 2018 (the "**BBA**"), reflects one of Congress's most ambitious approaches for addressing climate change. The enhancements and expansion in the BBA of section 45Q not only provide a stronger foundation for carbon capture projects through the sequestration of carbon oxides in geologic formations, they also create new opportunities for utilization of carbon oxides through incentives to create other commercial uses.

In perhaps the most important new change to section 45Q, Congress added carbon oxide "utilization" as a method of sequestration that can qualify for the credit. Recognizing that utilization of carbon oxide is fundamentally different from secure geologic storage of carbon oxide (whether it is simply captured for disposal or first used as a tertiary injectant in a qualified EOR project), Congress established a separate statutory framework for determining when carbon oxide is utilized and for measuring the amount utilized, which appears in section 45Q(f)(5).

Rather than create a new statutory framework, Congress directed that measurement of qualified carbon oxides involved in the "utilization" process be accomplished through the provisions of the Clean Air Act, which have already been interpreted and implemented by the Environmental Protection Agency ("**EPA**"). As discussed more fully below, this separate statutory framework directs that the amount of carbon oxide utilized be measured based upon an analysis of "lifecycle greenhouse gas emissions," as defined in the Clean Air Act. Under the Clean Air Act, this definition requires an analysis of "mass values for *all* greenhouse gases . . . adjusted to account for their relative global warming potential," and this definition is incorporated in the Proposed Regulations. Thus, while section 45Q provides a credit for "qualified carbon oxide," in the case of utilization, the statute states that measurement of the amount utilized is to be made pursuant to an LCA that, under the Congressionally incorporated definition of the term "lifecycle greenhouse gas emissions," takes into account the net emissions of all greenhouse gases, which produces a result in tons of carbon dioxide equivalents ("**$CO_2e$**").

At a minimum, the incorporation of this definition from the Clean Air Act creates an ambiguity in section 45Q, which should be resolved in favor of LCA measurement for carbon utilization. Because carbon oxides are a subset of all greenhouse gases, there appears to be a basic tension in the text of the statute: although the section 45Q credit states that it is only available with respect to the capture and utilization of qualified carbon oxides, the method of measuring utilization is by an LCA in which all greenhouse gas emissions must be taken into account in order to determine the amount of qualified carbon oxide that is utilized and for which the credit is granted.

In this letter, we explain why the LCA measurement provision is appropriate for utilization. Because the statute provides that utilization of qualified carbon oxides must be measured based upon an LCA that accounts for all greenhouse gases, there is no way to interpret the utilization lifecycle measurement provision in a manner that would leave the amount of qualified carbon oxides utilized unaffected by net changes in emissions of other greenhouse gases, like methane. Congress could have created a measurement provision that excluded all greenhouse gases, other than carbon oxides, from the statute, but it did not. Instead, Congress incorporated the definition of lifecycle greenhouse gas emissions from the Clean Air Act, which

mandates measurement of all greenhouse gases. This leads to the legal conclusion that the utilization provisions of the statute require that emissions of all greenhouse gases be taken into account in measuring the amount of qualified carbon oxides utilized for purposes of determining the amount of section 45Q credits that are allowed.

Furthermore, as illustrated by Example 1 and Example 2, below, a contrary reading of the statute would lead to perverse results that could exacerbate the adverse effects of climate change. Accordingly, the only way to give full effect to Congress's decision to incorporate the definition of lifecycle greenhouse gas emissions from the Clean Air Act is to take into account net emissions of all greenhouse gases, including displacement effects, in measuring the utilization of qualified carbon oxides.

This reading is also supported by the policy behind section 45Q. In particular, adopting a robust LCA measurement that takes into account emissions of all greenhouse gases will help reduce the direct and indirect greenhouse gas emissions. Under the statute, utilization includes the use of qualified carbon oxides "for any other purpose for which a commercial market exists" (other than use in EOR). Although there are potentially many such uses, this letter focuses on the use of landfill gas ("**LFG**")—which consists of roughly 50 percent carbon dioxide ("**$CO_2$**") and 50 percent methane—to produce electricity. The direct emissions of LFG produced by landfills, and the indirect emissions produced by burning fossil fuel at a power plant to make electricity, are two of the largest contributors to greenhouse gas emissions in the United States.[4] As demonstrated by an appropriate LCA, LFG-to-electricity projects simultaneously reduce direct emissions through utilization of LFG that would otherwise be emitted into the atmosphere and indirect emissions through displacement of electricity that would otherwise be produced using fossil fuels. For this reason, use of LFG to produce electricity is exactly the type of carbon capture and utilization to which section 45Q should apply. Any ambiguities in the statute should be resolved in favor of Congress's intent to provide an incentive to reduce carbon emissions and the adverse effects of climate change.[5]

### A. Key Recommendations

This comment letter recommends that Treasury adopt guidance that clarifies the standards for performing an LCA consistent with the statutory language incorporating an

---

[4] Environmental Protection Agency, *Sources of Greenhouse Gas Emissions*, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#commercial-and-residential (April 11, 2020).

[5] *See, e.g.*, *Statement of Sen. Sheldon Whitehouse*, *available at* https://www.whitehouse.senate.gov/news/release/whitehouse-applauds-passage-of-bipartisan-carbon-capture-technology-bill ("This bipartisan bill will help to clear a path for businesses in Rhode Island and around the country that turn carbon pollution into something useful. And it takes a key step forward in combatting climate change by putting a dollar value on reducing carbon pollution. I'm proud to have joined Senators Heitkamp, Barrasso, and Capito to find common ground.").

analysis of "lifecycle greenhouse gas emissions" as defined in the Clean Air Act. The elements of the LCA standards recommended in this comment letter include:

- Measurement of qualified carbon oxide utilization should take into account emissions of *all* greenhouse gases. Examples should be included in the final regulations that demonstrate how a net increase or a net decrease in the emissions of any greenhouse gas involved in the lifecycle of the product analyzed is taken into account under an LCA.
- Measurement of qualified carbon oxide utilization should take into account displacement effects of greenhouse gas emissions, or the greenhouse gases that would otherwise have been emitted to produce the same product created by the process that is utilizing carbon oxide.
- Taxpayers should be permitted to rely on an LCA that has been accepted or created by the EPA, such as the EPA's Landfill Methane Outreach Program ("**LMOP**") LCA of LFG projects, for measurement of the amount utilized.
- The same measurement standards should also apply for purposes of the 25,000 metric ton utilization threshold provision of section 45Q(d)(2)(A). As discussed in detail below, because utilization is measured by an LCA of all greenhouse gases involved, the EPA's methodology (under the Clean Air Act) of converting these into carbon dioxide equivalent ("**$CO_2e$**") should be used for this provision.

This comment letter also recommends that:

- Treasury should provide guidance on the meaning of use for "any other purpose for which a commercial market exists." Specifically, if the use results in a good or service that is available for purchase by the public or nongovernmental entities, it should be deemed to constitute use for a purpose for which a commercial market exists.
- In applying the additional equipment provision of section 45Q(b)(2), taxpayers should be permitted to rely on a good faith estimate of the volume of carbon oxide as measured by the greenhouse gas LCA that would have been captured in the year prior to the effective date of the BBA.
- Treasury should clarify the rules that will be applied in situations in which multiple taxpayers own different components of equipment that fall within the meaning of "carbon capture equipment" and produce a single stream of qualified carbon oxide. For example, credits could be allocated as agreed to by the parties and, in the absence of such agreement, pro rata based on the equipment's contribution to increased carbon oxide capture. In the case of the installation of additional carbon capture equipment owned by a taxpayer distinct from the owner of the existing facility or carbon capture equipment placed in service before the date of enactment of the BBA, the amount of section 45Q credits described in Prop. Treas. Reg. § 1.45Q-1(g)(1)(ii) should be allocated entirely to the owner of such additional equipment.

## II. Statutory Background

Section 45Q was originally enacted by section 115 of the Energy Improvement and Extension Act of 2008[6] and amended by the American Recovery and Reinvestment Tax Act of 2009[7] ("prior section 45Q"). Prior section 45Q(a) provided a credit for $CO_2$ sequestration that was generally available to a taxpayer that captured qualified $CO_2$ at a qualified facility and disposed of the $CO_2$ in secure geological storage within the United States. Notice 2009-83[8] provided guidance to taxpayers on the application of prior section 45Q. Prior section 45Q(e) provided that, at such time as the IRS certified, in consultation with the EPA, that 75,000,000 metric tons of qualified $CO_2$ had been taken into account for purposes of section 45Q credit, the IRS would publicly announce that the section 45Q credit would cease to be available for the calendar year following such announcement (the "**credit termination provision**").

Congress expanded and extended the section 45Q credit in the BBA.[9] The 2018 amendments apply to taxable years beginning after December 31, 2017.[10] New section 45Q generally provides for a tax credit in an amount equal to a dollar value per metric ton of qualified carbon oxide captured by the taxpayer and (i) disposed of in secure geological storage, (ii) used as a tertiary injectant in a qualified EOR project and disposed of in secure geological storage, or (iii) utilized in certain ways described in section 45Q(f)(5). In general, the credit termination provision no longer applies to carbon capture equipment placed in service on or after February 9, 2018. Instead, section 45Q credits are allowed during the 12-year period beginning on the date such carbon capture equipment was originally placed in service.

Section 45Q(f)(5)(A) defines utilization of qualified carbon oxide as:

(i) the fixation of such qualified carbon oxide through photosynthesis or chemosynthesis, such as through the growing of algae or bacteria;

(ii) the chemical conversion of such qualified carbon oxide to a material or chemical compound in which such qualified carbon oxide is securely stored; or

---

[6] Pub. L. No. 110-343, 122 Stat. 3829 (Oct. 3, 2008).

[7] Pub. L. 111-5, 123, Stat. 115, Division B, § 1131 (Feb. 17, 2009).

[8] 2009-44 I.R.B. 588, *modified by* Notice 2011-25, 2011-14 I.R.B. 604.

[9] Pub. Law. 115-123, §41119(a) (Feb. 9, 2018). This letter references "new section 45Q" and "prior section 45Q" when necessary to distinguish between statutory provisions before and after the enactment of the BBA. Where such distinction is unnecessary, this notice references "section 45Q."

[10] *See id.* at §41119(b).

(iii) the use of such qualified carbon oxide for any other purpose for which a commercial market exists (with the exception of use as a tertiary injectant in a qualified [EOR] project), as determined by the Secretary.

Section 45Q(f)(5)(B) (the "**lifecycle measurement provision**") provides a method for measuring the amount of qualified carbon oxide that is utilized by a taxpayer. In particular, section 45Q(f)(5)(B)(i) provides that the amount utilized:

> shall be equal to the metric tons of qualified carbon oxide which the taxpayer demonstrates, based upon an analysis of lifecycle greenhouse gas emissions and subject to such requirements as the Secretary, in consultation with the Secretary of Energy and the Administrator of the Environmental Protection Agency, determines appropriate, were—
>
> (I) captured and permanently isolated from the atmosphere, or
>
> (II) displaced from being emitted into the atmosphere,
>
> through use of a process described [in section 45Q(f)(5)(A)].

Section 45Q(f)(5)(B)(ii) defines "lifecycle greenhouse gas emissions" by incorporating by reference the definition of such term from section 211(o)(1) of the Clean Air Act (substituting the word "product" for the word "fuel" each place it appears in the definition). As a result, lifecycle greenhouse gas emissions for purposes of section 45Q means:

> the aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the Administrator [of the EPA], related to the full [product] lifecycle, including all stages of [product] and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished [product] to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.

By incorporating the term "lifecycle greenhouse gas emissions" as defined in the Clean Air Act, Congress necessarily also incorporated each term defined by the Clean Air Act that is contained in that definition, including the definition of "greenhouse gas." That definition provides that the term includes "carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, sulfur hexafluoride" and, in the discretion of the EPA Administrator, "any other anthropogenically-emitted gas that is determined by the Administrator, after notice and comment, to contribute to global warming."[11]

The lifecycle measurement provision applies only with respect to qualified carbon oxide utilization. There is no corresponding measurement provision that applies with respect to qualified carbon oxide that is disposed of in secure geologic storage or used as a tertiary injectant in EOR. As a result, emissions of greenhouse gases other than carbon oxides are not relevant for the purposes of the sequestration and EOR provisions of the statute.

[11] 42 U.S.C. § 4575(o)(1)(G).

Section 45Q(d)(2) provides for a series of thresholds that apply in determining whether a facility is a "qualified facility" for purposes of section 45Q. Section 45Q(d)(2)(A) (the "**utilization threshold provision**") provides a special, lower threshold for small facilities that rely on the utilization provisions of the statute. In particular, a qualified facility includes any industrial facility meeting the beginning of construction requirements of the statute that captures "in the case of a facility which emits not more than 500,000 metric tons of carbon oxide into the atmosphere during the taxable year, not less than 25,000 metric tons of qualified carbon oxide during the taxable year which is utilized in a manner described in" section 45Q(f)(5). Other facilities must either meet a 500,000 metric ton threshold (for electricity generating facilities not qualifying for the utilization threshold provision) or a 100,000 metric ton threshold (for all other facilities).[12]

In enacting the new section 45Q provisions, Congress recognized that some existing facilities may want to expand to take advantage of the new, enhanced credit. As a result, Congress enacted section 45Q(b)(2) (the "**additional equipment provision**") to apply to qualified facilities that were placed in service prior to the date of enactment of the BBA for which additional carbon capture equipment is placed in service after the date of enactment of the BBA. In particular, under the additional equipment provision, amounts of qualified carbon oxide falling below the $CO_2$ capture capacity of carbon capture equipment in service at such facility on the day before the date of the enactment of the BBA are taken into account under the old section 45Q provisions, while amounts in excess of this $CO_2$ capture capacity are taken into account under the new section 45Q provisions.

Section 45Q(h) provides that the Secretary may prescribe regulations and other guidance as may be "necessary or appropriate" to carry out section 45Q, including regulations or other guidance to determine whether a facility is a qualified facility.[13]

## III. Clarification of Standards for Lifecycle Analysis

As described above, Congress adopted a separate statutory framework to measure the amount of carbon oxide utilized. This determination is to be based upon a lifecycle greenhouse

[12] Section 45Q(d)(2)(B), (C).

[13] When a regulation is promulgated under a specific grant of authority, it is entitled to even greater deference by courts than a regulation promulgated under the Secretary's general grant of authority under section 7805(a). *U.S. v. Vogel Fertilizer Co.*, 455 U.S. 16, 24 (1982). Courts have concluded that grants of authority to promulgate regulations "necessary and appropriate to carry out" a section of the Internal Revenue Code should be broadly construed to further the purposes of the statutory provision. *See, e.g.*, *Sidell v. Comm'r*, 225 F.3d 103 (1st Cir. 2000) (authority under section 469(l)); *Barnes v. Comm'r*, 130 T.C. 248 (2008) (authority under section 6015(h)); *Hulett v. Comm'r*, 150 T.C. No. 4 (2018) (authority under section 7654(e)); *King v. Burwell*, 759 F.3d 358 (4th Cir. 2014), *aff'd* 135 S.Ct. 2480 (2015) (authority under section 36B).

gas emissions analysis, as defined in the Clean Air Act.[14] Critically, the Clean Air Act definition of lifecycle greenhouse gas emissions takes into account all greenhouse gases, adjusted to account for their relative global warming potential.[15]

Recognizing this, the Proposed Regulations incorporate the definition of lifecycle greenhouse gas emissions from the Clean Air Act and make clear that the mass values for all greenhouse gases are to be taken into account on a $CO_2e$ basis. Prop. Treas. Reg. § 1.45Q-4(c)(1) provides that:

> the term lifecycle greenhouse gas emissions means the aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes) related to the full product lifecycle, including all stages of product and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished product to the ultimate consumer, *where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential according to Table A-1 of 40 CFR Part 98 subpart A.*

Important questions, however, remain. Section 45Q(f)(5)(B) provides that the measurement of qualified carbon oxide utilized by the taxpayer will be "based upon" an analysis of lifecycle greenhouse gas emissions but does not specify exactly how this LCA will be taken into account. Prop. Treas. Reg. § 1.45Q-4(c)(2) provides some elaboration on this point by stating that the "taxpayer measures the amount of carbon oxide captured and utilized through a combination of direct measurement and LCA." However, because the standards of an adequate LCA are reserved in the Proposed Regulations, critical questions remain regarding exactly how the lifecycle greenhouse gas emissions analysis, which—by definition—must take into account all greenhouse gases, will be used to measure the amount of qualified carbon oxide utilized by the taxpayer. Highlighting this potential area of uncertainty, the preamble to the Proposed Regulations states:

> Although the section 45Q credit is only available with respect to qualified carbon oxides, all greenhouse gas emissions are taken into account under this analysis.

In this section, the comment letter explains why the utilization lifecycle measurement provisions need to take into account the emissions of all greenhouse gases in order to give full effect to the statutory definition of lifecycle emissions that Congress chose to incorporate from the Clean Air Act. One could argue that only emissions of carbon oxides need to be taken into account in an LCA because only carbon oxides can meet the definition of "qualified carbon oxides" in the statute. In this section, we demonstrate why this conclusion does not follow from the text of the statute and would, in fact, lead to perverse results that would allow the section 45Q credit to incentivize utilization processes that exacerbate global warming.

---

[14] Section 45Q(f)(5)(b)(i), (ii).

[15] 42 U.S.C. § 7545(o)(1)(H).

In addition, this section will explain why Treasury should retain the ISO LCA Standard in the final regulations. Final regulations should not attempt to adopt one-size-fits-all rules for the identification of boundaries and baselines of an LCA, but should instead rely on the principles outlined in the ISO LCA Standard and the IRS and Department of Energy approval process described in Prop. Treas. Reg. § 1.45Q-4(c)(3).

Finally, we note that the preamble to the Proposed Regulations acknowledges that the IRS is contemplating making additional changes to IRS Form 8933, *Carbon Oxide Sequestration Credit*, to take the Proposed Regulations into account.[16] In revising Form 8933, Treasury should reflect the lifecycle measurement provisions that require carbon oxide utilization to be measured based upon an analysis of greenhouse gas lifecycle emissions.

A. Measurement of Qualified Carbon Oxide Utilization Should Take Into Account Emissions of *All* Greenhouse Gases as Well as Displacement Effects

1. Measurement of Qualified Carbon Oxide Utilization Should Take Into Account Emissions of *All* Greenhouse Gases

As described above, in enacting the BBA, Congress decided to incorporate the definition of "lifecycle greenhouse gas emissions" from the Clean Air Act[17] to measure the utilization of qualified carbon oxide. Under the Clean Air Act, this definition requires an analysis of "mass values for *all* greenhouse gases . . . adjusted to account for their relative global warming potential." The EPA has implemented this definition under its mandatory greenhouse gas reporting rules.[18] For this purpose, greenhouse gases include methane, nitrous oxide, and certain other gases—in addition to carbon oxides.[19] Under these rules, emissions of each greenhouse gas are calculated and then converted to metric tons of "carbon dioxide equivalent," also referred to as "$CO_2e$" using a fixed "global warming potential factor" for each greenhouse gas.[20] The regulations summarize this calculation with the following equation:

$$CO_2e = \sum_{i=1}^{n} GHG_i \times GWP_i \qquad \text{(Eq. A-1)}$$

Where:

$CO_2e$ = Carbon dioxide equivalent, metric tons/year.

---

[16] 85 Fed. Reg. at 34,062.

[17] 42 U.S.C. § 7545(o)(1)(H).

[18] 40 C.F.R. Part 98.

[19] Under the Clean Air Act, carbon monoxide has not yet been designated as a greenhouse gas. However, the expansion of section 45Q under the BBA from "qualified carbon dioxide" to "qualified carbon oxide" suggests that Congress intended the new section 45Q provisions to apply to carbon monoxide.

[20] *See* 40 C.F.R. § 98.2(b).

$GHG_i$ = Mass emissions of each greenhouse gas, metric tons/year.
$GWP_i$ = Global warming potential for each greenhouse gas.
n = The number of greenhouse gases emitted.[21]

Section 45Q, on the other hand, generally provides a credit for the capture and disposal, use, or utilization of "qualified carbon oxide." Carbon oxides (generally, carbon dioxide, carbon monoxide, and other compounds consisting of combinations of carbon atoms and oxygen atoms) are a subset of all greenhouse gases. For the reasons discussed below, by incorporating lifecycle greenhouse gas emissions as defined in the Clean Air Act into section 45Q(f)(5), Congress must have intended that all greenhouse gases—including methane—be taken into account for purposes of the measuring utilization. Thus, if methane is part of the "lifecycle" of the process that utilizes captured carbon oxide, it must be part of the equation of the greenhouse gases that are emitted, permanently isolated, or displaced from being emitted into the atmosphere.

This is further supported by focusing on additional language incorporated from the Clean Air Act, specifically defining the term "lifecycle greenhouse gas emissions" as "the aggregate quantity of greenhouse gas."[22] The word "aggregate" means something formed or calculated by the combination of many separate units or items. It means the total of items which are collected together as a whole, in this case the total of all greenhouse gases expressed in $CO_2e$.[23] Indeed, in applying the Renewable Fuel Standard, the EPA has consistently provided all results in $CO_2e$. The EPA has stated "Lifecycle emissions are normalized per energy unit of fuel produced and presented in kilograms of carbon-dioxide equivalent GHG emissions per million British Thermal Units of renewable fuel produced (kg CO2e/mmBTU)."[24] To our knowledge, in the decade since EPA started implementing section 7545(o)(1), the EPA has never applied an LCA by disaggregating the "aggregate quantity" of "greenhouse gas emissions" into component gases. The ISO LCA Standard, which was adopted by the Proposed Regulations, also supports the conversion of lifecycle indicator results to common units and the aggregation of the converted results in order to get a comprehensive measurement.[25]

Furthermore, if Congress had intended to only reflect emissions of carbon oxides, it could have said so. In incorporating the definition of "lifecycle greenhouse gas emissions" from the

---

[21] *Id.* *See also* ISO LCA Standard § 4.2.3.3.1 (providing an example of converting to $CO_2e$ using a "characterization factor" of the global warming potential for each greenhouse gas) and § 4.4.2.4 ("The calculation of indicator results (characterization) involves the conversion of [lifecycle indicator] results to common units and the aggregation of the converted results within the same impact category. This conversion uses characterization factors. The outcome of the calculation is a numerical indicator result.").

[22] 42 U.S.C. § 7545(o)(1)(H) (emphasis added).

[23] Dictionary.com, available at https://www.dictionary.com/browse/aggregate.

[24] 75 Fed. Reg. 14,670, 14,787 (Mar. 26, 2010).

[25] *See* note 21, above.

Clean Air Act into section 45Q, Congress modified the definition by replacing the word "fuel" with "product" each place that it appeared.[26] Congress showed that it knew how to modify the Clean Air Act definition when it was appropriate to do so. Congress could just have easily replaced the words "greenhouse gas" or "greenhouse gases" with "carbon oxides," but it did not. Given that Congress chose not to make this change, it makes little sense to first aggregate all greenhouse gases only to disaggregate and ignore all greenhouse gases other than carbon oxides.

The conclusion that all greenhouse gases should be taken into account also flows from the statutory framework. Section 45Q(f)(5) expressly provides that this lifecycle measurement is used for purposes of calculating the amount of credit allowed under section 45Q(a)(2)(B)(ii) and section 45Q(a)(4)(B)(ii). Indeed, this is the only provision in the statute labeled "measurement" and it makes clear that for "utilization" this is the only method to be used. Section 45Q(f)(5)(B)(i) states that the amount of qualified carbon oxide utilized by the taxpayer is "equal to the metric tons of qualified carbon oxide which the taxpayer demonstrates, based upon an *analysis of lifecycle greenhouse gas emissions* . . . , were (I) captured and permanently isolated from the atmosphere, or (II) displaced from being emitted into the atmosphere, through" the process utilizing the carbon oxide. The LCA reflected by the formula above incorporates the amount of $CO_2e$ both permanently isolated from, and displaced from being emitted into, the atmosphere, as required by the statute. This is not surprising, as Congress expressly incorporated the Clean Air Act and is presumed to know how the EPA has interpreted that Act.[27] As noted above, a contrary interpretation would be directly at odds with how the EPA has interpreted the Clean Air Act.

Other provisions of section 45Q implicitly recognize the importance of the EPA's LCA to the utilization of carbon oxide. Section 45Q(f)(4) provides for recapture of section 45Q credits when qualified carbon oxide ceases to be captured, disposed of, or used in EOR in a manner consistent with the requirements of section 45Q. However, utilization is not included in this recapture provision. This is because an LCA already takes the emission of carbon oxide over the full lifecycle of a given process into account, which renders a recapture provision for utilization unnecessary. If carbon oxide (or other greenhouse gas) escapes as part of the utilization process, the lifecycle equation will recognize this implicitly.

The Proposed Regulations provide that the mass values for all greenhouse gases are to be taken into account on a $CO_2e$ basis.[28] However, to give full effect to the definition of greenhouse gas emissions from the Clean Air Act, Treasury guidance should include standards for an LCA that provide for a comprehensive accounting of the aggregate of all net greenhouse gas emissions, as the EPA has done in the context of the Clean Air Act.

---

[26] Section 45Q(f)(5)(B)(ii).

[27] *In re Haas*, 48 F.3d 1153, 1157 ("Congress is presumed to be aware of pertinent, existing law when it passes legislation") (11th Cir. 1995) (citing *Miles v. Apex Marine Corp.*, 498 U.S. 19, 30 (1990); *see also Goodyear Atomic Corp. v. Miller*, 486 U.S. 174, 184–85 (1988)).

[28] Prop. Treas. Reg. § 1.45Q-4(c)(1).

One could emphasize different words in the statute—that the amount utilized is "equal to the metric tons of *qualified carbon oxide* which the taxpayer demonstrates, *based upon* an analysis of lifecycle greenhouse gas emissions . . . "—and argue that the lifecycle greenhouse gas emissions analysis under 42 U.S.C. § 7545(o)(1)(H) must be (i) first decomposed into emissions of carbon oxides, on the one hand, and emissions of other greenhouse gases, on the other; and (ii) only emissions of carbon oxides should be considered for purposes of the lifecycle measurement provision. Such an approach is inconsistent with the statutory cross reference to the Clean Air Act, as it would effectively require an unscrambling of the "aggregate quantity" of all greenhouse gases. In addition, as illustrated by the example below, this interpretation can lead to anomalous results.

*Example 1: Utilization of $CO_2$ with Net Increase in Greenhouse Gas Emissions*

Facts:

Carbon capture equipment is placed in service at a qualified facility after the date of enactment of the BBA. The equipment captures $CO_2$ (and no other gases) that would otherwise be released into the atmosphere as industrial emissions of greenhouse gas. The taxpayer measures x tons of $CO_2$ at the source of capture. After capturing the $CO_2$, the taxpayer uses the $CO_2$ for a purpose for which a commercial market exists, as determined by the Secretary to constitute "utilization" of the $CO_2$ within the meaning of section 45Q(f)(5)(A)(iii). A lifecycle greenhouse gas emissions analysis shows that this process of utilizing the captured $CO_2$ permanently isolates the x tons of captured $CO_2$ from the atmosphere but also results in the emission of a substantial quantity of methane into the atmosphere. After adjusting the amount of methane emissions to account for the relative global warming potential of methane (within the meaning of 42 U.S.C. § 7545(o)(1)(H)), the analysis shows a net increase in greenhouse gas emissions over the lifecycle of the process utilizing the $CO_2$.

Analysis:

If the interpretation is adopted that only measures emissions of carbon oxide and emissions of greenhouse gases other than carbon oxides are disregarded, the LCA would show only a net decrease in emissions of x tons of $CO_2$.

However, it seems unlikely that Congress intended this result. By incorporating the definition of lifecycle greenhouse gas emissions from the Clean Air Act, Congress demonstrated that the purpose of the lifecycle measurement provision is to appropriately measure the impact of a taxpayer's utilization process on global warming. A lifecycle analysis of "*all* greenhouse gases" is needed because a process that replaces emissions of $CO_2$ with other, more damaging, emissions of other greenhouse gases like methane should not be encouraged with the grant of a tax credit.

Instead, we believe that the analysis of lifecycle greenhouse gas emissions from the Clean Air Act should be given its full effect. Because the LCA shows a net increase in emissions of all greenhouse gases over the lifecycle of the process utilizing the $CO_2$, the amount of qualified carbon oxide the taxpayer is treated as utilizing under the lifecycle

measurement provision should be negative (or zero), and a credit should not be allowed under section 45Q.

We note that the use of an LCA only applies to determine how much carbon oxide has been utilized within the meaning of section 45Q(f)(5)(A)—it does not apply to measure the disposal or injection of carbon oxide. Under Notice 2009-83,[29] only the contained weight of $CO_2$ is included; other substances, such as water, are not included. Thus, for example, if a taxpayer captures carbon oxide and methane and disposes of them in secure geologic storage or uses them in EOR, the amount of methane disposed of or injected is not factored into the amount of the credit. The LCA, which is only employed in the case of utilization, looks at the entire process and accounts for inputs, emissions, displacement effects, and weights them according to their effect on global warming. This measurement is more appropriate for processes, such as utilization, where the carbon oxide is not being trapped in geologic storage.

2. Measurement of Qualified Carbon Oxide Utilization Should Take Into Account Displacement Effects

There is another key distinction between the utilization provisions of section 45Q and the provisions governing disposal and use in EOR. The provisions governing disposal and use in EOR only account for qualified carbon oxide that is directly captured by carbon capture equipment placed into service at a qualified facility. As a result, Notice 2009-83[30] provides that the amount of qualified $CO_2$ for purposes of the section 45Q credit is presumed to be the lesser of the amount measured at capture and the amount verified at disposal or injection, unless the taxpayer can establish to the satisfaction of the Secretary that the greater amount is the correct amount.

Such a rule is not appropriate for measuring utilization because it ignores the amount of qualified carbon oxide that is "displaced from being emitted into the atmosphere."[31] A life cycle analysis, however, takes displacement into account in addition to qualified carbon oxide that is "captured and permanently isolated from the atmosphere."[32] The preamble to the Proposed Regulations reflects the importance of the effects of displacement when it states that an LCA is intended to "quantify[] the greenhouse gas emissions of a product or process and compar[e] that impact to a baseline."[33]

Displacement is a term of art used in environmental guidance, which refers to indirect reductions in greenhouse gas emissions that result from comparing a process for utilizing

[29] § 4.03(b).

[30] § 4.03(a).

[31] Section 45Q(f)(5)(B)(i)(II).

[32] Section 45Q(f)(5)(B)(i)(I).

[33] 85 Fed. Reg. at 34,056.

qualified carbon oxide against baseline emissions of the processes in the same commercial market.[34] By definition, a molecule of greenhouse gas that is displaced from being emitted is not a molecule that was captured by carbon capture equipment placed into service a qualified facility. Instead, it is a molecule that otherwise would have been emitted had the utilization process not displaced a baseline process in the same commercial market.

It might be argued that the lifecycle measurement provision states that the lifecycle greenhouse gas emissions analysis is used only to determine the amount of qualified carbon oxide that is "utilized" under paragraph (2)(B)(ii) or (4)(B)(ii) of subsection 45Q(a). But in order to qualify for a credit under section 45Q, qualified carbon oxide must both be "captured" under paragraph (2)(A) or (4)(A) and "utilized" under paragraph (2)(B)(ii) or (4)(B)(ii) of subsection 45Q(a). Thus, one could argue that a rule similar to that in Notice 2009-83,[35] limiting the amount of qualified carbon oxide to the lesser of the amount captured and the amount measured under the lifecycle measurement provision, should apply.

However, the lifecycle measurement provision expressly requires that the measurements include qualified carbon oxide that is "displaced from being emitted into the atmosphere" in addition to qualified carbon oxide that is "captured and permanently isolated from the atmosphere." It is unlikely that Congress would give taxpayers the benefit of taking into account qualified carbon oxide that is "displaced" (rather than "captured") with the lifecycle measurement provision while simultaneously taking that benefit away by limiting the amount of the credit to only the amount measured at the source of capture with section paragraph (2)(A) or (4)(A) of section 45Q(a).

In addition, reading an independent capture requirement into section 45Q(a)(2)(A) and section 45Q(a)(4)(A) for utilized qualified carbon oxide, would nullify the "displaced from being emitted into the atmosphere" language of the lifecycle measurement provision. Moreover, the word "captured" in "captured and permanently isolated from the atmosphere" language would be unnecessary surplusage. This would be inconsistent with the presumption that statutes should be construed "so that effect is given to all its provisions, so that no part will be inoperative or superfluous, void or insignificant."[36]

Because the lifecycle measurement provision expressly incorporates displacement effects, it is critical that these effects be taken into account in calculating the amount of section

---

[34] *See, e.g.*, Environmental Protection Agency, *Lifecycle Analysis of Greenhouse Gas Emissions under the Renewable Fuel Standard*, https://www.epa.gov/renewable-fuel-standard-program/lifecycle-analysis-greenhouse-gas-emissions-under-renewable-fuel ("The sum of all of these lifecycle emissions for each renewable fuel pathway are then compared to the direct emissions from the baseline petroleum fuel it displaces. The results of these analyses are used to determine if the fuel pathways meet the [greenhouse gas] reduction thresholds required by the [Clean Air Act].").

[35] § 4.03(a).

[36] *See, e.g., Hibbs v. Winn*, 542 U.S. 88, 101 (2004).

45Q credits allowed. A rule that considers only the lesser of the amount of qualified carbon oxide captured and the amount utilized would be inconsistent with the language of the lifecycle measurement provision and the structure of section 45Q. This can be illustrated by the following example.

*Example 2: Utilization of $CO_2$ with Displacement*

Facts:

Carbon capture equipment is placed in service at a qualified facility after the date of enactment of the BBA. The equipment captures $CO_2$ (and no other gases) that would otherwise be released into the atmosphere as industrial emissions of greenhouse gas. The taxpayer measures x tons of $CO_2$ at the source of capture. After capturing the $CO_2$, the taxpayer uses the $CO_2$ for a purpose for which a commercial market exists, as determined by the Secretary to constitute "utilization" of the $CO_2$ within the meaning of section 45Q(f)(5)(A)(iii). A lifecycle greenhouse gas emissions analysis shows that this process of utilizing the captured $CO_2$ permanently isolates the x tons of captured $CO_2$ from the atmosphere but also results in the displacement of an additional y tons of $CO_2$ that otherwise would have been emitted (e.g., because the alternative base case process for producing the same product leads to the emission of y tons of $CO_2$). As a result, the analysis shows a net decrease of x + y tons of $CO_2$ emitted over the lifecycle of the process utilizing the captured $CO_2$.

Analysis:

As discussed above, one might argue that while the taxpayer should be treated as utilizing x + y tons of $CO_2$, the taxpayer should only be treated as capturing the x tons of $CO_2$ that were measured at the source of capture and should only be entitled to a credit in connection with the lesser of the amount measured at the source of capture and the amount measured under the lifecycle measurement provision.

However, this reading would fail to give full effect to Congress's intent in incorporating the definition of lifecycle greenhouse gas emissions from the Clean Air Act. The purpose of the lifecycle measurement provision is to appropriately measure the impact of a taxpayer's utilization process on global warming so that the amount of economic incentive provided by the credit is proportional to the beneficial impact of the taxpayer's activities. Here, the taxpayer has reduced potential global warming in two ways: first, by capturing and permanently isolating x tons of $CO_2$ from the atmosphere; and second, by displacing y tons of $CO_2$ from being emitted into the atmosphere. As a result, the taxpayer should be provided the economic incentive associated with reducing $CO_2$ emissions by x + y tons on a lifecycle basis.

3. Recommended Guidance

Measurement of qualified carbon oxide utilization should take into account emissions of *all* greenhouse gases and should also take into account displacement effects of greenhouse gas emissions. Examples—such as Examples 1 and 2, above, and Example 3, in Section V, below—

should be included in the final regulations to demonstrate how a net increase or a net decrease in the emissions of any greenhouse gas will be taken into account under an LCA. In revising IRS Form 8933, Treasury should reflect the lifecycle measurement provisions that require carbon oxide utilization to be measured based upon an analysis of greenhouse gas lifecycle emissions for all greenhouse gases, including displacement effects.

### B. Taxpayers Should be Permitted to Rely on an LCA That Has Been Accepted by the EPA

As described above, the lifecycle measurement provision of section 45Q(f)(5)(B) provides the backbone for interpreting the utilization provisions of section 45Q. Because an appropriate and comprehensive LCA is so important to the proper implementation of these provisions, Treasury should encourage taxpayers to rely on the expertise of the EPA by expressly allowing taxpayers to rely on an LCA that has been accepted or created by the EPA. Such a safe harbor will provide needed certainty to taxpayers, and will allow the IRS to focus on the administration of tax laws, where the IRS has distinctive expertise, while deferring to the EPA on matters where the EPA has distinctive expertise.

#### 1. EPA's LMOP

The EPA's LMOP can provide a prototypical example for how such an EPA-accepted LCA would work.[37] It could be used for example to measure the lifecycle greenhouse gas emissions involved in the production of electricity using LFG. LFG is a natural byproduct of the decomposition of organic material that has been placed in landfills in anaerobic (without oxygen) conditions.[38] LFG contains roughly 50 to 55 percent methane and 45 to 50 percent $CO_2$, with less than 1 percent non-methane organic compounds and trace amounts of inorganic compounds.[39] Most of the LFG produced seeps out of landfills through cover material and escapes into the atmosphere unless captured. In the guidance issued in 2009, Treasury provided a broad definition of "industrial facility":

> Industrial facility refers to a facility that produces a $CO_2$ stream from a fuel combustion source, a manufacturing process, or a fugitive $CO_2$ emission source that, absent capture and disposal, would otherwise be released into the atmosphere as industrial emission of greenhouse gas.[40]

---

[37] LMOP is a voluntary program that works cooperatively with industry stakeholders and waste officials to reduce or avoid methane emissions from landfills. *See https://www.epa.gov/lmop/about-landfill-methane-outreach-program*.

[38] EPA LFG Handbook, at 1-1.

[39] *Id.*

[40] Notice 2009-83 § 3.02(a).

This definition generally has been retained in the Proposed Regulations.[41]

A landfill with appropriate LFG collection equipment—including wells, pipes, and blowers for collecting LFG, meters and monitoring equipment for measuring collected LFG, and gas processing equipment for processing LFG—generally should meet this definition of an industrial facility. Notably, this definition appears to call for analysis of a counterfactual situation: would there have been a fugitive $CO_2$ emission source released into the atmosphere in the absence of capture? In the absence of carbon capture equipment placed into service at a landfill, LFG that leaks into the atmosphere would provide a fugitive $CO_2$ emission source released into the atmosphere.[42] Furthermore, a landfill is not a "natural carbon dioxide-bearing formation[] or a naturally occurring subsurface spring," so it appears that the exclusion of Prop. Treas. Reg. § 1.45Q-2(d)(1) should not apply. Therefore, LFG is the kind of industrial emission to which section 45Q should apply.

LFG electricity projects reduce greenhouse gas emissions in two ways. First, methane that would otherwise be released into the atmosphere is captured and converted to water and $CO_2$ when it is burned to produce electricity ("direct GHG reductions").[43] Because methane is a potent greenhouse gas (more than 25 times stronger than $CO_2$ over a 100-year period),[44] conversion of methane into $CO_2$ and water produces a large net decrease in greenhouse gas emissions.

Second, producing electricity from LFG displaces the use of fossil fuels that would be needed to produce the same amount of electricity ("indirect GHG reductions").[45] Carbon in fossil fuels was not contained in recently living biomass; rather, the carbon was stored when ancient biomass was converted to coal, oil, or natural gas and would therefore not have been

[41] Prop. Treas. Reg. § 1.45Q-1(d) ("An industrial facility is a facility that produces a carbon oxide stream from a fuel combustion source or fuel cell, a manufacturing process, or a fugitive carbon oxide emission source that, absent capture and disposal, would otherwise be released into the atmosphere as industrial emission of greenhouse gas or lead to such release.").

[42] As discussed below, in Section VI of this letter, many landfills had carbon capture equipment in place prior to the enactment of the BBA. Under the additional carbon capture equipment provision of section 45Q(b)(2), the relevant counterfactual becomes: In the absence of (more efficient) additional carbon capture equipment, would the incremental amount of LFG—above and beyond the pre-BBA capture capacity—been a fugitive $CO_2$ emission source released into the atmosphere.

[43] EPA LFG Handbook, at 1-9.

[44] *Id.*, at 1-8.

[45] *Id.*, at 1-9.

emitted had the fossil fuel not been extracted and burned.[46] This displacement avoids greenhouse gas emissions from fossil fuel combustion by an end user facility or power plant.[47]

A lifecycle greenhouse gas emissions analysis of LFG projects under section 45Q should take into account indirect GHG reductions. Section 45Q and Prop. Treas. Reg. § 1.45Q-4(c)(1) recognize this by incorporating the definition of lifecycle greenhouse gas emissions from the Clean Air Act, which calls for an analysis of aggregate greenhouse gas emissions, "including direct emissions and significant indirect emissions" from the "full [product] lifecycle."[48] This kind of indirect GHG reduction from a process that utilizes "biogenic" carbon oxides, instead of fossil fuels, is a key example of where an examination of a *full* lifecycle requires comparison to the relevant baseline. All LCAs used in the implementation of the EPA's Renewable Fuels Standard under the Clean Air Act consider emissions of biogenic carbon as neutral. Similarly, the DOE, which participates in the review for technical adequacy of an LCA under the Proposed Regulations,[49] also has recognized biogenic carbon as neutral. As emphasized in the ISO LCA Standard adopted by the Proposed Regulations, an LCA is intended to provide a "cradle-to-grave" analysis that reflects environmental impacts "throughout a product's life cycle from raw material acquisition through production, use, end-of-life treatment, recycling and final disposal."[50] Accordingly, the ultimate release of $CO_2$ from a fuel that utilized biogenic carbon would show a greenhouse gas savings relative to a fuel that used a fossil-based carbon oxide.

Both the direct GHG reductions and indirect GHG reductions can be calculated using a lifecycle greenhouse gas emissions calculator created by the EPA as part of the LMOP program.[51] This calculator allows LFG electricity operators to calculate the net lifecycle greenhouse gas emissions reductions of their projects. The tool calculates both the direct GHG reductions (based on the $CO_2$ equivalents of methane that is combusted by the project) and the indirect GHG reductions (based on the emissions avoided by the displacement of electricity generated from fossil fuels. The indirect GHG reductions can be calculated separately for each region of the country to take into account the different composition of displaced electricity generation.

---

[46] *Id.*, at 1-9 n.10.

[47] *Id.*, at 1-9.

[48] 42 U.S.C. § 7545(o)(1)(H) (lifecycle greenhouse gas emissions are based on "full fuel lifecycle"); section 45Q(f)(5)(B)(ii) ("'product' shall be substituted for 'fuel' each place it appears" in section 7545(o)(1)(H)).

[49] Prop. Treas. Reg. § 1.45Q-4(c)(3).

[50] ISO LCA Standard, at Introduction, p. v.

[51] EPA Landfill Methane Outreach Program, *Landfill Gas Energy Benefits Calculator*, https://www.epa.gov/lmop/landfill-gas-energy-benefits-calculator (last updated June 2019).

The proposed safe harbor would apply not only to LCA tools that have been created by the EPA, like the EPA's LMOP tool, but also to any other LCA that is created or accepted by the EPA in connection with the mandatory greenhouse gas reporting rules. This safe harbor approach is consistent with the approach adopted by Notice 2009-83, which recognized that a "range of modeling tools" could be used to conduct the risks of $CO_2$ leakage in the context of sequestration through secure geological storage.[52] We recommend that the EPA, in consultation with Treasury, compile a list of LCA tools that can qualify for the safe harbor.

2. Recommended Guidance

The final regulations should provide a safe harbor permitting taxpayers to rely on an LCA that has been accepted or created by the EPA, such as the EPA's LMOP LCA of LFG projects, for measurement of the amount of qualified carbon oxide that is utilized.

C. Final Regulations Should Retain the ISO LCA Standard

1. Discussion of ISO LCA Standard

Prop. Treas. Reg. § 1.45Q-4(c)(2) requires a taxpayer to prepare a written LCA report containing documentation consistent with the ISO LCA Standard. Prop. Treas. Reg. § 1.45Q-4(c)(3) requires the taxpayer to submit this written LCA report to the IRS and the Department of Energy (the "**DOE**"). The LCA will then be subject to a technical review by the DOE, and the IRS, in consultation with the DOE and the EPA, will determine whether to approve the LCA.

This framework provides appropriate safeguards for protecting the integrity of the section 45Q credits while allowing sufficient flexibility for the wide range of utilization processes that may be developed by taxpayers over time. Importantly, the ISO LCA Standard does not identify any particular model or method for conducting an LCA. For example, the ISO LCA Standard does not provide an actual model for any particular product. Rather, it establishes general principles that an LCA should follow. Given the large number of LCA models that have been produced, the approach of the Proposed Regulations is the most sensible method of assuring that taxpayers use a method that appropriately takes into account the variety of different considerations required of a comprehensive LCA.

The preamble to the Proposed Regulations requests "comments on how to achieve consistency in boundaries and baselines so that similarly situated taxpayers will be treated consistently."[53] We note that the ISO LCA Standard itself contains adequate guidance on these questions. A detailed discussion of the process of determining the appropriate baseline and boundaries is set forth in the ISO LCA Standard. It would be very difficult to develop a one-size-fits-all solution to the selection of boundaries and baselines for all products, as these determinations depend on the particular product involved. Attempting to do so in the final regulations is likely to undermine the ISO LCA Standard. It is more appropriate to indicate safe

[52] Notice 2009-83 § 5.02(b)(i)(B).

[53] 85 Fed. Reg. at 34,057.

harbors, such as methods used by the EPA described above, which have already undergone rigorous review and extensive use rather than trying to establish a single set of rules for all products that might utilize qualified carbon oxides.

2. Recommended Guidance

The final regulations should retain the ISO LCA Standard. In addition, the final regulations should rely on the process for determining the appropriate baseline and boundaries as set forth in the ISO LCA Standard—as well as the technical review that will be undertaken by the IRS and DOE—rather than attempting to adopt a one-size-fits-all approach to setting boundaries and baselines for an LCA.

D. The Same Lifecycle Measurement Should Apply for the Utilization Threshold Provision of Section 45Q(d)(2)(A)

1. Discussion of Utilization Threshold

It is unclear whether 25,000 metric ton threshold in the utilization threshold provision is measured based on an LCA. The lifecycle measurement provision expressly references the provisions of section 45Q that determine the amount of credit that is allowed for utilization (i.e., section 45Q(a)(2)(B)(ii) and section 45Q(a)(4)(B)(ii)) but does not expressly reference the utilization threshold provision. However, basic canons of statutory construction suggest that a lifecycle measurement should also be used for determining whether the utilization threshold has been met.

First, when the same word appears in multiple places in the same statute, it generally should be given the same interpretation. "The 'normal rule of statutory construction' is that 'identical words used in different parts of the same act are intended to have the same meaning.'"[54] It is, therefore, natural to presume that when the statute references the amount of qualified carbon oxide that is "utilized in a manner described in subsection (f)(5)" in the utilization threshold provision that this amount is the same amount described when the statute references the amount of qualified carbon oxide "utilized by the taxpayer in a manner described in subsection (f)(5)" in section 45Q(a)(2)(B)(ii) or section 45Q(a)(4)(B)(ii).

Second, if the statute was found to be ambiguous, its meaning may be determined in light of other statutes on the same subject matter. Under the *in pari materia* canon, statutes addressing the same subject matter generally should be read "as if they were one law."[55] Based on the incorporation of the Clean Air Act's measurement provision into section 45Q, the provisions of section 45Q should be read in light of the Clean Air Act and the EPA's mandatory greenhouse

[54] *Electrical Welfare Trust Fund v. United States*, 907 F.3d 165 (3rd Cir. 2018) (quoting *Gustafson v. Alloyd Co.*, 513 U.S. 561, 570 (1995)).

[55] *Erlenbaugh v. United States*, 409 U. S. 239, 243 (1972).

gas reporting rules.[56] And it is no coincidence that the special lower threshold established under the utilization threshold provision is 25,000 metric tons per year. This is identical to the threshold for reporting under the greenhouse gas reporting rules.[57] Under these EPA rules, this threshold is calculated based on the metric tons of $CO_2e$, which supports a similar interpretation of the same threshold under section 45Q. This would be consistent with published guidance under the old section 45Q provisions, which stated that claims made under section 45Q should match amounts reported under the EPA's mandatory greenhouse gas reporting rules.[58]

Finally, use of a lifecycle measurement for the utilization threshold provision is most consistent with the apparent purpose of the provision. The thresholds established by section 45Q(d)(2) appear to be intended to ensure that a given facility will have a sufficiently large potential impact on emissions before allowing a tax credit. A comprehensive lifecycle greenhouse gas emissions analysis provides the best measurement for the size of a facility's impact. It would make little sense to exclude a project that has a relatively large impact on reducing global warming potential under an LCA just because a portion of that impact results from reduced methane emissions. Furthermore, by creating a lower threshold for facilities relying on utilization than facilities that rely on storage or use in EOR, Congress apparently wished to make it easier for small scale utilization projects to qualify for section 45Q credits.

2. Recommended Guidance

The final regulation should apply the same measurement standards for purposes of the 25,000 metric ton utilization threshold provision of section 45Q(d)(2)(A). Because utilization is measured by an LCA of all greenhouse gases involved, the EPA's methodology (under the Clean Air Act) of converting these into metric tons of carbon dioxide equivalent should be used for this provision.

## IV. Treasury Should Provide Guidance on the Meaning of "Any Other Purposes for which a Commercial Market Exists."

### A. Definition of Commercial Market

Section 45Q(f)(5)(A) gives the Secretary broad authority to recognize different processes that make use of qualified carbon oxides as "utilization" for purposes of the statute. Section 45Q(f)(5)(A)(i) and (ii) list the fixation of qualified carbon oxide through photosynthesis or

---

[56] Consistent with this canon of construction, published guidance on the old section 45Q provisions provides that amounts reported under the EPA greenhouse gas reporting rules must be consistent with the amount of qualified $CO_2$ taken into account for purposes of section 45Q. Notice 2009-83 § 5.02(a), 2009-44 I.R.B. 588.

[57] *See* 40 C.F.R. § 98.2(a)(2).

[58] *See* Notice 2009-83 § 5.02(a) ("The amount reported under the [mandatory greenhouse gas reporting rules] (or any successor rule) must be consistent with the amount of qualified CO2 taken into account for purposes of the § 45Q credit.").

chemosynthesis (such as through the growing of algae or bacteria) and the chemical conversion of qualified carbon oxide to a material or chemical compound in which such qualified carbon oxide is securely stored as two specific examples of processes that will constitute utilization. But section 45Q(f)(5)(A)(iii) provides a broad catchall provision: utilization includes "the use of qualified carbon oxide for any other purpose for which a commercial market exists (with the exception of use as a tertiary injectant in a qualified enhanced oil or natural gas recovery project), as determined by the Secretary." The Proposed Regulations have reserved this issue for future consideration.[59]

The Supreme Court has said that in "determining the scope of a statute, we look first to its language, giving the words used their ordinary meaning."[60] The ordinary meaning of the word "any" is "expansive . . . that is, 'one or some indiscriminately of whatever kind.'"[61] Applying these principles, the phrase "any other purpose for which a commercial market exists" clearly has a broad sweep.

"Commercial market" is not a term of art that appears anywhere in the Internal Revenue Code other than section 45Q. As a result, Treasury should look to the plain meaning of the words. As ordinarily used, the phrase "commercial market" refers to any market for goods or services that is purchased or available for purchase by the public or nongovernmental entities.[62]

Treasury should adopt a similarly broad plain-language reading of this phrase for purposes of section 45Q. The broad language of section 45Q(f)(5)(A)(iii) reflects the myriad

---

[59] Prop. Treas. Reg. § 1.45Q-4(d).

[60] *Moskal v. United States*, 498 U.S. 103, 108 (1990).

[61] *United States v. Gonzales*, 520 U.S. 1, 5 (1997) (quoting Webster's Third New International Dictionary 97 (1976)). *See also*, *Ali v. Federal Bureau of Prisons*, 552 U.S. 214, 219–20 (quoting *Gonzalez*); *Department of Housing and Urban Development v. Rucker*, 535 U.S. 125, 130–31 (2002) (statute making "any" drug-related criminal activity cause for termination of public housing lease precludes requirement that tenant know of the activity); *Brogan v. United States*, 522 U.S. 398, 400–01 (1998) (statute criminalizing "any" false statement within the jurisdiction of a federal agency allows no exception for the mere denial of wrongdoing); *United States v. Alvarez-Sanchez*, 511 U.S. 350, 356, 358 (1994) (statute referring to "any" law-enforcement officer includes all law enforcement officers—federal, state, or local—capable of arresting for a federal crime).

[62] *See, e.g.*, The Computer Language Company Inc., *Definition of "Commercial Market"*, *available at* https://encyclopedia2.thefreedictionary.com/commercial+market (defining "commercial market" as "the sale of products and services to end users and public and private companies, but not to governmental agencies"); 48 C.F.R. § 2.101 (defining "commercial item" and "commercial marketplaces" (other than real property) for purposes of Federal Acquisition Regulations by reference to items "of a type customarily used by the general public or by non-governmental entities for purposes other than governmental purposes, and (i) [] sold, leased, or licensed to the general public; or (ii) [] offered for sale, lease, or license to the general public").

possible uses of qualified carbon oxide, and a narrow interpretation would unnecessarily restrict the utilization provisions. Accordingly, if the use of carbon oxide results in a good or service that is available for purchase by the public or nongovernmental entities, it should be deemed to constitute a purpose for which a commercial market exists. For example, use of LFG to produce electricity is a use for which a commercial market exists, since electricity can be purchased by the public. This definition is administrable by both taxpayers and the IRS, and it does not require any judgment as to the type or depth of the market.

Final regulations should expressly recognize that use of a qualified carbon oxide to provide a service can qualify as a use "for any other purpose for which a commercial market exists" and should not restrict this provision to the production of goods. First, this follows from the plain language of the statute; commercial markets exist for services, and not just goods, and "any" means "'one or some indiscriminately of whatever kind.'"[63] Moreover, including use in the provision of services will help to ensure that the utilization provisions can apply to the many important uses of $CO_2$ that do not result in the physical or chemical incorporation of $CO_2$ into the final product (such as those described in Appendix A).

One could argue that the phrase "any other purpose for which a commercial market exists" in section 45Q(f)(5)(A)(iii) is limited to the sale of products that make use of qualified carbon oxide, because section 45Q(f)(5)(B)(ii) directs that the word "product" should be substituted for "fuel" each place it appears in the definition of lifecycle greenhouse gas emissions incorporated from the Clean Air Act. However, as mentioned above, the plain language of section 45Q(f)(5)(A)(iii) is not so limited. If Treasury determines that section 45Q(f)(5)(B)(ii) acts as a limit on section 45Q(f)(5)(A)(iii), it should clarify that the term "product" is defined as necessary to implement the definition of life cycle greenhouse gas emissions—i.e., it is something that has a lifecycle that includes production, distribution, and use.[64] Such definition would reconcile the language of section 45Q(f)(5)(A)(iii) and (f)(5)(B)(ii) without requiring difficult-to-administer distinctions between goods and services. And clearly electricity qualifies as a product under this definition.[65]

---

[63] *See Gonzales*, 520 U.S. at 5. *See also* note 54, above.

[64] *See* 42 U.S.C. § 7545(o)(1), as modified by section 45Q(f)(5)(B)(ii).

[65] Even if Treasury adopts a traditional distinction between goods and services, electricity should be treated as a good. When electricity is generated, physical objects—electrons—are transported from the site at which the electricity is produced to the location of the ultimate consumers. Ratepayers are charged both a consumption charge for the physical consumption of electrons measured by kilowatts and are also charged for transportation of those electrons through a transmission charge. There is no basis in the statute for distinguishing electricity from any other physical product that is produced and delivered to customers. To the contrary, it would defy ordinary language to say that use in generating electricity is not use for a "purpose for which a commercial market exists." Federal agencies refer to "electrical products" in relation to electricity substantiating the commonly understood use of the term. *See, e.g.*, 18 CFR § 33.3(c)(1) (referring to "electricity products"). Furthermore, the IRS has concluded that the "[g]eneration of electricity constitutes production of tangible personal property" for purposes of section 263A, and as a result electricity producers are treated the same as manufacturers of any

Finally, we note that some commentators have argued that utilization requires the physical or chemical incorporation of qualified carbon oxide into the final product. However, as long as qualified carbon oxides are used as part of the process that produces a product, carbon oxides should not need to be physically or chemically incorporated into the final product. The flush language of section 45Q(f)(5)(B)(i) makes it clear that utilization refers to an entire "process" not just an end result. Section 45Q(f)(5)(A)(iii), in turn, provides that utilization includes "the use of [] qualified carbon oxide for any other purpose for which a commercial market exists." Furthermore, Congress would not have felt the need to expressly exclude use as a tertiary injectant in EOR from section 45Q(f)(5)(A)(iii) if uses in which carbon oxides were not physically or chemically incorporated into a final product were already outside of the scope of the provision. When $CO_2$ is used as a tertiary injectant in EOR, the $CO_2$ is not incorporated into the final product, namely oil, that is sold to consumers.

For the foregoing reasons, it should not matter if carbon oxides lose their chemical identity in the process, as in the growing of algae or in the reaction of captured carbon dioxide with calcium to produce a calcium carbonate used in cement, or if the carbon oxide is used for its various properties—such as it non-reactivity—but is not physically or chemically incorporated into the final product.[66] The qualified carbon oxide must be used in the process of manufacturing the product, but nothing in the statute requires the product to actually contain qualified carbon oxides.

B. Recommended Guidance

We recommend that Treasury provide the following guidance in final regulations regarding the scope of the language "any purpose for which a commercial market exists" in section 45Q(f)(5)(A)(iii):

- Consistent with the statutory text and traditional canons of construction, the final regulations should adopt a broad, plain-language reading of this provision.

---

other tangible goods under the unicap rules. Chief Counsel Advice 200152013 (Sept. 2001) (citing *Helvey v. Wabash County REMC*, 278 N.E.2d 608 (Ind. App. 1972); *Minnesota Power & Light Company v. Taxing District*, 182 N.W.2d 685 (Minn. 1970); *Curry v. Alabama Power Co.*, 8 So.2d 521 (Ala. 1942); *State Tax Commission v. Marcus J. Lawrence Mem. Hosp.*, 495 P.2d 129 (Ariz. 1972)).

[66] Many of these uses of $CO_2$ do not involve a chemical change in the $CO_2$ but rather utilize the rather unique properties of the gas. Carbon dioxide has several desirable characteristics such as inertness, non-explosiveness, non-corrosiveness, high volatility, cooling ability, and low-cost. For these reasons $CO_2$ is used in a variety of applications in food and processing industries. In many of these applications it is the very absence of chemical change in carbon dioxide that creates its usefulness. Examples of these important uses of $CO_2$ that do not result in the physical or chemical incorporation of $CO_2$ into the final product are provided in Appendix A.

- At a minimum, the final regulations should provide that the use of carbon oxide results in a product that is available for purchase by the public or nongovernmental entities will constitute a purpose for which a commercial market exists.

- The final regulations should avoid suggesting that qualified carbon oxide must be physically or chemically incorporated into the final product or can only be used in production of a good, as opposed to a service. It should only be required that the qualified carbon oxide be used in the process that results in the final product.

## V. Example of Proposed Standards for Lifecycle Analysis and Commercial Market

The operation of the proposed LCA standards and definition of commercial market, as applied to the use of LFG to produce electricity, is illustrated in the following example.

*Example 3: Reliance on EPA-Endorsed Lifecycle Analysis*

Facts:

After the date of enactment of the BBA and before 2024, carbon capture equipment is placed in service at a landfill that emits not more than 500,000 metric tons of carbon oxide into the atmosphere during the taxable year.[67] The equipment captures both $CO_2$ and methane that would otherwise be released into the atmosphere as emissions of greenhouse gas. The taxpayer measures x tons of $CO_2$ and y tons of methane at the source of capture. After capturing the mixture of $CO_2$ and methane, the taxpayer uses the gas to produce electricity for sale in the commercial electricity market. The taxpayer uses the EPA's LMOP tool to measure lifecycle greenhouse gas emissions that result in a net decrease of z tons of greenhouse gas emissions on a $CO_2e$ basis, based on both direct GHG reductions from the combustion of methane and indirect GHG reductions from the displacement of electricity generation from fossil fuels.

Analysis:

In an LFG electricity project, LFG that would otherwise be released into the atmosphere as emissions of greenhouse gas are collected, treated, and combusted to produce electricity. Although the $CO_2$ component of LFG is not itself combusted, it plays a key role in the electricity generation process

LFG is collected through a series of vertical and horizontal wells in the landfill and conveyed through a common header pipe. Blowers collect and direct the LFG to a treatment system that removes sulfur and moisture and then directs the captured stream to energy generation equipment typically in the form of reciprocating internal combustion

[67] Issues regarding measurement of incremental capture by additional carbon capture equipment that is placed into service after the date of enactment of the BBA at a qualified facility that was placed into service before the date of enactment of the BBA is discussed in Part IV, below.

engines. These engines burn the methane in the LFG and produce electricity. The $CO_2$ in the LFG is used to cool the flame in the engine to reduce emission of NOx in order to meet permit requirements.[68] As the EPA has recognized, LFG is classified as a "low NOx fuel" as a result of the lower flame temperatures caused by this use of $CO_2$:

> Landfill and digester (or sewage) gases and propane are examples of alternative fuels for SI engines, and the relative emission levels for LFG, propane, and natural gas are shown in figure 4-2. Landfill and digester gases have relatively low Btu contents compared to those of natural gas and propane and therefore have lower flame temperatures, which result in lower NOx emissions.[69]

The important role played by $CO_2$ is further demonstrated by contrasting engines that burn LFG and engines that burn pure methane. In particular, engines that burn pure methane typically have to recirculate their $CO_2$ emissions back into the fuel feed in order to achieve the same level of NOx emissions as engines burning LFG produces. Because these low levels of NOx emissions are required by permit, an LFG-to-electricity project generally would not be able to operate without using $CO_2$.

We believe that this use of the qualified carbon oxides is part of the process of making electricity for which a commercial market exists. The $CO_2$ and the methane present in the LFG are used in the process of making electricity. The electricity is sold into the regional electricity market. Thus, captured $CO_2$ is used in an LFG electricity project and is not simply passively emitted into the atmosphere.

In addition, as more fully discussed in Part III., below, a robust commercial market exists for electricity production generally, and for LFG electricity projects specifically. The EPA's LMOP tracks key data for LFG energy projects and maintains a database of existing projects. As of the end of 2019, the LMOP database included 578 operational LFG energy projects, 413 of which were LFG electricity projects.[70] As a result, use of captured $CO_2$ in the production of electricity would fall within the plain meaning of the phrase "any other purpose for which a commercial market exists" and the use of LFG to produce electricity should be treated as "utilization" described under section 45Q(f)(5)(A)(iii).

---

[68] A discussion of the value of the $CO_2$ in this process is included in Swan, D. and Bade, Shrestha, S., Combustion Modeling of Landfill Gas Fueled Spark Ignition Engine Performance, SAE Int. J. Fuels Lubr. 7(1):2014, doi. 10.4271/2014-01-1471 (attached as an exhibit to this letter).

[69] Environmental Protection Agency, *Alternative Control Techniques Document—NOx Emissions from Stationary Reciprocating Internal Combustion Engines*, EPA-453/R-93-032, at P.4-8 (July 1993).

[70] Landfill Methane Outreach Program, Landfill Gas Energy Project Data and Landfill Technical Data, available at https://www.epa.gov/lmop/landfill-gas-energy-project-data-and-landfill-technical-data.

For the reasons described in Parts II.A. and B., above, when properly interpreted, the lifecycle measurement provisions of section 45Q will take both the direct GHG reductions and indirect GHG reductions into account. First, as illustrated in Example 1, emissions of all greenhouse gases should be taken into account for an LCA to give effect to the statutory cross reference to the Clean Air Act and to appropriately measure the impact of a taxpayer's utilization process on global warming so that the amount of economic incentive provided by the credit is proportional to the beneficial impact of the taxpayer's activities. Second, as illustrated in Example 2, displaced greenhouse gas emissions should also be taken into account in order to give effect to the statutory language requiring measurement of the amount of carbon oxide displaced from being emitted.

Nor should the fact that $CO_2$ is emitted as a part of the combustion process change this result. An LCA takes these emissions of $CO_2$ into account by including only the net reduction in emissions, on a $CO_2e$ basis. Because methane emissions are significantly more potent in creating greenhouse gas effects than $CO_2$ emissions, the direct GHG reductions from an LFG electricity project are substantial. Furthermore, Congress recognized that the lifecycle measurement provision already takes the release of some amounts of $CO_2$ into account. In the case of sequestration or use in EOR, section 45Q(f)(4) provides for recapture of section 45Q credits when qualified carbon oxide ceases to be captured in a later year. However, utilization is not included in this recapture provision, because an LCA already takes the emission of carbon oxide over the full lifecycle of a given process into account.

Because the LMOP tool is endorsed by the EPA, the taxpayer should be able to rely on the its LCA of the LFG carbon capture equipment. Accordingly, the taxpayer satisfies all of the LCA standards and should be able to claim section 45Q credits based on z tons of carbon oxide captured and utilized as described in section 45Q(f)(5).

Finally, the LFG project should be treated as a qualified facility, so long as z is greater than 25,000 metric tons of $CO_2e$ during the taxable year. Construction of the facility and the carbon capture equipment began before 2024, and the facility emits not more than 500,000 metric tons of carbon oxide during the taxable year. For the reasons described in Part II.D., above, the same lifecycle greenhouse gas emissions analysis used to determine the amount of credit for utilization should be used for the utilization threshold provision. As a result, as long as z is greater than 25,000 metric tons of $CO_2e$, the LFG project should be treated as a qualified facility.

## VI. Treasury Should Provide Guidance on the Additional Equipment Provision of Section 45Q(b)(2).

### A. Discussion of Additional Equipment Provision

As a result of EPA and state regulations, most large landfills already collect a portion of the LFG that they emit.[71] These landfills must collect LFG emissions and can dispose of them either through open flaring or through other forms of controlled combustion. Simply flaring is cheaper but it creates no useful product through its generation of energy. Projects that generate electricity are more expensive to develop but should be encouraged since they create a product that displaces greenhouse gas emissions that would otherwise be created by alternative fuels such as oil or natural gas as feedstocks.

However, the EPA and state regulations do not require capture of 100 percent of the LFG emissions at these landfills. Landfills rely on valves at collection wells that are manually adjusted once or perhaps twice a month to attempt to optimize gas collection. Landfills are, however, dynamic facilities with gas generation and collection dependent on numerous, often changing factors. Because this less efficient manually-operated capture equipment is cheaper, many landfills have collection rates of 60 percent or lower.[72] This means that 40 percent of the carbon dioxide and methane escape into the atmosphere as an industrial emission of greenhouse gas. As a result, there is an imperative to provide an incentive for the adoption of more efficient carbon capture technologies.

Existing technologies are available for retrofitting landfills and improving gas collection rates. Encouraging this additional capture equipment through use of section 45Q would generate a very significant reduction in the amount of LFG now going uncaptured and escaping as greenhouse gases. For example, current gas collection rates generally depend on the manual adjustment of wellhead valves. This occurs sporadically and often lags the conditions that would maximize capture. If more automated valve adjustment could be made in real time, the capture efficiency would increase. The section 45Q credit might be enough economic incentive for landfills of all sizes to install more advanced valve systems that increase collection efficiency. Some portion of the LFG that now escapes can be captured and utilized with the installation of advanced wellhead monitoring and automated valve equipment. This equipment is available but there is little economic or regulatory incentive to install it. LFG captured by such equipment

---

[71] The 1996 EPA Standards of Performance for New Stationary Sources (NSPS) and Guidelines for the Control of Existing Sources, created under the Clean Air Act, require LFG collection for new and existing municipal solid waste landfills meeting certain size thresholds. In addition, under the Resource Conservation and Recovery Act, states are required to have regulatory agencies to oversee MSW landfills and ensure those landfills are in compliance with EPA regulations. Within this framework, some states—notably California—have chosen to create more stringent LFG regulations than are required by federal law.

[72] *See* EPA LFG Handbook, at 1-9; *see also* 40 C.F.R. Part 98, Subpart HH, Appendix Table 3 (LFG collection efficiency estimates, estimating 60 percent efficiency for active gas collection in the absence of intermediate or final soil cover).

could not have been flared in landfills but would have escaped prior to the installation of the equipment because it never would have been collected in the first place. The full benefits of such capture and displacement by utilization would have to be included in any lifecycle analysis. Because the gas that is not now being captured is vented and escapes into the atmosphere, the lifecycle analysis for the incremental benefits of new equipment that captures this incremental gas must use a boundary that starts at the source of venting.

The additional equipment provision of section 45Q(b)(2) provides such an incentive. As noted above, the additional equipment provision applies to qualified facilities that were placed in service prior to the date of enactment of the BBA for which additional carbon capture equipment is placed in service after the date of enactment of the BBA. In such a case, the amount of qualified carbon oxide that is captured by the taxpayer is treated equal as to: (A) for purposes of the old section 45Q provisions, the lesser of—(i) the total amount of qualified carbon oxide captured at such facility for the taxable year, or (ii) the total amount of the $CO_2$ capture capacity of the carbon capture equipment in service at such facility on the day before the date of the enactment of the BBA (the "**pre-BBA capture capacity**"); and (B) for purposes of the new section 45Q provisions, an amount (not less than zero) equal to the excess of—(i) the total amount of qualified carbon oxide captured at such facility for the taxable year, over (ii) the pre-BBA capture capacity.

The additional equipment provision thus bifurcates captured qualified carbon oxide into two parts: the portion attributable to pre-BBA capture capacity, which is subject to the old section 45Q provisions, and the incremental qualified carbon oxide that exceeds the pre-BBA capture capacity, which is subject to the new section 45Q provisions. The additional equipment provision, therefore, can provide landfills an incentive to install state-of-the-art carbon capture equipment that will allow them to capture a much larger proportion of LFG emissions and receive the benefits of the new section 45Q provisions with respect to incremental amounts of carbon capture.

However, taxpayers will need certainty in order to take advantage of this incentive. It is critical that taxpayers be able to determine the amount of pre-BBA capture capacity in order to determine how the additional equipment provision will apply and make the necessary calculations under the statute. Guidance is needed to help taxpayers understand the appropriate methods for determining pre-BBA capture capacity.

Because this will require taxpayers to look backward and establish capture capacity on February 8, 2018 (the day before the date of enactment of the BBA), a safe harbor that permits taxpayers to use a reasonable estimate of capture capacity would be appropriate. In particular, the safe harbor should apply when a taxpayer relies on a good faith estimate of the volume of carbon oxide that would have been captured in the year prior to the effective date of the BBA under similar conditions that prevailed at the qualified facility during the taxable year. Such good faith estimate should use actual historic site characteristics, data reported to the EPA, and realistic models developed by the EPA that allow the capture achieved in the year prior to the effective date of the BBA to be compared to the capture achieved in the taxable year. The pre-BBA capture capacity calculated in this manner would then be subtracted from the qualified carbon oxide captured so that only the utilization of incremental amounts of qualified carbon

oxide is taken into account under the lifecycle measurement provision in calculating the amount of section 45Q credit allowed under the new section 45Q provisions.

For example, taxpayers might rely on the methods and models for LFG capture that are included in the EPA's Subpart HH regulations. Using this data, which is already required to be calculated and reported, one could measure the improved efficiency of advanced capture equipment by comparing the amount of LFG that is actually collected after installation with the amount of LFG that had been captured before advanced capture equipment was installed under the formulas and assumptions developed by the EPA for predicting landfill gas collection system performance based on manual well-field measurement and tuning.[73]

Prop. Treas. Reg. § 1.45Q-1(g)(2) provides that a "physical modification or equipment addition that results in an increase in the carbon dioxide capture capacity of existing carbon capture equipment constitutes the installation of additional carbon capture equipment." Guidance also should clarify that "additional carbon capture equipment" can consist of any of the following or any combination thereof:

> (i) any carbon capture equipment placed in service at a qualifying facility that captures carbon from a source of emissions which source was not subject to capture prior to February 9, 2018;
>
> (ii) any carbon capture equipment placed in service at a qualifying facility that captures carbon from a new source of emissions which source was not in existence on February 9, 2018; or
>
> (iii) any carbon capture equipment placed in service at a qualifying facility on or after February 9, 2018 that increases or improves the capture capacity or efficiency of carbon capture equipment that was placed in service before February 9, 2018.

B. Example

An example of how the additional equipment provision could operate follows:

*Example 4: Additional Equipment Provision*

> Facts:
>
> A landfill emits not more than 500,000 metric tons of carbon oxide into the atmosphere each year. Prior to February 9, 2018, equipment was placed in service at the landfill to capture LFG (consisting of both $CO_2$ and methane) in order to comply with federal and state regulations.
>
> On January 1, 2019, high-efficiency carbon capture equipment is placed in service at the landfill to replace or improve the less-efficient carbon capture equipment that had

[73] *See* 40 CFR § 98.343(c)(3)(ii).

previously been placed in service. The taxpayer measures x tons of $CO_2$ and y tons of methane at the source of capture during 2019. Based on a good faith estimate using actual historic site characteristics, reported data, and realistic models, the taxpayer determines that, between February 9, 2017 and February 8, 2018, the less-efficient carbon capture equipment would have captured only .8x tons of $CO_2$ and .8y tons of methane under similar conditions that prevailed at the landfill during 2019.

After capturing the mixture of $CO_2$ and methane, the taxpayer uses the gas to produce electricity for sale in the commercial electricity market. The taxpayer uses the EPA's LMOP tool to measure lifecycle greenhouse gas emissions that result. If all LFG captured by the high-efficiency equipment were taken into account, the LMOP tool would show a net decrease of z tons of greenhouse gas emissions on a $CO_2e$ basis. However, only taking into account the incremental .2x tons of $CO_2$ and .2y tons of methane captured, the LMOP tool shows a net decrease of .2z tons of greenhouse gas emissions on a $CO_2e$ basis.

Analysis:

The high-efficiency carbon capture equipment was placed in service at a qualified facility after February 9, 2018, and it increased or improved the capture capacity or efficiency of carbon capture equipment that had been placed in service before February 9, 2018. As a result this equipment is additional carbon capture equipment and section 45Q(b)(2) should apply. The taxpayer determined the pre-BBA capture capacity based on a good faith estimate using actual historic site characteristics, reported data, and realistic models. As a result, the taxpayer's estimate should qualify for the safe harbor for such a determination.

The pre-BBA capture capacity calculated in this manner is then subtracted from the qualified carbon oxide captured so that only the utilization of incremental amounts of qualified carbon oxide is taken into account under the lifecycle measurement provision in calculating the amount of section 45Q credit allowed under the new section 45Q provisions. Using the lifecycle analysis provided by the LMOP tool, the taxpayer determines that, only taking into account the incremental .2x tons of $CO_2$ and .2y tons of methane captured, the utilization process resulted in a net decrease of .2z tons of greenhouse gas emissions on a $CO_2e$ basis. Accordingly, the taxpayer should be able to claim section 45Q credits under the new section 45Q provisions based on .2z tons of carbon oxide captured and utilized as described in section 45Q(f)(5).

C. Recommended Guidance

We recommend that Treasury provide the following guidance in final regulations regarding the additional carbon capture equipment provision of section 45Q(b)(2):

- The final regulations should adopt a safe harbor that permits taxpayers to use a reasonable estimate of capture capacity on February 8, 2018. In particular, the safe harbor should apply when a taxpayer relies on a good faith estimate of the volume of carbon oxide that would have been captured in the year prior to the

effective date of the BBA under similar conditions that prevailed at the qualified facility during the taxable year. Such good faith estimate should use actual historic site characteristics, data reported to the EPA, and realistic models developed by the EPA that allow the capture achieved in the year prior to the effective date of the BBA to be compared to the capture achieved in the taxable year.

- The final regulations should include an example—such as Example 4, above—that illustrates the application of section 45Q(b)(2).

- The final regulations should clarify that "additional carbon capture equipment" can consist of any of the following or any combination thereof: (i) any carbon capture equipment placed in service at a qualifying facility that captures carbon from a source of emissions which source was not subject to capture prior to February 9, 2018; (ii) any carbon capture equipment placed in service at a qualifying facility that captures carbon from a new source of emissions which source was not in existence on February 9, 2018; or (iii) any carbon capture equipment placed in service at a qualifying facility on or after February 9, 2018 that increases or improves the capture capacity or efficiency of carbon capture equipment that was placed in service before February 9, 2018.

## VII. Treasury Should Clarify Rules for Ownership of Carbon Capture Equipment by Multiple Taxpayers

### A. Discussion of Definition of Carbon Capture Equipment

The Proposed Regulations define "carbon capture equipment" as "all components of property that are used to capture or process carbon oxide until the carbon oxide is transported for disposal, injection, or utilization."[74] The Proposed Regulations also provide an extensive list of the types of components that are included within the scope of carbon capture equipment.[75] By adopting a broad definition of carbon capture equipment, the Proposed Regulations make it more likely that multiple parties will own different components of carbon capture equipment that

[74] Prop. Treas. Reg. § 1.45Q-2(c).

[75] Prop. Treas. Reg. § 1.45Q-2(c)(2) ("Carbon capture equipment generally includes components of property necessary to compress, treat, process, liquefy, pump or perform some other physical action to capture qualified carbon oxide. Components of carbon capture equipment include, but are not limited to, absorbers, compressors, conditioners, cooling towers, dehydration equipment, dehydration systems, electrostatic filtration, engines, filters, fixtures, glycol contractors, heat exchangers, liquefaction equipment, lube oil systems, machinery, materials, membranes, meters, monitoring equipment, motors, mounting equipment, pipes, power generators and regenerators, pressure vessels and other vessels, processing equipment, processing plants, processing units, pumps, reboilers, recycling units, scrubbers, separation vessels, solvent pumps, sorbent vessels, specially designed flue gas ducts, support structures, tracking equipment, treating equipment, turbines, water wash equipment, and other carbon oxide related equipment.").

contribute to the capture of a single stream of qualified carbon oxide. However, the Proposed Regulations do not provide any rules regarding the allocation of section 45Q credits in situations where more than one taxpayer owns different components of carbon capture equipment.

This silence in the Proposed Regulations may create uncertainty in such situations because multiple taxpayers could attempt to make conflicting claims under section 45Q credits with respect to a single stream of qualified carbon oxide. In the case of carbon capture equipment placed in service after the date of enactment of the BBA, section 45Q credits generally are attributable to the "the person that owns the carbon capture equipment and physically or contractually ensures the capture and disposal, utilization, or use as a tertiary injectant of such qualified carbon oxide."[76] If multiple persons own this carbon capture equipment, then it may be unclear how section 45Q credits should be allocated among the owners. Treasury should adopt a clear rule, such as an allocation as agreed to by the parties and, in the absence of such agreement, pro rata based on the equipment's contribution to increased carbon oxide capture, so that taxpayers will be fully informed when negotiating the scope and terms of any election under section 45Q(f)(3)(B).

The interaction with the additional equipment provision of section 45Q(b)(2) should also be considered. In the case of the installation of additional carbon capture equipment owned by a taxpayer distinct from the owner of the existing facility or carbon capture equipment placed in service before the date of enactment of the BBA, the amount of section 45Q credits described in Prop. Treas. Reg. § 1.45Q-1(g)(1)(ii) should be allocated entirely to the owner of such additional equipment. This follows from the statutory language, which segregates the additional capture volume from the pre-BBA capture capacity. Thus, the owner of the additional equipment is the only taxpayer that captures that incremental volume.

In addition, Treasury should provide flexible rules for "dual use" property. The final regulations should address, through examples or otherwise, the distinction between equipment that is integral to the industrial process that also, as a side effect, produces a stream of carbon oxide emissions and the equipment that is added on to such equipment expressly in order to capture this stream of emissions. Taxpayers should be permitted to elect to exclude such dual use property from the definition of carbon capture equipment. This would provide taxpayers with additional flexibility in structuring transactions that comply with the safe harbor provisions of Rev. Proc. 2020-12.

B. Recommended Guidance

We recommend that Treasury provide the following guidance in final regulations regarding ownership of carbon capture equipment by multiple taxpayers:

- The final regulations should adopt a clear rule, such as an allocation as agreed to by the parties and, in the absence of such agreement, pro rata based on the equipment's contribution to increased carbon oxide capture, so that taxpayers will be on firm footing in negotiating the scope and terms of any election under

[76] Section 45Q(f)(3)(A).

section 45Q(f)(3)(B).

- The final regulations should provide that, in the case of the installation of additional carbon capture equipment owned by a taxpayer distinct from the owner of the existing facility or carbon capture equipment placed in service before the date of enactment of the BBA, the amount of section 45Q credits described in Prop. Treas. Reg. § 1.45Q-1(g)(1)(ii) will be allocated entirely to the owner of such additional equipment.

- The final regulations should allow taxpayers to elect to exclude "dual use" property from the definition of carbon capture equipment.

## Appendix A
## Examples of Uses of Carbon Dioxide that Do Not Involve Physical or Chemical Incorporation into a Final Product

Many uses of $CO_2$ do not involve a chemical change in the $CO_2$ but rather utilize the rather unique properties of the gas. Carbon dioxide has several desirable characteristics such as inertness, non-explosiveness, non-corrosiveness, high volatility, cooling ability, and low-cost. For these reasons carbon dioxide is being used in a variety of applications in food and processing industries. In many of these applications it is the very absence of chemical change in carbon dioxide which creates its usefulness. A sampling of such uses demonstrates many of these "other purposes" which have become essential to our economy.

For example, $CO_2$ may be used, either alone or mixed with other gases, as a shielding gas in many welding processes where the gas protects the weld puddle against oxidation by the surrounding air. The $CO_2$ creates a cone around the welding flame, which "shields" the combustion from contamination. Because it does not interact with certain problematic gases, such as oxygen and nitrogen, $CO_2$ prevents harmful exposure of the weld surface to these gases. The $CO_2$ is introduced in the gas nozzle around the weld flame. Depending on the metal and technique use, the $CO_2$ may give off oxygen to the weld, helping penetration. However, in any event, a large amount of the $CO_2$ is simply released into the atmosphere once it has done its job. In some applications, there is no chemical interaction involving the $CO_2$; the gas simply aids the welding process and is released. The advantage of using captured carbon from, say, a biogenic source over a fossil source will be determined by the LCA showing what displacement of the fossil $CO_2$ is achieved. The impact of welding gas use on global warming has been studied and replacement of fossil CO2 with biogenic would reduce those impacts.[77]

Cooling is another key potential uses of captured $CO_2$. Just like in a landfill-gas-to-electricity engine, $CO_2$'s non-flammability can help to cool a welding process, which helps prevent distortion.[78] Techniques using $CO_2$ "snow" lasers are an example of the cooling use of

---

[77] *See, e.g.*, Nakhla, Shen, and Bethea, *Environmental Impacts of Using Welding Gas*, The Journal of Technology, Management, and Applied Engineering, Volume 28, Number 3, at pp. 2–7 (2012) (providing an LCA of gas production, transport and use and noting source of such gasses from ethanol plants).

[78] *See, e.g.*, A.D. Camilleri, T.G.F. Gray, D. Nash, *Mitigation of welding distortion and residual stresses via cryogenic CO2 cooling –a numerical investigation*, Proceedings of the Conference on Computer Technology in Welding and Manufacturing (2008) ("A more feasible and efficient mitigation technique in many situations is to cool the weld more rapidly by means of cryogenic CO2 application behind the weld. Cryogenic cooling reduces welding distortion mainly by decreasing the heat dissipated into the structure, consequently diminishing the size of zones undergoing yielding and permanent plastic deformation.").

$CO_2$ where the gas is used not to interact with the product directly but to create conditions which are optimal in its manufacture.[79]

Use in fire retardants can provide another example of the use of $CO_2$ that does not involve any chemical reaction. $CO_2$ is used in fire retardants because it is heavier than air and can force oxygen down and away from the flame area. $CO_2$ used to make a fire retardant will not change chemically in its use but remains $CO_2$. Use of captured $CO_2$ from a biogenic source for fire retardants would displace fossil-based $CO_2$ in fire extinguishers and an LCA would demonstrate the reduction in net greenhouse gas emissions.

A large amount of currently produced carbon oxides for industrial and commercial use is utilized for its cooling properties. Dry ice made from carbon dioxide is used in such diverse industries as food processing to rubber production. Dry ice has also become widely used in the electronics industry, where parts such as circuit boards can be delicately cleaned.[80] In many of these applications, $CO_2$ released as a gas from the super critical ice is again captured and reused. The $CO_2$ does not change chemically but its ability to be frozen to form dry ice allows it to be used in place of sandblasting or other cleaning methods, such as those using solvents. Just because dry ice continues to be $CO_2$ after being used to clean surfaces, and is not incorporated into a final product, does not mean that it is not "utilized" in making the product that is cleaned with the dry ice.

[79] Jack Gabzdyl, *Cryogenic weld cooling- Using "snow" as a cooling agent virtually eliminates weld distortion*, Industrial Laser Solutions for Manufacturing (2002).

[80] https://www.ascoco2.com/us/dry-ice-blasting/general-information-about-dry-ice-blasting/how-does-dry-ice-clean