



Carbon Capture Solutions

› Comprehensive EPC for sustainable practices in energy





Table of Contents

› Engineering the future with advanced CCUS	4
› CO2 capture engineering + project development	5
› CO2 capture technology	6
› CO2 treatment	7
› CO2 dehydration	8
› CO2 transportation + sequestration	9
› CO2 liquefaction + utilization	10
› CO2 distillation	11
› CO2 refrigeration	12
› CO2 management	13
› CO2 construction	16
› CO2 system fabrication	17
› Who we are	18





Introduction

Engineering the future with advanced CCUS

As global emphasis on reducing carbon emissions intensifies, industries increasingly turn to carbon capture, utilization, and storage (CCUS) strategies to diminish the impact of carbon-intensive operations and support regulatory requirements.

With our full suite of in-house capabilities in engineering, procurement, construction (EPC), fabrication of modular units, and project management for the energy sector, Audubon is well-positioned to integrate and advance CCUS solutions.



CO2 Capture

Engineering + project development

A pivotal step in transitioning to sustainable energy practices is carbon capture engineering. Leveraging our rich heritage and extensive industry experience, we are committed to bringing top-notch CCUS solutions to our clients.

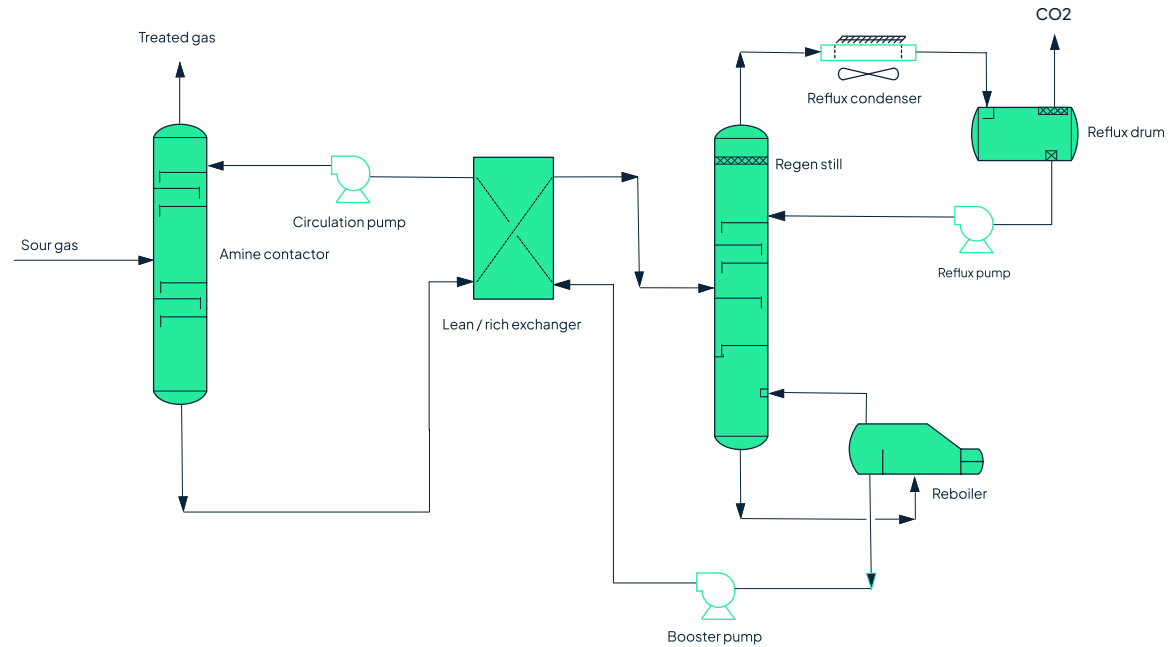
Our focus for CCUS projects is on crafting precise, workable plans. We ensure that the envisioned carbon capture systems are effective, align with regulations, and adhere to the highest performance standards—providing our clients with operational reliability, product optimization, and financial benefit.

Full-scale CCUS solutions

- › 45Q tax credit analysis + financial modeling
- › Conceptual engineering
- › Front-end engineering + design (FEED)
- › Detailed engineering + design
- › Procurement
- › Project management
- › Fabrication by Opero Energy
- › Construction + installation
- › Startup + commissioning
- › Owner's engineering

Effectively reduce emissions

Audubon captures carbon with cutting-edge, amine-based technologies to efficiently and economically remove CO2 from gas streams. Amine solvents selectively absorb CO2 for easy separation and quick amine regeneration.



Efficient, selective CO2 removal from:

Natural gas

Ensuring compliance with environmental regulations and enhancing the sustainability of your operations

Syngas

Optimizing the performance of hydrogen and gasification processes and reducing greenhouse gas emissions

Flue gas

Contributing to cleaner air and reduced footprints from power plants and industrial facilities

Advanced CO2 adsorption methods:

Pressure swing adsorption (PSA)

High purity, operational efficiency

Temperature swing adsorption (TSA)

High selectivity

Vacuum swing adsorption (VSA)

Low energy requirements

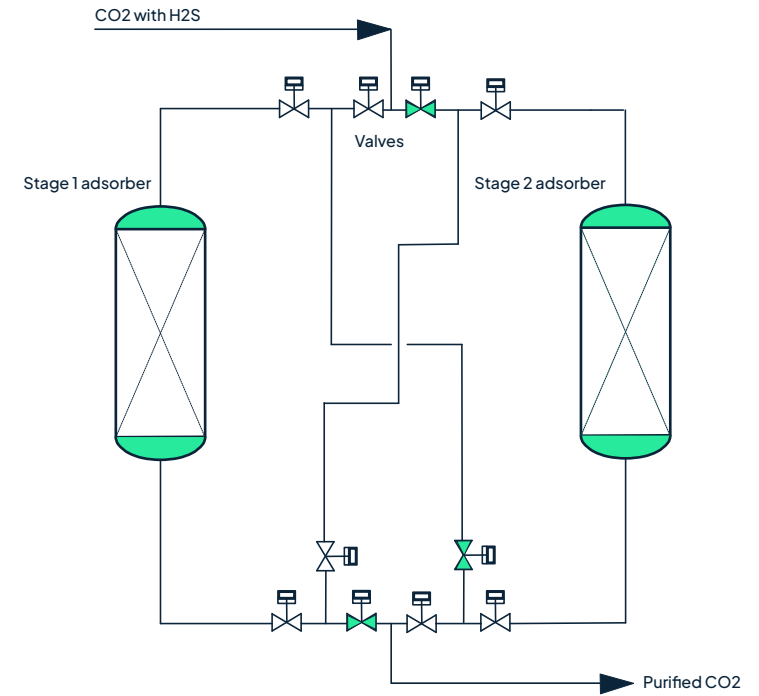
Membrane separation

Cost efficiency, reduced chemical storage and handling

CO2 Treatment

Preserve health, environment, + assets

Treating carbon before utilization is necessary to address health risks, environmental regulations, and corrosion. Audubon designs CO2 treatment solutions based on each specific gas stream, application requirements—and our expert knowledge of the advantages and cost efficiencies for varying methods.



H2S is toxic and requires efficient removal from streams in the natural gas, biogas, and petroleum industries to preserve human safety, environmental compliance, infrastructure integrity, and product quality. Common treatment methods include:

- › Fixed-bed catalyst
- › Amine-selective removal
- › Scavengers (triazine, nontriazine)
- › Iron sponge
- › Biological removal
- › Direct oxidation

O2 is typically found in low-pressure CO2 applications. Treatment solutions use catalytic reduction to react the oxygen over a metal catalyst to form water.

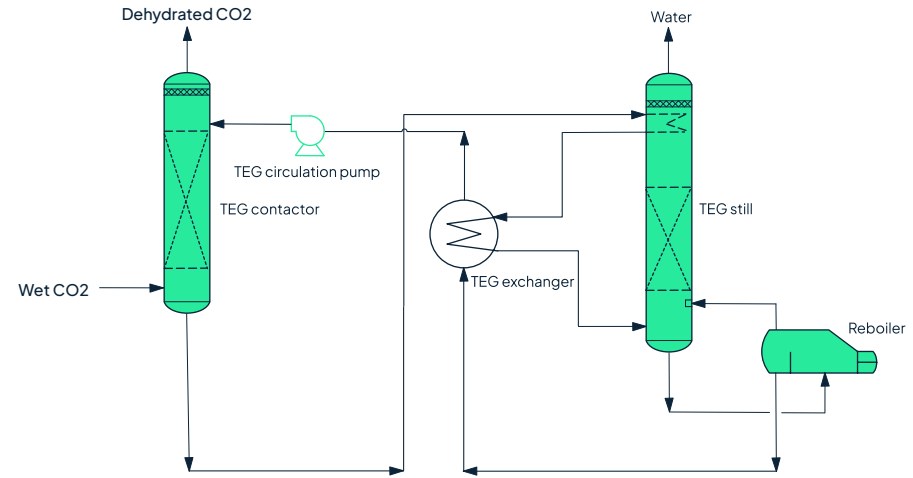
H2 is often found in CO2 from synthesis gas (syngas) amine streams. Treatment solutions flow hydrogen over an oxidative dehydrogenation catalyst, reacting the hydrogen to form water.

NOx + SOx result from nitrogen and sulfur existent in fuel gas, often at parts-per-million levels. Selective catalyst reduction (SCR) reacts NOx with ammonia over catalyst to produce N2 and H2O in flue gas. Flue gas desulfurization reacts SOx with calcium oxide to scrub the gas.

Hydrocarbons must be separated from CO2 to achieve enhanced oil recovery (EOR). Distillation and membrane separation are two methods to recover hydrocarbons and clean up CO2 for reinjection.

Meet water-content specs

As captured CO2 is often saturated with water vapor and contaminants, the process of dehydrating becomes crucial to ensure the gas meets pipeline water-content requirements. Whether the specification is 30 lb H2O/MMscf or completely dry, Audubon specially engineers, fabricates modular units for, and installs essential CO2 dehydration.



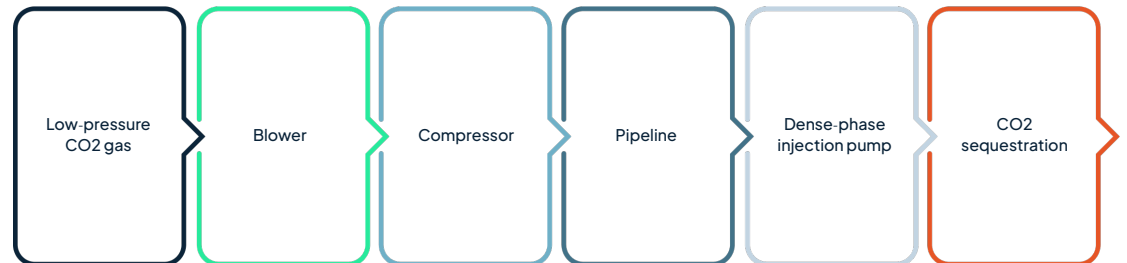
Triethylene glycol (TEG) dehydration is a widely used method for removing water vapor from natural gas and other gas streams, including CO2 in carbon capture processes. This technique prevents the formation of hydrates and reduces corrosion in gas transportation and storage systems.

Molecular sieve + dessicant dehydration methods are highly efficient for removing water vapor down to parts-per-million levels. They utilize highly porous materials with a precise and uniform pore structure, allowing them to adsorb gases and liquids selectively based on molecular size.

Mechanical refrigeration dehydration removes water from CO2 by Joule-Thomson recycle or cross-exchange with chilled water. It utilizes the Joule-Thomson Effect of the compressed dry CO2 to chill the wet CO2, condensing water.

CO2 Transportation + Sequestration

Ensure safety + efficiency



Transporting CO2 from capture sites to storage or usage sites poses its own set of challenges, primarily around safety and efficiency. Blowers move the low-pressure CO2 from the amine still or stack to compression for easier handling and transport. When the CO2 becomes dense-phase, pumping systems take over to move the compressed CO2 through pipelines over long distances. We engineer these systems to maintain the integrity and quality of the CO2, ensuring it reaches its destination without leaks or degradation. Our specialized systems allow operators to store geologically for the long term or capitalize on the trapped gas with EOR.

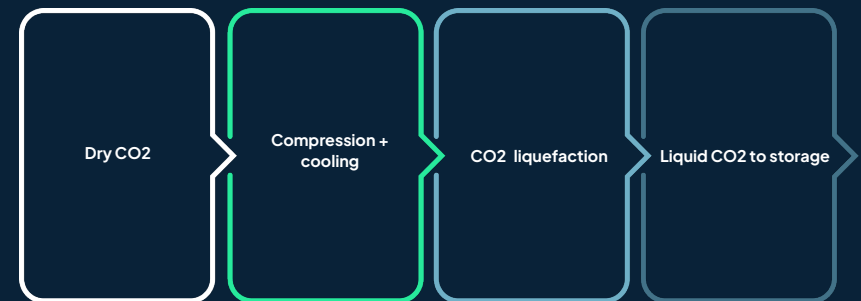




CO2 Liquefaction + Utilization

Capitalize on captured product

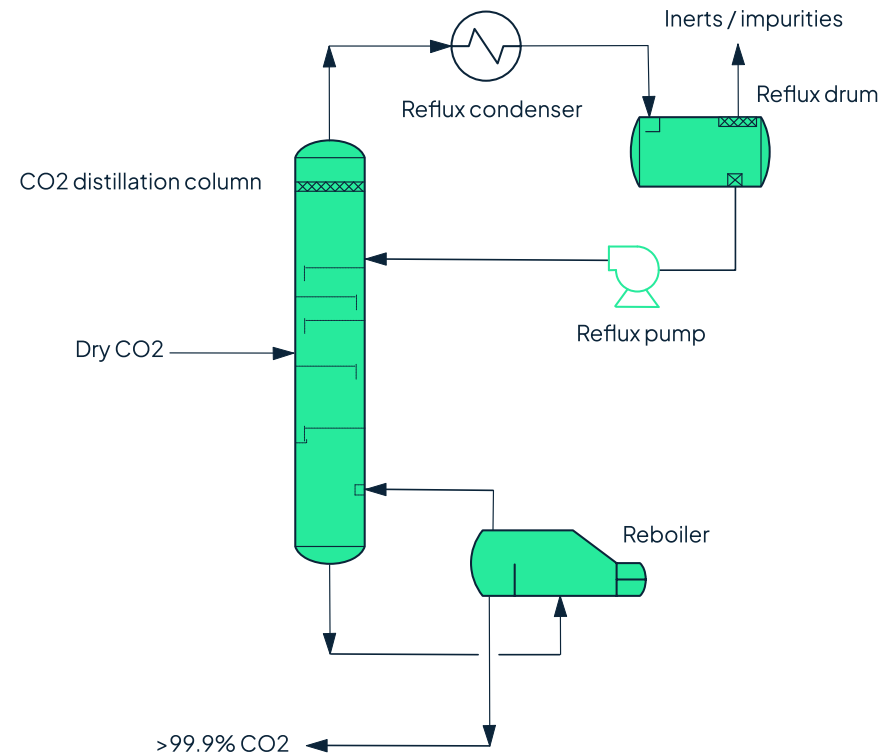
Once captured and treated, CO2 can be stored to prevent further release into the atmosphere. Audubon designs CO2 storage systems at low pressure using standalone refrigeration or integrated liquefaction. Applying our advanced liquefaction process, oil and gas, biogas, chemical, industrial, and food/beverage operators can utilize—and capitalize on—their captured product.



CO₂ Distillation

Achieve beverage-grade purity

Applications of carbon for human consumption require a purity greater than 99.9%. To help the beverage industry meet federal Food and Drug Administration (FDA) standards, Audubon applies CO₂ distillation to remove trace components—down to the PPM level. This specially engineered process runs CO₂ and impurities through a trayed distillation column, where the difference in vapor pressures separates CO₂ from other components. A reboiler provides the necessary heat to vaporize the more volatile components in the CO₂ liquid, while a condenser with reflux prevents CO₂ losses.



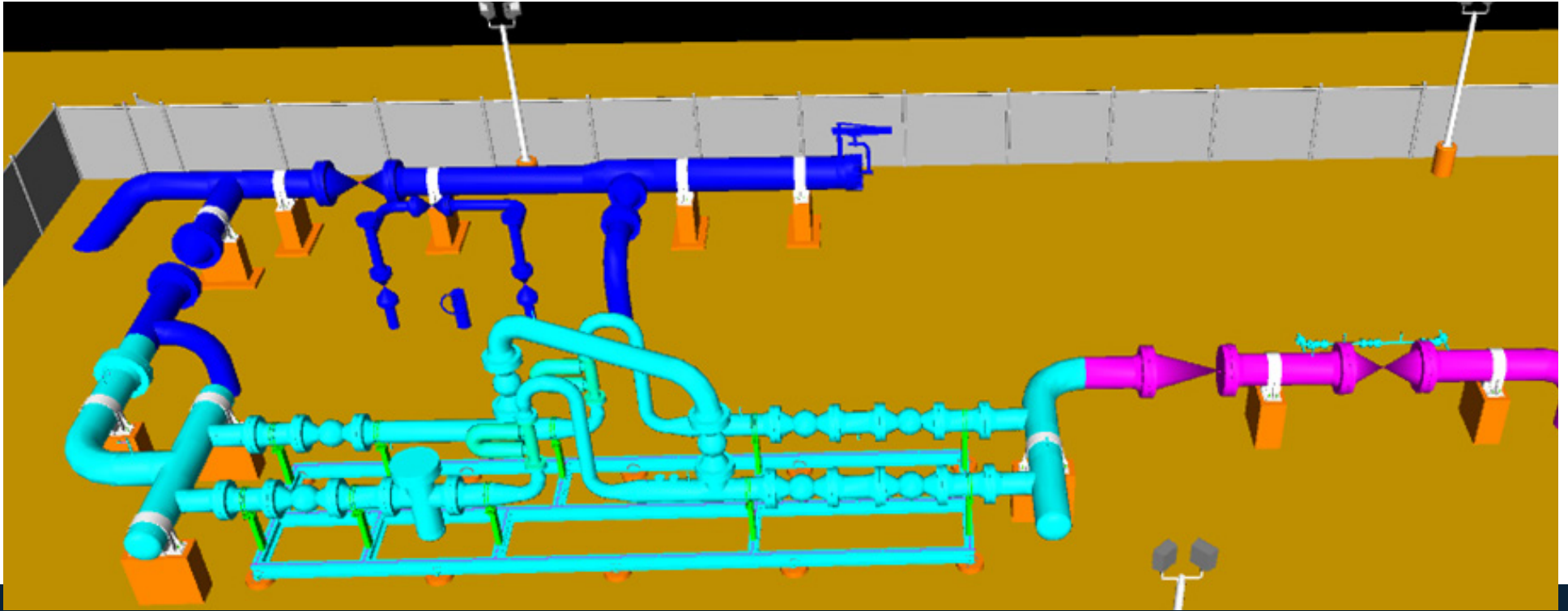
CO2 Refrigeration

Reach sustainability goals

CO2 refrigerant (R-744) is a sustainable and energy-efficient alternative to refrigerants with higher greenhouse gas levels. R-744 is a natural and environmentally friendly refrigerant. Compared to other refrigerants with global warming potentials (GWPs) in the 1,000s—R-744 has a GWP of just 1.

R-744 has a low viscosity and high heat-transfer coefficient, resulting in a high-performance refrigeration system. Audubon engineers and packages industrial-grade R-744 refrigeration units using robust transcritical screw compressors to meet cooling demand. Packaged equipment modules optimize plot space and reduce installation time in the field.



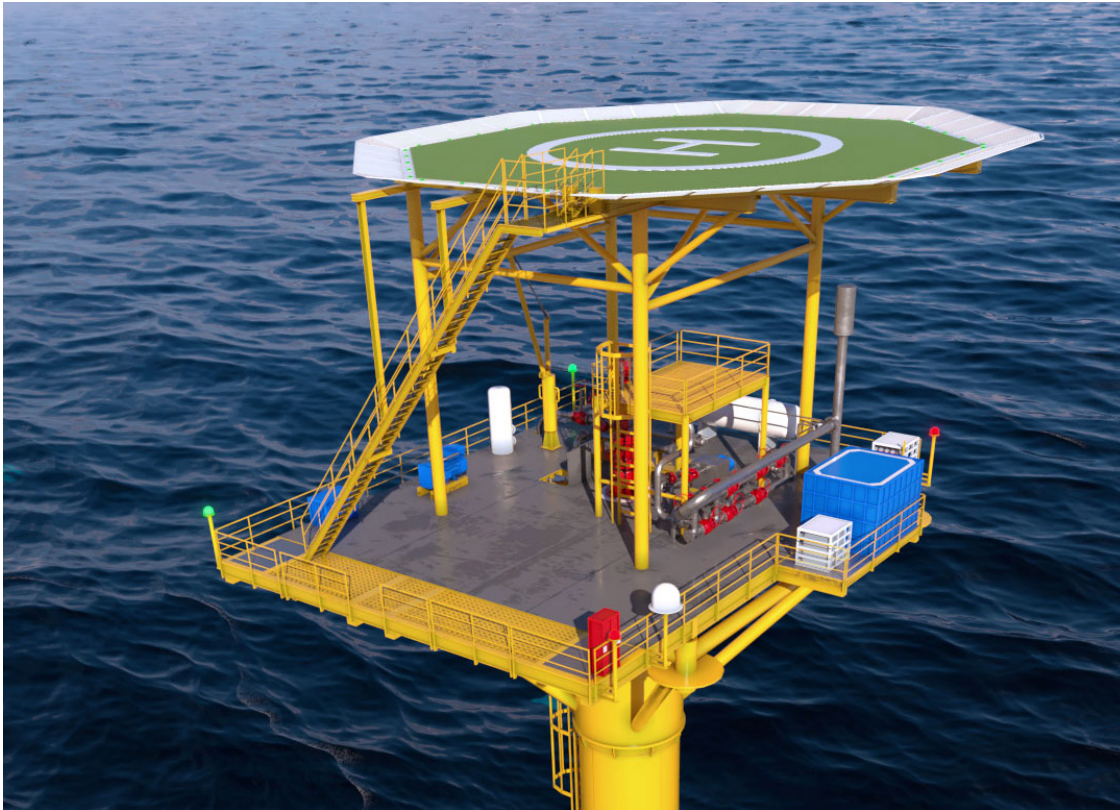


CO2 Management

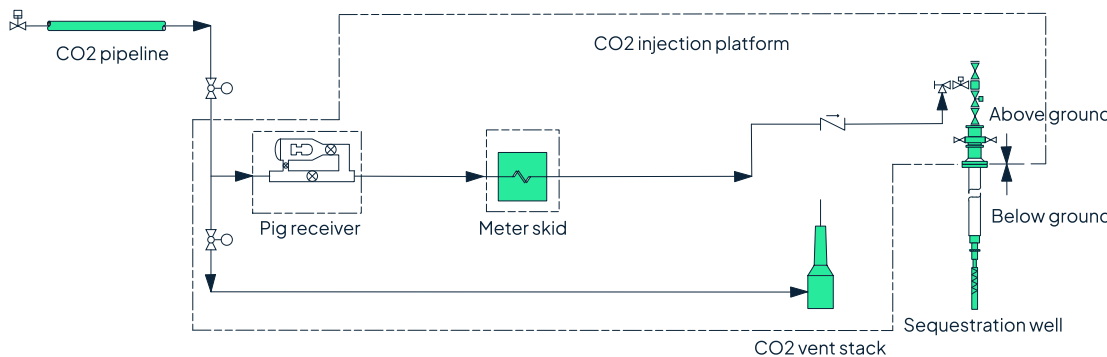
Make operations seamless

The final design piece of the CCUS puzzle involves end-to-end CO2 management, from metering to pipeline infrastructure to injection strategies. For each piece, Audubon designs systems to the highest standards of precision, integrity, and performance.

Meter skids measure and monitor the flow and composition of CO2, providing essential data for operational control and compliance reporting. Accurate data on the amount of CO2 captured, transported, and stored are vital for environmental reporting, regulatory compliance, and, in some cases, carbon credit trading. Meter skids provide the necessary precision in these measurements.



Injection technologies facilitate the storage of CO₂, either deep underground in geological formations or used in EOR processes. Both offshore and onshore injection methods require highly specialized and detailed practices to ensure environmental compliance.



Audubon supports the detailed design and engineering of CO₂ injection systems, including the wells, surface facilities, and associated infrastructure needed to transport and inject CO₂ at high pressures into underground reservoirs. We also support the integration of various system components, conduct tests to ensure intended functionality, prepare the facility for operational handover, and train personnel in system operation and maintenance to create a smooth transition.



Pipelines explicitly engineered for CO₂ transport form the backbone of the transportation network, linking capture sites with storage and utilization locations. Audubon supports this network by ensuring pipelines can accommodate high pressures and temperatures while maintaining structural integrity.

Our teams have the technical knowledge to recommend the optimum materials and coatings based on the purity of the CO₂ and other gas components.

Additional CO₂ pipeline services:

- › Environmental + social impact assessment
- › Regulatory compliance + permitting
- › Integration with storage + utilization sites
- › Corrosion management
- › Safety + monitoring



CO2 System Fabrication

Save time to startup

Opero Energy, a subsidiary of Audubon, delivers high-performance processing solutions to the energy industry, including specially engineered carbon capture units. Our customized processing systems utilize a modular approach and a turnkey design-build-install methodology to get operations—and production—started up sooner.

Upholding the highest levels of safety and industry certification, our in-house fabrication capabilities are diverse and robust:

- › Modular design + fabrication
- › Structural steel fabrication
- › Piping fabrication (carbon + stainless steel)
- › Mechanical assembly
- › ASME-certified pressure vessel fabrication
- › Electrical + instrumentation
- › Insulation + heat tracing
- › Factory acceptance testing
- › Quality assurance + control (QA/QC)



CO2 Construction

Build assets with confidence

Audubon leverages our deep expertise and innovative technology to deliver robust construction solutions tailored to the unique demands of the carbon capture sector. Our construction process encompasses comprehensive premobilization, thorough site preparation, and structured execution—so that each project meets the highest safety and quality standards while staying within budgets and timelines. Our construction services cover every aspect of CO2 infrastructure development:

- › Piping + instrumentation installation
- › Advanced instrumentation monitoring + control
- › Meter skid assembly + installation
- › Injection system building + commissioning



EPC | Fabrication | Field Services

Who we are

Audubon is a leading EPC, fabrication, and field services provider supporting the energy, power, utility, industrial, and manufacturing markets. Clients trust our comprehensive, flexible approach for their projects, whether new infrastructure development or existing asset optimization. Fueled by the latest technologies, our

innovative solutions improve performance and reduce risk while considering safety, environment, economics, and sustainability at every stage. We deliver the operational and technical excellence to meet our clients' evolving needs while creating long-lasting value in a changing world.

As Audubon's fabrication division, Opero Energy delivers high-performance processing solutions across energy sectors utilizing a modular design approach. We bring value to our clients' projects with specialized engineering and in-house, state-of-the-art fabrication.





audubon

People | Flexibility | Relationships | Experience

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