



CARBON CAPTURE, UTILIZATION AND STORAGE (CCUS)

CCUS is an acronym that represents Carbon Capture, Utilization and Storage. The carbon that is captured is the carbon dioxide that is emitted from producing facilities such as oil and gas refineries, petrochemical plants, electric power plants, cement, steel and other manufacturing facilities. The combustion of fossil fuels such as coal, oil, natural gas and other hydrocarbons produces this CO₂ emission, and it represents a significant portion of these industrial process plants' "carbon footprint." CCUS is a process where the CO₂ is captured or removed from the plant emissions streams and then purified and compressed into a concentrated stream. The CO₂ is then introduced to a pipeline or other transportation media such as ships or rail vessels, and ultimately utilized for value or injected into geologic formations to assure safe and permanent long-term storage. The key elements of the value chain are **capture**, **transportation**, and **utilization** of the CO₂ for chemical or physical value, then final injection for **storage** into geologic formations.



There are a number of key aspects of CCUS that are fundamental to the goal of Carbon Neutrality. Industrial Emissions of CO₂ represent nearly half of the overall anthropogenic (man-made) footprint. Tailpipe emissions from Internal Combustion Engines (ICEs) is just slightly greater. Industries that aspire to a carbon neutral goal have CCUS as an essential lynchpin for the energy transition to effectively lower carbon emissions. The key transition markets that require CCUS are:

1. Enabling the hydrogen economy – CCUS enables the removal of carbon from hydrogen, a versatile energy source gaining traction, for use in transportation, power generation, fuel substitution in manufacturing and energy storage. All of these require CCUS to de-carbonize the hydrogen produced from natural gas, and this hydrogen will represent over 90% of the anticipated growth of hydrogen, currently 13 billion cubic feet per day, that is projected to increase by as much as 10X over the coming 50 years. Hydrogen volume growth and technology scale up will require natural gas-based hydrogen with reduced carbon emissions that is via CCUS to make this growth possible.
2. Resilience for the electricity grid – The electric power grid must grow and meet the increased demand for electricity that is projected to increase by 50% in the next 30 years, therefore CCUS is essential. Not only must we add capacity to generate more electricity, but those electrons must be reliable and available such that the baseload needs of 24/7 operations be met. Gas and coal powered generation can be made carbon-free by deployment of CCUS and represent the key pathway to delivering this capability.



3. Industrial plants improvements – These facilities have emissions that can only be captured by CCUS, or by conversion to electricity that requires CCUS supported baseload power, or by substituting existing fuels with CCUS supported carbon-free hydrogen. Industries cannot achieve carbon neutrality without CCUS.

Texas must act on CCUS as we face the growing challenges of a global community demanding products that are lower carbon or carbon free. To meet the global demands for the energy transition, the elimination of fossil fuels is not a feasible objective over the next 30-50 years globally, and Texas is a major part of this global marketplace. Our industries, our workforce, and our economic structure are driven by supply of all forms of energy that much of the US receives from Texas. We will continue to have our energy in demand, but the requirements of the marketplace will also demand carbon neutrality - and CCUS is the backbone of that necessity. We can gain increased ability in meeting domestic demands while positioning Texas products preferentially in the global marketplace through lower carbon intensity production. We cannot meet the demand growth without fossil fuels –and we cannot meet such demand for low-carbon products without CCUS.

Texas has more carbon dioxide emissions than any other state in the United States. We also are blessed with geologic resources to store a greater amount of CO₂ than all of our state's emissions for the years to come. For that matter, this makes Texas not only capable of delivering the low carbon needs of our industries but to become a national resource for the Gulf Coast and potentially other parts of the U.S. in the pursuit of carbon neutrality. We can become the unmatched global center for reducing CO₂ through emissions reductions and carbon storage greater and more efficiently than anywhere else in the world – and not by subtracting or lessening our industries but by enabling this technological transformation to achieve affordable, reliable and carbon neutral in total.

The state must enact thoughtful legislative and policy support to realize this vision. Key areas that require attention are:

1. Land and pore space ownership on shore.
2. Offshore geologic assessments and clarity in applicable laws.
3. Economic incentives to support CCUS through bonds, economic development zones, etc., essentially mirroring of the renewables support that accelerated Texas to the forefront of those industries.
4. Policy support for infrastructure development such as pipelines.
5. Risk mitigation for CO₂ injection into geologic formations through supporting policies and long-term ownership and commercial structures to share the risk of CCUS as a public good investment.
6. Leadership in permitting – Class 6 primacy.



We operate globally, with companies committed to net neutral and net zero goals, with a skilled workforce equipped with technologies that are world leading. We can lead CCUS commercialization efforts while becoming an international technology and know-how hub to impact the global CO2 footprint and unlock tremendous economic opportunities in Texas.