Sparking the U.S. Clean Hydrogen Market

EXPLORING DEMAND-SIDE SUPPORT FOR CLEAN HYDROGEN

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Executive Summary

Clean hydrogen will play a pivotal role in decarbonizing emissions-intensive industries and processes that lack other cost-effective abatement alternatives. A federal tax credit established in the Inflation Reduction Act of 2022, the Section 45V tax credit, creates a supply-side support for Department of Energy’s Regional Clean Hydrogen Hubs program. Yet, challenges on both the supply and demand sides of the equation must be addressed.

Avoiding a supply and demand mismatch is critical. Uncertainty about whether clean hydrogen producers will find customers can discourage investment and undermine the impact of supply-side incentives.

To help overcome demand-side barriers, the Department of Energy’s Office of Clean Energy Demonstrations (OCED) is directing $1 billion in federal funding to provide demand-side support for clean hydrogen as part of the Regional Clean Hydrogen Hubs program. This initiative utilizes a portion of Hub funding from the bipartisan Infrastructure Investment and Jobs Act of 2021. The aim is to nurture a healthy market for clean hydrogen by promoting long-term offtake commitments that can help provide certainty for hydrogen producers, lowering barriers for hydrogen end-users, facilitating standardized hydrogen contracts, and enhancing market liquidity and transparency. The Department’s challenge now is to strategically allocate the $1 billion it has set aside for demand-side support to achieve these multifaceted goals.

This issue brief offers a comprehensive overview of the demand-side support tools under consideration and identifies several crucial factors to consider when designing specific demand-side mechanisms and programs.

The discussion that follows is informed by insights from a workshop hosted by the Bipartisan Policy Center (BPC) in July 2023. The workshop brought together a diverse group of experts, including hydrogen industry leaders, end-users, commodity specialists, and representatives from different political backgrounds.

Topics Covered in this Issue Brief

- Risks currently faced by hydrogen producers and potential offtakers.
- Advantages, disadvantages, and distinct attributes of different demand-side tools.
- Real-world deployment examples for a range of demand-side tools.
- Challenges unique to the U.S. hydrogen market.
- Crucial program design considerations.
THREE KEY TAKEAWAYS

Bipartisan Support is Vital

A program that is viewed as controversial or politically fraught will fail to gain the trust needed to de-risk projects and drive investment decisions. Bipartisan support for demand-side programs will increase private sector confidence that federal support will be available over the long term.

Support Should Not be Spread Too Thin

Making program eligibility overly broad or utilizing certain types of tools will result in limited federal resources being spread too thin across too many entities to drive impact. Rather than providing small subsidies to many possible end-users, support needs to be targeted strategically—for example, by cultivating offtakers with high potential demand or finalizing long term contracts.

Administrative Complexity is an Important Consideration in Program Design

The tools available to provide demand-side support for clean hydrogen vary widely in terms of their administrative complexity. Some tools require only the straightforward distribution of funds; others are far more involved because they engage with the complex processes of procuring and reselling hydrogen. Beyond assessing each tool’s effectiveness for addressing particular risks, evaluating whether the complexity of administering the tool necessitates specialized expertise, additional resources, or increased time for implementation is important.
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21 **KEY TAKEAWAYS FROM THE BPC WORKSHOP**
Introduction

Clean hydrogen is widely viewed as a key tool for decarbonizing certain emissions-intensive but hard-to-abate sectors, including some modes of transportation, and certain industrial processes. Under a net-zero-by-2050 scenario, the U.S. Department of Energy (DOE) projects that demand for hydrogen may grow up to five times above current levels.\(^1\) Policy “push” drivers, such as grants for demonstration projects and production tax credits (i.e. Section 45V), can kickstart investments in hydrogen production. Even with these incentives, challenges on the demand-side of the equation can threaten the near- and long-term viability of new hydrogen production projects.

Simply put, project developers need to have confidence that there will be customers for their product at a price that delivers an adequate return on investment to secure financing and proceed to construction. Without some certainty that there is a viable market for clean hydrogen, private lenders will deem these projects too risky. Long-term offtake agreements can provide a level of demand certainty but require creditworthy customers willing to enter into them.

Potential hydrogen customers also face a myriad of risks that could prevent them from entering into offtake agreements. If DOE’s Hydrogen Shot cost targets are met, the price of clean hydrogen will drop precipitously from approximately $5 per kilogram (kg) in 2020 to $1/kg by 2030.\(^2\)

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The expectation of falling prices can make offtake agreements based on current prices uneconomical for the offtaker later. Additionally, while the Inflation Reduction Act provides tax incentives to reduce the cost of specific types of equipment, such as fuel cells, the costs of transitioning other end-uses to run on hydrogen can still be prohibitive for potential end-users.

Given the nascency of clean hydrogen producers, end-users also face supply risk: if hydrogen producers go out of business, the users may have nowhere to turn for fuel. Finally, lack of price transparency in the hydrogen market adds further uncertainty. Project risk is very difficult to assess when both the price of hydrogen and the price customers will be willing to pay for hydrogen are unknown.

RISKS FACED BY POTENTIAL HYDROGEN OFFTAKERS:

• Expectation of falling prices can render offtake agreements based on current prices uneconomical in the future.
• Costs for offtakers to transition their operations to utilize hydrogen as a fuel source can be prohibitive.
• Nascency of the hydrogen industry and lack of liquidity introduce supply risk for offtakers.
• Lack of price transparency in the hydrogen market creates uncertainty regarding investment decisions.

To catalyze offtake agreements and de-risk clean hydrogen projects, DOE’s Office of Clean Energy Demonstrations (OCED) signaled its intent to establish a demand-side support mechanism that will provide up to $1 billion of support to projects affiliated with DOE’s Regional Clean Hydrogen Hubs (H2Hubs) over a multi-year period. In a notice of intent (NOI) released in July 2023, OCED states that it is considering an array of tools to help fill the demand gap for clean hydrogen, ranging from price support and financial incentives to federal procurement of hydrogen and resale back to the market. Additionally, the NOI states that OCED is considering whether a third-party entity (or entities) should be tasked with administering the tool and is seeking input on important design aspects and considerations.

To flesh out design considerations for demand-side support mechanisms, BPC hosted a workshop in July 2023 with stakeholders including hydrogen
producers, hydrogen end-users, commodity sector experts, federal agency experts, and NGOs from across the political spectrum. This document provides an explanation of the different demand-side tools that have been proposed for clean hydrogen and summarizes findings from the BPC workshop.

On September 14, 2023 DOE released a Request for Proposal soliciting an independent entity to administer the demand-side support program. Applications are due on October 26th, 2023 and selection notification is expected on November 30th, 2023.

Demystifying Hydrogen Demand-Side Support Tools

This section offers a brief explanation of how each support tool works, examples of past applications, and summarizes key features. Note that in the list of tools below, the demand-support entity could be the federal government or another type of entity, such as a private company, non-governmental organization, or consortium. However, the DOE Request for Proposal states the entity (or entities) should be a non-governmental third-party that is initially capitalized with federal H2Hub funding.4

- **Market-maker**: Demand-support entity buys hydrogen from producers and resells it to end-users, absorbing losses (if the selling price is lower than the purchase price) or collecting gains (if the selling price is higher than the purchase price).
- **Pay-for-difference**: Demand-support entity reimburses hydrogen producers for the difference if the market price for hydrogen falls below a set price floor.
- **Price floor with procurement**: Demand-support entity buys hydrogen from producers at a set price if the market price falls below the price floor.
- **Fixed level of support for producers**: Demand-support entity pays producers a fixed price per kg of hydrogen produced or delivered.
- **Fixed level of support for offtakers**: Demand-support entity pays offtakers a fixed price per kg of hydrogen purchased.
- **Offtake backstop**: Demand-support entity guarantees to fulfill the obligations of an offtake agreement for the hydrogen producer if the offtaker fails to follow through on the agreement.

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MARKET-MAKER

The demand-support entity is an intermediary, buying hydrogen from producers under long-term offtake agreements and selling the hydrogen to end-users in short-term transactions. The support entity incurs any losses or gains from the difference in the price it pays to procure hydrogen and the price it receives when it sells hydrogen. An advantage of this tool is that the intermediary can curate contracts that work for both producers and offtakers. A disadvantage is the requirement for extensive and competent administration to conduct transactions, as well as the possible need for physical infrastructure to store and transport hydrogen.

Example

The European Union’s H2Global Instrument is a market-maker tool for clean hydrogen expected to begin procurement in 2024. H2Global establishes a third-party intermediary, Hintco, that will buy clean hydrogen derivatives (green ammonia, green methanol, green e-kerosene) from producers via long-term offtake agreements awarded through a reverse auction. The hydrogen derivatives will then be sold to end-users in short-term transactions using a regular auction. If the price of procuring the green hydrogen is more than the price of selling it, Hintco will lose money on the transaction and vice versa. The auction design maximizes price transparency by revealing the lowest price hydrogen producers will sell at and the highest price offtakers will purchase at—in this way it also minimizes the cost of the subsidy per transaction. Additionally, the H2Global model includes separate auctions for different end-use sectors.

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5 H2Global Stiftung. (NA). The H2Global Instrument. https://www.h2-global.de/project/h2g-mechanism

6 In a reverse auction, multiple sellers compete to win a buyer's business by offering increasingly lower prices. The seller with the lowest bid at the end of the auction wins the contract or sale.
**Key aspects**

- Procures hydrogen derivatives rather than sending funds to producers.
- Manages the hydrogen between procurement and resale.
- Expertise needed to manage logistical and administrative requirements.
- Provides producers with price and offtaker certainty.
- Protects customers from supply/delivery risk compared to an offtake agreement, which may not guarantee that an individual producer comes through.
- Tailors contract terms to meet the needs of producers and offtakers.
- Auction design maximizes price transparency.
- Subject to uncertainty about the spread between buy and sell transactions, due to the variability of market prices.
- Protects hydrogen producers from input cost variability (e.g., cost of electricity and water).
**PAY-FOR-DIFFERENCE**

The demand-support entity enters into an agreement with a hydrogen producer to set a reference price, which acts as a price floor. If the producer sells hydrogen below the reference price, the support entity reimburses the producer for the difference. If the producer finds a buyer above the reference price, they sell to that buyer and the support entity is not involved. This form of support protects producers from unexpected price drops and can be especially valuable in markets that experience high price volatility.

**Examples**

- The U.S. Department of Agriculture (USDA) makes payments to farmers under its Price Loss Coverage (PLC) program when the market price of a covered agricultural commodity falls below a reference price set by the USDA.\(^7\) For example, the reference price for corn is set at $3.70 per bushel. If the market price falls to $3.50 per bushel, the farmer sells the corn at $3.50 and receives a payment from USDA equal to $0.20 per bushel. The program is broad-based— producers opt-in to become eligible for support.

- To support offshore wind development, the United Kingdom established the Low Carbon Contracts Company (LCCC), which provides payments to offshore wind generators when the market price for electricity falls below an agreed reference price.\(^8\) This approach, called “contract-for-differences,” is a variation of the “pay-for-difference” model in that the price floor also acts as a price ceiling: if the market price exceeds the reference price, offshore wind generators make payments to the LCCC. Because energy prices across Europe have been high, contract-for-differences agreements generated more than £1 billion for the LCCC between April 2022 and March 2023.\(^9\)

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Key aspects

- Sends funds to producers but without the need to procure and manage hydrogen.
- Efficient because support is not provided if market prices are sufficiently high and producers don’t need help.
- Requires agreement on a fair yet effective reference price, which can be difficult to determine in immature and illiquid markets.
- Does not directly provide offtakers for the product.
- Has uncertain costs because of the unpredictability and potentially high variability of market prices.
- Creates a moral hazard if producers are not incentivized to become cost-competitive and seek out the highest paying customers.
- Does not protect producers from input cost variability (e.g., cost of electricity and water). If these costs are high, the producer can lose money even at the reference price.
- Has traditionally been provided for products that need protection from price volatility (such as agricultural commodities) rather than products that need support to be price competitive.
PRICE FLOOR WITH PROCUREMENT

The demand-support entity purchases hydrogen from producers at a set reference price if and only if the market price falls below the reference price floor. Like pay-for-differences, producers are guaranteed to receive a set minimum price for their hydrogen. The key difference, however, is that the support entity buys and takes possession of the hydrogen (rather than simply making a payment based on a price difference). The support entity must be prepared to store and manage the hydrogen. If the market price is generally below the reference price, the support entity may end up procuring all or most of the hydrogen made by supported producers.

Example

Before shifting to a pay-for-difference design with the PLC program in 2014, USDA often procured agricultural commodities when market prices for those commodities were low. For example, the federal government would buy dairy products if the market price for these products fell below a reference price of $1.05/pound for butter, $1.13/pound for cheddar cheese, and $0.80/pound for nonfat dry milk. Food procured under this mechanism was distributed through government food assistance programs.

Key aspects

• Involves procuring the hydrogen rather than sending payments to producers.
• Support is not utilized if the market price stays above the reference price, but it is always provided if the market price is below the reference price
• Requires the demand-support provider to either resell or utilize the hydrogen it procures.
• Ensures that there is an offtaker for the product.
• Requires agreement on a fair yet effective reference price, which can be difficult to determine in immature and illiquid markets.
• Creates a moral hazard if producers are not incentivized to become cost-competitive and seek out the highest paying customer.
• Does not protect producers from input cost variability (e.g., cost of electricity and water). If these costs are high, the producer can lose money even at the reference price.
• Has uncertain costs because of the unpredictability and potentially high variability of market prices.
• Has traditionally been provided to products that need protection from price volatility (such as agricultural commodities) rather than commodities that need support to be price competitive.

**FIXED LEVEL OF SUPPORT FOR PRODUCERS**

The demand-support entity gives hydrogen producers a specified level of support per kilogram of hydrogen produced or delivered. This would function to some extent as a supply-side incentive and could be stacked on top of other incentives like the Section 45V hydrogen production tax credit. It would also help stimulate demand by making it possible for producers to reduce prices and still be profitable. The level of support could be the same for all producers or the level of support could vary based on specific factors such as choice of production pathway or emissions characteristics.

**Example**

The Inflation Reduction Act established a new tax credit for hydrogen production (under Section 45V of the U.S. tax code) that ranges from $0.60/kg to $3/kg depending on the emissions intensity of production pathway used. It is available to all hydrogen producers who meet certain emissions criteria.

**Key aspects**

- Sends funds to producers without requiring the support entity to procure hydrogen.
- Represents a direct subsidy that can allow producers to reduce prices and compete more effectively for offtakers.
- Does not directly incentivize demand or directly support offtakers.
- Difficult to estimate the cost of this support mechanism because it depends on future levels of hydrogen production.

**FIXED LEVEL OF SUPPORT FOR OFFTAKERS**

The demand-support entity makes payments to offtakers at a specified rate for each kilogram of hydrogen purchased. This policy would directly subsidize demand, complementing the Section 45V subsidy for production. It could help offtakers justify the investments needed to convert end-use equipment to run on hydrogen.

**Example**

The Inflation Reduction Act established a consumer tax credit for energy efficiency home improvements (under Section 25C of the U.S. tax code) that offsets between 10% and 30% of the cost of certain energy-efficient appliances, such as heat pumps. The policy is intended to make efficient appliances more attractive to consumers by subsidizing some of their higher upfront cost.
Key features

- Sends funds to offtakers rather than directly supporting producers or requiring the support entity to procure hydrogen.
- Directly incentivizes end-users to incur the costs to transition to hydrogen.
- Program costs are difficult to estimate because the overall support provided depends on how much hydrogen is purchased.

OFFTAKE BACKSTOP

The demand-support entity provides assurances to hydrogen producers by backstopping offtake agreements. If an offtaker fails to follow through on their side of the arrangement, for example, because the offtaker goes out of business, or lacks funds, or needs less hydrogen, the demand-support entity steps in and compensates the producer. This tool has sometimes been combined with other price support mechanisms, such as a pay-for-difference system, to ensure that the producer is paid even if an offtaker cannot be secured with the price support in place.

Example

The UK government’s Last Resort Offtaker (LRO) scheme assists electricity producers who have already entered into a contract-for-differences agreement by offering an alternative pathway to market for their electricity through a Backstop Power Purchase Agreement (BPPA). In effect, providing a safety net for producers who might struggle to secure power purchase agreements through traditional commercial channels. Under a BPPA, the electricity is sold at a specified discount below the market reference price. Its main goal is to ensure that new entrants always have a reliable market for their product.

Key aspects

- Does not directly incentivize demand or subsidize offtake agreements.
- Gives producers financial protection against failed offtake agreements.
- May require demand-support entity to procure hydrogen or find a new buyer if the backstop is utilized.
- Creates a moral hazard if producers are not incentivized to seek financially viable offtake agreements.

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BPC Workshop Summary: Key Considerations for Hydrogen Demand Support

BPC’s July 2023 workshop articulated objectives for DOE’s planned hydrogen demand initiative, identified crucial factors for designing demand-side support programs, and explored the pros and cons of different tools and approaches. Participants did not attempt to reach consensus on specific recommendations, rather shared insights and discussed trade-offs that DOE may find useful as it moves forward with its demand-side support program for clean hydrogen.

Goals of a Federal Hydrogen Demand-Side Support Program

Workshop participants identified several key goals for DOE’s hydrogen demand-side support program:

• Provide greater certainty about long-term offtakers for H2Hub hydrogen producers.
• Incentivize potential customers to adopt hydrogen as a fuel source.
• Catalyze standard contracts for the buying and selling of hydrogen.
• Develop a more liquid and transparent hydrogen market.
• Ensure that program design incorporates bipartisan principles.

As participants emphasized throughout the workshop, achieving these goals and kickstarting a hydrogen marketplace is a challenge with limited funding. While $1 billion in DOE funding represents a significant investment, there is an estimated $85–$215 billion investment gap through 2030 that needs to be filled for the U.S. hydrogen market to transition away from bilateral agreements and to a more standard commodity market with lower overall risk for both producers and offtakers. The challenge is how to utilize the $1 billion to crowd in as much private investment as possible.

SEVEN PROGRAM DESIGN CONSIDERATIONS

Getting the design details right for demand-side support tools and support entities is crucial. Participants discussed seven key considerations for determining how many projects receive support, which types of projects receive support, and what risks the support mitigates.

1. How can the program maintain bipartisan support?

Workshop participants agreed that building and maintaining bipartisan support is vital for ensuring long-term private sector confidence in the program and driving capital investments in the nascent clean hydrogen sector. Moreover, a mix of perspectives improves decision-making and increases the program’s effectiveness. From the outset, avoiding political red flags and including bipartisan oversight should be considered in the program’s design.

Establish an independent oversight board

The demand-support entity should establish an independent board of directors to oversee and advise the program and ensure accountability to Congress. This type of structure was included in the Foundation for Energy Security and Innovation, recently established under a provision the bipartisan CHIPS and Science Act of 2022, the Development Finance Corporation’s structure, and was recommended by BPC’s American Energy Innovation Council in its 2022 report. Candidates for an oversight board could be selected by the President or Secretary of Energy with the advice and consent of the Senate. Additionally, including private- and public-sector expertise on the board would increase overall program effectiveness, especially when dealing with investment decisions in public-private partnership structures, such as the H2Hubs.

Rely on emissions-based participation criteria already established under the Infrastructure Investment and Jobs Act (IIJA)

Multiple participants stressed the importance of relying on the IIJA’s already established criteria rather than creating new criteria. Specifically, projects that qualify as producing ‘clean hydrogen’ under the IIJA criteria should be eligible. Political criticism would likely ensue if funding were removed from the H2Hubs and directed only at specific types of projects. This would become even more controversial if new criteria were introduced that made an entire hub ineligible.


Ensure the process for receiving support is fair

Whether the process of selecting projects for support is competitive, criteria-based, or broad-based, participants agreed that a fair, consistent, and transparent process is vital. While program designs that use auctions or favor technologies with a high degree of commercial readiness might seem logical, attention to which types of projects or hubs might be disadvantaged as a result is also warranted.

2. Should the demand-side support program require hydrogen procurement or solely provide financial support?

A central point of deviation between the demand-side support tools described in this paper is whether they require the support entity to procure hydrogen (this is the case for the market-maker, price floor with procurement, and offtake backstop tools) versus making payments to producers or offtakers (as in the pay-for-differences approach or programs that offer a fixed subsidy to producers or offtakers). There was no consensus on the best approach among workshop participants. Both were seen as having advantages and disadvantages.

Procurement-based Tools

These kinds of tools guarantee an offtaker for the producer’s output and relieve the producer of needing to find a customer independently. In this way, these tools address the primary concern for hydrogen developers and immediately make the hydrogen projects less risky for investors. The market-maker approach also mitigates supply risk for offtakers by establishing a market where end-users can bid for hydrogen rather than relying on bilateral agreements with individual producers. Because the demand-support entity can provide long-term offtake commitments for producers, while also supporting short-term spot transactions for end-users, this approach can help establish a platform and framework for a self-sufficient hydrogen commodity market.

However, as workshop participants noted, procuring and managing substantial quantities of hydrogen would be administratively complicated, especially regarding physical delivery, transport, and storage. Another participant noted even if the demand-support entity avoids having to procure and physically take possession of the hydrogen, purchasing and reselling it introduces credit risk that requires additional risk management tools. Working through these administrative complexities may take time. For example, it has taken H2Global about three years from announcement to signing its first offtake agreement, leaving projects without support in the interim.¹⁵

**Payments-based Tools**

These tools are relatively simple to administer and can be set up quickly, which may be of first-order importance to demand-support entity. Additionally, the support entity will not have concerns regarding credit risk and risk management.

However, because producers will still need to find customers for their hydrogen, the financial support provided must be substantial enough to make hydrogen cost-competitive for end-users. This type of tool can only incentivize demand through prices; it does not entail short-term spot transactions or address supply risk for end-users as procurement tools can.

### 3. Should demand-side support be broad or targeted?

**Broad-based support**

While providing broad-based support to all H2Hub hydrogen producers or buyers would be simple to administer, participants were concerned that this approach would spread federal resources too thin. If broad-based support is offered but the total amount of support available is fixed, funds may dry up quickly and fail to provide the long-term certainty investors desire.

Many participants suggested providing long-term support to specific projects using a competitive selection process. However, opinions about which types of projects and which features should be prioritized in the competitive process varied.

**Targeted support to near-term end-users**

One idea was to concentrate support on projects or sectors that are closest to adopting clean hydrogen and therefore require less assistance to make the transition, thereby maximizing the volume of hydrogen production that can be incentivized by a given amount of support. In practice this would likely mean focusing on facilities or industries already using hydrogen, albeit hydrogen produced with a higher carbon intensity, and therefore would not need to make big investments in end-use equipment or infrastructure to switch to clean hydrogen. For example, ammonia production currently utilizes carbon-intensive hydrogen at scale. The main concern for ammonia producers in transitioning to clean hydrogen is the price difference. Subsidizing ammonia projects and offsetting the price difference could rapidly stimulate new offtake agreements when compared to funding projects that need to develop new methods to use hydrogen. However, some participants questioned whether subsidizing offtakers who are likely to transition in the near term anyway, even without government support, provides much added benefit.
Targeted support to high-potential end-users

Instead of aiding industries close to switching to clean hydrogen, some participants suggested supporting industries that have the potential to become significant offtakers of clean hydrogen but currently lack the necessary technology or operational capacity. For instance, the heavy-duty trucking sector stands out as a potential hydrogen user with the highest willingness to pay among all downstream applications analyzed in DOE’s report, “Pathways to Commercial Liftoff: Clean Hydrogen.” Moreover, as one participant noted, the Environmental Protection Agency’s proposed emissions regulations create additional incentives for commercial trucks to transition to cleaner fuels. However, this industry currently doesn’t use hydrogen at scale and would need time and resources to deploy fuel cell technology and infrastructure, which is not anticipated in the near term. Channeling support toward the trucking industry could help build a new customer base of high-paying offtakers who could anchor future demand for clean hydrogen. Even so, this might not immediately produce as many offtake agreements as focusing on industries that already use hydrogen.

4. Should demand-side support tools incorporate auctions?

One way to target support to specific projects while minimizing the cost of subsidies is to utilize an auction design, as the H2Global Instrument does as part of its market-maker approach. Auctions can be incorporated in a variety of tools to determine both which projects receive support and how much support is provided.

Value of auctions

On the supply side, reverse auctions can reward hydrogen producers who bid the lowest price and require the least support. On the demand side, auctions can award support to offtakers who bid the highest price and require the least support. For the market-maker tool, the gap between the lowest producer’s bid and the highest offtaker’s bid is the smallest amount that needs to be subsidized to close a transaction between two parties. Auctions can similarly be utilized to determine the reference price in the pay-for-differences and price-floor-with-procurement tools. Auctions are also valuable to nascent hydrogen markets overall because they promote price transparency by revealing the lowest price at which producers are willing to sell and the highest price at which offtakers are willing to buy. This is extremely valuable information for investors and project developers.


A vital principle in all auctions is that price should be the only differentiating factor between bids. If different types of producers (e.g., producers with lower and higher carbon intensities) enter a reverse auction and the support entity prefers one over the other (e.g. the producer with lower carbon intensity), a simple auction process will not capture this distinction and will only reward the lowest bidder. This is true for an auction with potential offtakers as well.

**Considerations for using auctions in the H2Hubs program**

While workshop participants saw considerable value in auctions, some of them questioned whether auctions would function correctly in the context of planned hydrogen hubs. Individual hubs may have a small number of participants, which would limit an auction’s effectiveness and could mean its results are not generalizable to the broader hydrogen market. Additionally, potential offtakers would likely have different end-uses for the hydrogen and could be at different technology-readiness levels, which would introduce considerations beyond price alone. (The discussion in the previous section regarding supporting clean hydrogen use by ammonia producers versus the heavy-duty trucking sector alludes to these kinds of considerations.) As seen in Figure #2, H2Global attempts to solve this issue by holding multiple offtaker auctions for each sector. However, this requires a much larger number of participants than may be present at individual hubs. H2Global instrument’s first auction was open to national and international bidders that offer the lowest costs.

Alternatively, auctions could be held across multiple hydrogen hubs to draw more participants, but this introduces new concerns. First, this approach is likely to be feasible only for tools that provide financial support but do not involve procurement, given the difficulty and added cost of delivering hydrogen across longer distances. Second, directing support to the lowest bidders across multiple hubs may give certain hubs an advantage. Those with the lowest input costs (e.g., for electricity and water) would likely outbid those with higher input costs and consume the bulk of the support. Further, certain hubs may have different types of end-users that differ in willingness to pay in the short run. Regional variation between hubs must be considered, as current prices may not represent long-term scale-up and decarbonization potential.

5. **Should the demand-side support tool be limited to hydrogen or include hydrogen derivatives?**

A question that applies to all tools is whether federal support should be provided only to hydrogen production or also provided to the production of hydrogen derivatives (as in the H2Global program). In the same way that the USDA provided support for dairy products such as butter to support milk producers, providing support for cleaner but more costly products, like ammonia, that utilize hydrogen can simultaneously increase demand for clean hydrogen and support clean hydrogen production. Unlike clean hydrogen, there are well established customer bases for hydrogen derivative products and their
prices are known. This can simplify the process of designing effective demand-side supports since it is easier to establish reference prices, locate customers for the items, and compare the cost of the conventional product with the version that uses clean hydrogen.

Overall, workshop participants agreed that DOE’s demand-side support program should support hydrogen and its derivatives.

6. Should DOE’s support tool focus on producers or offtakers?

Some tools (i.e., market-maker and pay-for-differences) cover the price gap between what producers are willing to sell for and what offtakers are willing to buy at, subsidizing both ends of the transaction. Other tools (i.e., price floor with procurement, fixed-level of support for producers, and offtake backstop) target producers, while still others (i.e., fixed-level of support for offtakers) subsidize only offtakers. Some workshop participants questioned whether the producer-focused tools effectively incentivize demand and catalyze offtake agreements.

As previously noted, the Section 45V hydrogen production tax credit incentivizes supply. Yet, there is no similar incentive for potential offtakers to incur the costs of purchasing clean hydrogen. Some participants strongly believe a hydrogen consumer tax credit or fixed level of support for offtakers is the missing ingredient. Either would directly reduce the cost of clean hydrogen to offtakers – as compared to tools that support producers in hopes that this support will be passed on in lower prices that eventually stimulate increased demand. Participants also suggested that federal support could be used to further subsidize the cost of the equipment and midstream infrastructure needed for offtakers to adopt hydrogen as a fuel source. This type of support would directly address one of the major barriers to increased demand: the costs to potential offtakers for switching to hydrogen.

7. Can funding be expanded?

Some participants noted that to accelerate clean hydrogen development and scale-up more effectively, federal funding for demand-side support should be increased beyond $1 billion. It was suggested that strategies could be explored for offsetting increased expenditures by raising revenue through fees or donations.

Bring in philanthropic capital

One participant proposed designing the demand-support entity so that it can accept philanthropic capital to increase the $1 billion in public funding and expand the program’s resource base. A participant noted that other federal programs mix public and private capital – for example, to make small business equity investments – to incentivize private investment. However,
OCED’s demand-side program does not include equity investments and is unlikely to generate a return on investment. Furthermore, it is unclear whether philanthropic capital would be interested in supporting a program that subsidizes specific clean hydrogen producers or end-users.

Fee structure

Participants discussed the idea that the support entity could charge a fee to producers or offtakers who collect demand-side support, such as 2% of the transaction. While transaction fees are common in commodity trading and would provide the support entity with some revenue, this approach would inherently reduce incentives for the producer or end-user and could be prohibitive for certain projects. Furthermore, because DOE’s demand-side support tool is primarily a subsidy program and the market price of clean hydrogen is not expected to rise above an effective reference price, a fee could delay but not prevent program insolvency.

Key Takeaways from the BPC Workshop

BIPARTISAN SUPPORT FOR DEMAND-SIDE PROGRAMS IS VITAL

A recurrent theme throughout the workshop was the importance of establishing and maintaining bipartisan support for DOE’s demand-side programs. Such support is seen as crucial for building private sector confidence in the staying power and effectiveness of federal programs. Drawing from analogous experience in other areas, there was wide support among workshop participants for the proposal to establish an independent board of directors. Participants also agreed that it would be important to avoid political red flags, such as deviating from congressional intent with respect to the H2Hubs program or implementing project selection processes that could be seen as inequitable or opaque.
DEMAND-SIDE SUPPORT SHOULD NOT BE SPREAD TOO THIN

Throughout the workshop, participants stressed the imperative to maximize the impact of the demand-side tool given the relatively constrained funding available for implementation. While there was debate about how to best focus the tool – specifically, whether it was better to prioritize immediate offtakers or give more weight to long-term potential – participants concurred that support should be targeted to best drive market growth and private sector engagement.

TOOLS VARY IN ADMINISTRATIVE COMPLEXITY

Although there was no unanimity on the choice of particular demand-side support tools, workshop participants recognized that certain options, like the market-maker approach, come with administrative complexities that require additional expertise, resources, and time for effective implementation. They also stressed that the selected tool should be user-friendly, since overly intricate and confusing tools might deter participation.

BPC appreciates the willingness of stakeholders and experts to come together to explore these policy design considerations. Designing demand- and supply-side support policies to leverage scarce federal resources should be done with care to ensure that clean hydrogen’s potential to support decarbonization and economic growth is fully realized in the decades ahead. Maximizing the chance for success of the H2Hubs should remain a key focus for the administration and stakeholders.
The Bipartisan Policy Center helps policymakers work across party lines to craft bipartisan solutions. By connecting lawmakers across the entire political spectrum, delivering data and context, negotiating policy details, and creating space for bipartisan collaboration, we ensure democracy can function on behalf of all Americans.