UNIVERSITY of HOUSTON | ENERGY

August 3rd, 2020

Via Electronic Transmission

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

Re: Comments on REG-112339-19 RIN: 1545-BP42, Credit for Carbon Oxide Sequestration

To Whom It May Concern,

On behalf of UH Energy, University of Houston we are pleased to submit our comments in support of REG-112339-19 RIN: 1545-BP42, the Request on Comments on Credit for Carbon Oxide Sequestration.

The proposed rules under Section 45Q of the Internal Revenue Code are expected to substantially advance carbon mitigation and management. However, we believe certain statutory definitions and provisions require immediate modifications and attention from the IRS for the proposed rule to effectively meet its objectives. Our comments and observations are detailed below. We thank you for your time and for considering our recommendations for REG-112339-19 RIN: 1545-BP42. We will be happy to provide further clarifications or comments in case any questions arise.

Sincerely,
Ramanan Krishnamoorti
Chief Energy Officer
UH Energy, University of Houston

Aparajita Datta
Research Assistant,
UH Energy, University of Houston

E Cullen Building, 4302 University Drive, Room 124B • Houston, TX 77204-2040
Office: 713.743.4307 • Fax: 713.743.4323 • uhenergy@uh.edu • www.uh.edu/energy

1. Section 45Q(c) details the geographical scope of qualified carbon oxide as "*captured and disposed of, injected, or utilized within the United States (within the meaning of section 638(1) of the Code) or a possession of the United States (within the meaning of section 638(2)).*"

1.1 Such a scope is severely limiting for at-scale carbon mitigation, and for achieving increased carbon capture, utilization, and storage (CCUS) activities through 45Q incentives. We highlight why this definition is antithetical to the objectives of Section 45Q:

a) Once emitted, carbon dioxide (CO_2) homogenously disperses through the atmosphere in 2-3 years[1], which makes mitigating atmospheric carbon oxide accumulation a global challenge.

b) The efficacy of the capture technologies improves and overall cost of carbon capture decreases with increasing CO_2 concentrations in the effluent stream from which it is captured. This makes point source (from coal and natural gas power plants, and hydrocarbon processing and conversion refineries and chemical plants) the most economically feasible. Moreover, integrating CO_2 capture technologies and optimizing their configurations and operations are achieved best when designed and built simultaneously rather than being added as retrofits to legacy generation equipment.

Point source carbon capture must account for 7-14% of the required emissions reduction to reach a net-zero carbon emissions goal by 2050[2]. Assuming an average capture rate of 1.5 MMtpa per facility, this translates to globally adding 1,950 new facilities by mid-century, which is more than 30 times the current global capacity of deployed or planned point-source CCUS projects[3].

Point source capture is most feasible and technologically mature from hydrocarbon processing facilities and hydrocarbon-based power plants. The U.S. has not committed to building either of those in the near or long-term. Therefore, carbon capture will depend on retrofitting old facilities, which would entail temporary decommissioning, challenging configurations, and will be cost-prohibitive to scale up.

c) The most economical, easy to configure, optimized, and integrated carbon oxide sources will be outside of the U.S. Specifically, new builds in Southeast Asia, Africa, and the Middle East will be ideal for point-source carbon dioxide capture. However, these regions lack appropriate opportunities for the cost-effective utilization of CO_2 and therefore must resort to geological sequestration as the only effective means of disposing that CO_2. This has resulted in poor adoption of carbon capture technologies. Many countries in these regions have been long-standing geopolitical U.S. allies and robust trading partners, providing markets for U.S. natural gas exports. Utilizing reinforced dual-use vessels that export LNG to these countries to backhaul CO_2 for utilization in the U.S. can be the cheapest source of CO_2, offering a distinctive and substantial competitive CCUS advantage to the U.S.

---

[1] NASA. (2009, December 15). Data from Atmospheric Infrared Sounder. Atmospheric Infrared Sounder. https://airs.jpl.nasa.gov/
[2] IPCC. (2018). Global Warming of 1.5 °C. https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf
[3] The World Bank. (2020). Key statistics on regional, national and subnational carbon pricing initiatives. Carbon Pricing Dashboard. https://carbonpricingdashboard.worldbank.org/

d) The U.S. has the most mature market for EOR. Specifically, in the Gulf of Mexico (GoM), there is currently <u>unmet</u> demand for 310 million metric tons of CO_2 to be used as a tertiary injectant. With advances in EOR technologies and projected global supply and demand, this CO2 demand for EOR in the GoM is predicted to grow to 3.9 gigatons by 2050[4]. The current demand is unmet as naturally occurring and anthropogenic CO_2 in the mainland southwest is supplied to onshore EOR projects. This is a strategic opportunity for supplementing tertiary recovery of hydrocarbon energy resources since the GoM represents about 20% of U.S. crude production[5]. Since exploration and drilling are the most prominent cost components of upstream operations, tertiary recovery through EOR will ensure that the U.S. remains competitive in the global energy market.

Utilizing existing offshore oil and gas pipeline infrastructure in combination with dual-use shipping will also avoid higher upfront capital costs from new pipelines and sunk costs at the end of a project's lifetime. Minimizing the cost of transport in such a manner would allow policy incentives such as 45Q to dedicatedly help drive down the cost of capture, which is the highest cost component of the CCUS value chain.

e) In addition to EOR operations, geologic formations in the U.S. can sequester up to 20,000 gigatons (metric) of CO_2[6]. Of this, 4,000 gigatons can be utilized through engineering practices and techniques that exist today which can provide appropriate, at-scale, optimized sinks for global anthropogenic carbon oxide emissions[7].

1.2 CCUS and carbon management at large cannot be effective without the right economics. Federal support in the form of 45Q will fail to achieve its objectives if CO_2 cannot be sourced at-scale. Therefore, CO_2 capture must be source agnostic.

1.3 We recommend that the statutory definition of qualified carbon oxide in Section 45Q (c) be modified, with related amendments to Section 45Q (d) qualified facility. While Section 45Q (b) contractually ensuring capture and disposal, injection, or utilization of qualified carbon oxide provisions that the taxpayer may "*enter into multiple contracts with multiple parties for the disposal, injection, or utilization of qualified carbon oxide*", it does not facilitate the converse wherein a carbon dioxide-seeking taxpayer, such as one representing an EOR demand center, may partner with multiple parties for sourcing CO_2. Any resultant foreign partnerships for CO_2 sourcing from such amendments must be subject to 26 CFR Section 6031, wherein we recommend that the sequestration partner be a U.S. tax-paying entity in all cases.

---

[4] National Energy Technology Laboratory & U.S. Department of Energy, Office of Fossil Energy. (2014, June). *CO_2-EOR Offshore Resource Assessment*. National Energy Technology Laboratory.
[5] U.S. Energy Information Administration. (2020). Energy Infrastructure with Real-Time Storm Information. eia.gov. https://www.eia.gov/special/gulf_of_mexico/
[6] National Energy Technology Laboratory & U.S. Department of Energy, Office of Fossil Energy. (2015, August). Carbon Storage Atlas (Fifth Edition). National Energy Technology Laboratory.
[7] U.S. Geological Survey. (2013, September). National Assessment of Geologic Carbon Dioxide Storage Resources. U.S. Department of the Interior.

2. Section 45Q-5 (h) defines recapture in the event of intentional removal from storage as "*If qualified carbon oxide for which a credit has been claimed is deliberately removed from a secure geological storage site, then a recapture event would occur in the year in which the qualified carbon oxide is removed from the storage site pursuant to § 1.45Q–5(a).*"

2.1 The definition or the examples detailed in Section 45Q-5 do not outline whether CO_2 that is recycled and reinjected during EOR operations would be considered as having been intentionally removed from storage.

2.2 We recommend that further clarification be provided for Section 45Q-5 (h) with specific examples of utilizing CO_2 as a tertiary injectant in EOR, the provisions for recycled and reinjected CO_2, and the consequent last-in-first-out (LIFO) accounting-basis for the same.

3. Section 45Q (2)(g) defines a qualified direct air capture facility as one that would *capture not less than 100,000 metric tons of qualified carbon oxide during the taxable year.*

3.1 Direct air capture is an energy-intensive process, and costs have been found to range from $94-$600 per metric ton of CO_2[8,9]. The cost of any new technology scales down tremendously as it matures. However, to successfully do so for direct air capture technologies and achieve economies of scale, pilot and demonstration-scale projects deployed on a distributed basis over a wider capture range must be incentivized.

3.2 At the currently proposed annual scale of 100,000 metric tons capture per facility, small-scale distributed projects will not qualify for federal support, making the economics prohibitive, which will deter market entry for new projects and stall industry-led and/or collaborative industrial-academic research required to make direct air capture commercially-feasible and scalable. Even if point-source capture arrests all new emissions, we will need technologies such as direct air capture to remove previous emissions from the atmosphere to effectively decarbonize.

3.3 We recommend that the qualifying annual threshold for direct air capture facilities in Section 45Q (2) (g) be scaled down by 70% of the current proposed 100,000 metric tons to 30,000 metric tons.

---

[8] National Academies of Sciences, Engineering, and Medicine, Studies (2019). *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda (Climate Change)*. National Academies Press.

[9] Keith, D. W., Holmes, G., St. Angelo, D., & Heidel, K. (2018). A Process for Capturing CO2 from the Atmosphere. Joule, 2(8), 1573–1594. https://doi.org/10.1016/j.joule.2018.05.006