

Carbon Dioxide (CO₂) Capture Experience

Testing, Studies, Implementations



Client	Project	Location	Scope Summary	Date
Enchant Energy	San Juan Generating Station CO ₂ capture front-end engineering and design (FEED) study	New Mexico	This pending DOE-funded project includes a FEED study for a large-scale installation of amine-based CO ₂ capture technology at the San Juan Generating Station (SJGS). Our scope includes detailed design of the balance-of-plant (BOP) scope and interconnections to support the capture facility, technical investigations and studies, technical specifications for equipment, development of capital and O&M costs, and regulatory reviews.	Pending
Membrane Technology Research (MTR)	Dry Fork; Integrated Test Center (ITC) CO ₂ capture FEED study	Wyoming	This pending DOE-funded project includes a FEED study for a large-scale installation of MTR's CO ₂ capture membrane technology. Our scope includes detailed design of the BOP scope and interconnections to support the capture facility, technical investigations and studies, technical specification for BOP equipment, development of capital and O&M costs, and regulatory reviews.	Pending
ION Engineering, LLC (ION)/ Nebraska Public Power District (NPPD)/DOE	Gerald Gentleman 2, CO ₂ capture FEED study	Nebraska	This pending DOE-funded project includes a FEED study for a large-scale installation of ION's CO ₂ technology at the GGS facility. This is a continuation of a previous pre-FEED project. Our scope includes detailed design of the BOP scope and interconnections to support the capture facility, technical investigations and studies, technical specification for BOP equipment, development of capital and O&M costs, and permitting.	Pending
Southwest Research Institute (SwRI)/DOE	University of Wyoming Central Energy Plant large pilot Phase 2 FEED study	Wyoming	This DOE-funded project kicked off in October 2019 and includes a FEED study for a large-scale pilot for International Test and Evaluation Association's (iTEA) flameless pressurized oxy-combustion technology. This is a continuation of the previous Phase 1 project, and our scope includes design of the BOP scope and interconnections to support the pilot unit, as well as development of capital and O&M costs.	2019-ongoing
Membrane Technology Research (MTR)	Dry Fork; Integrated Test Center (ITC) large pilot Phase 2 FEED study	Wyoming	This DOE-funded project began in September 2019 and includes a FEED study for a large-scale pilot of MTR's CO ₂ capture membrane technology. Our scope includes design of the BOP scope and interconnections to support the pilot unit, technical specification for BOP equipment, development of capital and O&M costs, and permitting.	2019-ongoing
Confidential Client	Confidential preliminary feasibility and cost study	Confidential	We are conducting a study of the applicability of a 40,000-tonne/year slipstream CO ₂ capture for water treatment at a new international supercritical coal boiler. The scope includes preliminary integration design, arrangement, and cost estimating.	2019-ongoing

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Confidential	Confidential scalability study	--	Sargent & Lundy is conducting a study for the evaluation of pilot skid installation and identification of requirements to scale up the system and develop a conceptual full-scale system. The scope includes developing a construction schedule, conceptual design, capital cost estimate, and O&M cost estimate.	2019-ongoing
MidAmerican Energy	Walter Scott Energy Center Unit 4 preliminary conceptual design study	Iowa	We are conducting a preliminary conceptual design study for a CO ₂ capture installation retrofit. The study scope includes development of preliminary conceptual layouts, utility estimates, high-level capital and O&M cost estimates, and economic analysis.	2019-ongoing
Carbon Capture Machine (UK) Limited	X-Prize Carbon Capture Competition test skid design	Wyoming	As subcontractor to CCM, Sargent & Lundy is supporting the design of a pilot skid carbon capture system to be installed at the Wyoming ITC as part of X-Prize's Carbon Capture Competition. Sargent & Lundy's role on the project includes equipment design, BOP engineering and design, and construction oversight.	2018-ongoing
Confidential	Confidential test skid design	Test skid design	Sargent & Lundy is providing owner's engineering services for the design of a test skid for new carbon capture technology. The skid will be installed at various industrial applications.	2018-ongoing
Confidential	Confidential oxy-combustion and CO ₂ capture study	--	We are supporting a confidential client in developing a study to evaluate conversion of an existing coal-fired unit to oxy-combustion, in conjunction with installing a CO ₂ capture system. This includes coordinating efforts of multiple subcontractors, as well as performing BOP engineering and cost estimating.	2018-ongoing
ION Engineering, LLC (ION)/ Nebraska Public Power District (NPPD)/DOE	Gerald Gentleman 2 CO ₂ capture study	Nebraska	As a subcontractor to ION, Sargent & Lundy is supporting development of a commercial CO ₂ capture design and costing study for a 300-MW (equivalent) carbon capture system. Our role includes performing studies, BOP engineering and design, constructibility review, and cost estimating.	2018-ongoing
Basin Electric Power Cooperative	Dry Fork Station 1 Integrated Test Center (ITC) - CO ₂ capture technology evaluation	Wyoming	Sargent & Lundy provided engineering services and developed costs to support development of the ITC using 20-MWe (87,500-ACFM) slipstream of flue gas from Dry Fork Station, divided among six test sites. The first scheduled ITC tests evaluated six different CO ₂ capture technologies for X-Prize's Carbon Capture Competition to demonstrate beneficial utilization of the recovered CO ₂ .	2015-2018

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University of Utah	Hunter CO ₂ capture and sequestration implementation	Utah	We assisted the client in evaluating the feasibility and economics of integrating CO ₂ capture technologies at an existing plant for sequestration in nearby geological sites. The evaluation included comparison of traditional amine-based technology and emerging cryogenic technology. As part of this project, Sargent & Lundy defined the BOP impacts and estimated the associated costs for the station for each technology.	2017
University of Wyoming	Jim Bridger CO ₂ capture and sequestration implementation	Wyoming	Sargent & Lundy a high-level evaluation to determine the potential of the station as a candidate for CO ₂ capture technology to provide a concentrated CO ₂ stream for sequestration. The evaluation was conducted as part of the DOE-funded CarbonSAFE program.	2017
CARBON 360/Petra Nova/ NRG Energy	W.A. Parish 8 CO ₂ capture and sequestration implementation	Texas	We provided owner's engineering services during development and design phase, including design reviews and HAZOP participation, in addition to detailed drawing review and detailed design of Hastelloy and fiberglass reinforced plastic (FRP) ductwork system capable of handling a 240-MWe slipstream (646,800 SCFM) of flue gas that is interconnected to the host unit (Unit 8) and the CO ₂ capture island. This design included a computational fluid dynamic (CFD) model, ductwork design, support steel design, and foundation design. Also performed evaluation of MHI's amine-based process producing 1.6 million tons of CO ₂ per year (4776 tons/day).	2013-2017
Confidential	Confidential CO ₂ capture for enhanced oil recovery (EOR) economic evaluation	Confidential	We assisted the client in evaluating the feasibility and economics of integrating CO ₂ capture technologies at an existing plant for use in EOR at nearby oil fields. As part of this project, Sargent & Lundy defined the BOP impacts and estimated the associated costs for the station.	2016-2017
Eastern Research Group, Inc. (ERG) for EPA	EPA Integrated Performance Model (IPM) update	--	Sargent & Lundy evaluated the cost and performance of various air pollution control technologies for use in EPA's updated IPM. The scope included technologies for NO _x , SO ₂ , HCl, mercury, PM, and CO ₂ control. At this time, the IPM model update has not been published.	2016
Confidential	Confidential CO ₂ capture for EOR economic evaluation	Confidential	We assisted the client in evaluating the feasibility of installing a CO ₂ capture system at an existing plant for use in EOR at nearby oil fields. This project included evaluating the permitting requirements for both the onsite CO ₂ capture equipment and the associated CO ₂ pipeline. Subsequent to the permitting evaluation, Sargent & Lundy evaluated the technical feasibility of integrating various configurations of CO ₂ capture technology within the limitations of the existing plant.	2016

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Confidential	Confidential novel CO ₂ solvent technical and economic assessment	Confidential	A developer of a second-generation CO ₂ capture solvent contracted Sargent & Lundy to perform a technical and economic assessment of a CO ₂ capture facility based on the use of their proprietary solvent as part of a DOE-funded project. The assessment evaluated the incremental cost of CO ₂ capture using this solvent based on installation at a theoretical greenfield power plant. We developed the conceptual design of the base plant and capital and O&M costs for the entire facility, including the CO ₂ capture island.	2015-2016
Confidential	Confidential novel CO ₂ capture technology evaluation	Confidential	A major U.S. utility company contracted Sargent & Lundy to perform a FEED study, in conjunction with the technology developer, to determine how to integrate the technology into an existing power plant. We provided preliminary design information, identified risks, and unknowns; and developed capital and O&M cost estimates to help the client evaluate the economics of developing the project further. The system was designed to capture 100,000 tons per year of CO ₂ , roughly equivalent to a 15-MWe slipstream of flue gas.	2014-2015
NRG Energy	W.A. Parish 8 CO ₂ capture and sequestration FEED study	Texas	Sargent & Lundy's earlier work at W.A. Parish 7 evolved to work at Unit 8 and was expanded in size to a 240-MWe slipstream. We provided owner's engineering services and BOP design for a 240-MWe CO ₂ capture utilization and storage (CCUS) demonstration project. The project received a funding grant from DOE. We were heavily involved in the development of the proposal to the DOE. As owner's engineer, Sargent & Lundy reviewed all technical aspects of the project, including HAZOP reviews for the facility.	2010-2013
U.S. DOE	Gasification projects	Indiana and Mississippi	We performed due diligence analyses on the projects for the DOE Loan Guarantee Program. The projects were intended to produce substitute natural gas (SNG) from coal and petroleum coke to power two plants ranging in size from 300 to 400 MW. The overall purpose was for the benefits of CO ₂ for use in EOR applications.	2010-2014
U.S. DOE	Generic efficiency study	--	We developed a conceptual design for a new 500-MW coal plant equipped with CO ₂ recovery that is fully thermally integrated. We determined potential overall efficiency improvements from integration and compared these to existing concepts.	2009-2013
Leonardo Technologies, Inc. (LTI) for DOE	Supercritical coal CO ₂ capture and sequestration study	--	Sargent & Lundy performed a detailed evaluation of the coal drying process and its integration with future innovative CO ₂ capture and sequestration project for 600-MW ultra-supercritical boilers. The evaluation included a conceptual cost estimate for the coal drying process utilizing low-level heat from flue gas, as well as from steam cycle.	2012

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LTI for DOE	Coal plan conceptual design with CO ₂ recovery	--	We evaluated various thermal cycles for a conceptual design for a new coal plant equipped with CO ₂ capture technology. The cycles included the use of two-pressure steam turbines, back-pressure turbine, and integration of the CO ₂ process steam with the main cycle. We developed cost estimates for three different cycles, including integration of coal drying.	2010-2012
SRA International, Inc. for EPA	EPA IPM update	--	Sargent & Lundy evaluated the cost and performance of various air pollution control technologies for use in EPA's updated IPM. The scope included technologies for NO _x , SO ₂ , HCl, mercury, and PM control. The 2012 updates were not published.	2010
NRG Energy	W.A. Parish 7 CO ₂ capture and sequestration DOE proposal	Texas	We supported proposal development to DOE as part of the Clean Coal Power Initiative (CCPI) 3 for 60-MWe slipstream (161,700-SCFM) demonstration facility on Unit 7. The facility would remove SO ₂ and capture 1,194 tons per day of CO ₂ using Fluor Econamine Plus and wet limestone scrubbing technology. The captured CO ₂ would be used for EOR in nearby oil fields. As owner's engineer, Sargent & Lundy provided all BOP engineering, including CO ₂ compression.	2008-2010
Confidential	Repowering/CO ₂ capture	Western U.S.	We compared costs for repowering several existing steam turbines, totaling approximately 500 MW, with natural gas combined-cycle power systems with installations of retrofit CO ₂ capture system technologies on existing boilers.	2010
US/EPA	Generic coal and IGCC plants	--	Sargent & Lundy developed a cost estimating workbook for applying efficiency enhancement technologies at existing power plants. We assessed possible reduction of CO ₂ for each technology, and compared the enhancements in relation to installation of new coal and integrated gasification combined-cycle (IGCC) plants.	2009-2010
Confidential	Confidential due diligence	Confidential	We performed due diligence analysis of the FutureGen project for a prospective participant in the FutureGen Alliance.	2009
ENMAX Corporation	Feasibility study	Canada	We worked with Hatch on studies of combined-cycle and IGCC projects, including evaluation of variations to syngas for combustion turbines: <ul style="list-style-type: none"> • Combined-cycle to IGCC retrofit prefeasibility study • High-hydrogen content Syngas combustion effects on combustion turbine generators prefeasibility study • IGCC/syngas/CO₂ EOR plant prefeasibility financial/market analysis 	2007-2009
NRG Energy	W.A. Parish and Limestone SO ₂ and CO ₂ capture	Texas	Evaluated SO ₂ and CO ₂ capture using Powerspan's ammonia-based ECO-SO ₂ and ECO ₂ technology. Powerspan's system was designed to use a 125-MWe slipstream of flue gas to produce 3000 tons per day of CO ₂ .	2007-2009

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Nebraska Public Power District	Generic CO ₂ utilization	--	We evaluated CO ₂ utilization using CO ₂ captured from a 700-MW power plant.	2008
Duke Energy	CO ₂ management	Confidential	We conducted a CO ₂ capture and compression retrofit feasibility study for a 600-MW coal plant.	2007-2008
Midwest Generation	Generic CO ₂ control pre-feasibility studies, CO ₂ management	--	Sargent & Lundy conducted CO ₂ control prefeasibility studies and carbon management for: <ul style="list-style-type: none"> • Flue gas desulfurization (FGD) technology selection, cost analysis, and site layout (spray dry absorber wet FGD, Powerspan technology) • FGD technology selection and CO₂ retrofit impacts • CO₂ transportation retrofit pre-feasibility study • CO₂ technology for capture and compression site constraint pre-feasibility study • CO₂ technology site selection, site layout, and performance impacts 	2007-2008
Confidential client	Site selection	Confidential	We provided services for site selection, feasibility studies, and CO ₂ management.	2007
IP&L	Generic CO ₂ capture	--	Sargent & Lundy prepared white paper on carbon capture.	2007
Oklahoma Gas and Electric	Pilot oxy-chem evaluation	Oklahoma	We assisted in Alstom proposal to DOE for pilot oxy-chem development.	2008
Oklahoma Gas and Electric	Fleetwide CO ₂ management	Oklahoma	Sargent & Lundy provided emissions data and costs for 25 units.	2007-2008