

Can hydrogen storage be a long-term energy source?

The global transition to a low-carbon economy is underway and fossil energy-enabled hydrogen research and development is a critical part of building a secure energy future. The U.S. Department of Energy (DOE) is endeavoring to better understand the potential for long-term hydrogen storage.

What is the DOE hydrogen program?

The DOE Hydrogen Program activities for hydrogen storage are focused on advanced storage of hydrogen (or its precursors) on vehicles or within the distribution system. Hydrogen storage is a key technological barrier to the development and widespread use of fuel cell power technologies in transportation, stationary, and portable applications.

What is hydrogen storage?

Hydrogen storage is a key enabling technology for the advancement of hydrogen and fuel cell technologies in applications including stationary power, portable power, and transportation.

How much does a hydrogen storage system cost?

Specific system targets include the following: \$10/kWh (\$333/kg stored hydrogen capacity). The collaborative Hydrogen Storage Engineering Center of Excellence conducts analysis activities to determine the current status of materials-based storage system technologies.

Can Underground hydrogen storage reduce operational risks?

The multi-year study also looked at technologies and tools available to reduce the operational risks associated with underground hydrogen storage in those systems and to develop technologies and tools that reduce those risks.

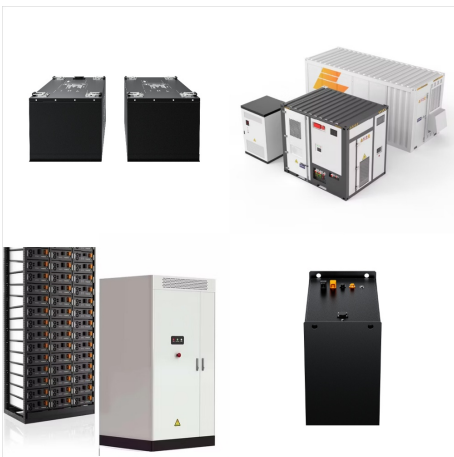
How has the DOE-supported R&D program impacted hydrogen & fuel cells?

sustained R&D effort has helped hydrogen and fuel cells evolve into commercially viable technologies in a growing market. Since the Program was accelerated in 2004, its efforts have advanced these technologies

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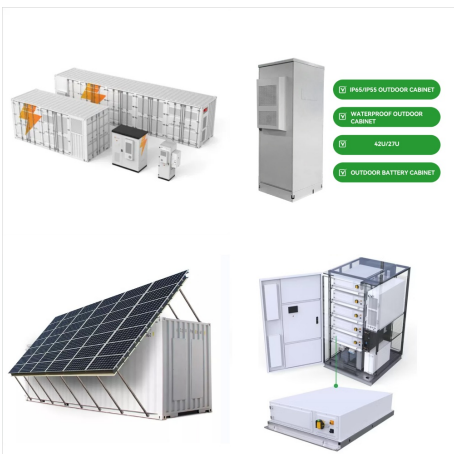
and achieved several significant accomplishments. DOE-supported activities have:



The U.S. Department of Energy (DOE) Hydrogen Program works in partnership with industry, academia, national laboratories, and federal and international agencies to: infrastructure, storage, fuel cells, and multiple end uses across transportation, industrial, and stationary power applications, Address safety concerns and develop model codes

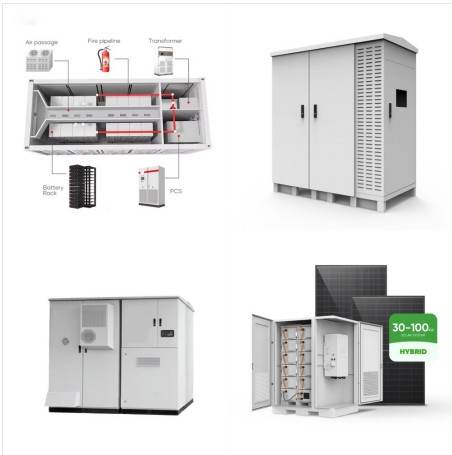


In addition to covalently bound hydrogen as solids, compounds that are capable of binding hydrogen as liquids have been studied. Examples of systems based on liquid carriers include n-ethylcarbazole 4 and methyl-cyclopentane 5 as shown in the figure. In addition to the need for off-board rehydrogenation of the spent product, some of the difficulty in working with these liquids ???



WASHINGTON, D.C. ??? In support of President Biden's Investing in America agenda, the U.S. Department of Energy (DOE) today announced \$47.7 million in funding for 16 research, development, and demonstration (RD& D) projects across 13 states to advance clean hydrogen technologies. The selected projects aim to lower technology costs, enhance ???

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Office of Energy Efficiency and Renewable Energy:
Hydrogen and Fuel Cell Technologies R& D
FY2021: DE-FOA-0002446: Energy Department
Announces \$33 Million to Advance Hydrogen and
Fuel Cell R& D and the H2@Scale Vision: 3/8/2021:
Office of Energy Efficiency and Renewable Energy:
FY2021 Vehicle Technologies Office Research
Funding ???



U.S. DEPARTMENT OF ENERGY OFFICE OF
ENERGY EFFICIENCY & RENEWABLE ENERGY
HYDROGEN AND FUEL CELL TECHNOLOGIES
OFFICE 12 H2@Scale: Enabling affordable,
reliable, clean, and secure energy ???Hydrogen can
address specific applications across sectors that are
hard to decarbonize ???Today: 10MMT H 2 in the
U.S. ???Economic Potential: 2 to ???



In June 2022, the Department of Energy issued a
\$504.4 million loan guarantee to finance Advanced
Clean Energy Storage, a clean hydrogen and
energy storage facility capable of providing
long-term, seasonal energy storage. The facility in
Delta, Utah, will combine 220 megawatts of alkaline
electrolysis with two massive 4.5 million barrel salt

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Topic 1: Components for Hydrogen Fueling of Medium- and Heavy-Duty (MD/HD) Vehicles. This topic seeks proposals to develop advanced components that will enable gaseous and/or liquid hydrogen fueling at refueling stations for MD/HD hydrogen-powered vehicles. Topic 2: Standardized Hydrogen Refueling Station of the Future.

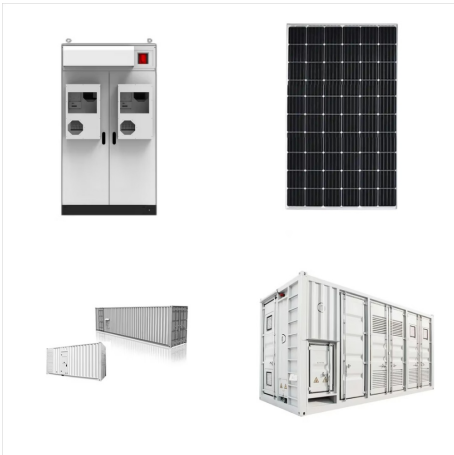


In June 2022, DOE announced it closed on a \$504.4 million loan guarantee to the Advanced Clean Energy Storage project in Delta, Utah ??? marking the first loan guarantee for a new clean energy technology project from DOE's Loan Programs Office (LPO) since 2014. The loan guarantee will help finance construction of the largest clean hydrogen storage facility in ???



The Long Duration Storage Shot establishes a target to reduce the cost of grid-scale energy storage by 90% for systems that deliver 10+ hours of duration within the decade. Energy storage has the potential to accelerate full decarbonization of the electric grid.

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Hydrogen is an energy carrier, not an energy source and can deliver or store a tremendous amount of energy. Hydrogen can be used in fuel cells to generate electricity, or power and heat. Energy Department-funded analysis has shown that hydrogen and fuel cells have the potential to achieve the following reductions in emissions:

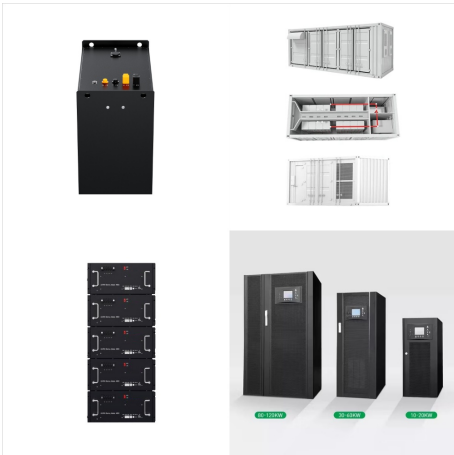


Hydrogen Storage. Physical Storage
Materials-Based Storage Materials-Based Storage.
Metal Hydrides Chemical Hydrogen Office of
Energy Efficiency & Renewable Energy Forrestal
Building 1000 Independence Avenue, SW
Washington, DC 20585. Facebook Twitter LinkedIn.
An office of.



The U.S. Department of Energy's (DOE) Hydrogen Program hosted a virtual Bulk Storage of Gaseous Hydrogen Workshop on February 10-11, 2022. The objectives of the two-day workshop were to: Connect industry, end users, and government with stakeholders in bulk gaseous storage or research, development, demonstration, and deployment (RDD& D) projects

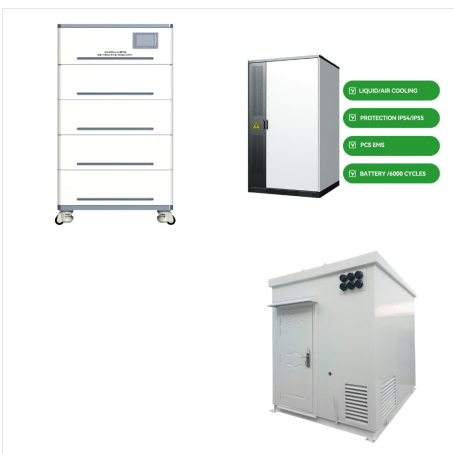
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Hydrogen is an energy carrier, not an energy source and can deliver or store a tremendous amount of energy. Hydrogen can be used in fuel cells to generate electricity, or power and heat. Energy Department-funded ???



WASHINGTON, D.C. ??? The U.S. Department of Energy (DOE) today announced nearly \$42 million in funding for 22 projects in 14 states to advance critical technologies for producing, storing, and deploying clean hydrogen. DOE also announced \$17.8 million to establish a new North American university research consortium that will help states and tribal ???



The Recommended Best Practices for the Characterization of Storage Properties of Hydrogen Storage Materials serves as a resource for the hydrogen materials development community on common methodologies and protocols for measuring critical performance properties of advanced hydrogen storage materials.; The Hydrogen Storage Materials Database provides the research ???

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The U.S. Department of Energy Hydrogen Program, led by the Hydrogen and Fuel Cell Technologies Office (HFTO) within the Office of Energy Efficiency and Renewable Energy (EERE), conducts research and development in hydrogen production, delivery, infrastructure, storage, fuel cells, and multiple end uses across transportation, industrial, and stationary ???



The U.S. Department of Energy (DOE) today announced a notice of intent for potential funding to accelerate the research, development, and demonstration (RD& D) of affordable clean-hydrogen and fuel cell technologies to drive national decarbonization. Including Cryogenic and/or High-Pressure Conditions will develop advanced materials for use



Advanced Clean Energy Storage Conditional Commitment. First, LPO offered a conditional commitment for a \$504.4M loan guarantee to the Advanced Clean Energy Storage Project, which would be a first-of-its-kind clean hydrogen production and storage facility capable of providing long-term seasonal energy storage. The facility in Delta, Utah, will

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Key DOE Hydrogen Authorizations in Energy Policy Act (2005, 2020) and Infrastructure Investment and Jobs Act (2021) Hydrogen is one part of a broad portfolio of activities. Priorities. 1. Low cost, clean hydrogen 2. Low cost, efficient, safe hydrogen delivery and storage 3. Enable end use applications at scale for impact



WASHINGTON, D.C. ??? The U.S. Department of Energy (DOE) today announced it closed on a \$504.4 million loan guarantee to the Advanced Clean Energy Storage project in Utah ??? marking the first loan guarantee for a new clean energy technology project from DOE's Loan Programs Office (LPO) since 2014. The loan guarantee will help finance construction of the ???



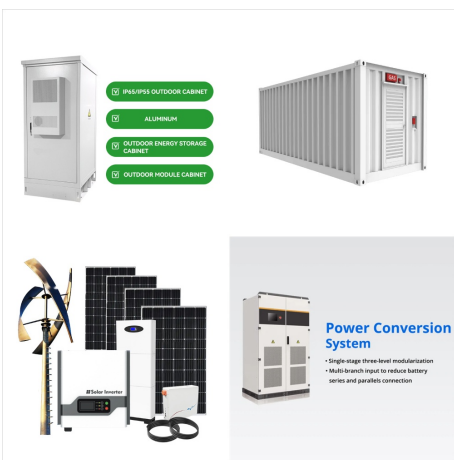
The Multi-Year Program Plan (MYPP) sets forth the Hydrogen and Fuel Cell Technologies Office's (HFTO's) mission, goals, and strategic approach relative to broader clean energy priorities of the U.S. Department of Energy (DOE). Aligned with the priorities in the U.S. National Clean Hydrogen Strategy and Roadmap, the MYPP identifies the challenges that must be overcome to realize ???

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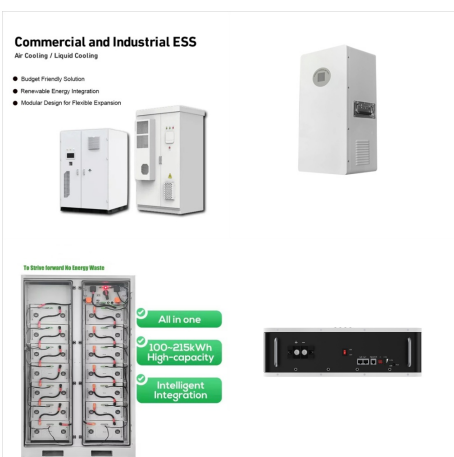
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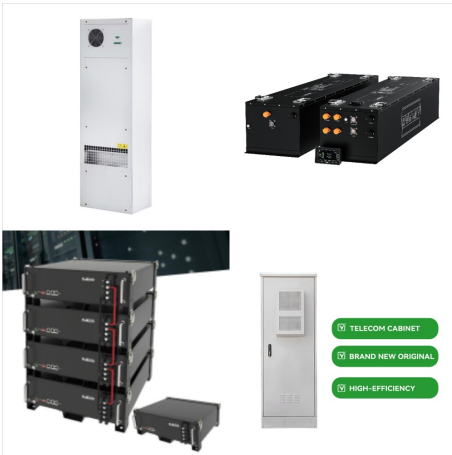


Physical storage is the most mature hydrogen storage technology. The current near-term technology for onboard automotive physical hydrogen storage is 350 and 700 bar (5,000 and 10,000 psi) nominal working-pressure compressed gas vessels???that is, "tanks."

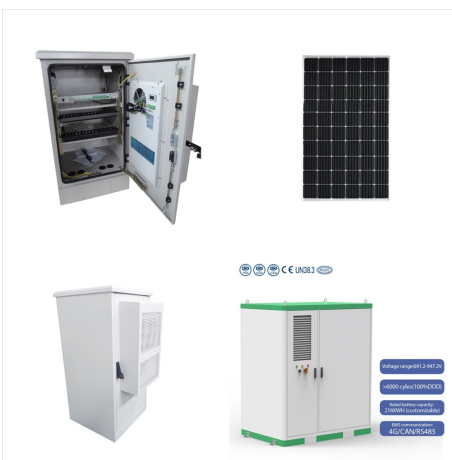


U.S. DEPARTMENT OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY FUEL CELL TECHNOLOGIES OFFICE 17 U.S. DOE in collaboration with: ???Dept. of Transportation (DOT)-Federal Railroad Administration ???DOT-Maritime Administration Source: DOT-FRA (top) & SNL (bottom) Data Centers and Energy Storage ???

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Fuel cells use the energy from hydrogen in a highly efficient way -- with only water and heat as byproducts. U.S. Department of Energy Hydrogen Storage. HFTO Information Resources. 1000 Independence Ave. SW Washington DC 20585 202-586-5000. Sign Up for Email Updates. Facebook Twitter Instagram Linkedin. About energy.gov.



WASHINGTON, D.C. ??? As part of President Biden's Investing in America agenda, the U.S. Department of Energy (DOE) today announced \$750 million for 52 projects across 24 states to dramatically reduce the cost of clean hydrogen and reinforce America's global leadership in the growing clean hydrogen industry. These projects ??? funded by the President's Bipartisan ???



The U.S. Department of Energy (DOE) Hydrogen Shot Summit convened thousands of stakeholders online to introduce the Hydrogen Shot, solicit dialogue, and rally the global community on the urgency of tackling the climate crisis through concrete actions and innovation. The Hydrogen Shot Summit was held virtually August 31 and September 1, 2021. ???

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H2@Scale is a U.S. Department of Energy (DOE) initiative that brings together stakeholders to advance affordable hydrogen production, transport, storage, and utilization to enable decarbonization and revenue opportunities across multiple sectors. Ten million metric tons of hydrogen are currently produced in the United States every year.