



OCED
Office of Clean Energy Demonstrations

THE OFFICE OF CLEAN ENERGY DEMONSTRATIONS



NAESB Webinar – Regional Clean Hydrogen Hubs Overview

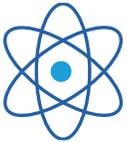
Office of Clean Energy Demonstrations
U.S. Department of Energy

OCED Mission

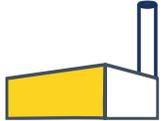
Deliver clean energy technology **demonstration projects at scale** in partnership with the **private sector** to **accelerate deployment, market adoption**, and the **equitable transition** to a decarbonized energy system.



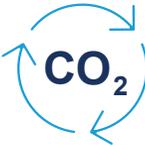
OCED Scope



**Advanced Reactor
Demonstrations (\$2.5 billion)**



**Industrial Demonstrations
(\$6.3 billion)**



**Carbon Management
(\$7 billion)**



**Long-Duration Energy
Storage Demonstrations
(\$505 million)**



**Clean Energy Demonstrations
on Mine Land (\$500 million)**



**Regional Clean Hydrogen Hubs
(\$8 billion)**



**Distributed Energy Systems
Demonstrations (\$50 million)**



**Liftoff Enabling Programs
(\$133 million)**



**Energy Improvements in Rural
or Remote Areas (\$1 billion)**



Regional Clean Hydrogen Hubs

Build regional clean H2Hubs across the country to create networks of clean hydrogen producers, consumers, and local connective infrastructure to accelerate use of clean hydrogen.

H2Hubs Demand-Side Support Initiative

- Sept 2023: Announced RFP. Responses were due on November 2, 2023.
- Jan 2024: H2DI was selected as the independent entity.
- Learn more about the initiative here: https://www.youtube.com/watch?v=QgOL_Xg7K1Q

H2Hubs Current Status

- **October 2023: DOE announced 7 projects selected for award negotiations.**

Selected Regional Clean Hydrogen Hubs



Hubs and involved project partners

Hub Name	State(s)	DOE Capital	Select Involved Partners
Alliance for Renewable Clean Hydrogen Energy Systems (ARCHES)	CA	Up to \$1.2B	Air Products, AES, Amazon, Clearway, Intersect Power, Linde, Mote, Nikola, Pilot Transit Centers, Plug Power, Port of Long Beach, Port of Los Angeles, Port of Oakland, San Diego Gas and Electric Company, Southern California Gas Company, Universal Hydrogen
Pacific Northwest Hydrogen Hub (PNWH2 Hub)	WA, OR, MT	Up to \$1B	Air Liquide, Amazon, Mitsubishi Power Americas, Portland General Electric Company, Puget Sound Energy, First Mode, Fortescue Future Industries
Appalachian Regional Clean Hydrogen Hub (ARCH2)	WV, OH, PA	Up to \$925M	Air Liquide, The Chemours Company, Dominion Energy, Empire Diversified Energy, EQT, Fidelis New Energy, First Mode, KeyState Energy, MPLX, Plug Power, TC Energy
HyVelocity H2Hub (Gulf Coast)	TX	Up to \$1.2B	AES, Air Liquide, Chevron, ExxonMobil, Mitsubishi Power Americas, Ørsted, Sempra Infrastructure
Heartland Hub (HH2H)	MN, ND, SD	Up to \$925M	Xcel Energy, Marathon Petroleum, TC Energy
Midwest Alliance for Clean Hydrogen (MachH2)	IL, IN, MI	Up to \$1B	Air Liquide, BP, Constellation, Invenergy, Nicor Gas
Mid-Atlantic Clean Hydrogen Hub (MACH2)	PA, DL, NJ	Up to \$750M	Chesapeake Utilities, Enbridge, Holtec, Monroe Energy, PBF Energy, PSEG

Selected H2Hubs Overview

**Unprecedented
Investment in America's
Hydrogen Infrastructure**

**Federal investment of
\$7 billion**

**To accelerate adoption of
hydrogen technologies**

**Approximately 3
Million Metric Tons of
Hydrogen Production
per Year**

**Providing tangible
benefits for Americans**

**Dedicated Dollars for
Community Benefits**

**Tens of Thousands of
Jobs**

**Greenhouse Gas
Reduction of 25 million
Metric Tons Per Year**

What is a Regional Clean Hydrogen Hub?



- ENERGY
- CONSUMERS
- COMMUNITY
- HYDROGEN PRODUCTION STORAGE



**Images are not drawn to scale*



Prioritizing Community Benefits in OCED Projects

OCED **requires** applicants to include a Community Benefits Plan to help ensure broadly shared prosperity in the clean energy transition.

By **prioritizing community benefits**, we can ensure the next chapter in America's energy story is marked by greater justice, equity, security, and resilience.

Community & Labor Engagement



Diversity, Equity, Inclusion, & Accessibility



Investing in the American Workforce

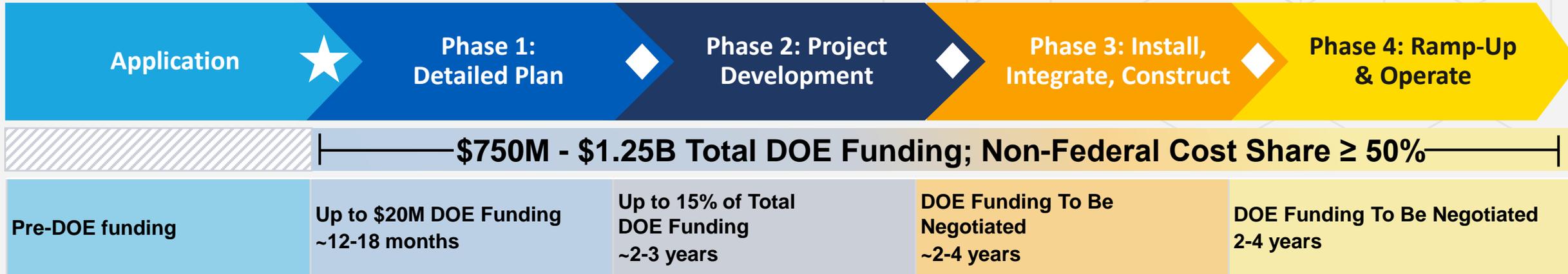


Justice40 Initiative



Phased Approach to Project Management

- ☆ Initial Application
- ◇ Go/No-Go Decisions



Next Steps – Negotiations

Award Negotiations: OCED has commenced negotiations with project selectees.

After Award: *IF the projects receive an award (successful negotiations)*

- Selectees enter into cooperative agreement with OCED
- Detailed Project Plan begins
- OCED will work with selectees to ensure compliance with the National Environmental Policy Act (NEPA)
- Significant engagement with OCED and awardee



Whole of Government Approach to Clean Hydrogen



U.S. National Clean Hydrogen Strategy and Roadmap



Hydrogen Shot
(\$1/kg by 2031)



Clean Hydrogen Standard



H2Hubs Demand-Side Support Initiative



IRA tax incentives



Clean Hydrogen Pathways to Commercial Lift-Off Report



Hydrogen Interagency Task Force (HIT)

a collaboration among 11+ U.S. federal agencies to further advance a whole-of-government approach to executing the national clean hydrogen strategy



Additional DOE funding:
Clean H2 Electrolysis
Clean H2 Manufacturing and Recycling
(additional \$1.5B)





Hydrogen Hubs Demand-Side Initiative

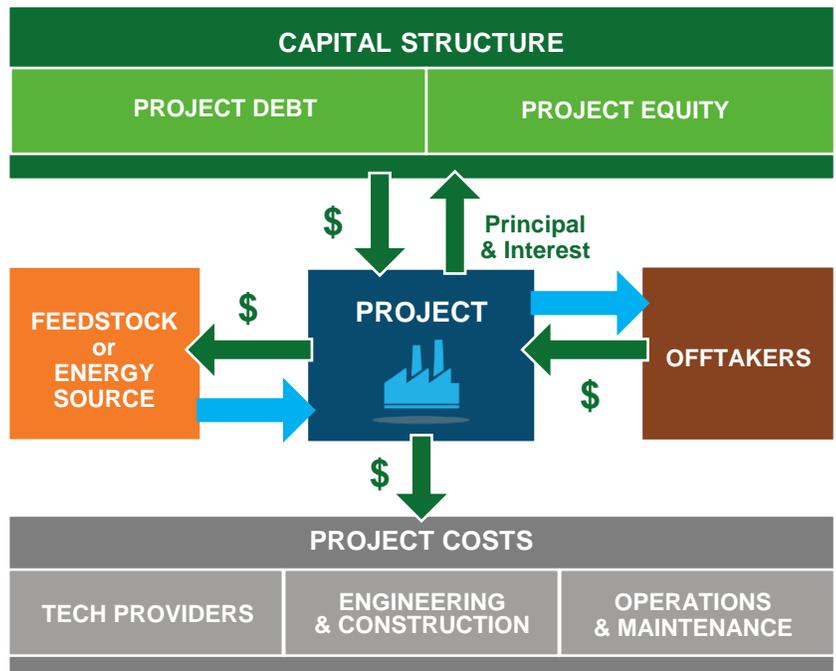
Demand-Side Initiative Overview

- Establishing reliable demand and mature markets is critical to unlocking capital formation for the energy transition
- DOE is using a portion of the funding from the H2Hubs program to provide financial revenue or demand support for Hydrogen Hub projects and catalyze a mature market for clean hydrogen
- DOE is working with the H2DI consortium led by the EFI Foundation, S&P, and ICE to design and eventually execute these demand-side measures at DOE-funded H2Hubs



Several risks hinder project investability for more nascent sectors

Project finance ecosystem



Common project finance issues clean energy projects face

Merchant curves: Customers don't want to sign long-term contracts for volume and/or price until the project is running

- **Example:** Carbon Black, Hydrogen, SAF

Maintenance: For first-of-a-kind project it is hard to find an expert that can operate the plant well; often technologies take 10-15 years to get to best-in-class operations

- **Example:** Nuclear, SAF

Permitting issues: Significant barriers or delays to projects through permitting, deterring development

- **Example:** Geothermal, Transmission, Low-impact hydro

Financing issues: Inability to secure debt financing at acceptable terms to the developer

- **Example:** SAF Producers (LCFS / RIN Price volatility), OSW vessel developers

Project finance ecosystem and technology ecosystem overlap, but are not the same, and require a different set of tools to support

Nascent clean energy markets face supply-demand stalemate

High costs and uncertain supply **scare away buyers**, impeding market development

Producers struggle to obtain financing without a reliable demand outlook



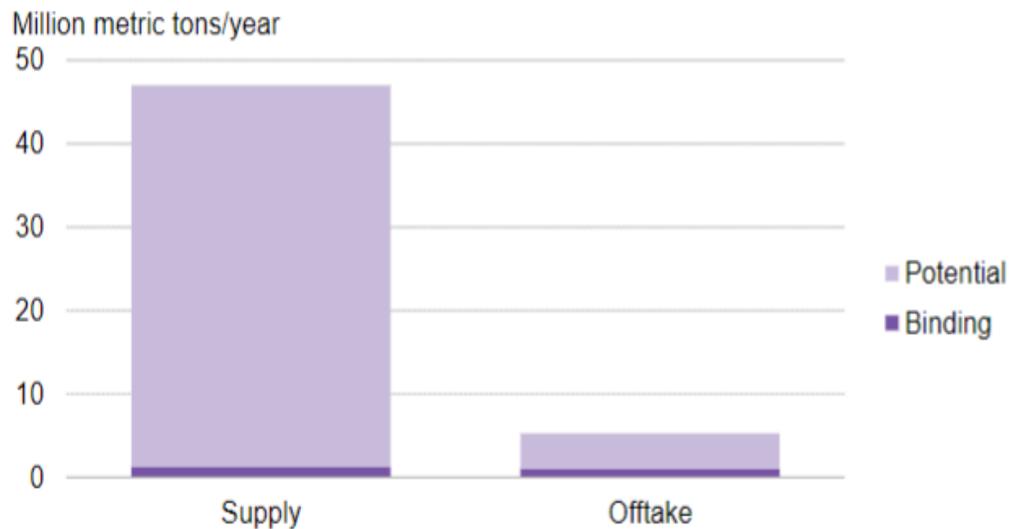
Without deployment, **costs remain high, supply remains uncertain, and markets don't mature**

H2 lacks the bankable demand needed to move from announcements to steel in the ground

Only ~10% of announced clean hydrogen supply have found potential buyers

To reach Final Investment Decision, investors require offtake agreements and financeable structures

Low-carbon hydrogen supply and offtake by 2030



Source: BloombergNEF. Note: Data as of Sept. 29, 2023. The database only includes projects of over 20 megawatts or 2,800 metric tons/year of capacity. Potential offtake includes letters of intent, heads of terms, memorandums of understanding, and unspecified offtake agreements disclosed in news.

“ Today, investments in production outpace offtake, and **many offtakers are hesitant to sign long-term contracts.**”

Hydrogen Council

“ Demand is the key bottleneck limiting the scale up of the hydrogen industry in the near term”

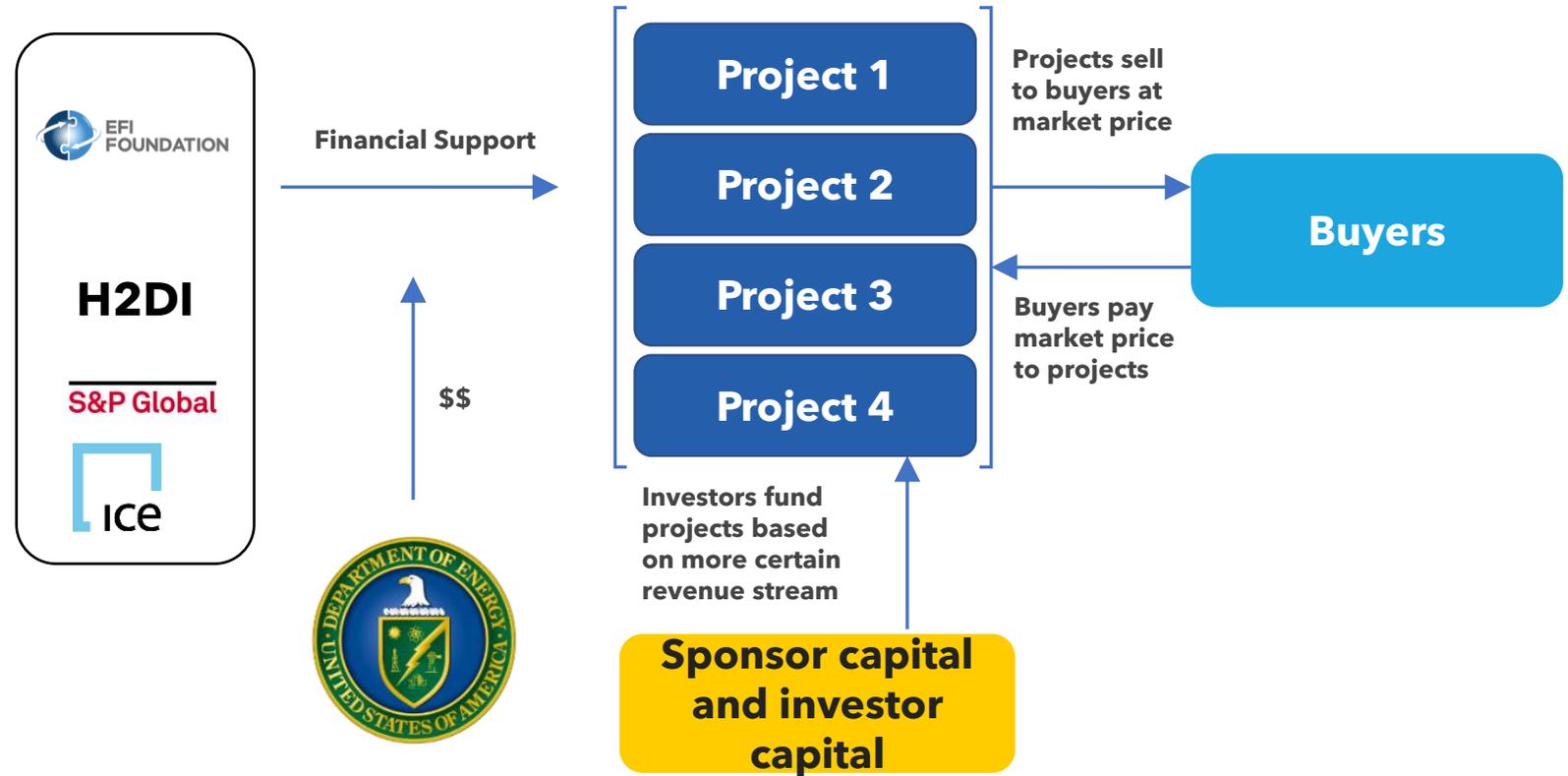
Bloomberg
NEW ENERGY FINANCE



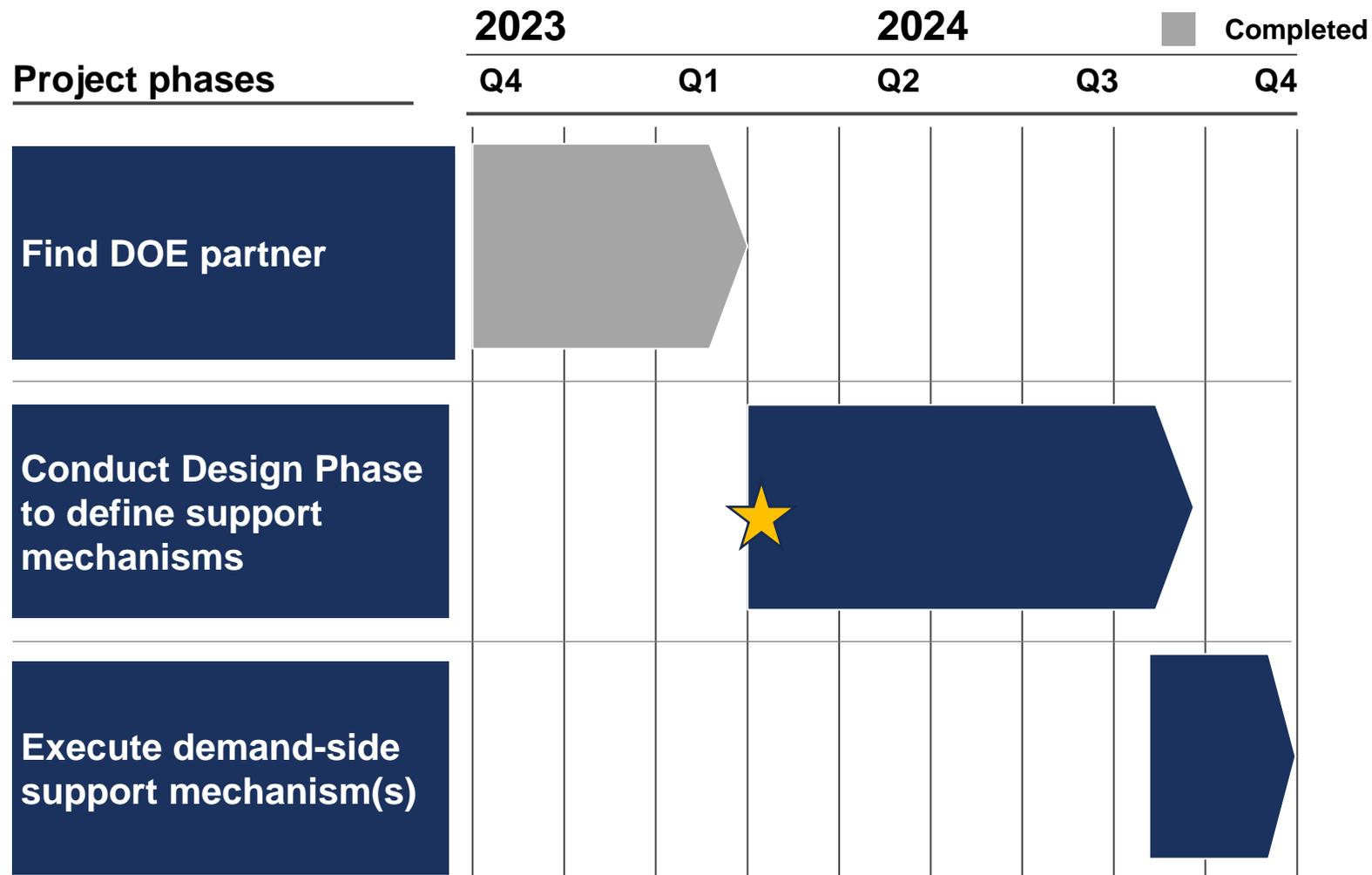
DOE will work with the H2DI consortium to provide the demand signal needed for market certainty at our Hydrogen Hubs

OCED announced the selection of the H2DI consortium, led by EFI Foundation, S&P, and ICE to support design of a demand-side program

Announcement kicks off a 6-9 month Design Phase to determine most catalytic demand-side mechanism



Where we are



With the Consortium selected, DOE is moving into the Design Phase of this work

Four workstreams to tackle the big questions

Big question	Workstream	Description
Which demand-side mechanism(s) can unlock investment and catalyze market formation?	H2 market analysis	Determining the most catalytic way to allocate funds to derisk Hub projects and seed a mature hydrogen market for a variety of end uses
	Mechanism design and financial analysis	Translating results of market analysis and insights on maturity of each potential offtake market into specific demand-side financial instruments that derisk projects
	Stakeholder engagement	Incorporating perspectives from Hubs and their participants, developers, buyers, and commodity markets and project finance practitioners.
How can we execute those mechanisms?	Organization design, operations, and governance	Designing and staffing the Independent Entity needed for execution and to whom the Execution Phase OT agreements will eventually be awarded



Demand-side support can unlock hub projects and catalyze broader market formation

Our primary imperative: Derisk projects at Hubs

- “Zero-to-one” impact that unlocks FID that would not have been possible otherwise
- Given capped funding, can support a handful of small projects

Our related objective: Catalyze broader market maturity

- Given current state of the market, a fully liquid hydrogen commodity market may be far off
- Publishing key terms of agreements could build price transparency and contract standardization



Discussion / Q&A

Our primary imperative: Derisk Hub-affiliated projects

- “Zero-to-one” impact that unlocks FID that would not have been possible otherwise
- Given capped funding, we likely can only support a handful of small projects

Our related objective: Catalyze broader market maturity

Key questions:

- **Price transparency:** What sorts of mechanisms would best promote clean hydrogen price transparency?
- **Contract standardization:** How can mechanisms best support standard commercial terms for clean hydrogen?
- **Unique role:** Outside of directly funding projects, how else can we utilize this Entity’s unique role in the market to help the broader hydrogen economy?

Please enter questions / comments via chat for discussion during Q&A



H2Hubs Resources

Regional Clean Hydrogen Hubs

- [Program Page](#)
- [Press Release](#)
- [Overview of Selected Projects](#)
- [Local Engagement Opportunities](#)
- [OCED CBP fact sheet](#)

Demand-Side Support Initiative for Clean Hydrogen

- [Request for Proposals \(RFP\)](#)
- [Video: OCED Update on Demand-Side Support Initiative](#)

Additional Clean Hydrogen Resources

- [U.S. National Clean Hydrogen Strategy and Roadmap](#)
- [Hydrogen Interagency Task Force](#)
- [Clean Hydrogen Pathways to Commercial Liftoff Report](#)
- [Hydrogen Shot](#)

Additional DOE Resources

- [Office of Economic Impact and Diversity assistance to advance equity & CBP in communities](#)
- [Office of Energy Jobs technical assistance to advance CBP jobs, labor & skilled workforce](#)



Other thoughts on the
demand-side initiative?
Get in touch with H2DI
at agkizer@h2di.org



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energy.gov/OCED

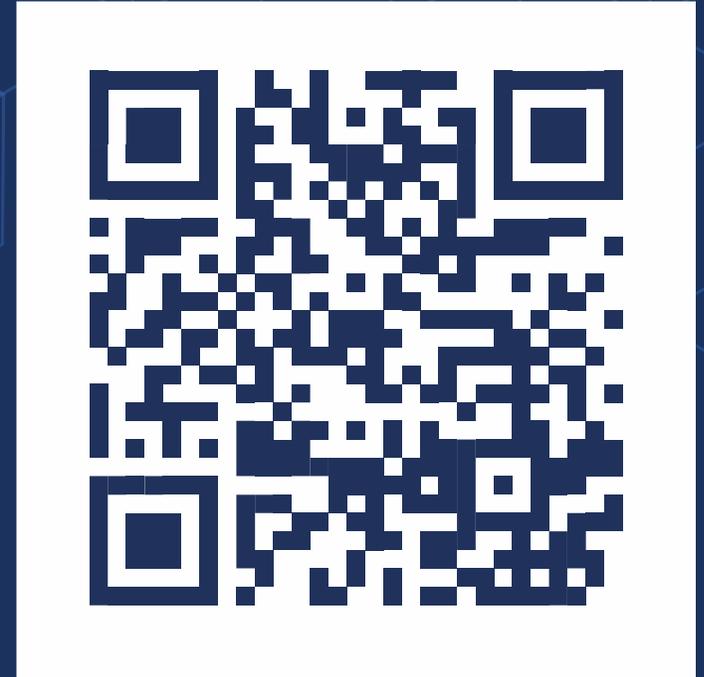
For more information, please contact oced@hq.doe.gov

Thank you!



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