Project Update Part I: Domestic CCUS Development Efforts

NARUC-WIEB Carbon Capture, Utilization, and Storage Workshop

FRIDAY, OCT. 2, 2020 | 1 – 2 PM ET
SPEAKERS

• William Swetra, Senior Policy Analyst, Oxy Low Carbon Ventures
• Lee Beck, CCUS Policy Innovation Director, Clean Air Task Force
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Occidental’s Integrated Portfolio

Permain Unconventional
- 1.6 MM acres including premier Delaware Basin position
- Strategic infrastructure and logistics hub in place
- EOR advancements

Permain Conventional
- 1.4 MM net acres
- Significant scale, technical capability and low-decline production
- CCUS potential for economic growth and carbon reduction strategy

Gulf of Mexico
- 10 active operated platforms

Rockies
- Leading position in the DJ Basin
- Largest position in Colorado

South America
- Premium position in Colombia
- Steamflood development

Africa
- Positions in Algeria, Ghana

Middle East
- Positions in UAE, Oman

OIL & GAS
Focused in world-class basins around the globe

CHEMICALS
Leading manufacturer of basic chemicals

MIDSTREAM
Integrated infrastructure and marketing provides access to global markets.
Leadership Commitment

Occidental’s leadership is taking climate change seriously—taking action today to reduce emissions on a global scale.

The Low Carbon Ventures group is a core business segment dedicated to emissions reduction and low-carbon initiatives, reporting directly to Occidental’s executive leadership.

“We need to do our part as corporations. There are enough companies committed to making it happen. It needs to be a worldwide approach.”

-Vicki Hollub
Our Vision for a Low-Carbon Economy
Low-Carbon Economy

We can create a closed loop system whereby all CO₂ is captured and sequestered while ensuring an adequate supply of energy to support industrial growth.

- Emission Free Power
- DAC
- Point Source Capture
- CO₂ Capture
- Transportation emissions captured with DAC
- Carbon Neutral Oil
- CO₂ Utilization & Storage
- Dedicated CO₂ Sequestration
- Carbon Neutral Energy
- CO₂
- Emission Free Power
Oxy Low Carbon Ventures was formed to sustainably enhance Occidental’s business, while providing impactful global emissions reduction solutions.

This group is dedicated to:

- Global Leadership in providing low-carbon solutions and advisory services to support a sustainable energy and development future
- Leveraging our 40 years of expertise in carbon management and large-scale carbon dioxide separation, transportation, use and storage to develop CCUS projects
- Directly reducing Occidental’s Scope 1–3 emissions
- Increasing energy efficiency
Projects & Ventures
Project Highlight

Partnership between White Energy and Oxy Low Carbon Ventures

- First announced project under the enhanced FUTURE Act (45Q tax credit)
- Develop carbon capture at White Energy’s two ethanol plants in the Texas panhandle
- Expected to capture 700,000 MTPA CO₂
- Transport captured CO₂ to Occidental’s fields in the Permian Basin
- CO₂ stored is validated by EPA-approved monitoring, reporting and verification plan.

White Energy is a producer of biofuels in Texas. The company owns and operates two ethanol plants with the capacity to produce 250 million gallons per year.

Project Intersect
A MODEL PROJECT FOR INDUSTRIAL CO₂ CAPTURE

Project Overview

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NET Power

The world’s first zero-emissions natural gas power plant

NET Power

DEMO FACILITY in La Porte, TX

INNOVATIVE CO₂ driven turbine

COST-EFFECTIVE clean power generation

WATER-FREE operation

RELIABLE 24/7/365 emissions-free power
Carbon Engineering

Direct Air Capture Technology

REMOVES CO₂ directly from the atmosphere

DEPLOYABLE everywhere

CAPTURES 1 million tons of CO₂ per year

CO₂ CAN BE UTILIZED to create Carbon-neutral oil and fuels
The Midwest CO$_2$ Superhighway

Capturing Emissions from 57 Industrial Facilities

Pipeline Spans

7 STATES
5 INDUSTRIES
40 MM Tons

Legend
- Star: Ammonia
- Pencil: Cement
- Circle: Coal
- Triangle: Ethanol
- Square: Refinery
- Dotted line: Existing CO$_2$ Pipeline
- Dotted line: Midwest Pipeline
Dedicated Sequestration Hubs

CO₂ Plume

CO₂ Dissolved in Formation Water

Coal Beds

Oil & Gas Reservoir

Saline Aquifer
NARUC – WIEB CCUS Workshop: Domestic CCUS Development Efforts
Lee Beck, CCUS Policy Innovation Director, lbeck@catf.us

October 2, 2020
What Is Carbon Capture?

- Carbon capture technologies capture, transport and store CO$_2$ from energy-intensive industries and the air. It hence address both the
  - Flow of CO$_2$ by capturing emissions from power plants and industrial facilities
  - Stock of CO$_2$ by capturing CO$_2$ directly from the atmosphere

More than **2000 carbon capture facilities** are needed by 2050
What A Net-Zero Carbon Energy System Looks Like

End-Use
- Buildings
- Transport
- Industry

Energy Storage & Delivery
- Electricity
- ZCF (H₂ & NH₃)

Primary Energy Production
- Renewables
- Nuclear
- CCUS & Upstream GHG Mitigation

Negative Emissions
Theory of Change: How to commercialize carbon capture?

Innovation Policies

- R&D
- Demonstration
- Deployment
- Ecosystem

Economywide GHG Policies

- Carbon Pricing
- Clean Electricity Standards
- Emission Limits

CCS needs both capture and transport/storage infrastructure to scale-up
Policy is key to innovation
The Current Policy Landscape

- The 45Q amendments create a robust business case for investment in CCS and provide the policy confidence that investors require.
- The California LCFS CCS Protocol also makes carbon capture eligible for credits that reduce the lifecycle emissions from fuels or directly from the air.

<table>
<thead>
<tr>
<th>Type of CO₂ Storage/Use</th>
<th>Minimum Size of Eligible Carbon Capture Plant by Size (kTCO₂/yr)</th>
<th>Relevant Level of Tax Credit Given in Operational Year (USD/TCO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POWER PLANT</td>
<td>OTHER INDUSTRIAL FACILITY</td>
</tr>
<tr>
<td>DEDICATED GEOLOGICAL STORAGE</td>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>STORAGE VIA EOR</td>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>OTHER UTILISATION PROCESSES*</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
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*Each CO₂ source cannot be greater than 500 kTCO₂/yr. Any credit will only apply to the portion of the converted CO₂ that can be shown to reduce overall emissions.

Source: Global CCS Institute
Current Legislative Landscape

45Q and DOE-support have led to a significant increase of carbon capture projects in planning over the past two years, with more than 30 projects in various stages of development through the US. To improve the chances of success for these projects and a continued, healthy growth of the project pipeline, CATF enactment of these existing legislative proposals:

- **45Q Optimization**: 10-year Extension and Direct Pay
- **Permitting**: Appropriations for Class VI Well Permits and State Primacy Applications; $25M at Agency, $50M for primacy, for five years
- **Commercial Demonstration (Sec.503, HB2)**: $7.5B Advanced Carbon Capture*, $1.25B for FEED studies, $1.25B for Direct Air Capture, $2.5B for Geologic Storage development for five years
- **R&D (FERD/EFFECT-LEADING)**: $2.15B for carbon capture, DAC, and geologic storage over five years (reflects FERD funding levels)
- **USE IT**: DAC concept creation prize, infrastructure permitting efficiency

*Goal is commercial demonstration of at least three advanced carbon capture technologies through 3rd of a kind level
Project Tracker: Diversity of Applications

![Bar chart showing the number of projects in planning across various applications](chart.png)
The Path Towards Commercialization

Innovation Criteria

• Reduce cost
• Compress deployment timeline
• Affordable Financing
• Build Ecosystem (saline storage & CO₂ transport)

Policies & Models

• PTC for natural gas power
• Financing & grants for CO₂ transportation infrastructure
• Geologic Storage Utilities
• Geologic Storage & Storage Clusters
• Offshore Storage of CO₂
QUESTIONS

Submit questions two ways:

1. Raise your hand and the moderator will call on you to unmute your line

2. Type a question into the question box
NARUC-WIEB CCUS WORKSHOP SCHEDULE

1. Sept. 11: The Case for Carbon Capture, Utilization, and Storage
2. Sept. 18: Breaking It Down: CCUS Technologies
5. Oct. 9: Project Update Part II: International CCUS Development Efforts

Full Agenda | Registration

All webinars are held from 1:00 – 2:00 pm ET
UPCOMING NARUC EVENTS

Innovation Webinars

• Oct 22, 3-4PM (ET): Emerging Possibilities for Bulk Energy Storage
• Nov 19, 3-4PM (ET): Where the Wind Blows: Offshore Wind Outlook for State Regulators

NARUC Annual Meeting – Nov 5-6 and 9-11

• Registration open
• https://www.naruc.org/meetings-and-events/naruc-annual-meetings/2020-annual-meeting/
Save-the-Dates

Fall 2020 JOINT CREPC-WIRAB MEETING Webinar Series

Fridays: October 23, October 30, November 6, and November 13, 2020
11:00 – 12:30 PM (MT) / 10:00 – 11:30 AM (PT)

You are invited to join us on Fridays this October and November for the Fall 2020 Joint CREPC-WIRAB Meeting Webinar Series, where western electric utility policymakers and regulators, industry experts, consumer advocates, and other stakeholders will explore and discuss current and emerging electricity trends, challenges, and opportunities for the Western Interconnection.

https://westernenergyboard.org/

Joint CREPC-WIRAB Meetings are conducted by the Committee on Regional Electric Power Cooperation (CREPC)—a joint committee of the Western Interstate Energy Board and the Western Conference of Public Service Commissioners—and the Western Interconnection Regional Advisory Body (WIRAB).
THANK YOU

Join us for the next webinar in the NARUC-WIEB CCUS Workshop

Friday, Oct 9 | 1:00 – 2:00 pm ET

Project Update Part II: International CCUS Development Efforts

• Jeff Erikson, General Manager, Client Engagement, Global CCS Institute

• C. Beth Hardy, Vice-President, Strategy & Stakeholder Relations, International CCS Knowledge Centre