

## Zero-Carbon Fuels Recommendations

While zero-carbon fuels (ZCFs) can take the form of hydrogen, ammonia, or synthetic hydrocarbons made with carbon extracted from air, they all involve the production of zero-carbon hydrogen. Potential pathways to produce hydrogen with minimal to no greenhouse gas emissions include low- and high-temperature electrolysis and methane reforming with carbon capture and storage.

ZCFs present opportunities for the U.S. electric power industry, as both a fuel consumer and as a fuel producer. The electric power industry could generate ZCFs using the electricity and/or heat supplied by large-scale renewable or nuclear power plants and either could distribute the ZCFs for customer use in a range of sectors or store and/or use the ZCFs themselves. Even if not the producer of ZCFs, the electric power industry could supply the zero-carbon electricity for others to produce ZCFs. The electric power industry also could use ZCFs produced by others to fuel dispatchable thermal power generation.

FY22 (Authorized Funding Levels and Programs)	FY22 (Recommended Funding Levels for Current and New Program Authorizations)	FY22-25 (Cumulative Recommended Funding Levels for Current and New Program Authorizations)
partial of \$830,000,000	\$3,430,000,000 <i>(\$2,500,000,000)*</i>	\$13,720,000,000 <i>(~\$12,500,000,000)*</i>

*\*bracketed numbers represent funding levels that do not have corresponding authorizations*

A federal policy agenda for zero-carbon fuels must prioritize demonstration of key pathways for production in the next few years. Research and development funding should be increased across existing programs. Finally, deployment and commercialization will require new, targeted studies of the zero-carbon fuels system and potential, as well as new economic incentives.

### Demonstration

- Existing demonstration efforts should be expanded and accelerated, and Congress should authorize and provide the Department of Energy (DOE) with approximately \$3 billion annually in funding to support integrated demonstrations on the following use cases:
  - ZCF production and use in thermal generators;
  - ZCF production and grid balancing with variable renewable and/or nuclear generation;
  - Energy storage;

- Distributed generation production opportunities;
  - Decarbonized natural gas supply and transport through existing infrastructure; and
  - ZCF production and use for downstream end-use in transportation, industrial, and agricultural sectors and with appliances. Demonstrations could take the form of cooperative agreements between DOE and the private sector or another type of program.
- For demonstration projects, the appropriate cost-share split between DOE and the private sector should not necessarily be tied to a 50/50 split.
  - Supported demonstrations should be allowed to maintain eligibility for ZCF deployment incentives, which cover operating costs more effectively.

## Research & Development

- Increase appropriations for ZCF-related RD&D efforts at DOE (across offices) to \$400 million per fiscal year, with continued and/or expanded support for R&D in numerous priority technology areas.

## Deployment

- Establish tax incentives for producing hydrogen and/or investing in hydrogen-producing equipment (beyond the previously authorized federal investment tax credit for fuel cells) that are authorized through at least 2035; are eligible for some form of monetization; go to the producer of hydrogen; are tied to the amount of fuel produced; have minimum carbon-intensity requirements for eligibility; are indexed to energy commodity costs; and can be claimed in addition to other credits that might apply to other parts of the value chain.
- Encourage and authorize the federal government to execute long-term offtake contracts for ZCFs (potentially via a contract-for-differences mechanism).
- Direct DOE to continue and to expand its current initiatives to evaluate the overall potential of existing electric and natural gas infrastructure to produce and transport hydrogen.
- Direct DOE to prepare a study aimed at informing private-sector investment in ZCFs that would: inventory existing pipeline assets; assess the capacity of pipeline networks to transport hydrogen and/or hydrogen carriers; assess the probability of embrittlement; assess the costs of pipeline inlay with various materials; and identify potential high-risk areas within existing infrastructure that deserve special attention with respect to safety and reliability.
- Direct DOE to assess whether natural gas pipeline upgrades or revamping could offer added transport capacity for ZCFs.
- Direct DOE to assess how to “right-size” hydrogen production opportunities with end-use applications.
- Direct DOE and other agencies to develop a safety protocol for assessing pipeline materials and system pressures in existing natural gas pipeline systems to determine their ability to safely distribute natural gas/hydrogen blends and the potential for pipeline embrittlement.
- Direct DOE and the Department of Transportation to undertake a study to assess whether federal safety standards and oversight for hydrogen pipelines are sufficient and to develop standards and guidance for the safe integration of hydrogen, ammonia, and other hydrogen carriers.
- Fully fund at FY2020 levels for at least 5 years the H2NEW consortium and other existing HFTO consortia (5-year, \$50 million effort).

- Increase funding for DOE’s Hydrogen and Fuel Cell Technologies Office and/or other DOE offices to create new consortia of electric companies and other types of energy and infrastructure companies to foster one or more integrated ZCF “value chain” demonstrations.

## **About the Carbon-Free Technology Initiative**

The Carbon-Free Technology Initiative (CFTI) is focused on implementation of federal policies that can help ensure the commercial availability of affordable carbon-free, 24/7 power technology options by the early 2030s to help the electric power industry meet net-zero carbon reduction commitments. Participants in the CFTI include the Edison Electric Institute (EEI) and its member companies, Clean Air Task Force, Bipartisan Policy Center, Center for Climate and Energy Solutions, ClearPath, Great Plains Institute, Information Technology & Innovation Foundation, Nuclear Energy Institute, and Third Way.

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