insights

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CCS: The Path Ahead

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Carbon capture and sequestration (CCS) refers to the slate of technologies that remove carbon dioxide (CO_2) from the emissions of point sources or the atmosphere, transport it, and permanently store it deep underground. Though CCS is already a mature technology in oil and gas for enhanced oil recovery operations, the United Nations' Intergovernmental Panel on Climate Change recently re-identified CCS as critical to reaching net-zero global emissions by 2050. A 2020 Princeton study found that to even have a shot at achieving net-zero by 2050, the United States would need to scale up more than a thousand carbon capture facilities nationwide, with associated infrastructure to sequester at least one billion tons of CO_2 per year. To put this in perspective, in 2020, the United States only captured around 25 million tons from 13 commercial-scale facilities.

Since 2020, Congress has taken several actions to revamp tax incentives, including expanding and enhancing available tax incentives under the Inflation Reduction Act of 2022 (IRA), to help developers and investors implement CCS projects. While the full impact of the IRA has yet to be seen, prior similar congressional action led to an influx of new proposals to build out current CCS capacity. However, significant regulatory hurdles remain toward effective scaling of sequestration efforts across the country.

Initially, there is substantial regulatory uncertainty facing CO_2 pipeline siting. In building out CCS infrastructure, we must come to terms with the geographic separation between point sources for emissions capture and suitable sequestration locations—i.e., pipelines must be built to transport available CO_2 from the locations where it is generated or captured to stable injection sites. If the United States is to meaningfully contribute to reaching net-zero by 2050 (in accordance with goals set by the Biden administration), efficiency mandates transportation by pipeline. But at present both the Federal Energy Regulatory Commission (FERC) and the Surface Transportation Board (STB) have indicated they have no jurisdiction over rates and siting of intrastate or interstate CO_2 pipelines. The other potential federal agency, the Pipeline and Hazardous Materials Safety Administration (PHMSA), does not have siting authority. Therefore, CO_2 pipelines must comply with a patchwork of state siting laws and regulations.

While sequestration injection wells under the Safe Drinking Water Act are exempt from the National Environmental Policy Act (NEPA), if a developer's planned pipeline would cross federal lands, the developer could seek a right-of-way to do so, but at the cost of triggering NEPA compliance. NEPA compliance introduces additional uncertainty into the permitting for CO_2 pipelines, since obtaining an environmental impact statement or environmental assessment required by NEPA takes time. In addition, potential litigation over the adequacy of NEPA compliance—which is more likely to occur if a proposed project is controversial—can cause costly delays.

On top of potential multistate and federal litigation over siting, the lack of unified siting authority complicates the intricate matchmaking required to efficiently and economically pair sources of CO_2 to suitable locations for sequestration. While the Department of Energy recently released a beta version Carbon Matchmaker Interactive Map to help facilitate economical CCS development, it relies heavily on self-identified activities and does not provide needed oversight. Without federal oversight, commercial development of important infrastructure is difficult to coordinate across state lines. The federal government, on the other hand, potentially could create a unified regulatory structure that would allow for a more streamlined permitting process.

Another siting issue concerns environmental justice. Due to the prior siting of oil and gas infrastructure in historically underprivileged and underserved communities, various stakeholders have raised concerns that CCS projects will continue to be sited in similar locations, which could subject already overburdened populations to additional risks such as CO_2 pipeline ruptures. In the absence of clear federal CO_2 pipeline siting authority, it is difficult to uniformly enforce and advance environmental justice concerns. With unified and better-coordinated oversight, federal agencies could help ensure CCS would be responsibly scaled; would be protective of public health, the environment, and the economy; and

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would not disproportionately impact historically underserved communities.

In addition to regulatory concerns, the potential long-term liability associated with sequestration projects is a major barrier to development. Some developers must demonstrate that sequestration projects can last up to 100 years in order to qualify for available incentives. Long-term liability introduces uncertainty, as regulatory landscapes and unforeseen events obviously may occur during the active life of a long-term sequestration project. States looking to attract CCS projects are actively enacting legislation to address this uncertainty. However, these states are few and far between. Indiana, Wyoming, Louisiana, Montana, and North Dakota are the only states that provide a sunset for long-term risk. These states, usually upon an operator's sufficient demonstration that it has satisfied specific conditions, will assume ownership and responsibility for the CO_2 storage facility.

Indiana's regulations could have the quickest transfer timeline, as the state will issue a certificate of project completion within 180 days of receiving an operator's application, but the state has also established a state fund to facilitate the long-term monitoring and management of CCS projects. Louisiana, at 10 years, and Wyoming, at 20 years, require periods after injection has ceased before a project operator may apply to transfer liability to the state. Illinois has only authorized the transfer for one project, upon which liability transfers after the gas reaches the status of post-injection. Other states, like Kansas and Texas, have established CO_2 storage funds from fees collected from parties participating in state sequestration but have not made strides toward assuming liability.

Meanwhile, California currently does not provide a liability transfer mechanism, conditions low carbon fuel standard credits upon a demonstration the project will sequester carbon for 100 years, and requires periodic monitoring and reporting for the same period. The uncertainty and long risk tail associated with long-term projects could chill otherwise eager investors. Because CCS is critical to achieving national climate goals and the Biden administration's "net-zero by 2050" objective, states and Congress should strongly consider adopting additional liability transfer mechanisms or other mechanisms to mitigate long-term risk.

Another barrier concerns the design and operational challenges associated with either converting existing pipelines to transport CO_2 or safely constructing lasting infrastructure. Currently, PHMSA applies safety requirements to CO_2 pipelines similar to those for pipelines carrying hazardous liquids such as crude oil under 49 C.F.R. §§ 190, 195–99. However, CO_2 has unique characteristics that could be reflected in pipeline design, corrosion protection, leak monitoring, and overpressure protection. Without detailed PHMSA regulations, CO_2 pipelines could be subject to different state requirements under their respective pipeline safety laws without a clear regulatory floor—and with a single pipeline potentially subject to multiple, competing standards should it cross state lines. Given perceived challenges associated with converting existing pipelines such as pressure differentials, compatibility of CO_2 with compressor materials, and metal fatigue, and the urgency with which we must scale this infrastructure, there is a need for enhanced regulatory clarity from PHMSA and other agencies. Indeed, PHMSA initiated a new rulemaking in May 2022 to update standards for CO_2 pipelines and solicited research to continue strengthening pipeline safety, which could address these concerns.

In order to help achieve net-zero by 2050, the nation must address federal siting jurisdiction, environmental justice concerns, long-term liability, and design and operational issues associated with CCS infrastructure. Interestingly, following *West Virginia v. EPA*, 142 S. Ct. 2587 (2022), which struck down climate rules governing certain coal-fired power plants, EPA seems poised to consider even more stringent standards based on pollution control technologies such as CCS. If that occurs (and survives any legal challenges), EPA's added regulatory pressure on the power sector could encourage other regulators to help clarify and streamline CCS projects and infrastructure permitting and regulatory requirements. But in the interim, CCS developers must contend with an uncertain and fragmented regulatory landscape.

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