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April 11, 2022

Council on Environmental Quality
730 Jackson Place NW
Washington, DC 20503

Subject: ClearPath Response to the Council on Environmental Quality's Carbon Capture, Utilization, and Sequestration Guidance [Docket Number CEQ-2022-0001]

Dear Council on Environmental Quality Staff:

ClearPath appreciates the opportunity to provide a response to the Council on Environmental Quality's (CEQ) Carbon Capture, Utilization, and Sequestration (CCUS) Guidance.

ClearPath's mission is to develop and advance policies that accelerate breakthrough innovations to reduce emissions in the energy and industrial sectors. To advance that mission, we develop cutting-edge policy solutions on clean energy and industrial innovation. An entrepreneurial, strategic nonprofit, ClearPath 501(c)(3) collaborates with public and private sector stakeholders on innovations in nuclear energy, carbon capture, hydropower, natural gas, geothermal, energy storage, and heavy industry to enable private-sector deployment of critical technologies. ClearPath is supported by philanthropy, not industry, which gives us the flexibility to focus on policies that can support the commercialization of these technologies. It is with this background that we write this response to CEQ's CCUS Guidance.

As acknowledged by CEQ in the draft guidance, carbon capture, utilization, storage, and removal are critical to meeting global decarbonization goals. Without prioritizing clean energy innovation and acceleration, meeting global decarbonization goals will not be achievable.[1] The passage of the bipartisan Infrastructure Investment and Jobs Act (IIJA) infused nearly $12 billion into carbon reduction and removal programs.[2] It is imperative that the demonstration and deployment programs are implemented efficiently to lower the cost of these technologies, successfully prove these technologies at commercial scale, and ensure prudent stewardship of taxpayers' dollars. But right now, the ability of the United States to deploy CCUS and reduce carbon emissions is limited by how fast we can responsibly and efficiently permit decarbonization projects. Removing unnecessary

[1] https://www.iea.org/reports/energy-technology- perspectives-2020

[2] Carbon reduction and removal programs in the IIJA include $3.5 billion for carbon capture pilot and demonstration projects, $2.1 billion for low-interest loans and grants for transport and storage infrastructure projects, $2.5 billion for expansion of carbon sequestration programs, $500 million for industrial decarbonization demonstration projects, and $3.5 billion for direct air capture hubs.

barriers to clean energy is essential to meeting U.S. national security objectives, reliable electricity needs, and global emissions reduction objectives.

1. Facilitating Federal decision making on CCUS projects and carbon dioxide pipelines

As CEQ states in the draft guidance, the process for permitting a CCUS project is similar to that for any industrial activity. For this reason, CEQ should implement procedures that streamline the permitting process since the average environmental impact statement takes 4.5 years to complete, with one quarter taking upwards of 6 years.[3] Permitting processes can delay timelines, which are of significant concern if projects are to meet the funding timelines laid out in IIJA. The IIJA appropriated funding through 2025 for the demonstration projects; therefore, it is imperative that permitting timelines are expedited. It is also important to point out that while the process for CCUS may mirror other industrial activities, CCUS should not be viewed as "any industrial activity" as there could be multiple benefits associated with these rather than other projects, such as reduced air pollution and carbon dioxide (CO_2) emissions, creation of good-paying jobs, and development of hydrogen and direct air capture (DAC) infrastructure.

The Utilizing Significant Emissions with Innovative Technologies (USE IT) Act clarified that carbon capture projects and CO_2 pipelines are eligible for expedited permitting reviews under Title 41 of the Fixing America's Surface Transportation (FAST) Act (referred to as FAST-41). Within the IIJA, the Federal Permitting Reform and Jobs Act was enacted, which sets a permitting timeline goal of less than two years for FAST-41 projects. CEQ should include the less than two year target timeline within the final guidance. ClearPath supports CEQ's recommendation that the Permitting Council Executive Director in consultation with member agencies should establish appropriate facilitating agencies for each CCUS project category, develop recommended performance schedules (keeping to the two year target in IIJA), and encourage agencies to implement memoranda of understanding for collaboration on project permitting activities.

CEQ stated in the draft guidance that the Federal Permitting Improvement Steering Council has not received any CCUS project applications for FAST-41 coverage and that agencies have not had the opportunity to develop a comprehensive permitting timetable. However, the Denbury Riley Ridge to Natrona project, which is a proposed CO_2 pipeline and associated facilities, was permitted under FAST-41.[4] CEQ should implement the lessons learned from that project as well as begin outreach with stakeholders on how to prepare for upcoming applications.

CEQ suggests in the guidance that agencies should consider developing programmatic environmental reviews, such as tiered documents or programmatic environmental impact statements (PEISs) under NEPA, or programmatic biological opinions under the Endangered Species Act. ClearPath supports a programmatic approach to permitting CCUS projects and recommends that CEQ provide direction to agencies with regards to this approach and utilizes it as a way to streamline permitting. The IIJA provided funding for CCUS demonstration projects, CO_2 transportation infrastructure, CO_2 storage, DAC hubs, hydrogen hubs, and industrial decarbonization demonstration projects. It is likely that many of these projects will be co-located to maximize funding and to develop regional and interregional carbon capture, removal, transport, storage, and utilization networks to share infrastructure and realize economies of scale. These regional and interregional hubs and networks would be good candidates for the programmatic environmental review process.

CEQ also states in the guidance that agencies should work with communities and Tribes during the scoping phase to identify alternatives to the proposed action, including alternatives that reduce environmental impacts. The wording of this section implies that alternatives will be superior to the

[3] https://ceq.doe.gov/docs/nepa-practice/CEQ_EIS_Timeline_Report_2020-6-12.pdf

[4] https://www.permits.performance.gov/permitting-projects/denbury-riley-ridge-natrona-project-co2

proposed action when in fact, the proposed action may have the lowest environmental impact. CEQ should acknowledge that the proposed action may be the recommendation with the lowest environmental impact. In addition, considering the specific and unique purpose and need for these projects, there may not be any reasonable alternatives. Practically, in many cases, a governmental authority (e.g, a public utilities commission or a grantmaking Federal agency) or private corporation will already have determined the need for these facilities. ClearPath recommends that the alternatives analysis is streamlined to only consider realistic alternatives to the carbon capture, utilization, storage, and removal proposal.[5]

ClearPath also supports the CEQ recommendation to convene the relevant agencies to assess opportunities for improvement in CO_2 pipeline permitting. The buildout of infrastructure is needed to transport CO_2 from where it is captured to where it can be utilized or securely sequestered underground. There are more than 5,000 miles of CO_2 pipelines transporting more than 70 million tonnes of CO_2 per year from both natural and anthropogenic sources.[6] Pipelines are generally the most cost-effective method of transporting large volumes of CO_2.[7] Analyses show that pipeline networks will need to be significantly scaled up to deploy CCUS at scale. For example, the Princeton Net-Zero America study estimates that 21,000 to 25,000 kilometers of an interstate CO_2 trunk pipeline network will be needed, along with 85,000 km of spur pipelines connecting to the trunk lines.[8] These critical infrastructure investments are an enabler to achieving large-scale carbon capture deployment and a net-zero emission economy.

Currently, the permitting processes for interstate and intrastate pipelines are complex and can involve federal, state, and local agencies. The only federal agency that has exercised any sort of authority of CO_2 pipelines siting and rates is the Bureau of Land Management (BLM), which gets involved if a pipeline crosses federal lands. The USE IT Act requires CEQ to establish two regional task forces to improve permitting processes and regional coordination of CCUS projects and CO_2 pipelines. CEQ should establish these task forces immediately to identify challenges, harmonize permitting processes, and facilitate regional planning.

The guidance also references that IIJA amended the Outer Continental Shelf Lands Act and requires the Department of Interior to promulgate related regulations within a year. Further, CEQ recommends in the guidance that a national program for monitoring deep geologic carbon sequestration. ClearPath supports the development of monitoring, reporting, and verification requirements for offshore carbon sequestration. ClearPath recommends lessons learned be implemented from the Environmental Protection Agency's (EPA) Class VI program to avoid the long and complex federal permitting process of onshore projects (Class VI permits have historically taken six years to be received), while ensuring the development of a comprehensive regulatory framework that demonstrates secure geologic storage. ClearPath, along with a number of other entities, submitted recommendations to the EPA last year for improving and streamlining the Class VI permitting program. CEQ should work with EPA to implement these recommendations, which are attached as an appendix to this submittal.

2. Public Engagement and Interdisciplinary Research

ClearPath recognizes the need for a rigorous permitting process to understand environmental and socioeconomic impacts of projects. The carbon capture demonstration projects and DAC hubs will be funded through the Office of Clean Energy Demonstrations (OCED), a new entity that was authorized by the IIJA. As the OCED begins operations, robust stakeholder engagement will be

[5] A similar proposal was made on pages 7 - 8 (item 3), https://static.clearpath.org/2019/03/clearpath-geis-whitepaper.pdf

[6] https://dualchallenge.npc.org/files/CCUS-Chap_2-030521.pdf

[7] https://dualchallenge.npc.org/files/CCUS-Chap_2-030521.pdf

[8] https://netzeroamerica.princeton.edu/?explorer=year&state=national&table=2020&limit=200

critical to its success. CEQ should work with DOE to ensure that OCED is engaging all relevant stakeholders throughout the demonstration process and provide clear guidance and expectations to project developers on stakeholder engagement, from the initial development of the funding opportunities through project selection, construction, and operation. Ensuring that project developers thoughtfully engage with host communities and ensure that communities directly benefit from these projects are of particular importance.

CEQ provided a list of actions that should be taken to facilitate transparent and meaningful public engagement. However, the language used by CEQ in this section implies that CCUS projects mostly will pose a burden to host communities, when there could be multiple benefits. ClearPath recommends that CEQ integrate actions into this list that developers should take to demonstrate how CCUS projects could pose opportunities and benefits for communities, such as improving air quality, providing cleaner, reliable, and more affordable power, and providing good-paying jobs.

3. Understanding Environmental Impacts

ClearPath is supportive of CEQ collaborating with the relevant agencies on studies regarding the effect of carbon capture deployment on air quality in the United States and to marine resources in the Outer Continental Shelf. Such studies could help facilitate public trust in carbon capture and storage by demonstrating the benefits of the technology and creation of mitigation plans to minimize potential impacts. However, CEQ should be mindful not to increase the burden on developers and create duplicate efforts that are already required by the permitting process, which already has the goal of identifying a project's environmental and socioeconomic impacts.

4. Carbon Capture Utilization and Carbon Dioxide Removal

Captured CO_2 can be converted into a variety of different products. The International Energy Agency (IEA) identified key categories of CO_2 products and services that are considered attractive opportunities in the near term: CO_2-derived fuels, CO_2-derived chemicals, building materials, and crop yield boosting.[9] Robust life-cycle analyses (LCA) and clear guidelines are needed to quantify and understand CO_2 uses. Conversion pathways can be highly energy-intensive; carbon utilization provides benefits when the application is scalable, uses low-carbon energy, and displaces a product with higher life-cycle emissions.[10]

Understanding the full costs and benefits (both economic and environmental) is crucial to properly scale up DAC technologies. LCAs will help understand how many emissions are produced per metric ton of CO_2 that's removed, and determine if this varies between technologies, location, climate, system size, etc. Monitoring, reporting, and verification frameworks are important to understand the duration captured CO_2 stays out of the atmosphere, whether the amount of CO_2 removed is appropriately quantified, and whether operating emissions are factored in to calculate net CO_2 removed.

ClearPath supports standardization across agencies with regards to methodology, standards, certifications, and reporting requirements to reduce the administrative burden associated with these processes and to be able to evaluate projects on a consistent basis. ClearPath also supports the creation of a repository to consolidate and publish LCA methodology, results, and information related to carbon utilization and carbon removal, building on existing collaboration through the Federal LCA Commons.[11]

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[9] https://www.iea.org/reports/putting-co2-to-use

[10] https://www.iea.org/reports/putting-co2-to-use

[11] https://www.lcacommons.gov/

5. Additional Recommendations

Recently, a group of policymakers, subject matter experts, and practitioners convened by the Aspen Institute released a report, "Building Cleaner, Faster," which addresses the need to streamline current environmental review and permitting processes to enable the buildout of decarbonization infrastructure with the scale, speed, and predictability required.[12] The report endorsed four critical paths to success:

1. Immediate approvals for qualifying critical projects with well-documented net environmental benefits;
2. Accelerated approvals for projects with less documented impacts by establishing categories of climate-beneficial projects at the outset, and then supplementing with an accelerated review focusing on uniquely local conditions;
3. Accelerated adjudications for permitting disputes to enable quicker review and certainty for critical clean energy projects; and
4. State and local conformity with the federal process to ensure fast and certain permitting and adjudication.

CEQ should strongly consider the results of this report to streamline the CCUS permitting process, recognizing that CCUS is a critical clean energy technology and climate-beneficial project.

Conclusion

CEQ's action to provide guidance on CCUS projects is timely, since the bipartisan IIJA contains significant investments into CCUS technology. As CEQ issues and implements guidance, the Agency should not undermine the robust infrastructure programs contained in the IIJA.

Thank you for the opportunity to provide a response. ClearPath encourages the staff to continue considering new ways to improve the efficiency and effectiveness of the CCUS permitting process. Please do not hesitate to reach out if you need additional information or have any questions.

Sincerely,

Jena Lococo
Program Manager, CCUS
ClearPath

[12] https://www.aspeninstitute.org/publications/building-cleaner-faster-report/

Appendix – Class VI Recommendations to EPA

July 14, 2021

William Bates, P.G.
Branch Chief
Office of Ground Water & Drinking Water: Prevention Branch
U.S. Environmental Protection Agency
Washington, D.C.

Dear Mr. Bates:

The undersigned entities representing Carbon180, ClearPath, Energy and Environmental Research Center at the University of North Dakota, Environmental Defense Fund, Gulf Coast Sequestration, Illinois State Geological Survey, Minnkota Power Cooperative, and Southern Company submit the below "Recommendations to the EPA on the Underground Injection Control Class VI Program" for your consideration.

Background

As part of the Appropriations Act of 2021, Congress has directed the EPA to submit a report on recommendations to improve the Underground Injection Control (UIC) Class VI permitting procedures for commercial and research carbon sequestration projects and to draft the report in consultation with the Department of Energy, relevant State agencies, previous permit applicants, and nongovernmental stakeholders. Only two of the six Class VI wells that have ever been permitted are in use for injection, and the permit application processing time was six years for both of these projects. Such a timeline would be a significant barrier to develop additional storage capacity at the rate needed to capture carbon dioxide as well as for projects trying to take advantage of the incentives provided by the IRS Section 45Q tax credit.

Due to the incentives offered by the section 45Q tax credit and the recent two-year extension of the time to qualify for the credit, a large influx of sequestration projects is anticipated in the development pipeline, and a growing number of states will be seeking to obtain primacy for the Class VI program. The Class VI permit and primacy approval process must become more efficient to enable growth of carbon capture and sequestration projects while also protecting drinking water resources, and we commend the Agency for working to remove obstacles from the deployment of carbon capture and sequestration projects while at the same time making sure storage is safe and secure.

The undersigned entities represent a diverse range of previous, current, and prospective permit applicants and nonprofit organizations engaged on environmental and clean energy policy. The objective of convening this group was to put forward a list of high priority, nonpartisan recommendations, that if implemented, would facilitate the timely scale-up of carbon capture and sequestration projects. The section below offers recommendations, in rough order of suggested priority, on how to improve and streamline the Class VI permitting program while balancing the need to protect environmental integrity.

Recommendations to the EPA on the Underground Injection Control Class VI Program

1. **Develop a Staffing and Resource Plan to Target State Primacy, Permitting Timelines, and Periodic Review**

The EPA should prioritize resourcing and staffing the Agency to ensure adequate support for permitting and the state primacy process as two key areas needed to meet the timelines proposed below. With the increased interest in carbon capture as essential to achieving climate change mitigation policy and the large number of carbon capture, removal, and storage projects in the development pipeline, the EPA's needs for fulfilling permitting requests exceed what has been historically allocated to the program. Additional resources will help EPA issue timely permits, prevent a backlog of applications from both state governments and project developers, and ensure safe geologic storage.

We recommend that EPA complete an analysis detailing the level of staffing, resources, and training needed to enable EPA and the states to be successful with timely reviews of both state primacy and project developer applications. In addition to the analysis, we recommend that EPA prioritize increases in funding for Class VI implementation and explicitly provide details of proposed spending on Class VI implementation in their annual budget requests to Congress.

a. Permitting Timelines

The Class VI permitting timeline, if unduly long or uncertain, can pose a major obstacle for carbon capture and storage project developers, which could serve as a barrier to meeting public and private sector emission reduction goals. Project costs often exceed hundreds of millions of dollars, and unpredictable permitting processes pose significant project risk because of the uncertainty in the timing of receiving project approval. Establishing a clearer permitting process and timeline will facilitate project development and reduce overall carbon emissions. The Consolidated Appropriations Act of 2021 provided a much-needed extension of the time to qualify for the 45Q tax credit, but many carbon management projects will be delayed, or may not even be possible, unless there is an efficient, orderly, and responsible process that is completed in an expeditious manner.

As of the time of this report writing, EPA has only issued six Class VI well permits (Permits to Drill) and only two wells have been constructed and operated (both located at the Archer Daniel Midland's ethanol plant located in Illinois). The time for the full permitting and authorization to inject process to be completed for the ADM wells was six years for both of the permits, and 18 months for the four moribund permits for the FutureGen Project.[1] A high degree of irregularity in how long the timing will be between submission of a complete application and issuance of an Authorization to Inject would pose significant project risk.

We recommend that the EPA establish target timelines for issuing a Permit to Drill as well as the Authorization to Inject to provide certainty to project developers. We recommend EPA target issuing a Permit to Drill within twelve months of receiving a complete application. Upon receipt of a Well Completion Report, the EPA should review, make any necessary modifications, and target issuing an Authorization to Inject within three months of receiving the Well Completion Report. If further information is needed to determine whether permit modifications are required based on results of the report, the EPA should notify the project developer as soon as possible after receipt and review of the report.

b. Prioritize State Primacy Application Process

As acknowledged by EPA in the Class VI rulemaking and subsequent April 2015 Memorandum titled *Key Principles in EPA's Underground Injection Control Program Class VI Rule Related to Transition of*

[1] National Petroleum Council. (2019). Meeting the Dual Challenge: A Roadmap to At-Scale Deployment of Carbon Capture, Use, and Storage. https://dualchallenge.npc.org/.

Class II Enhanced Oil or Gas Recovery Wells to Class VI, "The best implementation approach is for states to administer both the Class II and the Class VI UIC programs." States are encouraged to pursue primacy for the Class VI program. They have the best knowledge of regional geology and areas in need of special protection, along with necessary pre-existing relationships with the regulated community. At the time of this report writing, only North Dakota and Wyoming have received primacy over Class VI wells, but multiple states have either applied or signaled their intent to apply.

We recommend that EPA keep as a priority the expeditious approval of state primacy applications, target approval within twelve to eighteen months of having a complete application, and provide training and resources as needed to support state regulators through the process.

c. Undertake the Planned Periodic Review of the Class VI Regulation

As noted in the preamble to the Class VI regulation, EPA stated that an adaptive approach would enable the Agency to make changes to the program as necessary to incorporate new research, data, and information about geologic sequestration and associated technologies. EPA announced in the preamble that the EPA intended to review the rulemaking and data on sequestration projects every six years to determine if modifications are needed to the program. The rule was finalized in 2010 and the EPA has not yet performed a periodic review.

We recommend that EPA commit to performing the review and immediately establish a plan and framework for performing this review. We recommend EPA establish a set of criteria for what would be considered a substantive data pool for considering the review complete (e.g., timeline, number of projects reviewed, etc.) as well as a process for capturing lessons learned continuously throughout the review process. EPA should target commencing rulemaking by the end of 2025 in order to incorporate lessons learned and experience from previous permit reviews, fulfilling the appropriations request, and permit applications for new projects from now until the start of rulemaking.

2. Alignment of Requirements and Guidance with Purpose of Underground Injection Control Program

The purpose of the UIC program is to protect underground sources of drinking water (USDW). Below are key issues we recommend EPA should prioritize in implementation of the Class VI program and in future rulemaking.

a. Risk-based Approach to Financial Responsibility Requirements

The financial responsibility demonstration required by the Class VI regulation must cover all corrective action, injection well plugging, post-injection site care and site closure, and emergency and remedial response. Five project plans must be submitted to EPA as part of the application and "must be based on site-specific information," which detail the above items.[2] The regulation also notes that the demonstration must "be sufficient to address endangerment of underground sources of drinking water."

Project applicants have reported that EPA has imposed prescriptive requirements for estimating costs, particularly for estimates for remediating a USDW, regardless of project size.[3] We recommend that EPA

[2] U.S. Environmental Protection Agency. (2012). Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance.

[3] Van Voorhees, B. (2019). UIC Class VI Permit Refinements. Ground Water Protection Council Annual Forum. https://www.gwpc.org/sites/gwpc/uploads/documents/2019_Annual_Forum/UIC_Class_VI_Permit_Refinements___GWPC_Presentation_September_16_2019.pdf

allow a risk assessment and risk management approach to determining financial responsibility cost estimates, and clarify what information would be needed from an applicant to support that the demonstration is sufficient to address endangerment of USDWs. This will allow financial responsibility to be scaled to the size of the project and take into account site-specific factors, which are already supposed to be included in the project submittal as noted above.

b. Modify Post-Injection Site Care Based on Actual Site Conditions

The default post-injection site care (PISC) period established in the regulation is for 50 years, which is overly conservative in many cases and can present a challenge to project financing.

The existing regulation allows the Director to approve an alternative timeframe if the applicant can demonstrate the project no longer poses a risk of endangerment to USDWs. Within the existing regulatory framework, we recommend that EPA should encourage and allow project developers to leverage the flexibility provided by the regulation for making a demonstration to shorten the PISC period. If the rule is amended, we recommend that EPA remove the 50-year default time period and establish that applicants can propose a PISC timeframe during the application process or at any time during the operation or closure of the site instead of providing a default PISC timeframe. The PISC period should be based on the specific characteristics and operating history of the project and be established on a case-by-case basis, as the variety of site conditions will affect the PISC timeframe.

Additionally, clarification should be provided for what is required for closure of a site. Some EPA guidance documents suggest that closing a storage site requires demonstrating the plume is stable, while the regulation itself states that the site can be closed when the project "no longer poses an endangerment to USDWs."[4] The guidance documents suggest the plume must be immobile while the regulation itself suggests as long as the plume does not pose a risk to USDWs, it would not need to remain stagnant. This is the same approach already reflected in the Subpart RR regulations [40 CFR § 98.441(b)(ii) ("show that the injected CO_2 stream is not expected to migrate in the future in a manner likely to result in surface leakage")]. EPA's supporting documents should be updated in alignment with the regulatory language.

c. Flexible Requirements Based on Risks to Underground Sources of Drinking Water

The Class VI regulation requires testing and monitoring the extent of the CO_2 plume and absence/presence of elevated pressure by using direct methods in the injection zone(s) and indirect methods. We recommend that monitoring and testing programs and requirements should be based on site-specific conditions and be proportionate with the risk to USDWs from the project. There are many different monitoring methods and tools that can be used, but not every method or any particular method should be imposed on a project, especially if the requirement would impose significant costs without an actual nexus to assessing endangerment of USDWs. For example, surface or soil gas monitoring should not be required as part of a monitoring plan or a permit requirement. This type of monitoring is meant to detect CO_2 leakage at the surface, which is extremely unlikely for a properly permitted project, and would introduce substantial costs to a project.[5]

[4] Van Voorhees, B. (2019). UIC Class VI Permit Refinements. Ground Water Protection Council Annual Forum. https://www.gwpc.org/sites/gwpc/uploads/documents/2019_Annual_Forum/UIC_Class_VI_Permit_Refinements___GWPC_Presentation_September_16_2019.pdf

[5] Van Voorhees, B., S. Greenberg, and S. Whittaker. (2021). Observations on Class VI permitting: Lessons learned and guidance available: Illinois State Geological Survey, Special Report 9, 23 p.

Additionally, monitoring of the injected CO_2 plume should be to demonstrate that the plume will remain contained and will not pose an endangerment risk to USDWs, rather than determining the exact location. The requirement for direct monitoring of the injection zone should not be interpreted as requiring monitoring wells into the injection zone in every case. This would result in unnecessary penetrations of the injection zone, which could create leakage pathways. We recommend that EPA allow flexibility for applicants to use monitoring methods appropriate for the risks of the project and not routinely require the use of monitoring wells into the injection zone. We also recommend that the monitoring program be developed to demonstrate containment of the CO_2 rather than to determine the precise location of the CO_2 plume. Indirect and above zone monitoring often can sufficiently demonstrate containment of the plume.

EPA should also be forward looking and provide flexibility in the requirements to allow for new technology and new techniques to be used as they are developed.

d. Adaptive Computational Modeling Requirements

Computational modeling is a significant part of the permitting process as it is used to delineate the area of review and to make post injection site closure demonstrations. EPA allows the use of proprietary models for the application process. However, prior permit applicants have reported that EPA or its contractors have tried to replicate the modeling and sometimes have required applicants to redo modeling using EPA's preferred model, which has caused unexpected additional resource expenditures and delays.[6] It is unclear whether these EPA requirements have resulted in any environmental benefit.

We recommend that EPA clarify and align with project applicants prior to conducting modeling on what the modeling expectations and requirements are, such as the model to be used, so that unnecessary replication of the modeling can be avoided. The regulation does not require that EPA replicate the modeling, though the guidance documents suggest that the UIC Program Director may choose to replicate the model.[7]

e. Revise the Area of Review Framework

The Area of Review (AoR) is the region around the project where USDWs may be endangered by the injection activity.[8] The lateral and vertical migration of the CO_2 plume and formation fluids is to be predicted using site characterization, data, and modeling. The AoR is significant for establishing the expanse of a project's environmental assessment and associated operating costs, as it is the area required to be evaluated for corrective action, emergency and remedial response, and monitoring. Project applicants are to consider endangerment to USDWs by both the movement of the CO_2 plume and the movement of the elevated pressure front, where fluid pressures are sufficient to force fluids into a USDW.[9]

We recommend that the AoR be established through risk-based approach requirements based on the site-specific characteristics. EPA guidance provides that a risk-based approach to AoR delineation may be

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[6] Van Voorhees, B. (2019). UIC Class VI Permit Refinements. Ground Water Protection Council Annual Forum. https://www.gwpc.org/sites/gwpc/uploads/documents/2019_Annual_Forum/UIC_Class_VI_Permit_Refinements___GWPC_Presentation_September_16_2019.pdf

[7] U.S. Environmental Protection Agency. (2013). Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance.

[8] Underground Injection Control Program: Criteria and Standards, 40 C.F.R. § 146.81(d) (2010).

[9] U.S. Environmental Protection Agency. (2013). Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance.

pursued.[10] The risk-based AoR approach accounts for the operating reality that the area of the free-phase CO_2 plume around an injection well is typically much smaller than the area of the elevated pressure front capable of endangering a USDW. An important distinction between EPA Methods 1 and 2, which both calculate a critical pressure threshold, and the risk-based AoR approach is that the risk-based approach (1) calculates and maps the potential incremental flow of formation fluids from the storage reservoir to the USDW that could occur, and then (2) delineates the areal extent beyond which no significant leakage would occur. Therefore, the region beyond which no significant leakage would occur does not present an endangerment to the USDW leaving the region inside of this areal extent as the risk-based AoR. Establishing an AoR through a risk-based approach would allow for appropriate, fit-for-purpose standards to be applied depending on the risk. Complete details of the risk-based AOR model are found in Burton-Kelly et al.[11]

f. Restore the Definition of USDW

The UIC regulations allow an aquifer or portion of an aquifer that otherwise meets the definition of "underground source of drinking water" to be designated as an "exempted aquifer" if it has no real potential to be used as a drinking water source and meets certain criteria. Geologic sequestration primarily occurs in saline formations, which generally would not be fit for drinking water. However, the UIC regulations do not allow new aquifer exemption designations for Class VI injection wells.[12] This has already prevented the permitting of at least one carbon capture and storage research project.[13] Categorically restricting the geologic formations into which CO_2 can be injected will slow down widespread deployment of carbon capture and storage technologies without yielding a significant environmental benefit. We recommend EPA revise the regulations to apply the established criteria to Class VI wells for identifying aquifers that are not USDWs to be designated as "exempt" notwithstanding having total dissolved solids (TDS) levels below 10,000 parts per million (ppm).

3. Reduce Administrative Burden on the Agency and Project Developers

a. Allow Comprehensive Project Application Submittals and Permitting

The Class VI regulation does not allow area permits for Class VI wells. EPA has taken the approach that individual well permits are essential to ensure that every well is constructed, operated, monitored, plugged, and abandoned in a manner that protects USDWs. While the handful of projects that have submitted Class VI applications to EPA have only been for a small number of wells, some projects will require tens if not hundreds of wells to enable the wide scale deployment of carbon capture and storage (such as at a storage hub). A mature carbon capture industry may grow from regional hotspots, where there is favorable geology and highly concentrated sources of carbon dioxide to support its capital-intensive infrastructure. Some prospective applicants have expressed concern that this requirement will be both burdensome and inefficient for themselves and the EPA with the amount of paperwork that will need to be generated and the time it will take to review all of the separate documents. In addition, many projects start out with a few injection wells and have plans to expand based on demand for storage. The

[10] U.S. Environmental Protection Agency. (2013). Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance.

[11] Burton-Kelly, M.E., Azzolina, N.A., Connors, K.C., Peck, W.D., Nakles, D.V., and Jiang, T. (2021). Risk-based area of review (AOR) estimation in overpressured reservoirs to support injection well storage facility permit requirements for CO_2 storage projects. https://onlinelibrary.wiley.com/doi/10.1002/ghg.2098.

[12] Underground Injection Control Program: Identification of Underground Sources of Drinking Water and Exempted Aquifers, 40 CFR § 144.7(a) (2010).

[13] National Petroleum Council. (2019). Meeting the Dual Challenge: A Roadmap to At-Scale Deployment of Carbon Capture, Use, and Storage. https://dualchallenge.npc.org/.

injection wells and CO_2 plume do not behave in isolation, so moving to a project-wide approach is more appropriate to ensure protection of USDWs. For classes for which area permits are allowed (all classes other than I and VI), the UIC regulations already require that "[t]he cumulative effects of drilling and operation of additional injection wells [be] considered by the Director during evaluation of the area permit application and are acceptable to the Director."[14]

Within the existing regulatory framework, while continuing to ensure proper review of all elements of each project, EPA should identify opportunities for consolidating well applications and encourage project-wide plans for a single project to streamline the permitting process. EPA should also amend the regulation to allow the use of area permits.

b. Review and Update Guidance Documents

EPA currently has 14 final guidance documents on its Class VI website that are designed to assist with program directors implementing the program and well owners or operators in complying with the regulations. Although these guidance documents are intended to show how to comply with the Class VI rule, inconsistencies have been found between the regulations and guidance.[15]

We recommend EPA complete a review of the guidance documents to ensure they reflect the latest information and are consistent with the regulation. EPA should also consider consolidating the number and volume of the documents to make them more user-friendly for applicants.

Thank you for the opportunity to submit these recommendations to address our joint concerns with the existing regulations. Please contact us with any questions.

Respectfully submitted,

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[14] Underground Injection Control Program: Authorization by Permit, 40 C.F.R. § 144.33(c)(3) (2010).

[15] Van Voorhees, B., S. Greenberg, and S. Whittaker, 2021, Observations on Class VI permitting: Lessons learned and guidance available: Illinois State Geological Survey, Special Report 9, 23 p.

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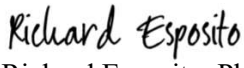

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