



June 28, 2024

DOE Hydrogen Program Appropriations: FY2025

The U.S. Department of Energy (DOE) Hydrogen Program addresses the development of applications that use hydrogen in place of today’s fuels to provide modern energy services. The program also considers hydrogen as an established industrial chemical, for example, in petroleum refining. The DOE program includes over 400 projects involving research and development (R&D), systems integration, and demonstration and deployment activities—collectively performed by universities, national laboratories, and industry. These projects cover the energy value chain starting with producing hydrogen from diverse feedstocks; transporting and storing it; and finally using it in various applications. The program is led by the Hydrogen and Fuel Cell Technologies Office (HFCTO) within the DOE Office of Energy Efficiency and Renewable Energy (EERE), with participation by other DOE offices.

A future “hydrogen economy” using hydrogen as an energy carrier and fuel could offer an alternative to today’s economy, with its prevalent combustion of fossil fuels. Initially thought of as a new technology for personal mobility services (e.g., cars) and high-value applications such as provision of electric power during space flight, hydrogen is also receiving attention for industrial processes, heavy vehicles, forklifts, portable power, and buffering and balancing of grid electric power. For more information, see CRS Report R47487, *The Hydrogen Economy: Putting the Pieces Together*, by Martin C. Offutt.

Federal Hydrogen Programs

Authorizing Legislation

The Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976 (P.L. 94-413) authorized a federal hydrogen program, initially at the National Science Foundation. Congress transferred overall management responsibility of the hydrogen program to DOE with the Spark M. Matsunaga Hydrogen Research, Development, and Demonstration Act of 1990 (P.L. 101-566). The Energy Policy Act of 2005 (EPAct; P.L. 109-58) and its amendments, including the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58), further defined the DOE hydrogen program’s scope and purpose.

The DOE Hydrogen Program

Participants in the DOE Hydrogen Program include several offices with responsibility for supporting hydrogen work based on different sources of energy (e.g., renewable, fossil, nuclear) and types of end use (e.g., vehicles, portable power, thermal comfort). DOE’s June 2023 *National Clean Hydrogen Strategy and Roadmap* envisages 10 million metric tons of new production of hydrogen per year by 2030, further stipulated to be “clean hydrogen” as defined in statute and DOE regulation. The DOE May 2024 *Multi-Year Program Plan* (MYPP) identifies challenges to

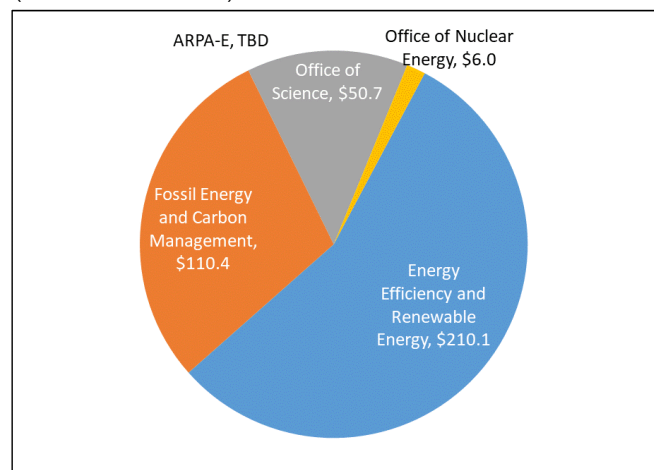
achieving a clean hydrogen economy: reducing cost and improving performance; de-risking and scaling up technologies across the value chain; and addressing barriers to large-scale adoption. DOE’s “Hydrogen Shot” goal for the cost of hydrogen is \$1/kilogram (kg) by 2031, not including delivery and dispensing, for production using electrolyzers that make hydrogen from water. Currently, the cost of hydrogen made with electrolyzers is \$5/kg to \$7/kg. The MYPP has a goal of <\$7 per kg, dispensed at the pump, for hydrogen used in trucks by 2028. The cost of delivered hydrogen currently ranges from \$12/kg to \$16/kg.

DOE Budget Authority and Request

Within DOE, two offices—EERE and the Office of Fossil Energy and Carbon Management—were responsible for executing over 80% of DOE’s budget authority on hydrogen and fuel cells from the FY2024 annual appropriation. The Office of Nuclear Energy and the Office of Science received smaller percentages. In FY2024, the joint explanatory statement accompanying the Consolidated Appropriations Act, 2024 (P.L. 118-42) directed \$396.0 million to the hydrogen crosscutting initiative. DOE anticipates that by the end of 2024, it will announce funding for hydrogen by ARPA-E (Advanced Research Projects Agency-Energy).

Figure 1. FY2025 Budget Request for Hydrogen Activities at DOE, by Office

(in millions of dollars)



Source: DOE FY2025 Congressional Justification. ARPA-E funding for hydrogen is determined annually based on programs developed through office and stakeholder priorities and defined, in part, by the proposals it receives and awards. Any ARPA-E funding would add to the above.

For FY2025, the President’s budget request for the DOE hydrogen crosscutting initiative was \$377.2 million (**Figure 1**). The funding for HFCTO makes up the majority of

funding from EERE in **Figure 1**, as well as the majority of EERE prior-year appropriations. HFTO intends to divide its \$170 million request for FY2025 as follows: hydrogen production, \$15 million; infrastructure, \$52 million; fuel cells, \$25 million; systems development and integration, \$75 million; and analysis, \$3 million.

In addition to annual appropriations, DOE received hydrogen-related advance appropriations from the IJA for FY2022 through FY2026. These include funds for two programs—Clean Hydrogen Manufacturing and Recycling Research, Development, and Demonstration; and Clean Hydrogen Electrolysis—which together were appropriated \$300 million for each of FY2022 through FY2026. On March 13, 2024, DOE announced funding for the first \$750 million in funding for these two programs. The IJA also appropriated \$8 billion for Regional Clean Hydrogen Hubs. In October 2023, DOE announced up to \$7 billion available for awards negotiations to seven hubs.

Where DOE Spends the Money

DOE’s Hydrogen Program awards grants, contracts, and cooperative agreements to investigators at universities, at national laboratories, and in industry. This supports over 400 projects. These include R&D focused on the hardware, such as the fuel cell, for a hydrogen economy. R&D is intended to reduce cost and improve performance of production and end-use technology and other parts of the hydrogen value chain. The projects also include work at higher levels of integration, such as to validate first-of-a-kind systems, reduce technological risk, and address the other aspects of a hydrogen economy (e.g., safety, codes and standards, and workforce development). In H.Rept. 118-126, which the joint explanatory statement to P.L. 118-42 incorporated by reference, the House Appropriations Committee encouraged DOE to examine the potential of hydrogen to provide power for electric vehicle charging in grid-constrained locations.

Hydrogen Programs at Non-DOE Federal Agencies

DOE’s HFTO has a coordinating role for hydrogen activities across the executive branch. Several other agencies—the Department of the Army, National Aeronautics and Space Administration, and Department of the Navy, among others—administer hydrogen programs. DOE estimates that, for FY2022 and FY2023 combined, projects funded by non-DOE hydrogen programs totaled over \$70.0 million, an increase of roughly \$30.0 million from combined FY2019 and FY2020. The projects range from basic research on fuel cells to activities aimed at early deployment, including demonstrations of fuel cells in applications such as forklifts and unmanned underwater and aerial vehicles.

P.L. 117-169, commonly known as the Inflation Reduction Act of 2022 (IRA), created the Clean Hydrogen Production Tax Credit in Internal Revenue Code Section 45V. The Department of the Treasury published a notice of proposed rulemaking (NPRM) and notice of public hearing on December 26, 2023, for implementing 45V. In S.Rept. 118-72, which the joint explanatory statement to P.L. 118-42 incorporated by reference, the Senate Appropriations Committee instructed DOE to support updates to

Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET), the model the IRA requires to be used to determine whether the “well-to-gate” greenhouse gas (GHG) emissions meet the threshold for eligibility for the tax credit and at what dollar level. Further information is available in CRS In Focus IF12602, *The Clean Hydrogen Production Credit: How the Incentives are Structured*, by Nicholas E. Buffie and Martin C. Offutt.

Recent Developments

On February 9, 2024, ARPA-E announced the awarding of \$20.0 million of FY2023 funds for geologic hydrogen for 16 projects. One-half the amount of the awards went to universities and roughly one-quarter each to the private sector and to DOE national laboratories. The projects collectively would address two areas. In one area, projects would consider management of reservoirs of naturally occurring hydrogen; these projects would receive roughly two-thirds of funds. In a second area, projects would focus on the subsurface production of hydrogen through stimulated mineralogical processes; these projects would receive roughly one-third of funds. ARPA-E also announced the awarding of funds to Argonne National Laboratory to expand GREET to include additional pathways for manufacturing hydrogen.

On October 13, 2023, President Biden and Energy Secretary Granholm announced seven grant awards for the Regional Clean Hydrogen Hubs (IJA §40314) to receive total funding of up to \$7 billion. On January 17, 2024, DOE announced that it had selected a consortium to receive \$1 billion for a Demand-Side Support Initiative as part of the Regional Clean Hydrogen Hubs. The Hubs received advance appropriations of \$1.6 billion for each of FY2022 through FY2026.

Congressional Considerations

H.Rept. 118-126 and S.Rept. 118-72 directed that DOE coordinate hydrogen and fuel cell programs across DOE offices. S.Rept. 118-72 noted the number of coordination mechanisms, including crosscuts and “Earthshots,” such as the Hydrogen Shot discussed above, and directed DOE to simplify and consolidate these into one function.

Congress continues to be interested in certain hydrogen topics. One topic is the 45V tax credit and how much of it can be claimed for the Regional Clean Hydrogen Hubs, which was discussed in the March 20, 2024, House Appropriations Subcommittee on Energy and Water Development’s Hearing on the Fiscal Year 2025 Budget Request for the Department of Energy. Another topic is the development and update of GREET, which could inform adjustments to project eligibility for the 45V credit and at what dollar level. A final topic is how and to what extent DOE considers the IJA-required goals for the Regional Clean Hydrogen Hubs (e.g., long-term employment, and feedstock and end-use diversity) and how quickly DOE obligates IJA funding.

Martin C. Offutt, Analyst in Energy Policy

Disclaimer

This document was prepared by the Congressional Research Service (CRS). CRS serves as nonpartisan shared staff to congressional committees and Members of Congress. It operates solely at the behest of and under the direction of Congress. Information in a CRS Report should not be relied upon for purposes other than public understanding of information that has been provided by CRS to Members of Congress in connection with CRS's institutional role. CRS Reports, as a work of the United States Government, are not subject to copyright protection in the United States. Any CRS Report may be reproduced and distributed in its entirety without permission from CRS. However, as a CRS Report may include copyrighted images or material from a third party, you may need to obtain the permission of the copyright holder if you wish to copy or otherwise use copyrighted material.