

Colorado

IMPLEMENTING CARBON CAPTURE AND STORAGE TECHNOLOGY

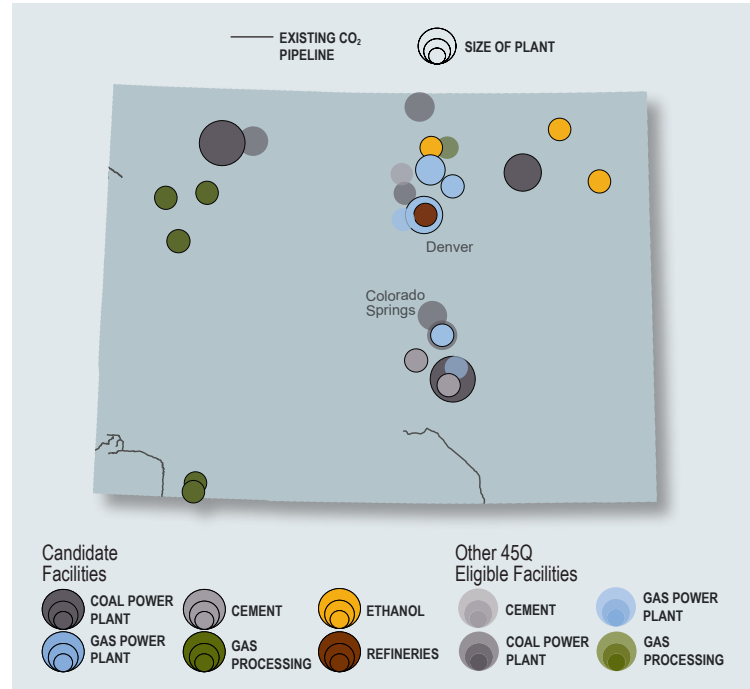
KEY TAKEAWAYS

- 18 industrial facilities in Colorado have been identified as economically feasible candidates for carbon capture technology implementation and qualify for the 45Q tax credit—capable of capturing over 10 million metric tons (MT) of CO₂ annually.
- Studies have shown that Colorado has the potential to store over 123 billion tons of CO₂ geological saline formations and at least 163 million MT of CO₂ in Enhanced Oil Recovery (EOR) fields.
- State utility statutes indicate the consideration and viability of carbon capture and storage technology for application onto future utility decarbonization initiatives.

Figure 1: Colorado has many facilities large enough to qualify for the 45Q carbon capture tax credit, including coal and gas power plants, gas processing facilities, and petroleum refineries. Facilities identified by the Regional Carbon Capture Deployment Initiative as potential early candidates for capture retrofit based on emissions, equipment, and estimated capture cost, are shown with outlines and darker colors. Details on these facilities are listed below.

Source: Great Plains Institute 2019; EPA 2018.

SOURCES BY INDUSTRY & VOLUME



POTENTIAL CANDIDATE FACILITIES FOR CAPTURE WITH ANNUAL EMISSIONS

Facility Name	Location	Industry	Total Facility CO ₂ Emissions thousand tons	CO ₂ Captured Target thousand tons	Estimated Capture Cost \$/ton
Craig (Unit 2 & 3)	Craig	Coal Power Plant	4,772	1,600	\$57
Comanche (Unit 3)	Pueblo	Coal Power Plant	4,765	1,600	\$57
Pawnee	Brush	Coal Power Plant	3,971	1,600	\$57
Cherokee	Denver	Gas Power Plant	1,125	800	\$59
Fort St. Vrain	Platteville	Gas Power Plant	1,223	800	\$59
Front Range	Fountain	Gas Power Plant	725	800	\$59
Rocky Mountain	Keenesburg	Gas Power Plant	899	800	\$59
Holcim Portland Plant	Florence	Cement	884	798	\$52
GCC Rio Grande	Pueblo	Cement	733	660	\$54
Meeker	Rifle	Gas Processing	483	336	\$13
Suncor Energy	Commerce City	Refineries	881	213	\$72
AR Loop & Simpson Treating	Durango	Gas Processing	251	167	\$15
Ignacio	Durango	Gas Processing	394	161	\$15
Willow Creek	Rifle	Gas Processing	298	155	\$15
Bargath	Parachute	Gas Processing	254	114	\$16
Sterling Ethanol	Sterling	Ethanol	126	112	\$20
Front Range Energy	Windsor	Ethanol	120	106	\$20
Yuma Ethanol	Yuma	Ethanol	120	106	\$20

Table 1: The Regional Carbon Capture Deployment Initiative estimated theoretical facility capture costs based on published capture equipment costs, facility-specific operational patterns, existing equipment, and level of emissions. Most states have a large number of facilities eligible for 45Q. Of those facilities, the above table lists likely economically feasible candidates based on estimated capture cost. This list is not meant to be definitive. Commercial decisions by participating companies, and policy and regulatory decisions by state governments, will ultimately determine if a project is feasible for carbon capture. Captured Emissions refers to the amount of carbon dioxide that can be expected to be captured at a facility considering relevant technological and economic constraints. Source: GPI 2019; EPA 2018.

REGIONAL CAPTURE OPPORTUNITIES

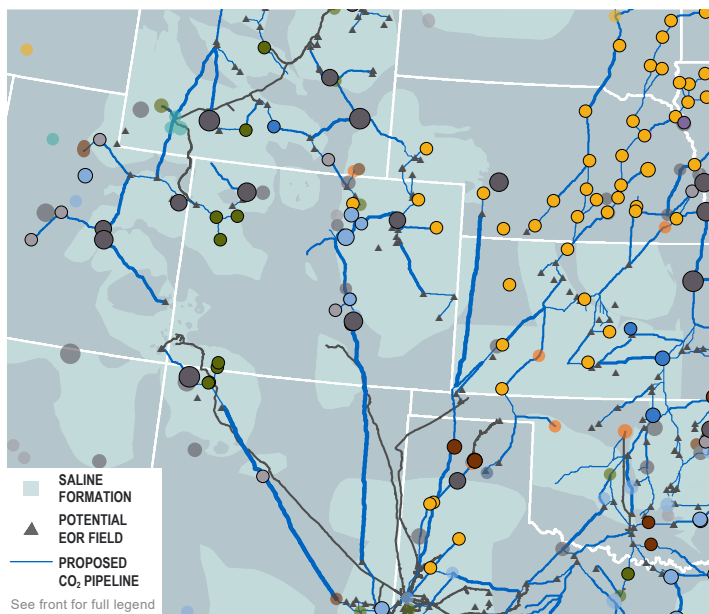
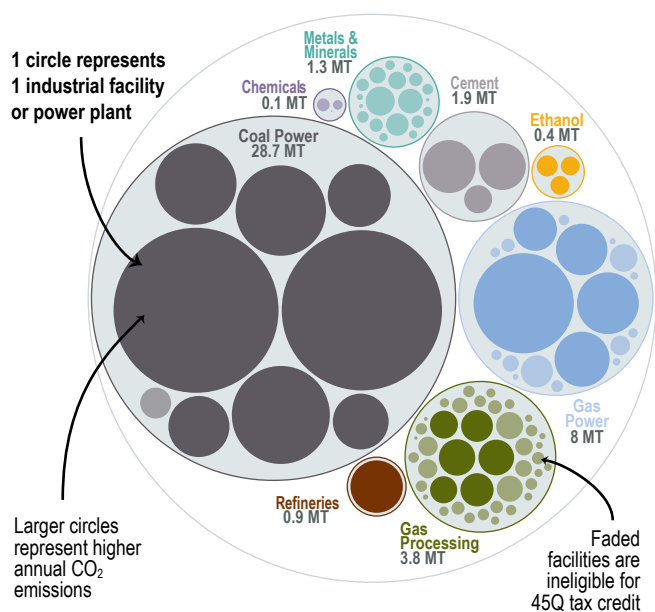


Figure 2: Potential regional CO₂ sources and pipeline corridors for transportation to utilization and storage sites as modeled by the Regional Carbon Capture Deployment Initiative.

FACILITIES AND EMISSIONS BY INDUSTRY



MT: Million metric tons CO₂

Figure 3: This bubble diagram visualizes the number of facilities and corresponding annual CO₂ emissions for each industry in Colorado. The darker large bubbles are eligible for the 45Q carbon capture tax credit, while the faded bubbles are too small to be eligible. The total amount of CO₂ emissions in Colorado is listed for each industry. Source: GPI 2019; EPA 2018.

The **Regional Carbon Capture Deployment Initiative** brings together state officials with diverse industry, NGO, labor, and other stakeholders to promote broad scale deployment of infrastructure for carbon capture, CO₂ pipelines, enhanced oil recovery (EOR), other forms of geologic storage, and beneficial utilization of CO₂ in the Western and Midwest regions of the country. The Initiative is staffed by the Great Plains Institute (GPI), a nonpartisan, nonprofit working to transform the energy system to benefit the economy and environment.

For more information on this effort, go to carboncaptureready.org or contact Patrice Lahlum at plahlum@gpisd.net.

LEGISLATIVE CONTEXT

Development of carbon capture and storage (CCS) legislation and essential clean energy regulations are taking shape in Colorado with power sector statutes considering CCS as a viable decarbonization technology and with the state Climate Action Plan setting decarbonization goals. Outlined in Colorado's revised Statute Title 40-2-123, the public utility commission will take into consideration new clean energy technologies that include projects which demonstrate the capture and sequestration of CO₂ in future utility investments. This consideration has not been fully utilized by power companies, but Xcel Energy, Colorado's largest utility, announced their goal of reaching zero-carbon electricity by 2050 with the potential for carbon capture in their decarbonization equation. Colorado set their state climate goals with House Bill 19-1261 (HB 19-1261), passed in 2019, aiming to reduce emissions from 2005 levels by 26% in 2025, 50% in 2030, and 90% by 2050. CCS technology can be an integral part of the state's ability to meet these emission reduction goals and should be included in future legislation to encourage and guide the implementation of economically feasible and environmentally beneficial CCS projects.

CAPTURE AND STORAGE POTENTIAL

Colorado has proven its CO₂ storage capabilities through research and longstanding commercial execution. Since 1986, oil fields in the state act as a secure storage location for the Exxon Shute Creek gas processing facility in Wyoming, with the CO₂ transferred via a pipeline system. Colorado is a member of the Southwest Regional Partnership (SWP) for Carbon Sequestration, whose goal is to identify sources and sinks in the region and create policy and protocols around the technology. The Colorado Geological Survey and SWP reported storage potential for CO₂ within the state in the Denver Basin, Cañon City Embayment east of the Rocky Mountains, and the Piceance and Sand Wash basins. In total, modeling has shown Colorado's saline storage potential at over 123 billion tons of CO₂ with an additional 163 million metric tons of CO₂ storage in EOR fields (see Figure 2).

Standing as the nation's seventh largest natural gas producing state, Colorado has the potential to capture nearly 1 million MT of CO₂ at five of its processing plants that have been identified as economically feasible and qualify for the federal 45Q tax credit. Xcel Energy, one of the largest utilities in Colorado, holds a state energy portfolio of 44 percent coal and 28 percent natural gas, with over half of the electricity needs in Colorado currently met with coal-fired power plants. There are eight coal facilities that qualify for the 45Q tax credit, three of which have been identified as potentially economically feasible candidates. These three facilities have the potential to capture 4.8 million metric tons of CO₂ annually. In addition to gas and coal facilities, Colorado has two 45Q qualified cement facilities that have been identified as near-term candidates for retrofit, with potential to capture over 1.4 million MT of CO₂ (see Table 1).

Maps and graphics within this document are based on work by the Great Plains Institute (GPI) to help the Regional Carbon Capture Deployment Initiative identify facilities that qualify for the federal 45Q tax credit and are optimal near-term investment opportunities for carbon capture for each state. For more information, visit carboncaptureready.org.