

Carbon Capture/Blue Hydrogen:

The early 2021 policy and project outlook

*February 18, 2021
Center for Houston's Future*

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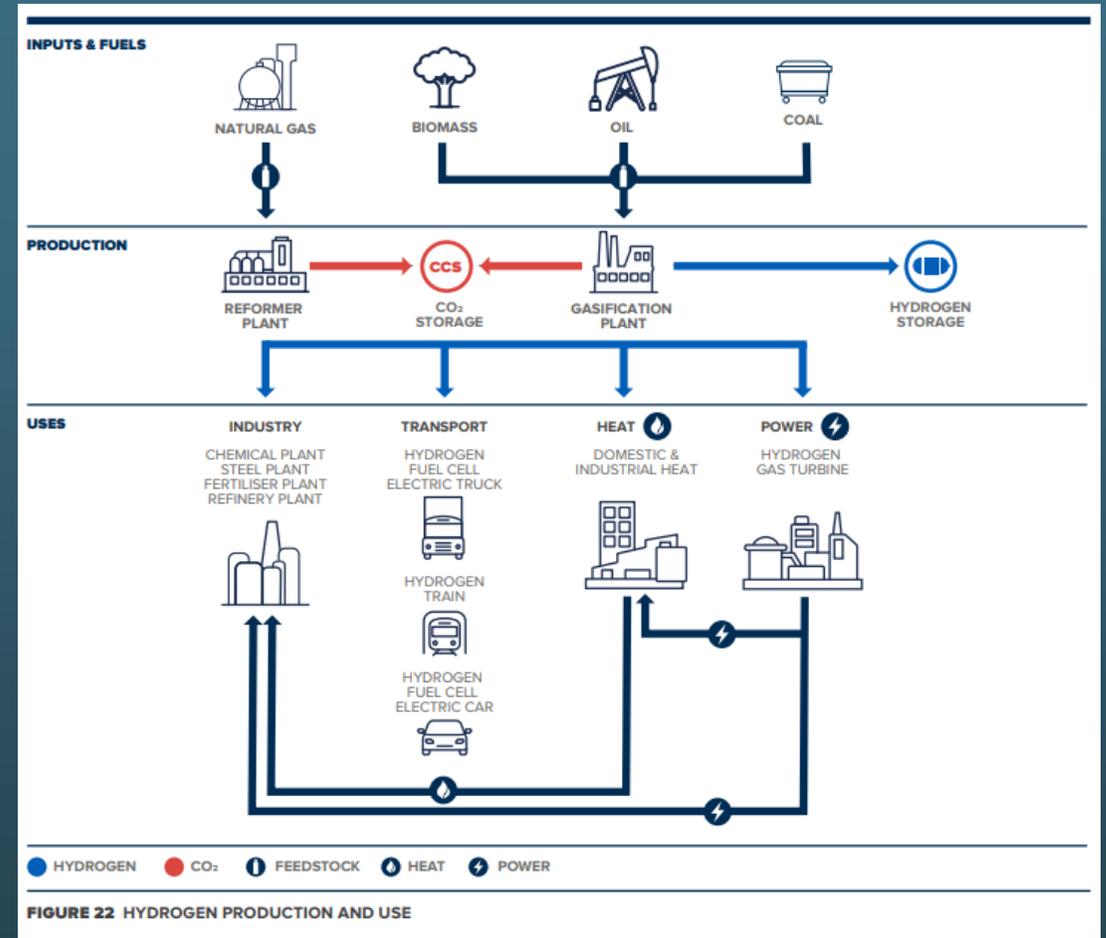
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The Pillsbury logo, featuring the word "pillsbury" in a lowercase, sans-serif font. The letters are a dark red color, and the logo is set against a white rectangular background.

Policy player profiles

- [Global CCS Institute](#)
Global Status of CCS 2020 Report
- [Carbon Capture Coalition](#)
Federal Policy Blueprint (May 2019)
- [Third Way – Carbon Capture](#)
Mapping the Progress and Potential of Carbon Capture, Use, and Storage (June 2020)
- [Clean Air Task Force – Decarbonized Fossil Energy](#)
- [Hydrogen Council](#)
- [Fuel Cell & Hydrogen Energy Association](#)
- [Atlantic Council – Energy & Environment](#)



In case you missed It—CCUS/H2 in 2020 Omnibus

- Energy Policy Act of 2020

- Authorizes \$6.2 billion for Carbon Capture, Use, & Storage (CCUS) over the next 5 years
 - Directs the DOE to conduct RDD&CA activities for carbon capture technologies
 - Authorizes support for pilot projects, including first-of-a-kind through third-of-a-kind commercial-scale demonstration program to show substantial improvements in the efficiency, effectiveness, and environmental performance for power, industrial, and other applications. (\$2.6 billion)
 - Directs DOE to establish an RD&D program for carbon storage, a large-scale carbon sequestration demonstration program, and an integrated storage program (\$800 million)
 - Establishes DOE RD&D program for carbon utilization. This section authorizes research to identify and evaluate novel uses for carbon, and includes a program to demonstrate applications of carbon utilization for a variety of sectors. Includes a national Carbon Utilization Research Center
- Blue Hydrogen
 - Requires DOE to conduct a study on the benefits of blue hydrogen technology and how that technology can further enhance the deployment and adoption of carbon capture and storage
- Funds are authorized, but must still be appropriated. Senator Joe Manchin (D-W.Va.), on Senate Appropriations Committee and Chair of Senate Energy & Commerce, is an advocate
- Increased eligibility of carbon capture technologies through DOE Loan Program
- Includes “USE It” Act, extending 45Q tax credits by two years, now for construction beginning before January 1, 2026

In case you missed it – clean tech funding

- Advanced Research Projects Agency-Climate (ARPA-C)
 - February 11, 2021 executive action
 - Biden Administration establishes new research center (ARPA-C) at the Department of Energy for Clean Tech funding, including CCUS/Blue Hydrogen
 - First \$100 million released through existing ARPA-E for initial open funding round: <https://arpa-e.energy.gov/open-2021>.
 - Project proposals due April 6, 2021

CCUS/H2 in the Broadcast Bills

- CLEAN Future Act
 - House Democrats' key climate and energy discussion draft from the 116th Congress, championed by Representative Frank Pallone (D-NJ), Chair of House Energy & Commerce
 - Key pieces likely to be combined together with the "Moving Forward Act" for the Democrats upcoming Tax & Infrastructure package
 - Democrats are seeking to include climate legislation together in the tax & infrastructure package to pass one large bill
 - Proposes a national goal for a 100% clean economy by 2050 and a federal Clean Electricity Standard (CES), as well as sector-by-sector clean energy legislation
 - Directs DOE to establish a CCUS technology commercialization program to improve efficiency, effectiveness, cost, and environmental performance of fossil fuel-fired facilities
 - Requires the Secretary of Energy, in consultation with the Administrator of the EPA, to establish a direct air capture technology prize program for qualified facilities that capture CO2 directly from the ambient air and capture over 10,000 metric tons of CO2 annually
- COVID Budget Reconciliation

CCUS/H2 in the Narrowcast Bills

- Acronauts working overtime on these bills for 117th Congress
- GREEN Act (H.R. 848)
 - Growing Renewable Energy and Efficiency Now (GREEN) Act introduced by Rep. Thompson (D-Cal.) (Chair of House Ways & Means Subcommittee on Select Revenue Measures). Already passed the House in 116th Congress within “Moving Forward Act”
 - Extends 45Q tax credits to facilities that begin construction before the end of 2026
 - Provides direct payment option for developers
 - Includes other clean energy tax credits (extension of PTC and ITC through end of 2026)
- ACCESS 45Q Act (H.R. 1062)
 - Accelerating Carbon Capture and Extending Secure Storage through 45Q (ACCESS 45Q) Act. Just re-introduced in 117th Congress by Rep. McKinley (R-W.Va.) (Ranking Member of House Energy & Commerce Subcommittee)
 - Extends 45Q Tax Credit from 2024 to 2034
 - Adds a direct pay option
 - Does not include other clean energy tax credits
- SCALE Act
 - Storing CO2 and Lowering Emissions (“SCALE”) Act elevating “federal role in leveraging private capital” in CCUS through low-interest loans
 - Introduced by bipartisan sponsors in 116th Congress in December 2020; reintroduction expected
 - Title I is a research, development and deployment (RD&D) center beneficial uses of captured carbon (biological and building products)
 - Title II is CIFIA, akin to TIFIA for transport and WIFIA for water—grants and loans for CO2 transportation infrastructure
 - Title III is “cost-share” grants or loans for storage, especially commercial hub storage suitable for receiving CO2 from multiple capture points. It also expands funding for Class VI CO2 injection wells under the Safe Drinking Water Act, either by the EPA or by states

CCUS/H2 policy horizon

- Tax & Infrastructure Package
 - Biden Administration intends to include climate agenda in a forthcoming package
 - Rep. Frank Pallone (D-N.J.), Chair of House Committee on Energy & Commerce, expects measures like [H.R.2 or the “Moving Forward Act,”](#) which passed the House in the 116th Congress
 - Includes hydrogen fueling infrastructure grants and hydrogen storage technology
 - **Climate measures likely to be combined with proposals in the CLEAN Future Act, including CCUS**
 - House Committees in the process of drafting. Expect to see negotiation over a Clean Energy Standard (CES) vs. a carbon price—may depend on what can pass via budget reconciliation
 - Senator Joe Manchin (D-W.Va.) has stated he is open to a CES in a broad infrastructure bill, as long as it also invests in technology that helps coal- and gas-fired power plants capture emissions
 - Expect to see an energy storage tax credit—left on the cutting-room floor in the December 2020 omnibus
- The ever-promised bipartisan infrastructure financing (CIFIA in SCALE Act)
- State incentives and legal reforms/clarifications: tax, grant, loan programs; permit streamlining; liability trust/insurance; ownership of pore space
 - Rob James et al., [Texas Carbon Capture article](#)
 - California Carbon Capture Blue Ribbon Panel [report](#)
- More to come on the entire color-agnostic hydrogen economy value chain: transportation, storage, fuel cell manufacture, charging/fueling, vehicles, and hybrid or hydrogen-fired turbines

CCUS projects landscape (source: [Global CCS](#))

| Name | Location | Date | Use | Sequestration | Capacity (Mtpa CO ₂) | Status |
|------------------------|----------|---------|---------------|---------------|-------------------------------------|-----------|
| Illinois Industrial | IL | 2017 | Ethanol | Geo | 1 | |
| Petra Nova | TX | 2017 | Power | EOR | 1.4 | Suspended |
| Coffeyville | KS | 2013 | Fertilizer | EOR | 1 | |
| Port Arthur APCo | TX | 2013 | Hydrogen | EOR | 1 | |
| Lost Cabin | WY | 2013 | Natural Gas | EOR | 0.9 | |
| Century | TX | 2010 | Natural Gas | EOR | 8.4 | |
| Great Plains/Weyburn | ND | 2000 | Syn Gas | EOR | 1 | |
| Shute Creek | WY | 1986 | Natural Gas | EOR | 7 | |
| Enid Fertilizer | OK | 1982 | Fertilizer | EOR | 0.7 | |
| Terrell/Val Verde | TX | 1972 | Natural Gas | EOR | 0.5 | |
| Wabash | IN | 2022 | Fertilizer | Geo | 1.75 | Dev |
| Lake Charles | LA | 2024 | Methanol | EOR | 4.2 | Dev |
| Dry Fork | WY | 2025 | Power | Geo/EOR | 2.3 | Dev |
| CarbonSAFE/Macon | IL | 2025 | Power/Ethanol | Geo/EOR | 3 | Dev |
| Tundra/Minnkota | ND | 2026 | Power | Geo/EOR | 3.6 | Dev |
| Integrated Mid-Con | KS/NE | 2025-35 | Power/Ethanol | Geo/EOR | 1.9 | Dev |
| Oxy/White Energy | TX | 2021 | Ethanol | EOR | 0.7 | Dev |
| UAL/Oxy/Chevron/CE DAC | TX | 2025 | N/A | EOR | 1 | Dev |
| ECO2S/Kemper 2.0 | MS | 2026-28 | TBD | Geo | 1 | Dev |

CCUS/H2 projects horizon (source: [CCC Project Database](#))

| Project Name Company/ies | Industry | Location | Capture capacity (Mtpa CO ₂) | Geologic Storage: Saline or Enhanced Oil Recovery (EOR) | Status |
|---|--|--------------------------|--|---|-----------------|
| Lake Charles Methanol, LLC. | Industrial - Petrochemicals | Sulfur, LA | 4 | EOR | Final financing |
| Project Interseqt White Energy / Oxy | Ethanol | Hereford & Plainview, TX | 0.7 | EOR | FEED complete |
| Systems International Inc. | Power - Waste to Energy | Chambers & Jefferson, TX | 3 | | FEED complete |
| Exxon | Industrial - Natural Gas Processing (LaBarge Carbon Capture Project) | Lincoln & Sweetwater, WY | | EOR | FEED |
| One Earth Energy facility | Ethanol | Gibson City, IL | | Saline | FEED |
| Red Trail Energy | Ethanol | Richardton, ND | | Saline | FEED |
| Svante / LafargeHolcim / Oxy / Total | Industrial - Cement | Florence, CO | 0.7 | EOR | FEED |
| Wabash Valley resource / OGCI | Industrial - Hydrogen | Terre Haute, IN | 1.5-1.7 | Saline | FEED |
| Basin Electric Dry Fork Station | Power - Coal | Gillette, WY | 2.2 | Saline | FEED |
| California Resources Corporation / OGCI | Power - Natural Gas | Kern County, CA | 1.4 | EOR | FEED |
| Enchant Energy City of Farmington, NM | Power - Coal | Waterflow, NM | 6 | Saline; EOR | FEED |
| Mustang Station of Golden Spread Electric Cooperative | Power - Natural Gas | Denver City, TX | | EOR | FEED |
| Nebraska Public Power / Ion Engineering | Power - Coal | Sutherland, NE | | | FEED |
| Panda Energy | Power - Natural Gas | | | EOR | FEED |

CCUS/H2 projects horizon (cont'd)

| Project Name Company/ies | Industry | Location | Capture capacity (Mtpa CO ₂) | Geologic Storage: Saline or Enhanced Oil Recovery (EOR) | Status |
|--|-------------------------------------|---------------------|--|---|----------|
| Prairie State Generating Company | Power - Coal | Marissa, IL | 6.2-8.2 | Saline | FEED |
| Project Tundra/ Minnkota Power | Power - Coal | Center, ND | 3.5 | Saline | FEED |
| Southern Company | Power - Natural Gas | MS or AL | 22.5 | Saline | FEED |
| DAC One / UAL /Oxy Carbon Engineering / Chevron | Direct Air Capture | Permian Basin, TX | 1 | EOR | FEED |
| DTE Energy | Evaluating multiple projects | Multiple locations | | Saline | Pre-FEED |
| Pacific Ethanol | Ethanol | Pekin, IL | 0.7 | Saline | Pre-FEED |
| Velocys / Oxy | Industrial - Biofuels | Natchez, MS | 0.3 | Saline | Pre-FEED |
| Clean Energy Systems | Power - Biomass | Central Valley, CA | 0.3 | Saline | Pre-FEED |
| Glenrock Petroleum | Power - Coal | Converse County, WY | 2.6 | EOR | Pre-FEED |
| LA SeQuest/ OXY | Industrial | Gulf Coast, LA | 10 | Saline | |
| Elysian / Starwood Energy Group / OGCI | Power - Natural Gas | | | EOR | |
| Illinois Clean Fuels OXY | Industrial - Biofuels | Morgan County, IL | 8.1 | Saline | |
| NETPower | Power - Natural Gas | | | | |
| G2 Net Zero LNG/NETPower | Power - Natural Gas | Cameron Parish, LA | >3 | | |
| Linde | Industrial - Natural Gas Processing | LA | 1.2 | Saline | |
| Linde | Industrial - Natural Gas Processing | TX Gulf Coast | 1.4 | Saline | |

CCUS/H2 policy and project success

- *Rob James article, “Finesses and game-changers in frontier project development: the case of carbon capture and storage”*
- One finesse: combine incentives (e.g., California Low Carbon Fuel Standard (LCFS), local incentives, avoided emissions penalties)
- Other finesse—how can a blue hydrogen project succeed today, or with just one of these bills becoming law? Capture, storage, use/sequestration
- Game-changers—what can happen when several of the bills come into effect? A carbon price could change economics dramatically
- The Gulf coast, and Houston, have natural advantages to foster not only carbon capture but also all aspects—**and all colors**—of the hydrogen economy

Thanks!

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Thanks to [Meghan Hammond](#) and [Alex Peyton](#) of Pillsbury's [Hydrogen Team](#) for research and comments!

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Appendix—the year 2021 so far

Major energy and environmental activity since January 20, 2021:

- **Wholesale EPA review**
 - EPA is directed to review and potentially replace dozens of Trump administration regulations and guidance. This review includes emissions standards for the oil and natural gas sector, the CWA Section 401 certification rule, vehicle fuel efficiency standards, and GHG emissions standards for airplanes.
- **Oil and gas permits and leases on federal lands**
 - Permit authorizations elevated to senior personnel decisions. Pause on all new oil and gas leasing on federal lands and in offshore waters pending completion of a review the programs “in light of the Secretary of the Interior’s broad stewardship responsibilities over the public lands and in offshore waters, including potential climate and other impacts associated with oil and gas activities on public lands or in offshore waters.”
- **Affordable Clean Energy power plant plan**
 - The D.C. Circuit struck down the Trump administration’s ACE rule. With the ACE rule vacated, the Biden administration will not have to repeal the rule before promulgating its own emissions standards.
But the Biden administration has said that it will not revive the Obama administration’s Clean Power Plan.
- **NEPA**
 - Reversal of Trump administration draft guidance limiting consideration of climate change in major federal actions. The Biden administration directed the Council on Environmental Quality to review, revise, and update guidance adopted under the Obama administration in 2016. Similar action regarding the Trump administration’s rule overhauling NEPA is expected.
- **Keystone XL**
 - The Biden administration cancelled a key federal permit for the Keystone XL pipeline. The action is under review by Canada.
- **Vineyard Wind**
 - In February 2021, the project developer announced that it would resume its federal review after a brief pause in December 2020, and now projects to complete construction by 2023.
- **Environmental Justice**
 - President Biden signed an executive order directing EPA and the Department of Justice to make environmental justice a top priority for both agencies.
- **Federal procurement**
 - President Biden directed federal agencies to “describe the agency’s plan to use the power of procurement to increase the energy and water efficiency of United States Government installations, buildings, and facilities and ensure they are climate-ready. Agencies shall consider the feasibility of using the purchasing power of the Federal Government to drive innovation, and shall seek to increase the Federal Government’s resilience against supply chain disruptions.”
- **Paris Agreement**
 - President Biden officially rejoined the Paris climate agreement on February 19, 2021. He set an April deadline to announce a pledge to cut emissions by 2030.
- **FERC PJM MOPR**
 - The new Chairman of FERC said in February 2021 that the PJM MOPR process is not sustainable ,and that FERC will work with grid operators to adopt a better approach.