STAKEHOLDER PERSPECTIVES: THE FUTURE OF CCUS

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ADDRESSING THE NATION’S ENERGY NEEDS THROUGH TECHNOLOGY INNOVATION
2019 NETL Carbon Capture, Utilization, Storage and Oil & Gas Technology Integrated Review Meeting
David L. Lawrence Convention Center, Pittsburgh, PA
August 27, 2019
Carbon Utilization Research Council (CURC) Members

**Coal Producers**
- Arch Coal, Inc.
- Cloud Peak Energy Resources LLC
- Lignite Energy Council
- Peabody Energy

**Equipment Suppliers**
- General Electric
- Mitsubishi Heavy Industries America, Inc. (MHIA)

**Labor Unions**
- International Brotherhood of Boilermakers
- International Brotherhood of Electrical Workers

**Technology Developers**
- ION Engineering
- Jupiter Oxygen Corporation
- NET Power

**NGOs**
- ClearPath Action
- EnergyBlue Project

**Research Organizations**
- Battelle
- Electric Power Research Institute (EPRI)
- Gas Technology Institute
- University of North Dakota Energy & Environmental Research

**State Organizations**
- Southern States Energy Board
- Wyoming Infrastructure Authority

**Trade Associations**
- American Coal Council
- American Coalition for Clean Coal Electricity (ACCCE)
- Edison Electric Institute (EEI)
- Energy Policy Network
- National Rural Electric Cooperative Association (NRECA)

**Universities**
- Lehigh University
- Ohio State University
- Pennsylvania State University
- Southern Illinois University
- University of Illinois/PRI
- University of Kentucky/CAER
- University of Wyoming
- West Virginia University

**Utilities**
- Basin Electric Power Cooperative
- Duke Energy Services
- LG & E and KU Services Company
- Southern Company
- Tri-State Generation & Transmission Association

Companies in orange indicate Steering Committee Members
Global CO₂ Emissions from Different Economic Sectors

Figure 3. Direct CO₂ emissions by sector, 2017

- Power: 39%
- Transport: 23%
- Industry: 23%
- Buildings: 10%
- Other: 5%

Source: IEA (2019). All rights reserved.
Importance of CCUS in Meeting Global Climate Targets

Source: International Energy Agency
How Many CCUS Projects Operating Today?

48 CCUS facilities globally – only 2 are power projects

Majority of projects are in the US – which capture and store 25 million tons annually

Source: Global CCS Institute
Global Carbon Capture by Industry to Meet 2°C Target

Source: Derived from *Energy Technology Perspectives 2016* (IEA, 2016).
U.S. CO₂ Emissions by Sector (2017)

Source: EPA GHGRP 2017 data by point sources

- **Electricity (Coal)**: 1209 Mt/a
- **Electricity (Natural Gas)**: 532 Mt/a
- **Electricity (Other)**: 24 Mt/a
- **Refining**: 206 Mt/a
- **Pulp and Paper**: 146 Mt/a
- **Cement and Concrete**: 67 Mt/a
- **Chemical Manufacturing**: 120 Mt/a
- **Iron & Steel**: 66 Mt/a
- **Other**: 216 Mt/a

**POWER GENERATION ACCOUNTS FOR 68% OF CO₂ EMISSIONS FROM INDUSTRIAL SOURCES**

FROM POWER GENERATION, THE MAKEUP OF CO₂ EMISSIONS: COAL 69%, NATURAL GAS 30%

Source: Electric Power Research Institute (EPRI)
First-of-a-kind CCS Costs In Different Industries

Figure 39. Break-even costs for CO₂ capture and storage by application
CCS Costs Can Come Down with Aggressive and Sustained Policy Support

As witnessed by the deployment curve with renewable energy technologies, we know that the costs for CCS – when coupled with policies to support their successive application into the commercial market – will reduce over time and make CCS competitive in the marketplace.

Each of these technologies has dropped 40-90% in cost in the U.S. since 2008.

Indexed Cost reductions since 2008. (Source: energy.gov/fe)
What is Needed to Enable Widespread CCUS Deployment?

- More experience with the integration of capture, transport and storage
- Cross-industry understanding of different business models involved in CCUS projects
- Financial industry confidence in CCUS projects
- Resolution to questions on pore space/mineral rights and long term liability for saline storage projects
- Expansion of CO$_2$ pipelines including trunklines
- Demonstrated leadership and commitment to CCUS from both the public and private sector, including ENGOs, industrial sector and fossil fuel industry
Thank You and Questions

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