



Fueling the Future

Overview of the U.S. Clean Hydrogen Landscape

November 21, 2023



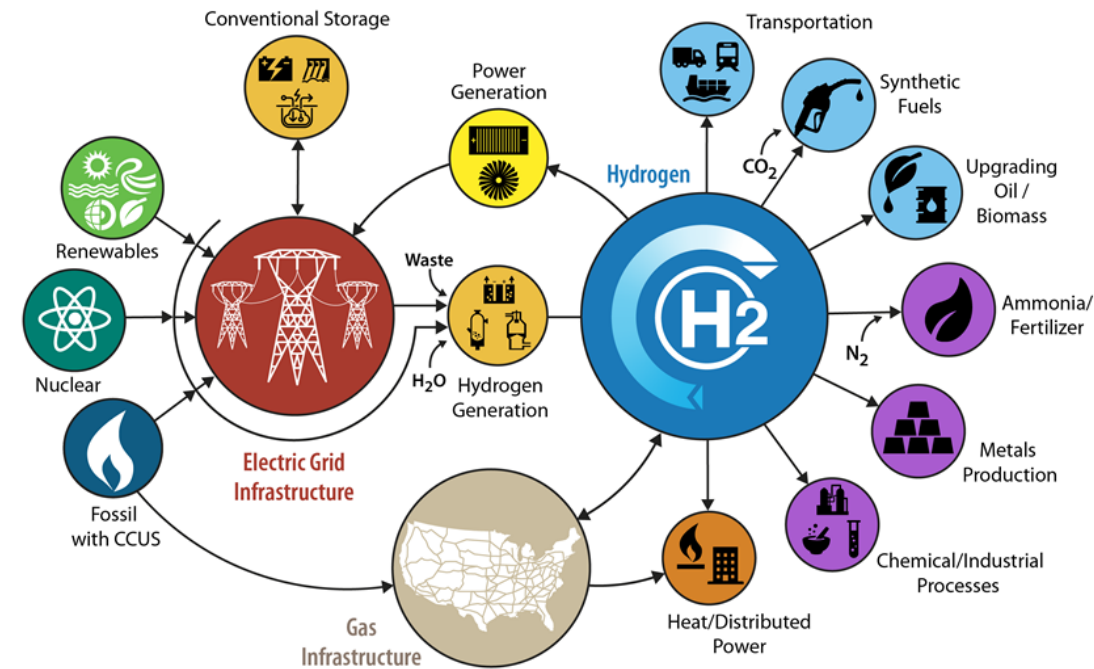
Agenda

- Clean Hydrogen Process
- Overview of the U.S. Hydrogen Strategy and Roadmap
- Inflation Reduction Act (IRA)
- Hydrogen Production
- Infrastructure
- Safety Aspects
- Price



Clean Hydrogen Process

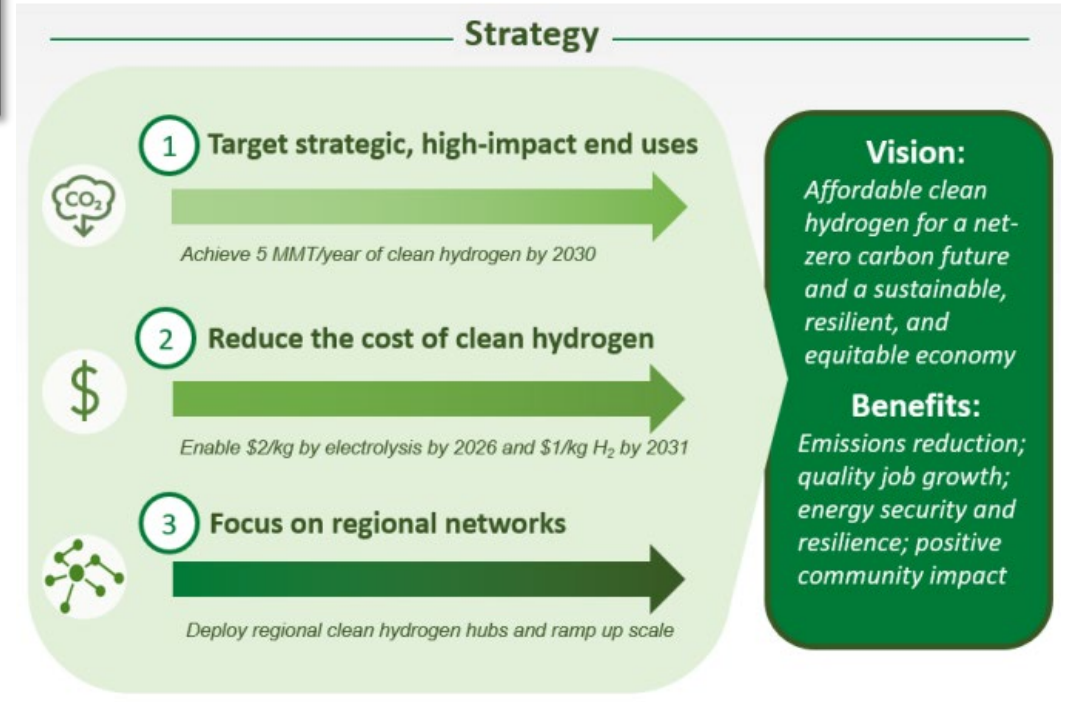
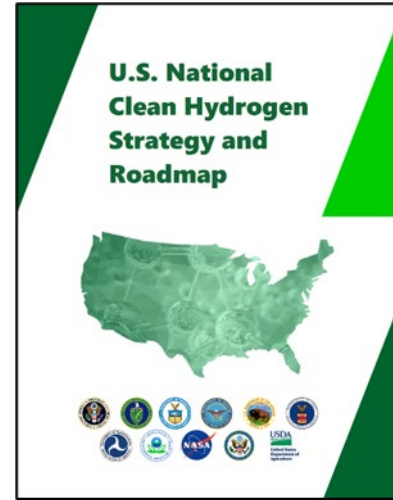
- Powerful Tool
 - Decarbonization
 - Tackle Climate Crisis
 - Job Creation
- Produced Using Water From:
 - Wind, Solar, Natural Gas with CCUS, and Other Methods
- Climate Crisis
 - Potential to Reduce Carbon Emissions
 - Help Realize President Biden's Goal of Net-Zero Carbon Emissions by 2050
 - Energy Storage





Overview of the U.S. Hydrogen Strategy and Roadmap

- Strategy 1: Target
 - Industrial Applications
 - Transportation
 - Power Sector Applications
- Strategy 2: Reduce
 - Hydrogen Production Cost
 - Onboard Storage Cost
 - Delivery and Dispensing Cost
- Strategy 3: Focus
 - Regional Clean Hydrogen Hubs
 - Economic Benefits





Inflation Reduction Act (IRA)

- Inflation Reduction Act (IRA)
 - Clean Energy Tax Credits
 - Increase Domestic Renewable Energy Production
 - Provision for Clean Hydrogen
 - Extend, Increase, or Create

- The Clean Hydrogen Production Tax Credit
 - 10-Year Incentive
 - Investment Tax Credit

- State Incentives





Hydrogen Production

➤ Current Production

- 10 Million Metric Tons (MMT) of Hydrogen
- Primary Demand:
 - Petroleum Refining
 - Ammonia Production
- Emerging Hydrogen Markets
 - Data Centers
 - Ports
 - Steel Manufacturing
 - Heavy-Duty Trucks

➤ Production Quantity Needed

- Aggressive Growth
- 20 MMT/Year by 2040
- 50 MMT/Year by 2050

Use of Hydrogen in the U.S. Today

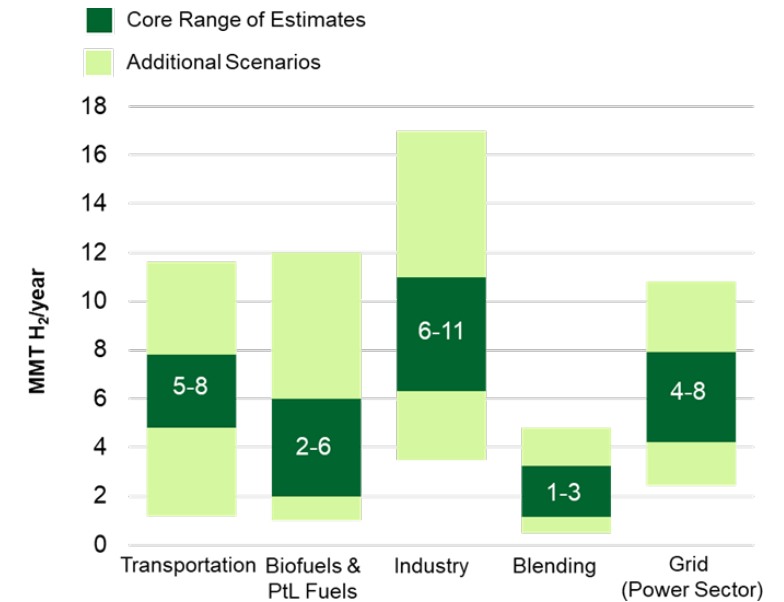
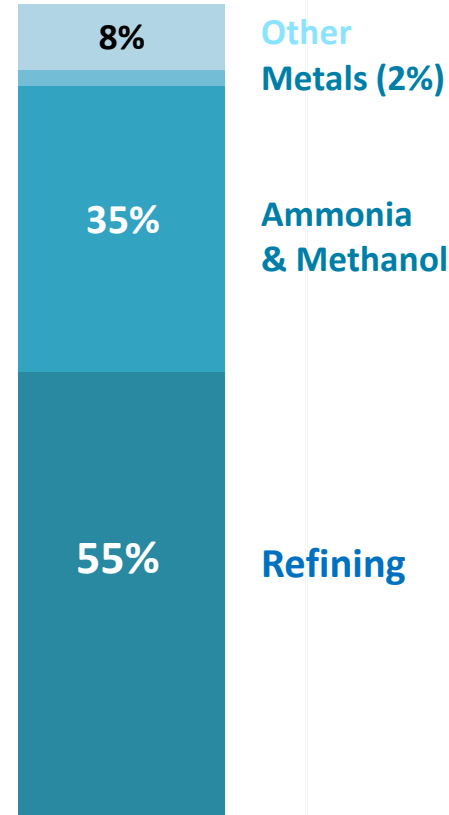
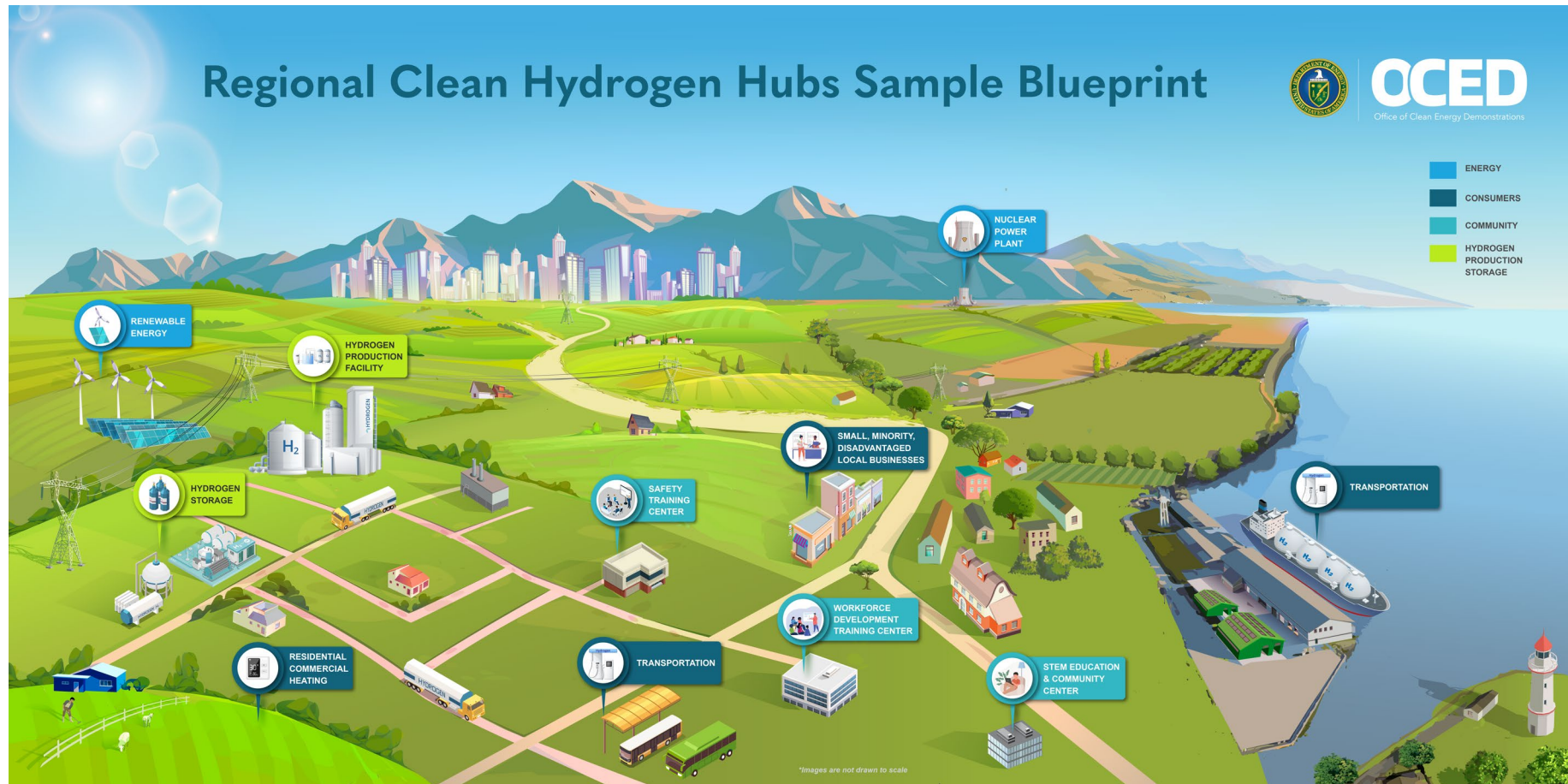


Figure: Ranges in potential hydrogen demand in 2050 in five key sectors: transportation, biofuels and power-to-liquid fuels, industry, blending, and energy storage and grid balancing.

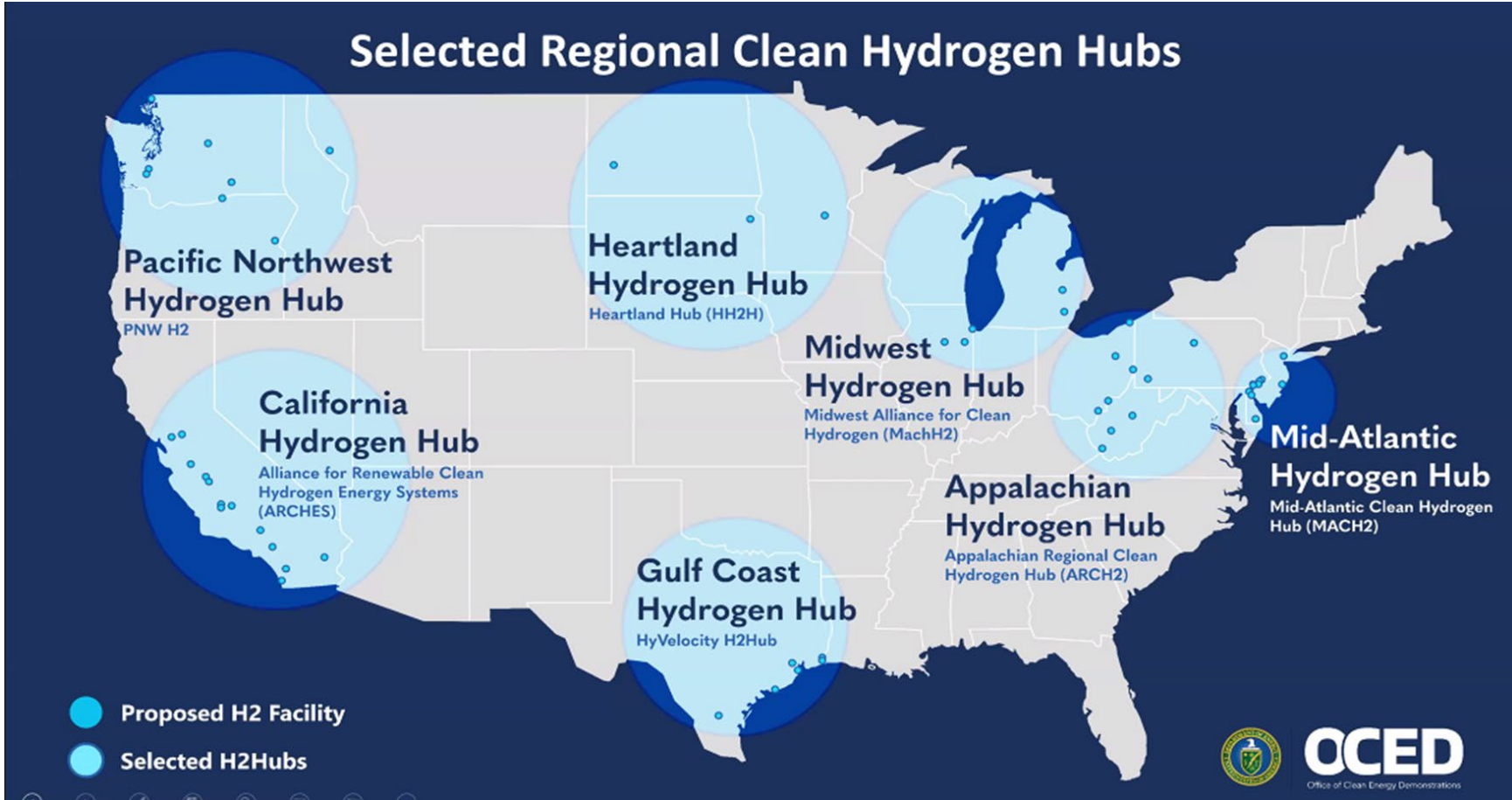


Infrastructure





Infrastructure





Safety Aspects

- Used Safely for Many Years
 - Metallurgical Applications
 - Food Industry
 - Space Programs

- Safer to Handle and Use than the Fuels Commonly Used Today.

- Lighter than Air
 - Dissipates Rapidly When Released

- Safe Hydrogen Systems Requirements:
 - Adequate Ventilation
 - Leak Detection
 - Special Flame Detectors

- Interagency Cooperation to Coordinate on Research and Development



Price

Hydrogen Shot

In June 2021, the DOE launched the first in a series of Energy Earthshots to accelerate breakthroughs of more abundant, affordable, and reliable clean energy solutions within the decade. This "Hydrogen Shot" – "111" – aims to reduce the cost of clean hydrogen to \$1 per kilogram in just a decade



1 Dollar



1 Kilogram

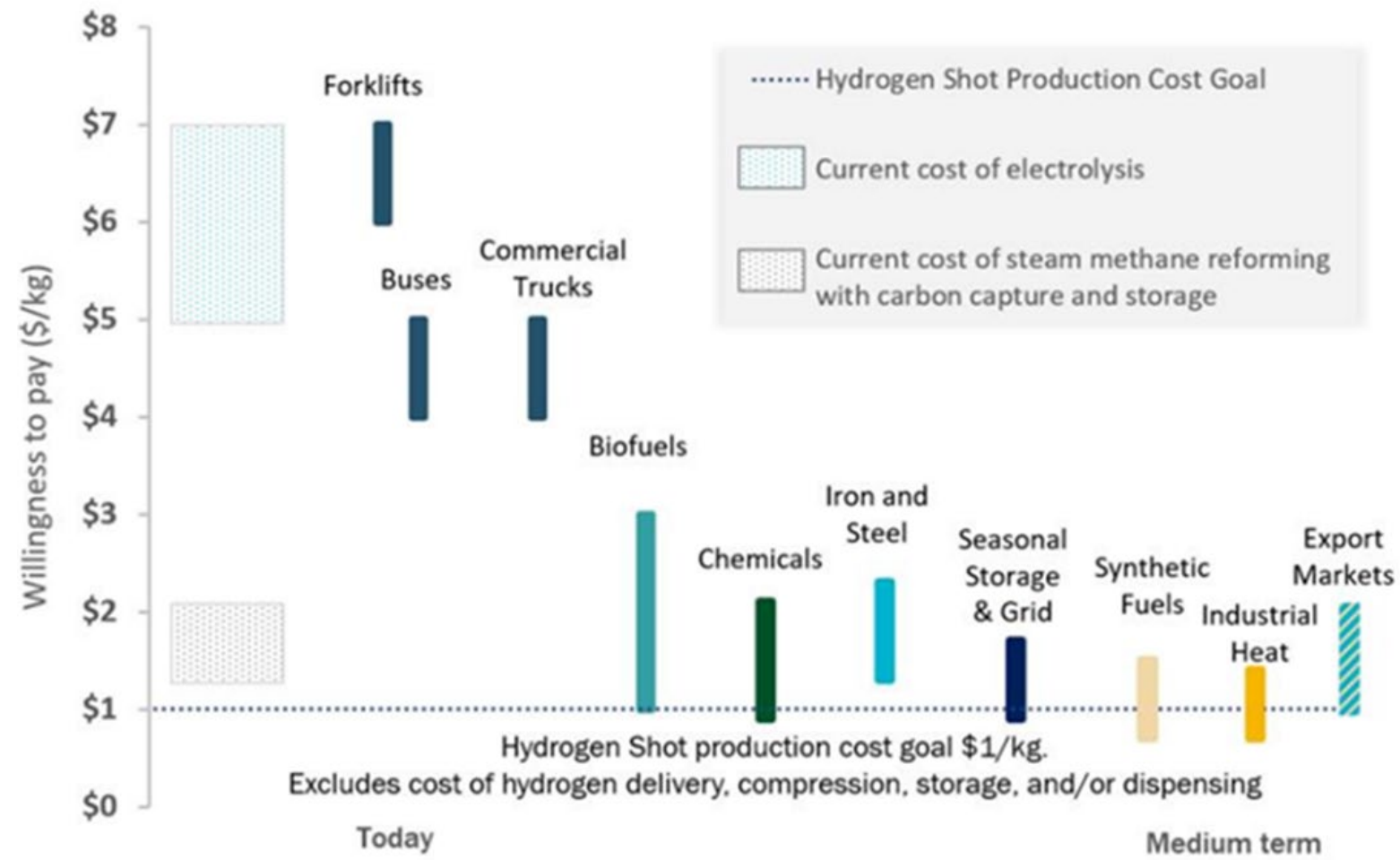


1 Decade

DOE is also working closely with industry to expand low-carbon hydrogen production capacity, including through grants, loans, and other tools and incentives. We will support multiple production routes with potential to achieve the Hydrogen Shot, to stimulate competition, innovation, investment, and commercialization, to catalyze sharp declines in cost, across the value chain.



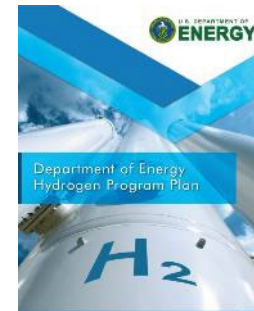
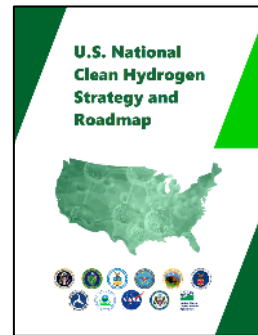
Price





Resources

Key Publications



www.hydrogen.energy.gov

- [U.S. National Clean Hydrogen Strategy and Roadmap \(energy.gov\)](https://www.energy.gov/u-s-national-clean-hydrogen-strategy-and-roadmap)
- [Hydrogen Shot | Department of Energy](https://www.energy.gov/hydrogen-shot): The U.S. Department of Energy's (DOE's) Energy Earthshots Initiative
- [America's First Clean Hydrogen Hubs](https://www.energy.gov/america-first-clean-hydrogen-hubs): Biden-Harris Administration Announces \$7 Billion for America's First Clean Hydrogen Hubs, Driving Clean Manufacturing and Delivering New Economic Opportunities Nationwide
- [Pathways to Commercial Liftoff - Clean Hydrogen - March 20 - FINAL \(energy.gov\)](https://www.energy.gov/pathways-to-commercial-liftoff-clean-hydrogen)
- [U.S. National Clean Hydrogen Strategy and Roadmap Interagency Collaboration \(energy.gov\)](https://www.energy.gov/u-s-national-clean-hydrogen-strategy-and-roadmap-interagency-collaboration)



Thank You!

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