



WIEB-NARUC Carbon Capture, Utilization, and Storage (CCUS) Virtual Workshop

A Six-Part Webinar Series

September 11 – October 16, 2020

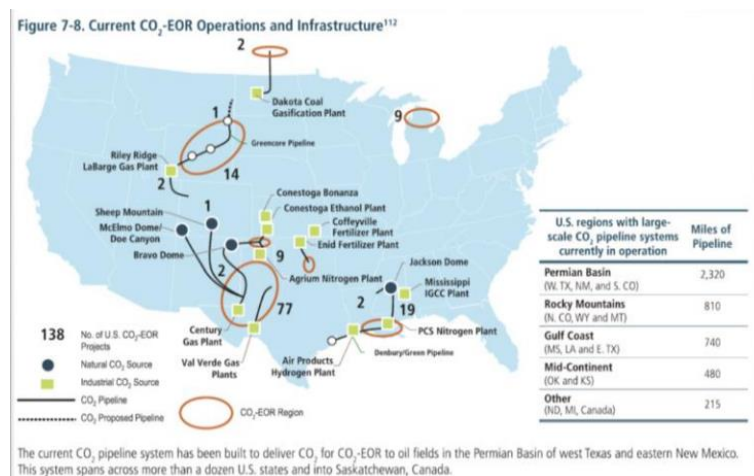
The NARUC Subcommittee on Clean Coal and Carbon Management hosted a six-part webinar series between Sept. 11 and Oct. 16, 2020. The series explored challenges and opportunities facing the U.S. coal fleet with regards to carbon capture, utilization, and storage (CCUS), and connected stakeholders with experts from the power industry, federal and state government, and other key voices. NARUC and the Western Interstate Energy Board (WIEB) co-sponsored this series, with support from the U.S. Department of Energy (DOE), Office of Fossil Energy, through the DOE-NARUC CCUS Partnership.

All materials and recordings from the six webinars are available on NARUC's [website](#). This summary offers key takeaways from each webinar.

[#1: The Case for Carbon Capture, Utilization, and Storage \(Sept. 11\)](#)

View [recording](#) and [presentation](#)

Increasing numbers of local communities, state governments, and utilities across the Western Interconnection are working to reduce greenhouse gas emissions and realize clean energy objectives, while maintaining resource adequacy and system reliability. A diverse coalition of CCUS supporters, including the Intergovernmental Panel on Climate Change, environmental groups, labor organizations, innovators, public interest groups and the energy industry, are working to deploy carbon capture technology because they increasingly recognize that CCUS will provide a useful and necessary tool in efforts to reduce atmospheric carbon dioxide (CO₂) concentrations. This webinar laid the groundwork for this webinar series by providing a summary of clean energy goals and an overview of CCUS and how it can contribute to climate change mitigation.



Speakers:

- Kipp Coddington, School of Energy Resources, University of Wyoming
- Brad Crabtree, Vice President, Carbon Management, Great Plains Institute
- Cecile Conroy, Director of Government Affairs, International Brotherhood of Boilermakers

Key points:

- State clean energy targets and utility carbon reduction goals are growing



- CCUS is a broad solution and a necessary step to decarbonize the power sector as well as the industrial sector, which accounts for approximately one-third of global greenhouse gas emissions
- 13 commercial scale CCUS facilities operate in the U.S., capturing 25 million metric tons of CO₂ per year (Mtpa)
- The U.S. hosts over 5,000 miles of CO₂ transportation infrastructure
- Carbon capture is cost-effective and critical to retaining and growing U.S. high-wage energy, industrial, and manufacturing jobs
- The 45Q tax credit for CCUS, along with regional and state incentives and planning, are important steps to take to achieve economy-wide deployment of CCUS

[#2: Breaking it Down: Carbon Capture, Utilization & Storage Technologies \(Sept. 18\)](#)

View [recording](#) and [presentation](#)

Each component of CCUS is pursuing various technology developments to address challenges of scale and economics. This webinar broke down each component to provide an update on the most promising technologies involved in CO₂ capture (e.g., solvents and membranes, as well as different combustion approaches); utilization (e.g., enhanced oil recovery; advanced materials; polymers and bioplastics; fuels and chemicals; and concrete and building materials) and storage (geologic siting and Class VI permitting under the Underground Injection Control program). The DOE Carbon Storage Assurance Facility Enterprise (CarbonSAFE) initiative was also discussed.

Carbon Capture, Use, and Storage Primer

CO₂ Enhanced Oil Recovery:
Utilizes CO₂ to extract 30-60% more of the reservoirs oil reserve

Saline Aquifer Geologic Storage: CO₂ storage in deep, pressurized, formations that contain only salt water

WHAT IS CCUS?
Carbon capture, utilization, and storage is a method of significantly reducing CO₂ emissions that would otherwise go into the atmosphere.

WHY WYOMING IS A GREAT PLACE FOR CCUS!



Speakers:

- Dr. Holly Krutka, Executive Director, School of Energy Resources, University of Wyoming
- Jason Begger, Wyoming Energy Authority
- Scott Quillinan, Director of Research, School of Energy Resources, University of Wyoming

Key Points:

- Phase I of CCUS involves capturing CO₂, and Phase II involves carbon conversion/utilization
- The largest and most advanced post-combustion CO₂ capture systems are based on a suite of technologies that use aqueous amines
- DOE is aiming to reduce the cost of capture to \$30 per ton of CO₂ captured by 2030, and is advancing novel technologies to achieve this goal
- Pre-combustion CO₂ capture can be applied to power plants with integrated gasification combined cycle (IGCC) technology, and the cost of capture in this system is lower due to a high CO₂ concentration
- The Wyoming Integrated Test Center provides a platform to test and scale commercial carbon capture and utilization technologies



- Captured CO₂ can be used in a variety of ways, including for enhanced oil recovery and as chemicals for fertilizer production
- DOE's CarbonSAFE program is developing large-scale carbon storage complexes

#3: Financial Incentives and Investment Efforts (Sept. 25)

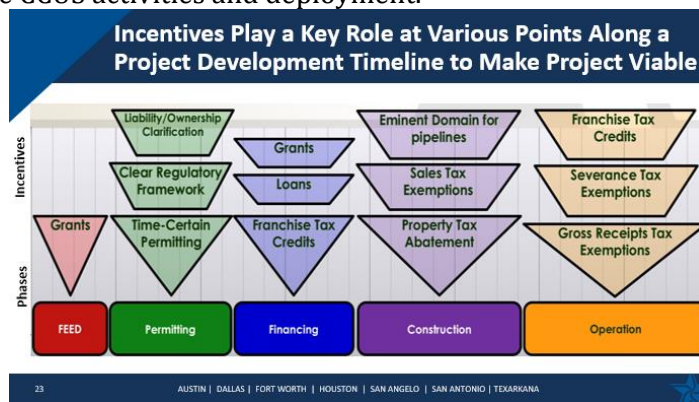
View [recording](#) and [presentation](#)

Federal and state policies, tax incentives, and investment efforts can provide important incentives to CCUS project development and remove barriers to the deployment of CCUS technology. This webinar explained the section 45Q and 48A tax incentives and discussed other financial mechanisms, such as private activity bonds, master limited partnerships, and opportunity zones, currently in place to govern and promote CCUS activities and deployment.

Speakers:

- Shannon Angielski, Executive Director, Carbon Utilization Research Council
- Michael Nasi, Partner, Jackson Walker LLP

Key Points:



- There are many different components to the CCUS ecosystem, with policies designed to promote certain aspects of the ecosystem through capture, transport and storage
- FY2021 appropriations for DOE programs include \$1.25 billion in emergency infrastructure spending for Fossil Energy, with \$750 million for CCUS-related projects
- Federal legislation includes:
 - Fossil Energy R&D Legislation
 - House Climate and Energy Legislation
 - CO₂ Infrastructure Legislation
 - Federal Tax Legislation
 - Section 48A Tax Credit Legislation
 - 45Q Carbon Sequestration Tax Credit
- Pending 45Q legislation includes proposals to extend the section 45Q tax credit and/or allow taxpayers to claim a tax credit in the form of a cash payment
- COVID-19 may reduce tax liability of project developers and investors over the next several years
- State CCUS incentives include financial incentives in the form of local property taxes or state tax exemptions and credits, and environmental, oil and gas, and utility regulatory incentives



#4: Project Update Part I: Domestic CCUS Development Efforts (Oct. 2)

View [recording](#) and [presentation](#)

This webinar was the first of a two-part series to identify and provide an overview of CCUS projects currently in operation and under development in the United States.

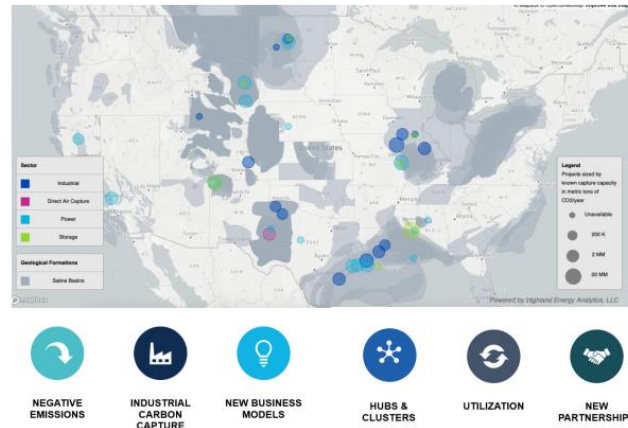
Speakers:

- William Swetra, Senior Policy Analyst, Oxy Low Carbon Ventures
- Lee Beck, CCUS Policy Innovation Director, Clean Air Task Force

Key Points:

- Highlighted domestic projects include:
 - Project Interseqt, a partnership between White Energy and Oxy Low Carbon Ventures, is a model project for industrial CO₂ capture and is expected to capture 700,000 Mtpa CO₂
 - The world's first zero-emissions natural gas power plant created by NET Power in La Porte, TX
 - The Midwest CO₂ Superhighway which spans seven states and five industries to capture emissions from 57 facilities
- Ecosystem roadblocks, or access to CCUS transport infrastructure and geologic storage, is an emerging problem in the U.S. for large-scale deployment. Policy is key to innovation
- The Clean Air Task Force created the [US Carbon Capture Projects Map](#) to track projects

US Carbon Capture Projects Map



#5: Project Update Part II: International CCUS Development Efforts (Oct. 9)

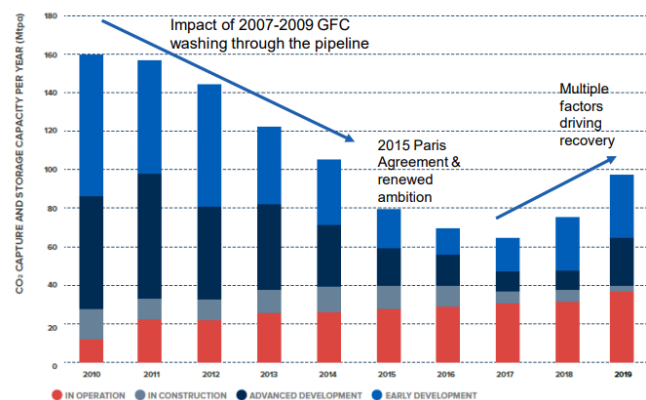
View [recording](#) and [presentation](#)

This webinar was the second in a two-part series to identify and provide an overview of CCUS projects currently in operation and under development around the world.

Speakers:

- Jeff Erikson, General Manager, Client Engagement, Global CCS Institute
- C. Beth Hardy, Vice President, Strategy & Stakeholder Relations, International CCS Knowledge Centre

CCS FACILITY CAPACITY



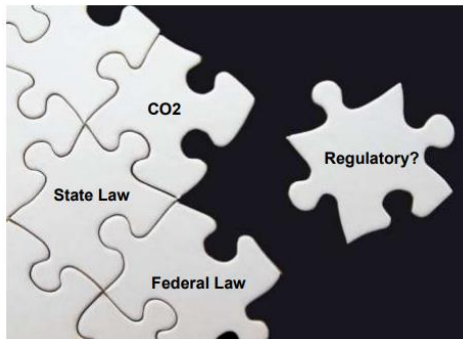
- 40 million tpa
- 260 million tonnes to date



Key Points:

- Worldwide, 21 operational commercial carbon capture facilities have captured 260 million tons of CO₂ since 2010, with current capacity nearing 40 Mtpa and another 55 Mtpa of projects in development
- The Global CCS Institute counts 15 carbon “hubs” on every continent except Antarctica, with clustered capture, storage, and/or utilization infrastructure
- The Boundary Dam Integrated CCS project retrofitted an existing coal unit with a carbon capture system, transporting captured CO₂ via pipeline for enhanced oil recovery
- Other major CCUS projects in Canada include the Weyburn-Midale CO₂ monitoring and storage project, Quest blue hydrogen project, and Alberta Carbon Trunk Line

[#6: Regulatory Considerations and Policy Recommendations \(Oct. 16\)](#)



View [recording](#) and [presentation](#)

Recognizing the ability of CCUS projects to contribute significantly to efforts to mitigate climate change—and in light of increasing local, state, and utility efforts to reduce GHG emissions within a meaningful timeframe—this webinar discussed important regulatory considerations and identify a range of policy recommendations that states can consider to ensure they are carbon capture ready.

Speakers:

- Hon. Kara Fornstrom, Chairman, Wyoming Public Service Commission
- Doug Scott, Vice President, Electricity and Efficiency, Great Plains Institute

Key Points:

- Traditional electric ratemaking models and utility risk preferences are impeding the pursuit of CCUS on coal-fired power plants
- Wyoming’s House Bill 200 (HB200) requires the PSC to establish energy portfolio standards that maximize the use of dispatchable and reliable low-carbon electricity, including CCUS
- HB200 grants explicit authority for regulated utilities to seek rate recovery for prudent costs associated with CCUS
- Gas processing, ethanol, ammonia, chemicals, and hydrogen facilities offer the lowest average estimated cost of capture per ton of CO₂, according to a Great Plains Institute study on economically feasible carbon capture retrofit sites in the U.S.
- States can implement “carbon capture ready” policies and regulations, including primacy for permitting CO₂ injection wells, rules for CO₂ transport and long-term storage, and financial incentives and state tax optimization
- Regional collaboration, such as the Multistate CO₂ Transport Initiative memorandum of understanding between multiple states to develop and implement a CO₂ transport infrastructure plan, is essential