

January 31, 2024

The Honorable Gina Raimondo
Secretary
U.S. Department of Commerce
1401 Constitution Ave., N.W.
Washington, DC 20230

RE: Recommendation from the Environmental Technologies Trade Advisory Committee on
Carbon Management as it Pertains to 45Q Credits and Rules

Recommendation 2024-6

Dear Secretary Raimondo:

Global climate change remains a threat to economic growth as it puts pressure on our infrastructure, health, transportation, and other hard to decarbonize sectors. The U.S. is currently working with 20 countries through the Carbon Management Challenge. With your assistance, the U.S. can further lead the way in developing and deploying technologies and scaling carbon management solutions. Doing so will both reduce and manage domestic and global greenhouse gas emissions and make exportation of U.S. technologies more competitive with accompanying economic benefit.

The Environmental Technologies Trade Advisory Committee (ETTAC) is a federally established committee whose purpose is to advise on the policies and procedures of the U.S. government that affect environmental technology, goods, and services exports. We appreciate that the Department of Commerce has agreed to a previous ETTAC recommendation to convene a series of technical and market-based exchanges and roundtables on U.S. technology exports. As you convene these sessions, we ask that a discussion and study providing a comparative analysis between international and domestic carbon credits and funding be included with the objective of creating a roadmap for leveling the carbon capture, removal, and management field. This research should be shared with and include participation by the Department of Energy (DOE) and Department of Treasury's Internal Revenue Service (IRS).

The current assembly of voluntary, reimbursable credits in the U.S. ignores the beneficial practices involving circularity and other forms of sequestration in favor of traditional methods such as deep well injection, high parasitic load technologies, and enhanced oil recovery operations¹. We suggest you promote the important additional pathways to store or reuse CO₂ in a circular fashion, that we believe can be eligible under the 45Q provision and Inflation

¹ Ssebadduka, R., Sasaki, K., Sugai, Y., An analysis of the possible financial savings of a carbon capture process through carbon dioxide absorption and geological dumping, *International Journal of Energy Economics and Policy*, 2020, 10(4), 266-270, doi.org/10.32479/ijeeep.8800

Medina-Martos, E., Galvez-Martos, J.L., Almarza, J., Lirio, C., Iribarren, D., Valente, A., Dufour, J., Environmental and economic performance of carbon capture with sodium hydroxide; *Journal of CO₂ Utilization*, 2022 60(101991); doi.org/10.1016/j.jcou.2022.101991

Kramer, D., Carbon dioxide removal is suddenly obtaining credibility and support, *Physics Today*, 2022, 75(6) 26-29, doi.org/10.1063/PT.3.5017

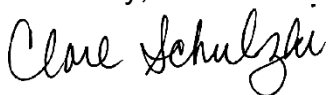
Reduction Act (IRA) with your interagency colleagues. We also urge that flexibility be provided with this dated credit system, which is biased toward generating pure compressed CO² gases and liquified CO² streams into geological sequestered subsurface storage locations or future pipelines. U.S. companies entering international markets are at a disadvantage with their international counterparts. Leveling of current credit regimes will allow U.S. companies to compete globally in carbon capture, usage, and storage (CCUS), carbon removal technologies, and carbon management and foster the export of domestic technology.

Updating our credits program, which significantly drives the development and acceptance of new technologies, would make it more easily understood and properly supported. Recent inquiries as to the life-cycle assessment (LCA) program by third-party vendors are at a backlog (see addendum #4). Unless the process becomes more streamlined, our own domestic barriers to trade export will harm U.S. interests and have global implications. We encourage the Department of Commerce to work with the IRS so that 45Q standards are technology-neutral, while adhering to the rules required by law. Securities and Exchange Commission (SEC) and Internal Revenue Service (IRS) guidance on the increased tax credit program under section 45Q of the Internal Revenue Code needs to be updated.

In addition to the 45Q tax credit, government funding through existing federal programs (e.g., IRA, IIJA) or new programs for applied R&D and commercialization/trade promotion are needed to accelerate and maximize the export potential of innovative carbon reduction and management technologies. The benefits are multi-faceted: energy-climate sustainability, economic incentive to domestic technology development and manufacture, and global climate benefit.

We appreciate the consideration of this recommendation and encourage you to take appropriate action as soon as possible. Further concerns of the 45Q program are provided in the attached addendum. We look forward to working with you to support the implementation and the growth of the U.S. environmental exports.

Sincerely,

A handwritten signature in cursive script that reads "Clare Schulzki".

Clare Schulzki
ETTAC Chair

CC: Department of Energy Secretary Jennifer Granholm
Treasury Secretary Janet Yellen
IRS Commissioner Daniel Werfel

Addendum

Additional Considerations:

The latest Sixth Assessment Report from the Intergovernmental Panel on Climate Change (IPCC) offers crucial insights into achievable climate scenarios amid the current pace of global temperature rise, specifically finding that gigatons of carbon management will be needed. Updating the U.S. CO² carbon capture and management policy, specifically 45Q, with more comprehensive enhancements and efficiency gains is vital to developing and accepting present and future climate technologies. Continued delays and confusion in the program will slow technology adoption and result in economic and environmental consequences.

Several published studies have shown (Ssebadduka, et al., 2020; Medinas-Martos, et al., 2022) that systems requiring compression, refrigeration, and pumping of pure CO² streams in any form will not be truly carbon negative due to parasitic energy loads. Parasitic energy is defined as the extra fuel necessary for combustion that provides the energy to implement additional hardware or practices. Eliminating these loads with other technologies, such as carbonate generation, can have truly net negative carbon intensity and generate useful products for reuse in a circular economy. Carbonate technologies can also be configured, for geological sequestration or ocean addition (current studies underway, Kramer, 2022) without negative parasitic energy losses.

45Q Concerns:

Historically, the U.S. has been a frontrunner in pioneering innovative and sophisticated technologies for global export. However, in the development of both point of use (POU) and direct air capture (DAC) carbon capture (CC), and additional carbon management technologies, the U.S. has encountered barriers to implementation. Europe has outpaced and overtaken the CC technology space due to favorable conditions for domestic companies and the unfavorable domestic rules for U.S. development and implementation of such technologies.

To develop, fund, pilot, and scale CC technologies, known requirements for federal incentives programs are paramount. Securities and Exchange Commission (SEC) and Internal Revenue Service (IRS) guidance on the increased tax credit program under section 45Q of the Internal Revenue Code has been delayed. Credits vary widely across different end states for the captured CO². Greater subsidies for geologic sequestration fail to recognize the higher parasitic loads associated with desorbing, compressing, and refrigerating the CO² into a liquid for storage and injection. The CO² processing results in higher carbon intensity than other novel approaches but at 41% higher credit rate. Ultimately, offering higher credits for geological sequestration deters development of novel uses for CO² generated end- or by-products and other promising carbon management pathways. This process also favors the use of captured CO² with preference given to the recovery of oil and gas from CO² injection into subsurface voids. There is presently a shortage of geographically located Class VI wells that may accept CO² injection. Location directly affects the overall carbon footprint from transport of CO² to these locations that require additional refrigeration and compression.

Several journal papers have shown that amines and other processes, like chilled ammonia, do not meet net carbon-negative operations and only reduce the carbon intensity (CI) instead of reversing the amount of CO₂ released into the atmosphere. This reversal is of the utmost importance, given the dire rise in global climate change and meeting the U.S.'s climate targets. A recent study of 18 different technologies at the pilot level and above demonstrate that very few of these are net carbon negative and most have a significant cost per metric ton of CO₂ captured from POU. As currently written under section 45Q, tax credits and direct pay subsidies will be offered for each metric ton of CO₂ captured according to the following categories:

Process Stack or Duct Point of Emission (POE):

- Utilization or "Circular Economy" (regardless of whether utilized product ever re-releases CO₂ into the atmosphere) – 60.00 USD
- Qualified for Oil and Gas Recovery – 60.00 USD
- Geologic Sequestration (Class VI well) – 85.00 USD

Direct Air Capture (DAC):

- \$180 with Class VI Well Storage
- \$130 a ton for utilization

European counterparts typically have CO₂ reimbursement at \$150/mt. Unless the government programming addresses these imbalances and preferential treatment reimbursements, the U.S. technology offerings globally will be limited and out of date.

Additional barriers to U.S. CCUS technology and management development are requirements that need to be met to qualify for the 45Q credits program. Some of these barriers are listed herein.

1. DAC must meet a minimum CO₂ capture rate annually of 1000 metric tons. This may be too stringent. To remove CO₂ from the low concentrations found in ambient air (~420 ppmv), large volumes must be processed. Moving the volumes of air required to meet minimum thresholds involves high energy input (last calculated at 90 hp and 24/7 continuous operations). More passive systems (requiring less energy) are penalized from participating because of the minimal thresholds required.
2. POU capture minimums are 12,500 mts for industrial facilities. A similar issue exists with POU sources where CO₂ levels are typically orders of magnitude higher (1-100%) than ambient CO₂ concentrations (0.042% CO₂). An example is the recent law in Colorado that states that all CO₂ emissions from POU sources must reduce their 2005 CO₂ emissions levels by 26% by 2025 and staging up to 100% by 2050. A company that may only want to reduce their CO₂ emissions by 26% due to funding will be forced to go without the 45Q credits program unless they purchase a much larger system to obtain 45Q credits.
3. Unknowns and needed clarification. An example of this is in the requirement of the program to have a technology have an overall capture efficiency >75% efficiency. It is assumed that this pertains to that portion of a gas stream treated and not the entire emissions from a site with potentially multiple emission sources. There is no formal

channel for raising such questions as final guidance has not been released as of this date. In our opinion, any mass of CO₂ removed permanently from the atmosphere is beneficial and should be considered as eligible for the 45Q program.

4. Informal guidance from DOE (ref National Energy Technology Laboratory 45Q Addendum to the CO₂U LCA Guidance Toolkit) requires an annual approval process for the 45Q credit. It is our opinion that a one-time requirement is appropriate for continuous operating procedures without significant design modification from baseline conditions (e.g., 20%). Allowing for a one-time LCA verification will alleviate regulatory burden, save DOE and industry resources, and avoid delays in the credit approval process; in general, it will ease the pathway for implementation of carbon capture technology, which is a priority goal of the 45Q program.
5. It is our concern that the requirement of “actual” full-scale data to be used in granting 45Q credit will deter investors and industry from pursuing CC technologies. In our opinion, data from rigorous and well-designed pilot studies should be accepted for use in ISO-certified LCAs. Allowing estimates of future full-scale performance to qualify for 45Q credits will allow investors and industry to more confidently invest in these capital-intensive, multi-year, multi-million-dollar technologies. Without this assurance of tax credits, investment in carbon management will be severely impacted in a negative way. Audits can and should serve as checks to full-scale performance. Look-back provisions are currently in-place for previous versions of 45Q and should remain.
6. Although the NETL CO₂U LCA Guidance document has been published, it is also explicitly stated that support and training resources are not available for preparing LCAs for the purposes of 45Q. With the significant funding provided by the U.S. government for CC initiatives and the increasing interest in industry to implement technology to remove CO₂ from the atmosphere, we would like to express a concern for the amount of U.S. government resources allocated for granting 45Q credits with DOE-approved ISO-certified LCAs
7. To qualify for the 45Q program, prevailing wage requirements and an apprenticeship program must be fulfilled and certified. While these programs are important, we assert they have no place in the 45Q program to foster innovation and development of novel technologies. Instead, when applied to the technology-focused objective intent, these provisions stunt innovation and investment. Start-ups often must run lean and invest in skilled labor and hardware. This requirement should be reserved for operations or staffing larger C management operations or after a certain time period. Enforced otherwise, these provisions add bureaucracy and create a delay in technology development. Time is of the essence in development of these technologies.
8. Eligible entities. Carbon Procurement Utilization Grants exist to promote technology development. To be eligible for recent funding announcement opportunities from the Department of Energy, the organization receiving the grant must be an “eligible entity.” Eligible entities are defined as states, units of local governments, or public utilities and agencies. Preventing the commercial sector from accessing these funding mechanisms stifles development of novel technology. Requiring partnership with eligible entities introduces unneeded bureaucracy and slows progress.

9. Open the definition of geological sequestration: “A wide range of carbon removal technologies are rapidly advancing. Existing policies that limit tax credit eligibility to only a few technologies (e.g., § 45Q’s consideration of only direct air capture and point-source carbon capture technologies) fail to recognize the breadth of cutting-edge permanent carbon removal solutions that are being developed by U.S.-based Companies.” Many companies request opening circular economics of CO₂ reuse and allowing other products of CCUS and C management to be allowed credits for geological sequestration other than pure CO₂.
10. A recent review and parsing of letters to the IRS request for comment on the 45Q program had more than 100 submissions. The following supporting claims are made and requested: Ocean Sequestration: The National Academies 2021 Report, which documents that the potential for CO₂ sequestration in the ocean is far greater than any other opportunity available: <https://www.nationalacademies.org/news/2021/12/new-report-assesses-the-feasibility-cost-and-potential-impacts-of-ocean-based-carbon-dioxide-removal-approaches-recommends-u-s-research-program>. More than 10 companies submitted letters of support for ocean additions of carbonates to induce CO₂ uptake and sequester CO₂.

Summary:

Updating the U.S. CO₂ credits program with more comprehensive enhancements and efficiency gains is vital in driving the development and acceptance of present and future climate technologies. If developers and customers are limited to a subset of technologies and an outdated credit system using narrowly defined terms, development will be shunted. Continued delays and confusion in the program will slow technology adoption and result in economic and environmental consequences. We urge the Administration’s swift action and collaboration to support the growth of U.S. technology, exportation of these technologies.