

# The Importance of Carbon Capture to Decarbonizing the Electricity Sector

## Introduction

**N**EARLY EVERY STUDY FOCUSED ON DECARBONIZING the electricity sector by mid-century concludes that some fossil generation with carbon capture and storage (CCS) is likely to be a necessary part of the decarbonization mix. In the Midcontinent Power Sector Collaborative's A Road Map to Decarbonization: Electricity Sector, natural gas generation with carbon capture plays a significant role by 2050 in nearly every decarbonization scenario analyzed. Although the technology has not been deployed in the region on a power plant, it has been deployed on an ethanol plant and a natural gas processing plant. If carbon capture is likely to be part of the decarbonization solution, how can the region better prepare to take advantage of the carbon capture option?

This issue brief initially details the role that carbon capture is projected to play in the long-term decarbonization of the electricity sector in the Midcontinent. The brief then explains the federal tax credit passed to encourage carbon capture and recommends ways that states and the private sector can contribute to deployment of carbon capture in the region.



## What does the Midcontinent Power Sector Collaborative's road map analysis tell us about the long-term need for carbon capture in the region's power sector?

Participants in the Midcontinent Power Sector Collaborative, including utilities, cooperatives, public power, environmental groups, and state officials, consider it very likely that the power sector will substantially decarbonize by mid-century. The Collaborative set out to better understand what decarbonization would look like in the range between 80 and 95 percent below 2005 levels by 2050. Figures 1 and 2 show the power plant fleet makeup in 2050 under 80- and 95-percent

decarbonization scenarios, respectively, in which natural gas prices remain low and renewables costs are moderate. Of the dozens of scenarios modeled for the road map effort, only scenarios with high natural gas prices and lower decarbonization levels did not choose natural gas with CCS as part of the decarbonization mix.

Beyond the electricity sector, carbon capture is expected to play a role in decarbonizing the transportation and industrial sectors. Carbon capture can improve the carbon

### What is carbon capture? How is the carbon utilized or stored?

Carbon capture describes the process of separating carbon dioxide (CO<sub>2</sub>) from the emissions stream on a power plant or other emissions source. Once captured, the carbon would then be transported to a location where the CO<sub>2</sub> is permanently stored, either in a product (e.g., cement) or in a geological formation. Carbon dioxide has been used since the 1970's by the oil industry to enhance oil recovery from mature oil fields.

FIGURE 1: Generation Mix Under 80% Cap by 2050 (with Low Gas Prices, Moderate RE Costs)

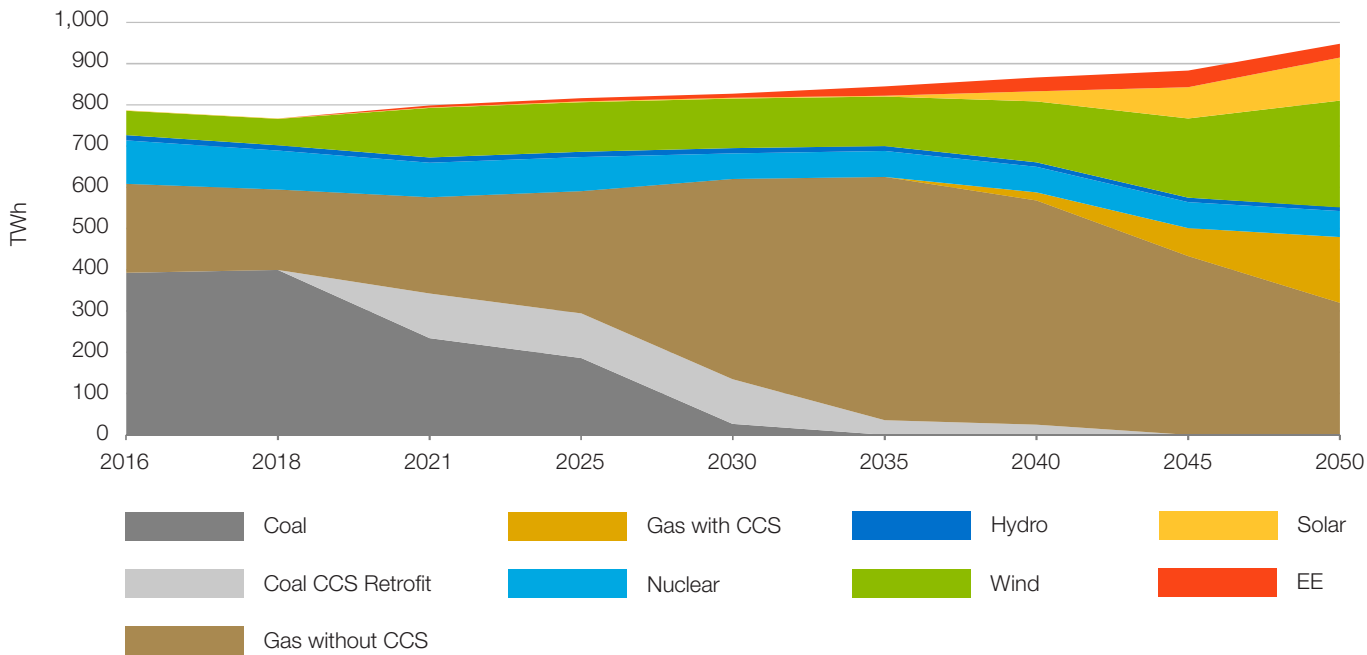
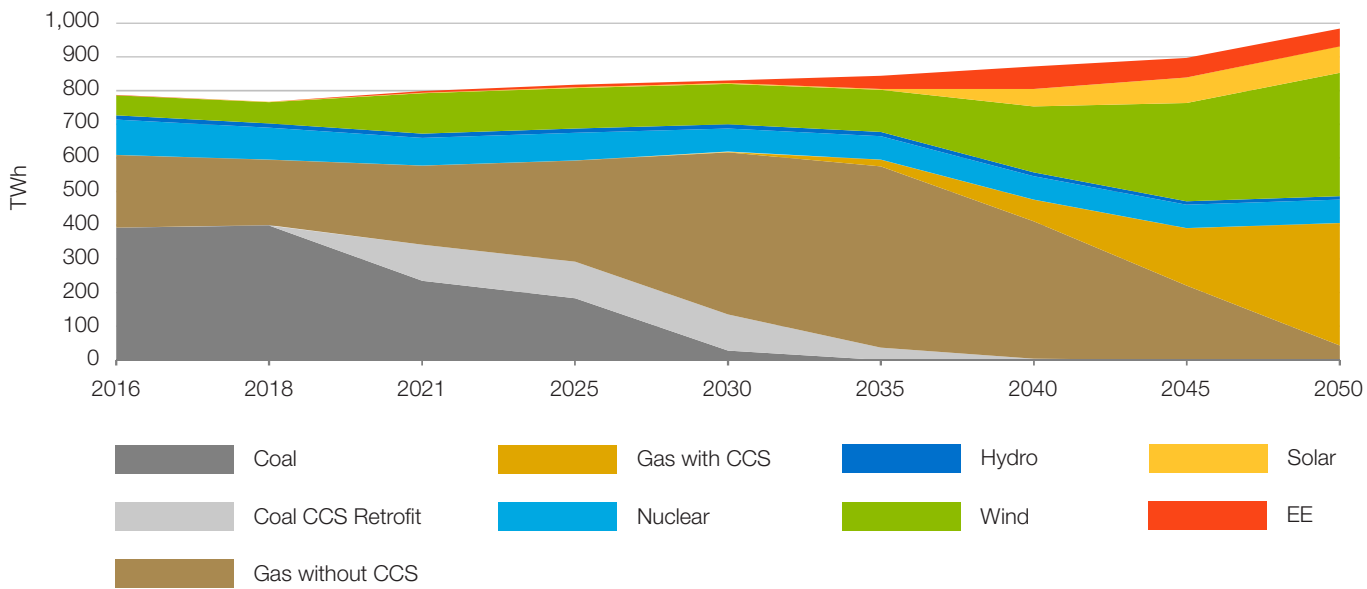


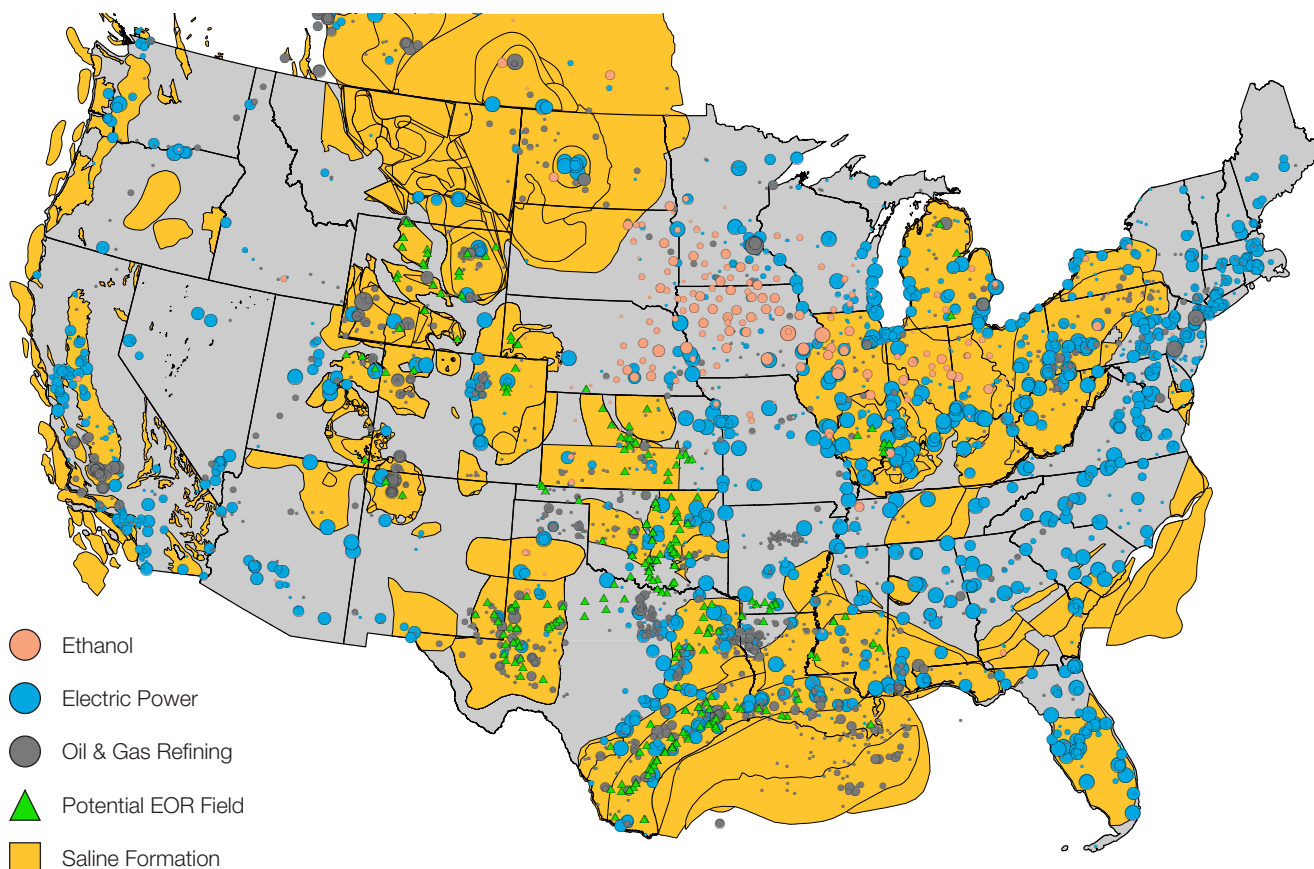
FIGURE 2: Generation Mix Under 95% Cap by 2050 (Low Gas Prices, Moderate RE Costs)



profile of transportation fuels through its use on facilities that produce biofuels and/or electricity. Over time, carbon capture could play a role in achieving negative emissions when installed on facilities that produce biofuels that have stored carbon from the atmosphere. Carbon capture can also lower the carbon intensity of oil produced using CO<sub>2</sub> captured from industrial sources. This process is referred to as CO<sub>2</sub>-enhanced oil recovery (EOR) where CO<sub>2</sub> storage can occur incidentally to oil production.

Figure 3 shows the location of potential sources of CO<sub>2</sub> for storage as well as the location of saline formations and oil basins where CO<sub>2</sub> might be stored. Some locations have both sources and sinks (i.e., suitable locations for storage), while other locations would require pipelines to transport the CO<sub>2</sub> from sources to sinks.

FIGURE 3: Location of Potential Carbon Dioxide Sources and Sinks by Type



Source: Great Plains Institute 2019.

## The federal carbon capture tax credit

In February 2018, Congress expanded and reformed the “45Q” tax credit—named for the section of the tax code that contains the credit—for the geologic storage and beneficial use of carbon captured from industrial facilities and power plants. The changes to 45Q are expected to drive new carbon capture projects in the Midcontinent and elsewhere. Under the 45Q tax credit, carbon capture projects can receive up to \$35 dollars per ton of carbon permanently stored through beneficial use such as enhanced oil recovery and up to \$50 for carbon permanently stored in a geological formation. To be eligible, the project must commence construction within seven years of enactment of the amended 45Q tax credit and credits are awarded for a period of 12 years after the carbon capture equipment is placed in service. According to the Collaborative’s modeling analysis, the tax credit is projected to drive between 8 and 14 gigawatts of carbon capture retrofits on coal power plants in the region in the relatively near term, primarily to serve EOR projects.



## How can the region ensure carbon capture will be a readily available option for power sector decarbonization?

The federal 45Q tax credit is expected to lead to new deployment of carbon capture applications in the Midcontinent region, but in some cases carbon capture projects may need state and local support to increase project deployment. State leaders and stakeholders can help ensure that carbon capture emerges as a readily available part of the decarbonization mix for the power sector. Below are some examples of actions that could be taken to support carbon capture. The policies chosen will depend on individual state circumstances.

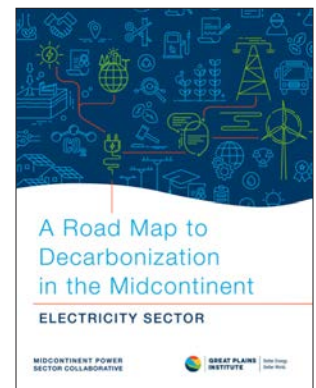
- Support pipeline infrastructure. Once carbon is captured at a power plant or other source facility, such as an ethanol plant, it must be transported to the location where it will be permanently stored. A network of pipeline infrastructure is thus a necessary part of the carbon capture deployment scenario. Figure 3 shows the location of possible CO<sub>2</sub> sources, including ethanol and power plants, as well as the location of saline formations in the Midcontinent region. Existing CO<sub>2</sub> pipelines built to serve EOR activities are also shown.
- State-level support. There may be cases in which the federal tax credit proves insufficient to motivate certain projects and state policy can make the difference. The following state policy actions could support additional projects:

- Optimize state tax policies. States could consider changes in state tax policy to provide incentives for carbon capture from power plants, industrial sources like ethanol plants, and the use and permanent storage of captured carbon in products. Some ideas in this area include exempting carbon capture facilities from sales tax on equipment purchases, or relief from property taxes or state credits on the capture of carbon.
- State low-carbon energy standard. States could consider adopting a policy that promotes carbon capture as eligible for credit, such as under a low-carbon energy standard.
- Direct state investment in initial project deployment.
- Review of regulatory requirements. States could undertake a review of state regulatory and permitting requirements to facilitate carbon capture projects and the development of pipeline infrastructure.

As noted, carbon capture is part of a larger mix of technologies necessary to reach decarbonization by midcentury. As such, policies and actions to support carbon capture would necessarily be in addition to—and not instead of—other policies and actions needed to achieve decarbonization across the energy system, such as renewable energy policies and actions.

### About the Midcontinent Power Sector Collaborative

The Midcontinent Power Sector Collaborative brings together a diverse set of stakeholders from across the Midcontinent region to develop a road map to decarbonization by mid-century. Participants in the Collaborative include investor-owned utilities, cooperatives, merchant power producers, public power, environmental groups, and observing state officials. The Collaborative is facilitated and staffed by the Great Plains Institute. The goal of the Collaborative's road map is to provide policy makers and stakeholders with a better sense of what may be needed to achieve deep carbon reductions in the region so as to inform better near-term decisions and position the region to meet the challenges ahead.



**MIDCONTINENT POWER  
SECTOR COLLABORATIVE**



**GREAT PLAINS  
INSTITUTE**

Better Energy.  
Better World.

[roadmap.betterenergy.org](https://roadmap.betterenergy.org)