CARBON UTILIZATION RESEARCH COUNCIL
ADVANCING FOSSIL ENERGY SOLUTIONS

Federal CCUS Policy Update

Midland CO_2 Conference

Mike Weiner, Associate Director, Carbon Utilization Research Council

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CURC CARBON UTILIZATION RESEARCH COUNCIL

ADVANCING FOSSIL ENERGY SOLUTIONS

UNIQUE MISSION

With a global focus on reducing emissions from fossil fuel utilization, CURC's nonpartisan, technology-driven mission ensures the long-term value of fossil energy resources in an increasingly carbon-constrained world.

CONSENSUS DRIVEN & TECHNICALLY INFORMED

CURC brings technology developers and end users together. Our recommendations represent the consensus of our membership, including cutting-edge technical experts from a diverse set of interests in power generation.

SKILLED FACILITATORS

CURC is an established facilitator and trusted authority on advanced fossil energy technologies. We maintain productive working relationships with Members of Congress and the Department of Energy, and these entities turn to CURC for the most recent, fact-driven expertise and recommendations on federal policies affecting technology.

PIONEERING RESEARCH & GLOBAL COLLABORATION

CURC collaborates with world-class U.S. and international research organizations, and has been a driving force behind the crafting and passage of federal legislation, creating financial incentives for fossil fuel technology development and Funding for research programs at the U.S. Department of Energy.

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CURC CARBON UTILIZATION RESEARCH COUNCIL
ADVANCING FOSSIL ENERGY SOLUTIONS

State of Play

- Infrastructure Investment and Jobs Act signed into law in November
  - Includes $1.2 trillion in federal investment for infrastructure programs, including $65 billion for power infrastructure
  - $12.1 billion included for CCUS-specific activities
- *Build Back Better* Act passed House of Representatives on November 19
  - Modifications likely in the Senate to get to 50 votes

Infrastructure Investment and Jobs Act

- Appropriations for CCUS Programs (five-year appropriation):
  - CCUS Demonstration Projects - $2.5 billion
  - CCUS Pilot Projects - $937 million
  - Carbon Storage Validation and Testing - $2.5 billion
  - Carbon Dioxide Infrastructure Finance and Innovation - $2.1 billion
  - Class VI Well Permitting - $75 million
  - Front-End Engineering and Design Studies for Carbon Dioxide Transport Infrastructure - $100 million
  - Carbon Dioxide Utilization - $310.14 million
  - Regional Direct Air Capture Hubs - $3.5 billion
  - Commercial Direct Air Capture Technology Prize - $100 million
  - Precommercial Direct Air Capture Prize - $15 million
- **TOTAL: $12.1 billion**
- DOE released RFI on Deployment-Ready Carbon Reduction and Removal Technologies on December 6
  - First RFI to be released by DOE directly stemming from infrastructure bill

CCUS Highlights – Infrastructure Bill

- **CCUS Demonstration Program - $2.5 billion/five years**
  - Funding appropriated for six CCUS commercial demonstration projects – two each on coal power facilities, natural gas power facilities, industrial facilities
- **CCUS Large-Scale Pilot Projects - $937 million/five years**
  - As authorized, large-scale pilots defined to the scale of technology development beyond laboratory development and bench scale testing, but not yet advanced to the point of being tested under real operational conditions at commercial scale
  - DOE has more flexibility to award funds within pilot program – no specification of facilities that must be funded

CCUS Highlights – Infrastructure Bill

- **CO_2 Storage Validation and Testing Program: $2.5 billion/five years**
  - Building on CarbonSAFE, appropriates funds for DOE cost share for integrated commercial CO_2 storage hubs capable of storing CO_2 from multiple sources.
- **CO_2 Infrastructure Finance and Innovation Act Program: $2.1 billion**
  - Establishes program to finance shared CO_2 transport infrastructure with federal credit instruments, loans, grants, or a combination
  - Eligible projects include carbon dioxide transportation infrastructure or associated equipment, including pipeline, shipping, rail, or other transportation infrastructure and associated equipment

Build Back Better Act

- *Build Back Better Act* currently includes modifications to Section 45Q tax credit that reflect CURC priorities and recommendations:
  - Direct Pay
  - Extension of Commence Construction Deadline from December 31, 2025 to December 31, 2031
  - Increased credit value for all CCUS applications
    - Point source CCUS bonus credit value: $85/ton geologic storage; $60/ton EOR
    - DAC bonus credit value: $180/ton geologic storage; $130/ton EOR
    - Projects must satisfy Prevailing Wage and Apprenticeship requirements to qualify for bonus credit – projects receive “base” credit value if they do not (“Bonus” credit is 5x “base” credit)

Build Back Better Act (cont.)

- Additional 45Q modifications:
  - Definition of Eligible Facility
    - Annual Tonnage Threshold Requirements
      - EGUs: 18,750 metric tons
      - Industrial Facilities: 12,500 metric tons
      - DAC Facilities: 1,000 metric tons
  - Facility-Wide Percentage Capture Requirements
    - EGUs: 75%
    - Industrial/DAC Facilities: N/A
- 45(b)(3) provision reducing value of 45Q for projects receiving other forms of federal assistance **modified** to only impact PABs (federal grants not impacted)

Build Back Better Act (cont.)

- Outstanding issues on 45Q:
  - Facility-wide requirement to capture 75% of emissions for power sector CCUS projects left in place; industrial capture percentage requirement removed
  - Effective date of amendment changes:
    - Existing projects and projects beginning construction prior to January 1, 2022 are not eligible for increased credit values
- Other programs of interest currently included in reconciliation:
  - $40 billion for DOE Title XVII Loan Program
  - $5 billion for DOE to provide financial support for Energy Community Reinvestment Financing Program, which enables low-carbon reinvestments in energy communities (CCUS may be an eligible expense)
  - CCUS eligible for $10 billion USDA grant/loan program for rural electric cooperatives to achieve GHG emissions reductions

Thank You and Questions

Mike Weiner

Associate Director

Carbon Utilization Research Council

mrw@vnf.com

CURC CARBON UTILIZATION RESEARCH COUNCIL
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Federal Clean Hydrogen Policy Update

DECEMBER 7, 2021

C2FC Clean Hydrogen Future Coalition

CHFC Foundational Principles

(1) Clean hydrogen is a critical pathway to achieve U.S. decarbonization objectives.
(2) Investments in the full value chain of clean hydrogen production, transport and delivery, storage and use, as well as the infrastructure across multiple sectors, will be necessary to scale clean hydrogen in the U.S.
(3) Policies designed to stimulate clean hydrogen production and use throughout the U.S. economy should be fuel agnostic and technology neutral, with a focus on achieving near-net zero CO_2 hydrogen production.
(4) Skilled labor and the use of existing infrastructure are essential to the deployment of clean hydrogen throughout our economy.

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Nuclear Energy Institute

ONE Gas

Sempra Energy

Siemens Energy

Southern Company

Tennessee Valley Authority

U. of Wyoming School of Energy Resources

UND Energy & Environmental Research Center

Voice of the Arctic Inupiat

Wabash Valley Resources

Williams Companies

Coalition Efforts to Support Mission

- Develop and communicate a clear message on the role of clean hydrogen in the transition to a zero CO_2 economy.
- Educate policymakers about the need for and benefits of clean hydrogen.
- Identify and prioritize policy designs to support clean hydrogen production, transport, delivery, storage, and end-use markets.
- Collaborate with other groups, stakeholders and environmental NGOs in the development of policies to support hydrogen.
- Advocate and lobby for federal legislative, regulatory and other policies that support the coalition mission.

State of Play

- Infrastructure Investment and Jobs Act (H.R. 3684) signed into law in November
  - Includes $1.2 trillion in federal investment for infrastructure programs, including $65 billion for power infrastructure
  - $9.5 billion included for clean hydrogen-specific activities
  - Hydrogen refueling infrastructure also an eligible expense for Charging and Fueling Infrastructure Grant Program
- *Build Back Better Act* passed House of Representatives on November 19
  - Modifications likely in the Senate to get to 50 votes
- Other hydrogen-related legislation has also been introduced or is in development but will not be acted upon in 2021, including:
  - Hydrogen Infrastructure Initiative (Sens. Chris Coons and John Cornyn)
  - Clean Hydrogen Deployment Act (Reps. Paul Tonko and David McKinley)
  - Department of Energy Clean Hydrogen and Fuel Cell Research, Development, and Demonstration Act (*draft bill*)

Infrastructure Investment and Jobs Act – Clean Hydrogen Provisions

REGIONAL CLEAN HYDROGEN HUBS - $8.5 billion/five years

- DOE directed to support the development of *at least* 4 regional clean hydrogen hubs, which are defined to mean a network of clean hydrogen producers, potential clean hydrogen consumers, and connective infrastructure in close proximity
- Hubs must reflect to the maximum extent practicable:
  - *Feedstock Diversity:* Requirement for at least one regional clean hydrogen hub to demonstrate hydrogen production from renewables, nuclear, and fossil fuels with CCS
  - *End-Use Diversity:* Requirement for at least one regional clean hydrogen hub to demonstrate end-use of clean hydrogen in the electric power, industrial, residential and commercial heating, and transportation sectors
  - *Geographic Diversity:* Each clean hydrogen hub must be located in a different region of the United States and use energy resources that are abundant in that region
  - *Hubs in Natural Gas-Producing Regions*: At least 2 regional clean hydrogen hubs must be located in regions with the greatest natural gas resources

Infrastructure Investment and Jobs Act – Clean Hydrogen Provisions

CLEAN HYDROGEN ELECTROLYSIS PROGRAM - $1 billion/five years

- DOE directed to initiate a Clean Hydrogen Electrolysis Research, Development, Demonstration, Commercialization, and Deployment program for the purposes of commercialization to improve the efficiency, increase the durability, and reduce the cost of producing clean hydrogen using electrolyzers
- Program goal to reduce the cost of hydrogen produced via electrolysis to less than $2 per kilogram of hydrogen by 2026

CLEAN HYDROGEN MANUFACTURING AND RECYCLING - $500 million/five years

- DOE directed to award multiyear grants to, and enter into contracts, cooperative agreements, or other agreements authorized under the bill for RD&D projects to advance new clean hydrogen production, processing, delivery, storage, and use equipment manufacturing technologies and techniques

Infrastructure Investment and Jobs Act – Clean Hydrogen Provisions

NATIONAL CLEAN HYDROGEN STRATEGY AND ROADMAP

- DOE directed to develop a technologically and economically feasible national strategy and roadmap to facilitate widescale production, processing, delivery, storage, and use of clean hydrogen.

CLEAN HYDROGEN RESEARCH AND DEVELOPMENT

- Reauthorizes clean hydrogen RD&D activities at DOE with the following program goals:
  1. Advance research and development to demonstrate and commercialize the use of clean hydrogen in the transportation, utility, industrial, commercial, and residential sectors; and,
  2. Demonstrate a standard of clean hydrogen production in the transportation, utility, industrial, commercial, and residential sectors by 2040.

CLEAN HYDROGEN DEFINITION

- DOE and EPA directed to develop initial standard that defines the term 'clean hydrogen' to mean hydrogen produced with a carbon intensity equal to or less than 2 kilograms of carbon dioxide-equivalent produced at the site of production per kilogram of hydrogen produced
- DOE and EPA are directed to revisit whether the carbon intensity definition should be adjusted no later than five years after the initial standard is developed.

Build Back Better Act

- Clean Hydrogen Production Tax Credit (additional information on following slides)
- $40 billion to DOE to guarantee loans for eligible projects under EPACT05 section 1703. The section further appropriates $3.6 billion for the costs of guarantees made under section 1703
- $5 billion to DOE for the cost of providing financial support to the Energy Community Reinvestment Financing Program under EPACT05 section 1706. DOE is directed to establish a program to provide financial support to eligible entities for the purpose of enabling low-carbon reinvestments in energy communities.
- $200 million to DOE for hydrogen fueling equipment through State Energy Programs. The financial assistance provided in this section targets the buildout of infrastructure in rural, underserved, and disadvantaged areas.
- $3.5 billion to DOE for domestic manufacturing conversion grants relating to domestic production of plug-in electric hybrid, plug-in electric drive, and hydrogen fuel cell electric vehicles and components of such vehicles under EPACT05 section 712.

Clean Hydrogen PTC in House *Build Back Better Act*

- Creates a Production Tax Credit (PTC) for clean hydrogen with a tiered incentive structure that rewards hydrogen production with the lowest carbon intensity
  - Five tiers
  - Top tier value - $3.00/kg of hydrogen produced with CI score of 0 – 0.45 CO2e/kg H2
- Tax credits structured with “Bonus” and “Base” Credit Rate
  - Projects are eligible for “Bonus” rate if they satisfy certain prevailing wage and apprenticeship requirement
  - “Bonus” rate = 5x “base” rate
- Direct Pay
- Projects claiming Clean Hydrogen PTC may also claim Section 45 renewable PTC, but not Section 45Q tax credit for carbon oxide sequestration
- Directs use of most recent GREET model to conduct lifecycle analysis up to point of production
  - Requires LCA definition to meet the CAA RFS definition
- Allows use of RECs to meet carbon intensity values

BBBA Clean Hydrogen PTC Credit Values

Lifecycle $CO_2e/kg\ H_2$	***Build Back Better Act*** PTC $/kg H_2 (Bonus/Base value based on % of credit)	**CHFC Proposed Changes to *BBBA*** PTC $/kg H_2 (% of credit at $3.00 rate)
0 – 0.45	$3.00/$0.60 (100%)	Maintain
0.45 - 1.5	$1.02/$0.20 (33.4%)	$2.50 or $2.00 (83.3% or 67%)
1.5 - 2.5	$0.75/$0.15 (25%)	$2.00 or $1.50 (67% or 50%)
2.5 – 4.0	$0.60/$0.12 (20%)	$1.00 (33.3%)
4.0 – 6.0	$0.45/$0.09 (15%)	N/A

Thank You and Questions

Michael Weiner

Associate Director

Clean Hydrogen Future Coalition (CHFC)

mrw@vnf.com