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Office of Clean Energy Demonstrations

THE OFFICE OF CLEAN ENERGY DEMONSTRATIONS



Briefing: H2Hubs Demand-side Initiative

DRAFT – PRELIMINARY

Office of Clean Energy Demonstrations

U.S. Department of Energy

Agenda

- 1 Overview of H2Hubs demand-side support program**
- 2 Review of findings from Request for Information**





The history of energy is that demand formation always lags supply, particularly when a novel source of energy is involved. No procurement officer ever got fired for buying energy this year the exact same way they bought it last year.

- David Crane, Under Secretary for Infrastructure



Historically, innovation policies have centered around supply-side economic tools...however, economic evidence supports the role that demand-side support can play... [to] accelerate market scaling.

- White House Council of Economic Advisors



Billions in funding for clean energy must become trillions in capital investments by 2050

Government Infrastructure and Climate Funding in Context

Incremental capital investment required to reach net-zero in the U.S. (\$10T)¹

Inflation Reduction Act Clean Energy investment (\$370B)

Bipartisan Infrastructure Law Funding to DOE (\$62B)

Recent legislation is providing **hundreds of billions** to build clean energy supply...

Reaching the scale we need means achieving **market liftoff** that unlocks trillions of private sector investment



Private capital is being pledged but not deployed at the necessary speed and scale

While unprecedented funding has been pledged and raised for clean energy...



\$130 trillion pledged by Glasgow Financial Alliance for Net Zero at COP26 from 450+ financial institutions to transition to net zero by 2050¹



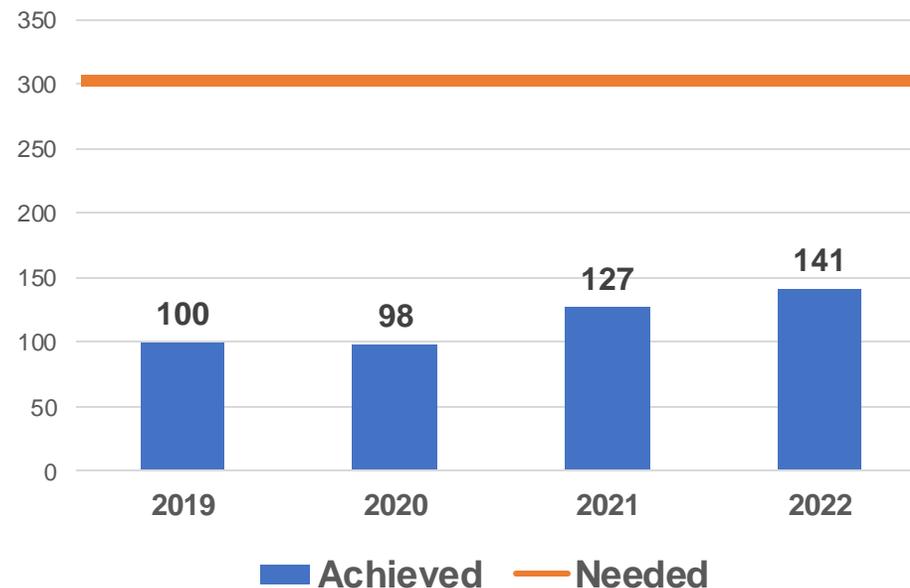
\$1 trillion pledged by JP Morgan for green initiatives that support climate action in 2021²



\$54 billion raised by VC/PE for climate tech in 2021³

Capital being deployed is substantially lower than required to achieve goals

U.S. investment flows into energy transition projects, (\$B)⁴



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**



Delivering net zero requires a total mobilization of public and private capital To get there, we must build sustainable and reliable energy markets

What we **need**

\$300B

**Annual incremental
capital investment
needed for net-zero U.S.
by 2050**

Where we **are**

\$140B

**2022 investment flows
into clean energy projects in
the U.S.**

Challenges

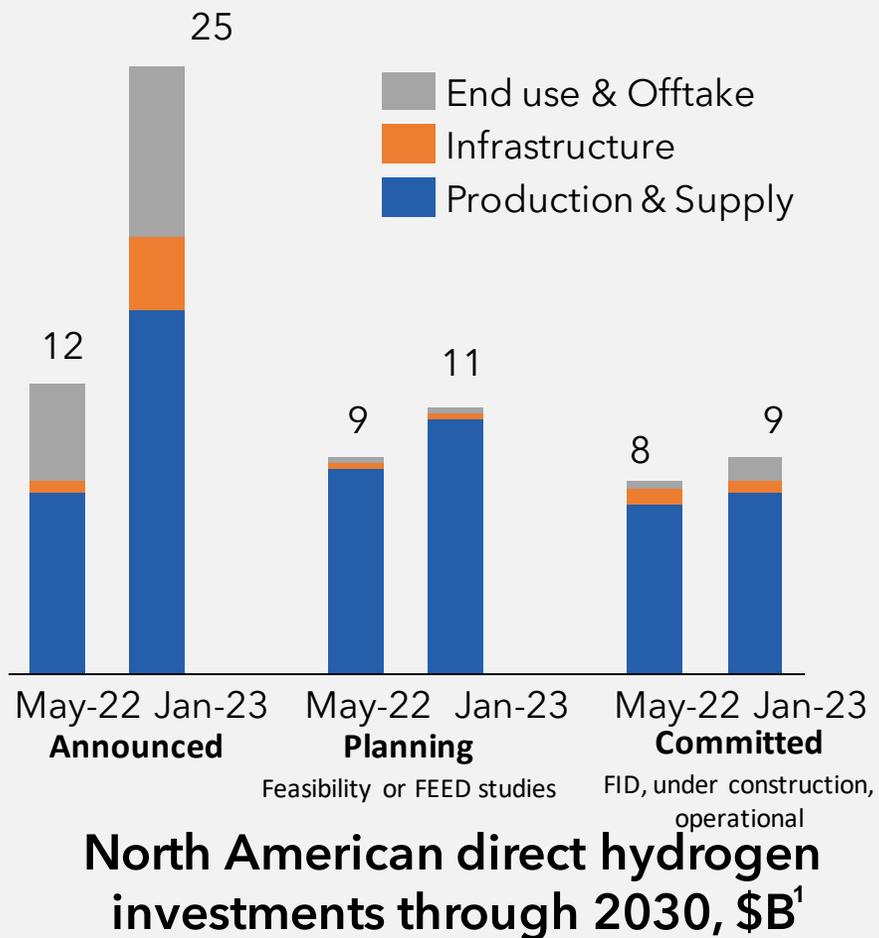


**We need to translate investor
interest into investible
projects with acceptable
risk/reward**

The need: Fostering a commercial environment conducive to large-scale investment for early deployments



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



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

Clean H2 Strategy and Roadmap emphasized the need to “**avoid stranded assets by creating demand certainty**” and listed leveraging “data gathered from the [hydrogen] hubs” to “**identify optimal approaches to market liftoff, such as using contracts for difference**” as a key part of the hubs program

DOE National Clean Hydrogen Strategy and Roadmap

“Scaling the market will require **continuing work on addressing demand-side challenges**



“Recent federal incentives may not create adequate demand to drive national hydrogen market formation; additional policy and regulatory actions are needed.

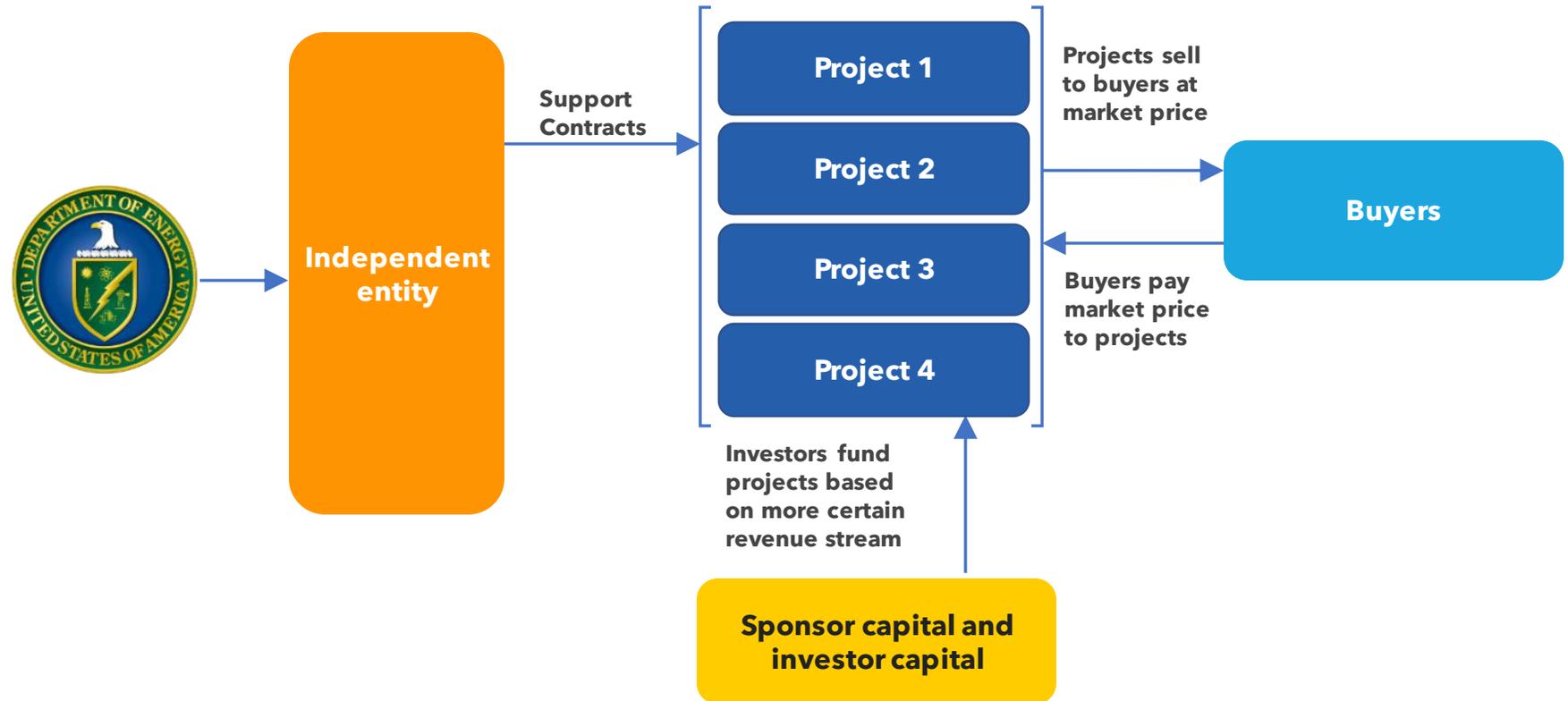


“Today, investments in production outpace offtake, and **many offtakers are hesitant to sign long-term contracts.**

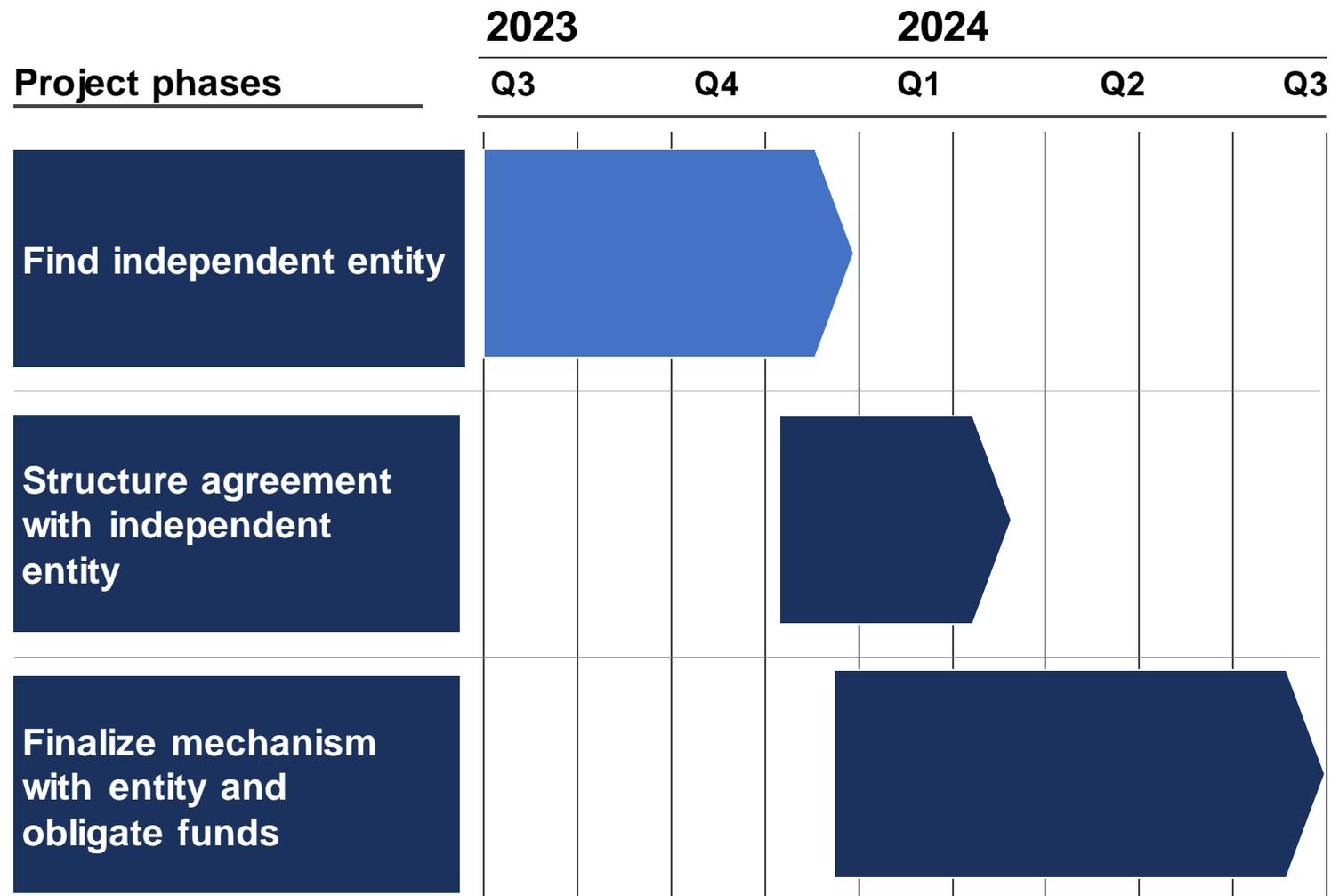


DOE will provide the demand signal needed for market certainty at our Hydrogen Hubs

DOE plans to use up to **\$500 million** **\$1 billion** in funding to seed revenue certainty for clean hydrogen projects at DOE Hydrogen Hubs



Finding the right independent partner is the first step



DOE will release an RFP in the late summer timeframe to find an independent not-for-profit entity capable of doing this important work



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- 1 Overview of H2Hubs demand-side support program
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RFI asked questions on mechanism design and implementation (1/2)

Mechanism design questions

- Most effective mechanisms for DOE to catalyze durable, bankable demand at H2Hubs?
 - Pay-for-difference contracts
 - Fixed level of support (e.g., fixed \$/kg amount)
 - Funding to support feasibility analysis
 - “Market-maker” for clean hydrogen
 - Other
- What competitive process should be used to select projects?
 - **Reverse auction** in which projects compete to bid the lowest level of support they need to make their project viable
 - **Request for proposal-like process** in which projects apply and are selected based on a variety of factors
 - **Eligibility-based process** in which all projects that meet certain threshold requirements receive some form of support
 - **Other**
- How can DOE design demand-side support to account for other kinds of support that H2Hubs projects may receive (e.g., tax credits, state and local government incentives, DOE cooperative agreement funding)?
- How can DOE structure demand-side support for H2Hubs to best catalyze the formation of a mature commodity market for clean hydrogen?



RFI asked questions on mechanism design and implementation (2/2)

Implementation questions

- If DOE were to establish a demand-side support mechanism for H2Hubs with an independent implementing entity or entities, **what capabilities and qualifications** should DOE prioritize when selecting an entity or entities? Should DOE **seek a single entity with national scope or several entities with regional scopes**?
- **What existing entities could administer and oversee** the demand-side support mechanism? If no existing entity currently exists with the necessary capacity or expertise, how long would it take to establish such an entity or entities? What are the **necessary areas of expertise for DOE to prioritize in selecting an independent entity**?
- What are the **risks to DOE in partnering with an independent entity** to administer a demand-side support mechanism? **What governance structures and guardrails** should DOE consider in designing a demand-side support mechanism to help maximize impact and minimize implementation risk? Are there any **models DOE should look to** in establishing a governance structure?



We received 118 submissions across a wide range of respondents



- Mining / manufacturing / chemicals
- Hydrogen start-up
- Green fuels
- Utility
- IPP Hydrogen developer
- Oil & gas
- Industrial gas company
- Industry group
- NGO
- Other
- Government
- Market maker / exchange
- Think tank
- Academia



Summary: Areas of alignment and divergence

For a majority of respondents...

- **There is a need for demand-side support for clean hydrogen.** Overwhelming majority of respondents spoke to a need for durable demand for clean hydrogen and many were explicitly supportive of a DOE demand-side effort
- **Pay-for-difference or “market maker”** mechanisms were identified as the most effective method for demand-side support
- **Working through a single independent entity with national focus** was cited as the best way to support projects
- **Demand-side measures should “stack”** with other forms of support (e.g., 45V, cooperative agreements)
- **\$500M to \$1B can only support a limited number of projects**, increasing the need for targeted program design that accounts for regional dynamics

Lack of consensus on...

- **Whether support should go to the producer or the buyer** of clean hydrogen
- **Whether to target hydrogen itself or derivatives** like ammonia, methanol, and SAF
- **How or if to consider carbon intensity** of supported projects (beyond existing H2Hubs requirements)
- **How long an independent entity should exist.** (e.g., support projects and wind down or play a longer-term role in the clean hydrogen market)



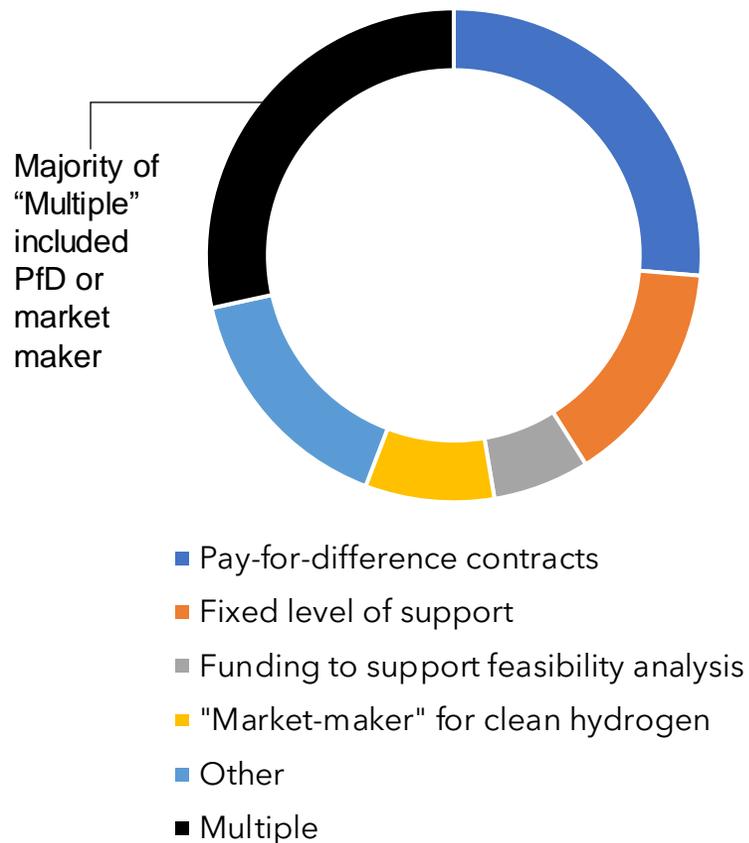
Summary: Implications for demand-side support program

- **Pay-for-difference or market-maker structure** in which DOE makes up gap between buyer willingness-to-pay and what projects need to construct garnered the most support
- Executing a demand-side mechanism will **require a high level of operational ability and commercial contracting / market expertise** to be successful
- While majority of respondents favored a single independent implementing entity with a national scope, **accounting for regional differences between Hubs** will be an important design factor
- Several respondents indicated **interest in responding to the RFP** for an independent entity or otherwise being involved in the entity



Mechanism design: Most effective demand-side support measures

Respondents' preferred support method

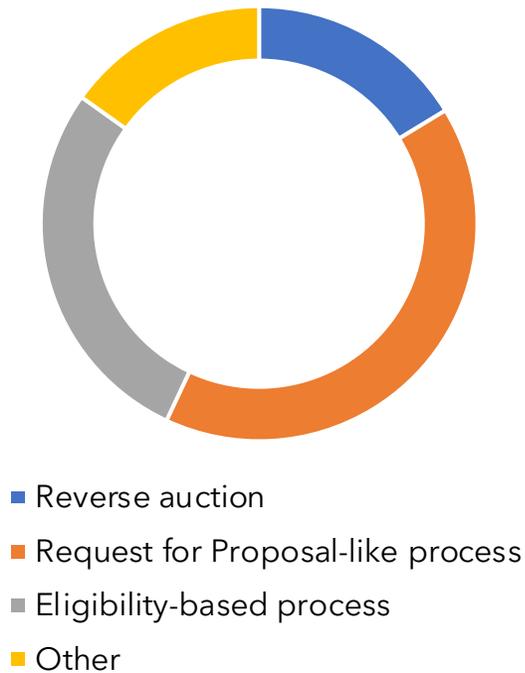


N = 96 (vs. 118 total respondents)

- Majority of respondents favored pay-for-difference or "market maker" approach in which **DOE funding makes up gap in market-determined price**
- **No clear consensus** over whether subsidy should be directed to the producer (to be able to offer a lower price) or the buyer (so they can pay a higher price)
- Fixed level of support (\$/kg) to projects runs the **risk of overshooting or undershooting support amount** and duplicates 45V, but may be easier to implement
- Several respondents called for **support for connective infrastructure and/or hardware** (e.g., FCEV trucks, H2-ready boilers / turbines)
- Some respondents called for **hub-specific measures** to account for regional differences in infrastructure, demand sectors, etc.
- Some respondents called for **eligibility for support beyond direct hub funding recipients**

Mechanism design: Best competitive process to select projects

Respondents' preferred selection method



N = 82 (vs. 118 total respondents)

- **Developers tended to favor an RFP-like structure** to select projects, though market makers, exchanges, and academia preferred reverse auctions
- Concerns that a simple reverse auction would lead to “race for the bottom” in which **nonviable projects might win underbid then fail to construct**
- Suggestion of **hybrid approach in which bidders to a reverse auction are pre-qualified** so only relatively mature projects with experienced teams can bid
- Several respondents suggested focusing support on a small number of projects to avoid **risk of “dilution” of funding if spread over too many projects**
- No consensus over **how CI should be treated** (presume all Hub projects are “clean” vs. select for lower-CI projects)

Mechanism design: Accounting for other forms of support to projects

- Most respondents said **demand-side support should be “stackable”** with other support (e.g., 45V, Hubs cooperative agreements)
- Competitive process can be structured to **ensure projects are not over-subsidized**, especially for auctions
- Little consensus on whether to correct for state and local clean hydrogen support

“ We recommend that the demand-side support be stackable with other kinds of support the H2Hubs may receive. Enabling projects to stack incentives will align incentives for first movers while spurring investment and activity across the hydrogen value chain

“ A reverse auction method requires that bidders take alternate funding into account in order to submit the lowest bid and maximize their chance of winning... Keeping demand proposals specific to individual hubs will ensure all applicants are within the same funding region.

“ In our view, to incentivize an efficient marketplace and encourage co-investment by State and local entities given the limited funding available, not adjusting for such incentives is appropriate



Mechanism design: Best way to catalyze formation of a mature clean hydrogen commodity market

- Use of **publicized “standard offer terms”** across supported projects can contribute to standardization
- **Significant engagement on standard contract terms** will be necessary before projects are selected to ensure a workable contract
- **Publishing prices** can be useful in catalyzing regional markets

“ Ensuring clear, published price signals as well as standard contract terms will be critical to catalyze a mature market...we recommend a “take or pay” obligation

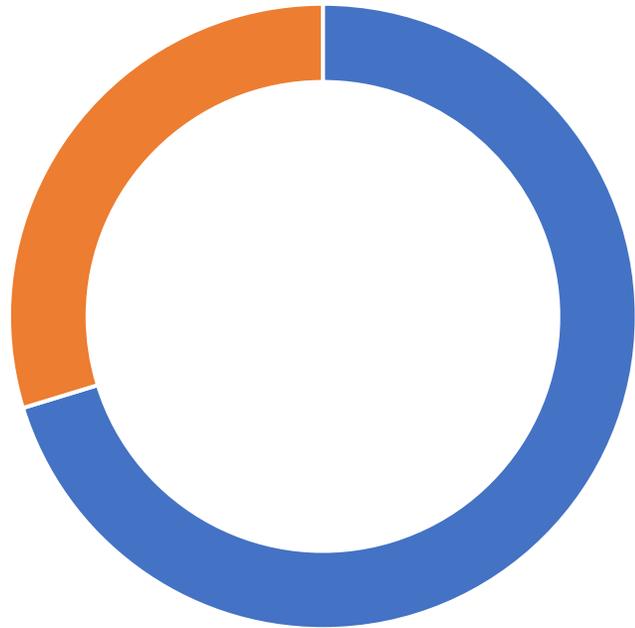
“ In preparation for [a similar mechanism abroad], for example, an international market consultation was held, which garnered over 1,000 participants worldwide.

“ Contract negotiations for hydrogen offtake via products with actionable terms and conditions will at a minimum require: contract term, hydrogen load profiles and volume, delivery location, and a pricing index reference. A regional and sectoral approach has a meaningful advantage to address these contracting requirements



Implementation: Qualifications needed for implementing entity

Respondents' preferred entity type



- Single entity with national scope
- Several entities with regional scope

N = 37 (vs. 118 total respondents)

- “ A national service provider could be centered around priority, low-carbon end-users and uses...State Governments and state level priority end-users (e.g., ammonia trade association, steel, and heavy industries, etc.) could provide regional support to the selected third party.
- “ [The entity] should have experience in dealing with procurement, contract law and state aid law, experience in the development and operation of gas markets, experience in commodity trading as well as engagement at the interface between private and public (PPP) entities.
- “ A new entity [should be established] to administer and oversee [the] demand-side support mechanism, primarily to ensure it possesses vital large-scale financial management expertise alongside the capabilities outlined previously.

Implementation: Risks to using independent entity and suggested governance structures and guardrails

“ Any independent entity that DOE partners with must have a comprehensive, balanced approach and methodology with a representative, flexible governance structure.

“ Considerations to evaluate in partnering with different entities include the tradeoff between industry market knowledge and operating independence against the risk of an unsatisfactory outcome due to lack of sufficient oversight.

RFI respondents highlighted potential risks, including:

- The **dilution of federal funding** going to overhead costs and implementation delays
- Designing a program that **favors certain producers**, rather than best options
- **Information/data security**
- **Conflict of interest**

Suggested guardrails included:

- **Alignment** between DOE's programs and federal regulatory certainty
- Allowing the third party to operate independently, while DOE maintains **strong governance oversight** including control over funding disbursement and selection criteria
- The independent entity should have **no revenue ties to applicants**
- **Prioritize non-profit organizations** with commercial expertise



Questions / comments?

Email us at
H2Hubs-Demand-Side@hq.doe.gov



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