CARBON CAPTURE COALITION

To: Environmental Protection Agency

From: Carbon Capture Coalition

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Re: EPA-HQ-OAR-2023-0072

EXECUTIVE SUMMARY

Members of the Carbon Capture Coalition (the Coalition) have prepared these comments on the U.S. Environmental Protection Agency's (EPA) proposed rule "*New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units and Emissions Guidelines for Greenhouse gas Emissions from Existing Fossil Fuel-Fired EGUs.*"

The Coalition appreciates EPA identifying carbon capture technologies as a key climate mitigation tool to reduce carbon dioxide emissions and co-pollutants from coal and natural gas electric generating units. This complex rule contains many complicated factors to consider, and our broad, diverse, bipartisan membership does not agree on all of them. These written comments on the draft rule are submitted as collaborative comments of the Coalition and do not represent a consensus position of the entire membership. Individual members of the Coalition or their trade organizations may submit additional comments on the draft rule that differ from these comments and go further on specific topics.

That said, we do agree that the full suite of carbon management technologies is a necessary part of the solution to cost-effectively meet both U.S. and global greenhouse gas emissions reduction targets while reducing the total amount of air pollutants released from power facilities.

Carbon capture, removal, transport, reuse and storage (collectively, carbon management) is fundamental to meeting the Biden Administration's net-zero and midcentury climate goals. In its most recent *Summary for Policymakers of the Sixth Assessment Synthesis Report*, the Intergovernmental Panel on Climate Change (IPCC) reaffirms the central role that these technologies will play in capturing carbon dioxide (CO_2) from heavy industry sectors, including cement, steel, refining and others, as well as directly removing excess carbon dioxide from the atmosphere.

While the United States now enjoys the most forward-looking framework of supportive policies for the deployment of carbon management technologies, meeting midcentury climate targets, while sustaining a high-wage jobs base and providing tangible health benefits to impacted communities, will require additional development and deployment of these technologies. Meeting these targets will require additional policy and regulatory changes and the Coalition is actively working to ensure a robust, timely and responsible process for project siting as well as regulatory and permitting regimes, is in place to ensure that carbon management technologies can scale in an appropriate timeframe to meet midcentury climate goals. Many of these policies and regulatory changes are outlined in the Coalition's 2023 Federal Policy Blueprint.

Our members want to emphasize several additional considerations that will be important for EPA to understand regarding the economywide deployment of carbon capture, transport, storage, or reuse, while the agency considers regulating emissions in the power sector.

Deploying Carbon Management in the Power Sector

While there is no silver bullet to address the impacts of our changing climate, carbon management technologies will be essential to decarbonizing our highest emitting sectors and put the U.S. on the path to achieve net-zero emissions by midcentury. Indeed, constraining the use of carbon management will significantly increase the cost and feasibility of reaching midcentury goals because it would increase reliance on technologies that are still not commercially available.[i]

In the power sector specifically, carbon capture will play an important role by 1) addressing emissions from existing power plants in the near- and medium-term, 2) providing low-emissions energy resource flexibility in regions with growing shares of renewable generation and 3) providing a pathway for creating net-zero and net-negative emissions, primarily through bioenergy power generation.[ii]

And while coal fired power generation makes up a decreasing portion of the U.S. power generation mix, at about 20 percent in 2022, fossil fuels still provide more than 50 percent of total power. Today, natural gas is now the dominant source of electricity generation, at nearly 40 percent, making deployment of carbon management in the power sector absolutely essential to meeting mid-century targets.[iii]

Carbon capture, transport and storage technologies have been proven at commercial scale in the United States for decades, and recent progress in developing and deploying these technologies in the power sector is promising. According to public announcements, the Coalition is aware of more than 35 publicly announced carbon capture projects at power plants, nearly two-thirds of these projects are at natural gas-

fired power facilities.[iv] More recent progress includes the following developments to design, construct and permit carbon management projects:

- TCEQ has issued Air Permits for the Calpine Baytown Project (natural gas, 896 MW peak capacity plant) and Deer Park Energy Center (natural gas, 1217 MW peak capacity) in Texas.
- EPA has announced that they are moving forward to issue two Class VI permits for Wabash Carbon Services in Indiana. The capture will occur at Wabash Valley Resources ammonia production plant.
- Minnkota Energy Cooperative announced in June 2023 that Project Tundra, a carbon capture project at the 455 MW capacity Milton Young Coal Power Plant in North Dakota, had entered its final stage of project development.
- NET Power announced its first commercial project, Project Permian, in November of 2022, and announced commencement of front-end engineering design on the project in April of 2023. The 300 MW class facility will leverage existing CO_2 transport and storage infrastructure in the Permian Basin in Texas.
- In May 2023, DOE selected nine companies and organizations to receive funding under a $189 million solicitation for front-end engineering and design studies for carbon capture, transport and storage projects.

In addition to this progress on installing carbon capture in the power sector, the U.S. has more than 50 years of experience safely transporting and securely storing CO_2 in appropriate geological formations. Already, EPA has a robust regulatory framework in place to monitor, report and verify CO_2 storage to maintain the integrity of the storage site and provide public confidence in the safe and secure geologic storage of CO_2, through the agency's Underground Injection Control (UIC) Program and the Greenhouse Gas Reporting Program. While direct air capture and carbon utilization are more nascent technologies, they will also play an important role in deeply decarbonizing the economy and will be subject to many of the same permitting and reporting regimes that have been used for existing carbon capture, transport, and storage projects.

Today, there are 12 commercial scale facilities capturing and safely storing CO_2 in the United States, with more than 160 carbon capture, removal, transport, reuse and storage projects publicly announced in the past few years. These announced projects, which are in various stages of development, are in direct response to the revised and expanded 45Q tax credit that was passed as part of the bipartisan FUTURE Act in 2018. Taken together, the unprecedented technology demonstration and federal investments in carbon management infrastructure enacted under the Bipartisan Infrastructure Law and subsequent bipartisan enhancements to the 45Q program are estimated to result in a 13-fold increase in carbon management capacity, and annual CO_2 emissions reductions of 210-250 million metric tons by 2035.[v]

Collectively, the Coalition is working to enact a comprehensive portfolio of supportive federal polices, including measures to address infrastructure and permitting needs, to ensure that carbon management technologies can appropriately scale over the next

decade to commercial deployment levels that put us on track to meet midcentury climate goals. The members of the Coalition stand ready to assist the EPA as it considers the appropriate role of carbon management technologies in the power sector.

Coalition Comments on the Proposed Rule

We provide the following specific comments on three topics within the draft rule: 1) carbon capture at existing coal plants, 2) carbon capture at existing gas plants and 3) carbon capture at new natural gas combined-cycle plants.

These rule-specific comments are followed by general comments on areas that are outside the specific purview of this rule but are critically important to scale the deployment of the carbon management industry. These topics include geologic storage availability, the ability to scale carbon reuse applications, and the locations of existing and planned carbon transport infrastructure.

Carbon Capture at Existing Coal Plants

The draft rule would set an emission standard based on 90 percent carbon capture at existing coal steam units beginning in 2030 for any coal plant that plans to operate after January 1, 2040.

- *Carbon capture has been demonstrated at existing coal plants*. The Coalition agrees that carbon capture technology has been effectively demonstrated at existing coal plants, including at both SaskPower's Boundary Dam plant in Saskatchewan, Canada, and at NRG's Petra Nova plant outside Houston, Texas.

- *The necessary lead time for a carbon capture retrofit project*. EPA states that a carbon capture retrofit project can be planned and executed at an existing coal plant in "roughly five years." The Coalition agrees that a retrofit project can be accomplished in a five-year period *provided* no obstacles are presented, and the project is relatively straightforward from a development and technological perspective. There are several potential economic and practical delays in deploying carbon management retrofit projects, including delays due to project permitting and financing. EPA should clearly specify what happens when factors outside the owner's control delay construction or operation of a carbon capture system.

- *The cost of carbon capture retrofits.* EPA relies on cost data obtained from NETL. The Coalition generally agrees with EPA's approach to estimating the cost of new carbon capture projects.

Carbon Capture at Existing Gas Plants

Under EPA's draft proposal, the owners and operators of existing baseload gas combined-cycle units could choose to comply with EPA's draft standard by installing carbon capture, utilization and storage technologies at a 90 percent capture rate by 2035. In the draft, EPA applies the standard to individual units with a nameplate capacity greater than 300 megawatts (MW) operating on average at a greater than 50 percent capacity factor.

- *Carbon capture is the most cost-effective technology for reducing carbon emissions from existing natural gas combined cycle plants.* The Coalition agrees that carbon capture is a demonstrated technology and ready for full scale deployment at existing natural gas combined-cycle plants, and as noted above has been proposed in several projects that are currently in progress. However, as industry wide deployment is technologically feasible, there remain economic and regulatory challenges as further discussed below.

- *Necessary timeframe for carbon capture projects at existing plants*. The draft rule provides existing gas plant owners with approximately 9 years to implement carbon capture retrofits. The Coalition considers this timeframe reasonable, with the caveat that factors outside the plant owners' control could still delay projects and EPA should clearly specify what happens when such factors delay construction or operation of a carbon capture system and associated transport and storage infrastructure. For example, there are wide swaths of territory around the United States that currently have no CO_2 pipelines and limited access to suitable storage space. Due to the necessary role these pieces of infrastructure play in the larger carbon management system, it remains unclear if the requisite infrastructure will be in place in time to meet EPA's timelines.

Carbon Capture at New Gas Combined-Cycle Plants

Under EPA's draft proposal, owners and operators of new baseload combined-cycle units could choose to comply with EPA's draft standard by installing carbon capture at a 90 percent capture rate by 2035. This standard applies to all new natural gas combined cycle units that operate as baseload units, which EPA defines as operating at approximately 50 percent capacity factor. The Coalition agrees that carbon capture

technology can be installed at new natural gas combined-cycle plants and unlike with existing plants, project sponsors can choose the location of new plants taking into account the availability of geologic storage and/or nearby utilization opportunities. New project sponsors can also take project and/or pipeline permitting into account before siting a new plant with carbon capture. For those plants in pre-construction phases of development at the time EPA issued the proposal, the Coalition recommends that EPA consider ways to accommodate those plants to the extent the finalized standards would adversely impact those plants.

General Coalition Comments on the Necessary Supportive Framework to Enable the Deployment of Carbon Management Technologies

In addition to considering the technological and economic feasibility of deploying carbon capture technologies at new and existing power plants, EPA should also consider the necessary supportive infrastructure, permitting and regulatory regime that are required to enable the growth of this industry. Scaling this industry in the compliance timeframes outlined in this proposed rule would benefit from a cohesive national plan to ensure a coordinated buildout of transport and storage infrastructure.

We urge EPA to work with states to make available supportive infrastructure and a robust and timely permitting process to deploy carbon capture technologies not only at individual facilities but in a coordinated regional manner. There are numerous areas of concentrated industrial activity within the vicinity of geologic storage formations throughout the United States that, along with existing commodity transport infrastructure, form potential carbon and hydrogen “hubs”. These hubs would act as early launching points for investment in carbon dioxide removal that can minimize financial and logistical barriers to market development but require intrastate planning and coordination at a regional level to enable economywide deployment of these technologies.[vi]

These associated infrastructure challenges are not unique to the power sector. Ensuring complex aspects of project development come together is necessary to scale carbon management technologies economywide. Key considerations for whether carbon management is cost-effective at an individual power facility includes:

- Proximity of the capture facility to either (1) appropriate geologic storage with access to sufficient pore space, or (2) available carbon utilization pathways;
- In those instances where geological storage or reuse is not possible at the capture location, proximity of the capture facility to existing or planned CO_2 transport infrastructure with sufficient capacity to transport the CO_2 to appropriate utilization or geologic storage site; and
- Considerations for safe and timely permitting of CO_2 transport and storage infrastructure.

Regional locations of appropriate geologic storage

The United States has some of the most abundant geologic storage available for captured CO_2 (see figure 1), detailed by the U.S. Department of Energy's Carbon Storage Atlas. Potential storage sites must be characterized through geologic study and injection testing, to ensure that they are high-quality CO_2 storage sites.[vii] Some of the best potential storage locations are, however not in close proximity to population centers that host the vast majority of the power plants in the U.S., and therefore require pipelines to transport captured CO_2 to appropriate geologic storage sites.

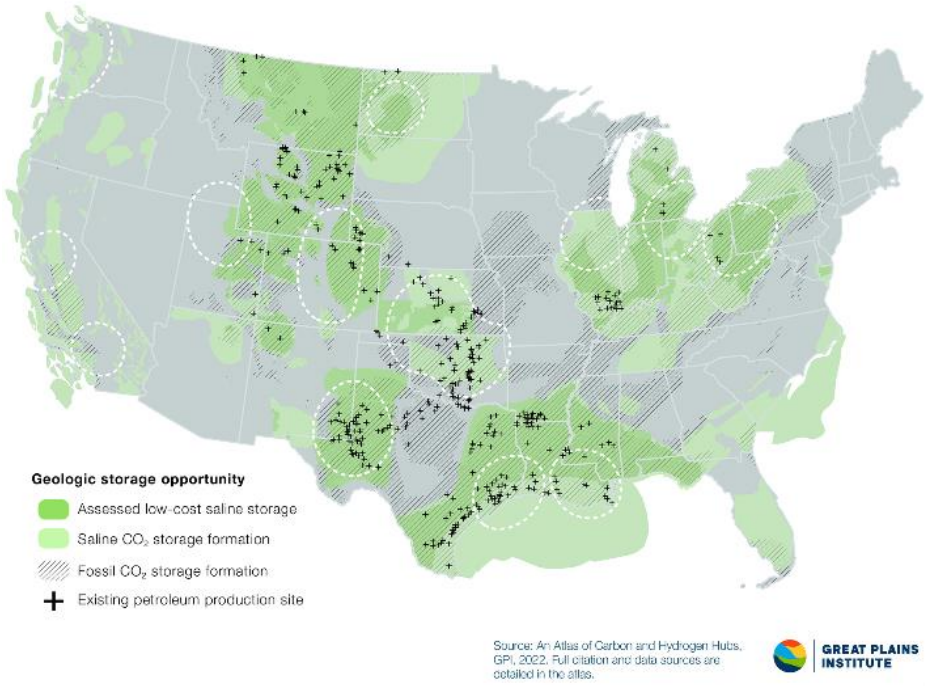

Figure 1: Geologic storage opportunities in the United States[viii]

Available geologic storage with carbon capture and hydrogen hubs identified in white dotted lines. These hubs are concentrated areas of potential carbon capture and clean hydrogen production and/or fuel substitution. These potential hubs represent a launching point for investment in carbon capture and hydrogen technologies, where the economics appear favorable for near-term investment.

Availability of appropriate carbon reuse technologies

Carbon reuse, also referred to as carbon utilization or conversion, is the reuse of CO_2 or CO to produce valuable products, such as low- and zero-emissions fuels, building materials, and other products that reduce greenhouse gas emissions as compared to products or processes that are typically derived from fossil fuels. While still nascent relative to the other technologies in the carbon management value chain, carbon reuse

can provide an important and valuable component to building the carbon management marketplace. Increasingly, carbon reuse is seen as an important complement to large-scale carbon storage, as it provides value-added markets and carbon reuse opportunities for carbon capture operations, while also creating long-term, circular supply chains. The National Academies of Science has estimated that globally, reuse pathways could use up to 1 gigaton of captured CO_2 per year.[ix] This growing carbon-to-value market could be worth an estimated $800 billion annually by 2030.[x]

High-volume products sourced from carbon reuse, including concrete, aggregates and fuels could drive both significant carbon reuse and market value. The cement and concrete sectors alone contribute 8 percent to annual global emissions; carbon capture and mineralization pathways have the potential to permanently store CO_2 and reduce the emissions footprint of the global cement and concrete industry on a gigaton scale. Last fall, a project to demonstrate CO_2 reuse for aggregate production came on-line at the Los Medanos Energy Center, a natural gas power facility in Pittsburg, California.

Carbon reuse projects provide the potential benefit of on-site reuse of captured carbon oxides. Deploying these reuse technologies at natural gas and coal fired power facilities could provide significant benefit, as they will not only utilize captured carbon oxides, but they can also potentially reduce other pollutants as reuse of pre-combustion industrial gases removes criteria pollutants as part of the reuse process.

However, the carbon reuse sector is still relatively nascent. Scaling carbon reuse pathways will require a range of market development policies including further pilot and demonstration scale projects to provide additional insights regarding cost, efficacy and scale, and buildout of CO_2 transport infrastructure, as well as continued breakthroughs in carbon reuse technologies and processes enabled by federal research, development, and deployment funding. Similar to carbon capture retrofits, direct air capture and CO_2 transport and storage projects, regulatory and permitting issues for carbon reuse will require considerable attention from project developers, state and local government, as well as host communities.

In recent years, there has been a renewed interest across the federal government and Congress to take novel steps to incentivize the development of the marketplace for products and services derived from carbon management. Small purchasing programs for materials and services from carbon oxides enacted by Congress in recent years have shown this type of policy can be vital to catalyzing a sustainable and effective marketplace for carbon reuse products. As demonstrated by current purchasing programs, harnessing the purchasing power of the federal government can be especially important in establishing markets for earlier stage carbon management technologies, including commercially available but nascent products.

Additionally, Treasury regulations for electing the 45Q tax credit pose a substantive barrier to carbon reuse project deployment, requiring the pre-approval of a life-cycle analysis (LCA) prior to claiming the section 45Q credits for such taxable year. DOE is not required under statute to conduct a new review of an LCA report for each taxpayer for each taxable year. However, the effect of current Treasury regulations and informal DOE guidance interpreting the LCA requirement for the utilization pathway is to require an annual approval process for the section 45Q credit, which creates a significant barrier for reuse technologies to benefit from the section 45Q tax credit. This is in contrast to common practice for LCAs performed in other sectors and for most purposes beyond 45Q. Without the certainty of knowing whether a project can claim the credit going forward, this process will likely severely limit investment in reuse projects going forward.

Considerations for safely and timely permitting of CO_2 transport and storage infrastructure

CO_2 transport infrastructure

Under today's policy framework, which includes the federal Section 45Q tax credit, it is already a positive economic proposition in some areas and industry sectors to finance regional CO_2 transport infrastructure. However, the costs of transporting captured carbon from emitting facilities can pose barriers to carbon capture, reuse, and storage deployment. Many of the existing industrial and power facilities in the United States are located in regions without significant appropriate geologic formations for CO_2 storage. Long distance transport infrastructure can unlock the economic potential for these facilities to sell captured CO_2 and earn tax credits for storage under Section 45Q.[xi]

There are currently about 5,150 miles of CO_2 transport pipelines in the United States. Economywide deployment of regional CO_2 transport infrastructure will require a significant buildout of this network, which will be enabled, in part, by 45Q as well as the $2.1 billion in lending and grant-making authority under the Carbon Dioxide Transportation Infrastructure Finance and Innovation program (CIFIA), authorized by the Bipartisan Infrastructure Law. Developing shared transport infrastructure connecting emitting sources to storage and utilization sites will minimize overall costs and land use impacts of deploying technologies.[xii] Although pipelines may offer the most cost-effective option for sufficiently large-scale CO_2 transport, other multi-modal transport options also offer flexibility, enabling routes to evolve over time and the frequency of transport to adapt in-line with the volume of material being transported.[xiii]

Timely permitting of storage via Class VI permits

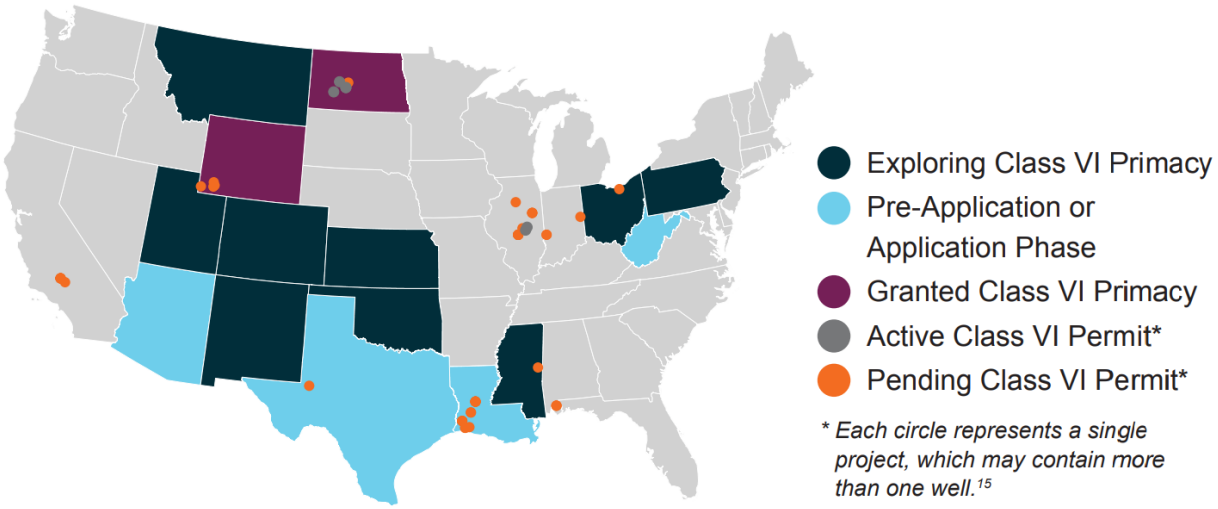

Figure 2: Class VI Well State Primacy Status and Pending Well Applications at EPA[xiv]

Granted Class VI permits are represented in grey dots, with pending in orange. States that are exploring Class VI primacy are shaded navy blue, those in the pre-application or application phase are light blue, and states with active primacy programs are purple. This map was last updated in April 2023. Additional individual Class VI well permits have been filed with EPA UIC since then.

Federal and state authorities ensure safe and permanent storage of CO_2 in appropriate geologic formations through the U.S. Environmental Protection Agency's Underground Injection Control Program for Class VI injection wells. Established in 2010, the program at the federal level has issued two Class VI permits for injection wells operating today, with more than 100 permit applications currently pending across all five regions. Of the more than 160 carbon capture projects that have been publicly announced, more than half have declared their intent to store CO_2 in saline formations and will require Class VI well permits.

EPA can grant primary permitting and enforcement authority—referred to as primacy—to individual states, territories, or tribes, which delegates authority to administer certain well classes in the UIC program in accordance with federal standards. Importantly, states, territories, or tribes can be approved for this delegation of primacy only when their regulations meet or exceed the federal UIC requirements.

The Coalition has supported increasing the staffing capacity at EPA to both permit Class VI wells and review state Class VI primacy applications. Doing so in a timely manner will be critical to achieving economywide scale of carbon management technologies and meeting both net-zero emissions in the power sector by 2035 and

midcentury climate goals. Already, EPA is taking steps to increase capacity to respond to the anticipated need, thanks in part to incremental increases in annual federal appropriations for the program. These funds are being used in part to build a technical assistance program with the Department of Energy to provide technical expertise and review Class VI well applications in a timely manner.

Additionally, the 2021-enacted Bipartisan Infrastructure Law fully funds the Storing CO_2 and Lowering Emissions (SCALE) Act, which provides $25 million over five years to support permitting of Class VI wells at EPA and $50 million for state activities including a grant program for states to establish their own Class VI permitting programs. To date, North Dakota and Wyoming have achieved primacy, with Louisiana's final determination from EPA expected soon. Texas, Arizona, and West Virginia are in the pre-application phase, and several other states are similarly exploring Class VI primacy.[xv] Since achieving primacy, North Dakota has permitted five Class VI wells under its state primacy program for four different projects.[xvi]

Conclusion

The Coalition appreciates EPA identifying carbon capture technologies as a key climate mitigation tool to reduce carbon dioxide emissions and co-pollutants from coal and natural gas electric generating units. While the supportive ecosystem in the United States has spurred an unprecedented number of carbon management project announcements, deployment of carbon capture in the power sector relies on the efficient, timely and safe permitting and availability of CO_2 pipelines, appropriate storage sites or reuse applications, and timely and efficient permitting programs.

ABOUT US

The Carbon Capture Coalition is a nonpartisan collaboration of more than 100 companies, unions, conservation and environmental policy organizations, building federal policy support to enable economywide, commercial scale deployment of carbon management technologies. This includes carbon capture, removal, transport, reuse, and storage from industrial facilities, power plants, and ambient air.

Economywide adoption of carbon management technologies are critical to achieving net zero emissions to meet midcentury climate goals, strengthening and decarbonizing domestic energy, industrial production and manufacturing, and retaining and expanding a high-wage jobs base. Successful commercial deployment of these technologies requires prioritizing meaningful engagement and consultation with local communities as

well as associated workforce development. Convened by the Great Plains Institute, Coalition membership includes industry, energy, and technology companies; energy and industrial labor unions; and conservation, environmental, and energy policy organizations.

Endnotes

[i] Is CCUS Too Expensive?, International Energy Agency, 2021.
[ii] The Role of CCUS in low-carbon power systems, international Energy Agency, 2020.
[iii] What is U.S. Electricity generation by energy source?, Energy Information Administration, accessed August 3, 2023.
[iv] US Carbon Capture Activity and Project Table, Clean Air Task Force.
[v] Jessie Jenkins, et al, "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022," REPEAT Project, Princeton University ZERO Lab, August 2022.
[vi] An Atlas of Carbon and Hydrogen Hubs for United States Decarbonization, 2022.
[vii] Geologic Storage is Permanent: An FAQ with Bruce Hill, Clean Air Task Force, 2021.
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[xi] Transport Infrastructure for Carbon Capture and Storage, Great Plains Institute, 2020.
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[xiii] National Academies of Sciences, Carbon Utilization Markets and Infrastructure: Status and Opportunities: A First Report, 2023.
[xiv] Class VI Wells Permitted by EPA, accessed August 3, 2023.
[xv] Primacy Enforcement Authority for the Underground Injection Control Program, EPA, 2022.
[xvi] Class VI – Geologic Sequestration Wells, North Dakota Mineral Resources, accessed August 3, 2023.