# US $CO_2$ Transport and Storage Infrastructure:

*Climate Importance, Economic Opportunity, and Policy Need*

CLEAN AIR TASK FORCE

## The SCALE Act:

**The Storing $CO_2$ and Lowering Emissions (SCALE) Act includes key policy pillars designed to overcome the barriers and drive $CO_2$ infrastructure deployment in the U.S.:**

- The Secure Geologic Storage Infrastructure Development Program will build upon the CarbonSAFE program to provide DOE cost share for commercial $CO_2$ storage hubs.
- Increased funding for EPA Class VI $CO_2$ storage well permitting, and grants for states to establish their own Class VI permitting programs, to ensure rigorous and efficient permitting of $CO_2$ storage sites.
- A DOE Front-End Engineering and Design (FEED) program to provide grants for a critical early step to moving projects forward, similar to existing FEED grants for carbon capture technologies.
- The $CO_2$ Infrastructure Finance and Innovation Act (CIFIA) program will finance shared $CO_2$ transport infrastructure. Modeled on the successful TIFIA and WIFIA programs for highway and water infrastructure, CIFIA will provide flexible, low-interest loans for $CO_2$ transport infrastructure projects and grants for initial excess capacity on new infrastructure to facilitate future growth.

Together, these programs would enable companies and states to develop this essential infrastructure for a low-carbon economy. The SCALE Act will reduce the chicken-and-egg challenge, and ensure that $CO_2$ infrastructure is built at efficient scale to enable accelerated and widespread carbon capture deployment.

Deploying $CO_2$ transport and storage infrastructure will enable key sectors of our economy to dramatically reduce their carbon emissions while sustaining and growing domestic industry, manufacturing, and energy production and the high-wage American jobs they support.

## The SCALE Act would:

**Enable infrastructure** to achieve net-zero emissions

**Create 13,000** direct and indirect jobs per year

View SCALE Act jobs report

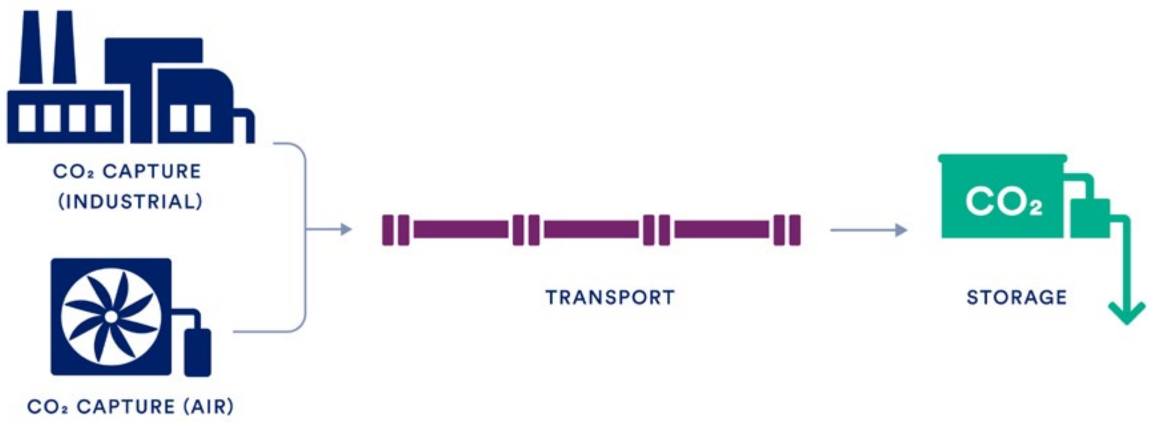
**Accelerate investment** in the decarbonization of emissions-intensive industries and carbon removal, creating even more jobs along the carbon capture value chain

## Carbon Capture's Importance for Industrial Emissions Decarbonization and Carbon Removal:

Carbon capture, transport, removal, and storage technologies are critical for achieving economy-wide net-zero emissions by mid-century, according to analyses by the Intergovernmental Panel on Climate Change and the International Energy Agency.

Carbon capture, removal, and storage have an essential role in capturing emissions from indispensable industries like steel, cement, plastics, and fertilizer production that have inherent $CO_2$ emissions in their production processes, have few other mitigation options, and account for around a quarter of global $CO_2$ emissions. In addition, Direct Air Capture must be deployed at large-scale in the coming decades amongst a portfolio of carbon removal technologies to remove $CO_2$ directly from the atmosphere to balance emissions that are either infeasible or more expensive to mitigate, and to reduce atmospheric $CO_2$ concentration.

Infrastructure must be built to transport captured industrial and atmospheric $CO_2$, and geological storage infrastructure is needed to permanently and safely store the $CO_2$.




## The Importance of Shared $CO_2$ Transport and Storage Infrastructure:

Interconnected $CO_2$ transport systems that collect $CO_2$ from multiple capture sources and deliver it to shared $CO_2$ storage sites, or 'hubs', are the key backbone infrastructure needed for widespread carbon capture deployment at the necessary scale. Multiple analyses, including Princeton's Net-Zero America study, the Decarb America Project, and work by DOE and the Great Plains Institute, have found that a significant buildout of $CO_2$ transport and storage infrastructure is necessary for the U.S. to achieve net-zero emissions, starting now and working towards 2030.

Pipelines are the dominant mode of $CO_2$ transport, although shipping and rail can be feasible options in certain circumstances. The U.S. has 5,000 miles of existing $CO_2$ pipelines in limited regions (compared with over 300,000 miles of natural gas transmission pipelines) that were developed over the past 50 years primarily to transport $CO_2$ from natural geologic sources to oil fields for use in $CO_2$ enhanced oil recovery. These pipelines are regulated by PHMSA and have operated safely and reliably with no significant environmental or safety incidents.

Industry has decades of experience safely storing $CO_2$ through enhanced oil recovery in the U.S. and at several dedicated geological storage sites around the world. However, only one commercial-scale dedicated $CO_2$ storage site exists in the U.S. today. Several more are under development through the DOE CarbonSAFE program, but a far larger scale-up is needed.

Similar to existing rail, highway, power, water, and gas infrastructure for their respective industries, $CO_2$ transport and storage infrastructure facilitates carbon capture deployment in three key ways:

- **Enabling more $CO_2$ capture from more places:** not all regions of the U.S. have suitable geology for storage, so $CO_2$ must be transported to regions that do. Storage hubs in suitable regions can store $CO_2$ from numerous sources in a wide area.
- **Realizing economies of scale:** $CO_2$ transport and storage infrastructure have strong economies of scale, whereby larger infrastructure handling greater $CO_2$ volume has lower unit cost per ton of $CO_2$. Aggregating more $CO_2$ from more sources decreases transport and storage costs, which in turn enables more carbon capture deployment.
- **Connectivity: creating a $CO_2$ market, lowering risk.** Shared $CO_2$ infrastructure systems will connect multiple buyers and sellers of $CO_2$. Such markets would decrease the demand or supply risk for any individual capture, utilization, or storage project, thereby reducing financing risk premiums and the total cost of carbon capture. Connectivity would also unleash the power of markets to drive innovation in technology and business models, inevitably accelerating carbon capture deployment.

Planning for future needs and investing in larger-capacity transport and storage infrastructure today will have significant benefits for accelerating future carbon capture deployment. The Great Plains Institute found that a system built with initial excess capacity could transport over double the amount of $CO_2$ for only 16% higher total capital cost, and that "federal support for future-proofing pipeline capacity through 'super-sizing' will drastically reduce costs as well as land use and environmental impact of $CO_2$ transport infrastructure."


## Barriers for Deployment:

Despite its importance, deployment of $CO_2$ infrastructure faces critical barriers that require federal support to be overcome:

- **Cost.** The Section 45Q tax credit enables economic $CO_2$ capture from many sources, but the credit value is not high enough to also fund major new $CO_2$ transport and storage infrastructure to support each individual capture project.
- **A chicken-and-egg challenge.** $CO_2$ transport and storage infrastructure must exist, or at least be certain to be built, before $CO_2$ capture projects can be committed. But the $CO_2$ capture projects must also exist or be certain before the transport and storage infrastructure can be committed.
- **Building for future demand.** $CO_2$ transport and storage infrastructure should be built with excess capacity to realize economies of scale and enable future growth, but initial $CO_2$ capture projects must bear the cost of the infrastructure and cannot pay for over-sized infrastructure unless additional support is provided.

Over 30 new carbon capture projects have been announced since Congress passed the revised Section 45Q tax credit for carbon oxide storage in 2018, showing the viability and potential of carbon capture. However, all of these projects are located either near existing $CO_2$ transport infrastructure or on top of the best geology for storage where transport infrastructure is not needed. No new shared $CO_2$ transport or storage infrastructure has been announced, owing to these critical barriers. The lack of $CO_2$ infrastructure is preventing many carbon capture projects that would be economically feasible today.

## Policy Support Already Exists Outside the United States:

The barriers above have been faced by other new industries and similar infrastructure systems like rail, highways, power, and water infrastructure. Government policy support played a major role in their successful deployment, and the federal government currently has active loan programs for each of these types of infrastructure. The need for similar enabling government policy support for $CO_2$ transport and storage infrastructure is being recognized and acted upon by governments around the world:

- The Alberta Carbon Trunk Line, a shared $CO_2$ transport system with significant excess capacity, was completed in 2020, enabled by $550 million funding from the Canadian and Alberta governments.
- The European Commission recently announced €135 million in funding to progress six $CO_2$ transport and storage network projects in five European countries.
- The Norwegian government recently committed more than $2 billion in funding for the Northern Lights shared $CO_2$ transport and storage project in the North Sea and two associated $CO_2$ capture projects.
- The UK established an £1 billion CCS infrastructure fund to support the development of $CO_2$ transport and storage hubs. Multiple hubs are under development, including Net Zero Teeside and Zero Carbon Humber.
- Australian governments are funding development of multiple transport and storage hubs and leading the development of the CarbonNet project.

The U.S. currently does not have any equivalent policy for supporting deployment of shared $CO_2$ transport and storage infrastructure. The DOE CarbonSAFE program is funding exploration and development for $CO_2$ storage sites, but it is well below the scale necessary. The 2015 DOE Quadrennial Energy Review recommended financial incentives for $CO_2$ transport infrastructure, but no such funding has been enacted.

Congress' enactment of the Section 45Q tax credit created a world-leading policy providing American innovators and investors with an incentive for financing carbon capture technologies. However, the lack of complementary federal support for $CO_2$ transport and storage infrastructure puts our nation at risk of falling behind the countries that have recently made substantial $CO_2$ infrastructure financing commitments.