From: Industrial Innovation Initiative, I^3
Contact: Gabrielle Habeeb
Address: 2801 21st Ave, S #220, Minneapolis, MN 55407
Phone: (815) 274-1817
Email: ghabeeb@gpisd.net
Date: March 1, 2023

Re: Request for Information (RFI) on the Department of Energy's Use of Demand-side Support for Clean Energy Technologies; OCED-RFI-23-1

Background

The Department of Energy (DOE) Office of Clean Energy Demonstrations (OCED) has a crucial role to play in advancing the technology and market solutions needed to significantly decarbonize the industrial sector. We are supportive of the Office's efforts to support these critical solutions through demand-side market mechanisms and appreciate this opportunity to provide comment. In response to the Request for Information (RFI) on the Department of Energy's Use of Demand-side Support for Clean Energy Technologies, the Industrial Innovation Initiative (I^3) has prepared the following document.

The Industrial Innovation Initiative (I^3) is an ambitious coalition that aims to advance solutions key to decarbonizing the industrial sector through policy development and implementation, technology demonstration and adoption, and demand-side market development. The Initiative builds on years of stakeholder engagement and extensive work by its co-conveners, Great Plains Institute and World Resources Institute, to collaborate with government officials and advance decarbonization solutions important to the industrial sector. I^3 values a stable climate, a safe and healthy environment, thriving livelihoods for American workers, and a strong US economy. The Initiative convenes key industry, environmental, labor, and other stakeholders, to advance cross-cutting strategies, policies, and programs for achieving industrial decarbonization by midcentury.

Category A: Most effective demand-side support measure for given technologies

1. What are the potential benefits and drawbacks of DOE implementing demand-side support measures in a given industry?

Demand-side support is critical to creating a low-carbon product market. New products often contain a cost premium relative to conventional alternatives or risks around uncertainty for early-adopting businesses. Stimulating demand via public sector procurement incentives or requirements can lower these barriers and help initial deployments of low-carbon technologies. Additionally, subsidies or grants to private purchasers can reduce or eliminate green premiums

and help legitimize and build confidence in the marketplace for low-carbon products. By ensuring predictable and reliable revenue streams, government demand-side support will reduce financial risk and enable a more stable investment environment. Subsidies like grants can require significant administrative oversight, stretching the capacity of the responsible agencies, and must be accounted for when establishing such support measures.

Demand-side support measures should apply to a large pool of suppliers rather than picking individual winners, be technology and feedstock neutral to foster continuous innovation, and, where applicable, set valuations using consistent and transparent life cycle assessment (LCA) methodologies for each sub-sector or product. Demand side support measures will be most useful if the government enters longer more certain contracts with new technology developers than the private market can offer due to technology or other risks. The following are some examples of breakthrough technologies that need scaling up and can benefit from demand-side support and market signals for low-carbon products.

Carbon capture & storage/utilization (CCS/U): With ~60% cement CO_2 emissions coming from chemical processes, CCUS technologies are recognized as imperative to the sector - but most remain at the demonstration phase requiring significant investment and time for large-scale implementation. Notably, technologies will take time to scale from TRL 5 to TRLs 6 and 7, making near-term investments in the whole value chain - including carbon transport and sequestration infrastructure - critical to the long-term success of these solutions. These pre-combustion, oxy-fuel, and post-combustion technologies require various degrees of retrofits and new installations.

Electrified and innovative kiln technologies: Electrified kilns and other non-combustion heat sourced kilns (such as those operating on thermal heat batteries) that can achieve the high temperatures needed for calcination are on the horizon. Direct separation technologies (or indirect calcination) have also been identified by DOE as an emerging technology for decarbonizing cement. This technology, however, does not have the specific funding stream it needs for development, as it falls beyond what is considered under the carbon capture umbrella. With ~40% cement CO_2 emissions coming from fuel combustion in kilns, these technologies are needed to complement CCUS.

Clinker substitution: There is significant scope to lower the clinker content of US cement, which accounts for ~85% of CO_2 emissions from cement, by increasing the production of blended cements with supplementary cementitious materials (SCMs). As traditional, industrial waste SCMs like fly ash and slag become less available due to tightening environmental regulations, the use of more readily available non-fossil-based SCMs like calcined clay is becoming increasingly important. Limestone-Calcined Clay Cement (LC3) is an example of a blended cement which can be produced with clinker content as low as 50% while meeting material performance standards. These blended cements require investment for new plant installations like additional silos for SCM storage.

Alternative cements: New types of low-carbon cements are emerging that contain different raw materials or alternative clinkers which conform to the durability and strength requirements of existing standards. Like blended cements, these also require some additional installations. One example is cement that uses calcium-silicate rock as its raw material instead of limestone, thereby avoiding the release of CO_2 through calcination.

Direct reduced iron (DRI): In steel production, coke, a product derived from coal, is burned in blast furnaces to produce carbon monoxide (CO). This CO is used to chemically reduce iron ore to metallic iron, in the process releasing CO_2. One key technological area of focus to decarbonize steel in the near term should be the production of steel with DRI. Instead of using coke, DRI uses a combination of hydrogen and CO or just hydrogen. DRI is used in only 5% of steel plants currently. Investment is needed in steel facilities for the direct reduction configuration that uses electric arc furnaces instead of blast furnaces in combination with DRI. This process can reduce emission by 60-90% compared to conventional coke-based production processes when combined with renewable electricity.

Clean hydrogen: To maximize the impact of DRI, the source of hydrogen needs to be low- or zero-carbon. Existing primary steel production in the US is largely located in the southern Great Lakes region and would benefit greatly from dedicated clean hydrogen production. Such production could make use of local renewable and nuclear energy sources to produce hydrogen through electrolysis. The region is also well suited for permanent geologic carbon storage, making steam methane reformer (SMR) hydrogen production, paired with CCS another viable pathway. Given the large amount of hydrogen needed for green steel-making, the production of low-carbon steel is directly related to the capacity of clean hydrogen production.

Sustainable Aviation Fuel (SAF): SAF is non-conventionally derived aviation fuel that can be made from a variety of feedstocks, including biological sources (e.g., cooking oils, plant oils) or from non-biological sources referred to as power-to-liquid (PtL) 'eFuels' or 'synthetic fuels' made from CO_2 and clean hydrogen. Different types of SAF can reach varying levels of carbon intensity (CI) reductions compared to conventional jet fuel, and represent the main pathway for decarbonizing the aviation industry. PtL SAF, for example, converts clean hydrogen made from carbon-free electricity and captured anthropogenic CO_2 into a liquid hydrocarbon fuel that can be used as a "drop-in" fuel (which means it can be used in the existing infrastructure and plane engines) and can reach deep CI reductions on an lifecycle basis (up to 100% in some cases). SAF, like many other sustainable products, is more expensive to produce and consumers, such as the aviation industry, have little to no margin to procure more expensive fuels. Therefore, government demand-based programs can play a critical role in accelerating the commercialization of various SAF production pathways.

Standards should be created to set a required carbon intensity benchmark for demand-side support measures. It is critical to set an appropriate threshold focused on specific product and material types that is more ambitious than the market average. It is also critical to increase stringency over time to encourage continued innovation towards mid century decarbonization.

2. a. What are the most important considerations for DOE in exploring advanced market commitments in particular?

Advanced market commitments (AMCs) signal demand and provide some market certainty for innovative products. AMCs are most effective for products that do not yet exist or are at a pre-demonstration level. AMC establishes a certain buyer with clear product specifications such as total volume or carbon intensity. This method holds promise as a way to incentivize research, development, and deployment of new low-carbon technologies and products. While many of the technologies for low-carbon products are already at the demonstration, pre-commercial or commercial phase, there is currently a lack of the type of demand needed to kickstart widespread adoption of decarbonization technologies. DOE should consider entering into advanced market commitments for products which have a large research base with well-understood characteristics that might not yet have been engineered at a large-scale.

2. b. What are the most important considerations for DOE in exploring guaranteed price floors or contracts-for-difference in particular?

Contracts for difference (CFDs) can be flexibly designed to cover green premiums associated with higher cost, lower emission products. A contract could compensate the buyer for the added cost of a clean product relative to the incumbent product. Another could attempt to more accurately pay for the carbon abatement from that switch, where the amount paid by the government to the product buyer is the added cost divided by the carbon abatement. For a clean hydrogen CFD, the former might pay the difference in cost between the incumbent fuel source and low- or zero- carbon hydrogen; the latter would actually take into account how much CO_2 is abated by the fuel switch and would likely provide the higher decarbonization value per dollar. Like any contract, DOE should have the best understanding possible of product costs and LCAs to most accurately set the reference price and new production or abatement costs. Otherwise, the CFD funding could go towards less effective technologies. Guaranteed price floors or contracts for difference can work where there are established liquid markets for the product (e.g. industrial products) and are less effective where there are nascent nontransparent markets (e.g., CO_2 removal credits).

2. c. What are the most important considerations for DOE in exploring other demand-side support measures (please specify a measure)?

DOE could play an important role in the public purchasing of low embodied carbon space by serving as the bridge that connects Buy Clean domestic policies to public/private initiatives and standards overseas such as the UN Industrial Development Organization's Industrial Deep Decarbonization Initiative (IDDI), the World Economic Forum's First Movers' Coalition (FMC), and the Climate Group's ConcreteZero and SteelZero partnerships. Such initiatives and policies have similar aims but are using different definitions for what should be considered under the low-embodied carbon umbrella. There is a need to harmonize standards and benchmarks for measuring and setting limits on GHG emissions for public purchasing between the U.S. and international initiatives. This is particularly crucial for the United States to continue to innovate on par with the international community and help retain its competitiveness on the global stage for products that are internationally traded.

Other demand-side support measures to consider include procurement policies that encourage companies to outperform each other on low-carbon innovation. A procurement bonus would provide a cost discount to a company's bid if it has lower carbon intensity than its competitors. An additional option is to also create a fund that covers the cost differential (if any exists) between the winning low-carbon bids and the bids that use conventional technologies. This enables agencies or departments to use low-carbon options without having to cover any additional costs through their operational budgets. All demand-side support measures should fit the specific business model and market of the technology, without taking funding from other programs intended to support the commercialization of these solutions.

Category B: Implementation of demand-side support measures

7. Do particular implementation approaches lend themselves particularly well to specific technologies and/or demand-side support measures?

Ultimate oversight and decision-making power, particularly as it relates to allocation of funds and contractual arrangements, should reside with the DOE. Through implementation of a demand side measure, the government has an opportunity to drive standards, including transparency and integrity in these nascent markets, and legitimize decarbonization solutions and technologies in the marketplace.

The DOE should support procurement programs at the federal level by continuing work with the White House Federal Buy Clean Initiative taskforce. Regionally, the H_2 and DAC Hubs selections should include measures that support off-taker market demand. Multiple states such as Oregon, California, Colorado, New York, and New Jersey are in the process of implementing Buy Clean or similar policies; DOE should provide supportive measures for states with existing procurement programs and boost information dissemination and public awareness in states that have not yet implemented low-carbon public procurement policies. DOE could further support states by establishing a fund to support low carbon procurement program costs.

The Inflation Reduction Act has provided the EPA funding to develop standards for data reporting such as environmental product declarations (EPDs) and carbon labeling programs. The DOE could also help support this work of the EPA by providing an international, federal, and state level context to the development of standards.

I^3's coalition of industry stakeholders are here to connect

The information contained within this document represents a small fraction of the collective knowledge and expertise of our participants. This document was prepared with the input and feedback of I^3 participants but does not reflect the express opinion of each participating organization. Members of I^3 are ready and willing to connect with the Department of Energy and Office of Clean Energy Demonstrations to provide key industry, labor, environmental, and business perspectives from our stakeholder group. If you would like to connect with us directly, please reach out to I^3 Project Manager, Gabrielle Habeeb, at ghabeeb@gpisd.net, and we will gladly arrange a meeting.