RESOURCES *for the* FUTURE

# Comments to the Office of Clean Energy Demonstrations in Reference to DE-NOI-0202301: Bipartisan Infrastructure Law: Additional Clean Hydrogen Programs (Section 40313): Regional Clean Hydrogen Hubs

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**Public Comment**
**July 2023**

RESOURCES *for the* FUTURE

July 24, 2023

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Attn: OCED-NOI-23-1

To whom it may concern:

On behalf of Resources for the Future (RFF), I am pleased to share the accompanying comments to the Office of Clean Energy Demonstrations (OCED) at the Department of Energy (DOE) in response to its Notice of Intent on the subject of putting $1 billion towards subsidizing demand for clean hydrogen.

RFF is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy.

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In this comment, we provide our perspective on whether such subsidies are needed and are large enough to matter; if not, whether there are more productive actions DOE can take; and, if a decision is made to subsidize demand, the advantages and disadvantages of various mechanisms to do so. We note that the comment period for responding to the NOI is very short considering the complexity of the subject matter. If DOE/OCED is willing to take further comments after the July 24th deadline, we will elaborate beyond these initial comments on the advantages and disadvantages of other actions DOE can take to support market growth and delve more deeply into alternative mechanisms for administering the demand support program.

The authors of these comments are:

- Alan Krupnick, Senior Fellow and Director, Industry and Fuels Program, and
- Aaron Bergman, Fellow.

If you have any questions or would like additional information, please contact me at **krupnick@rff.org**.

Sincerely,

Alan J. Krupnick
Resources for the Future

# Comments to the Office of Clean Energy Demonstrations in Reference to DE-NOI-0202301: Bipartisan Infrastructure Law: Additional Clean Hydrogen Programs (Section 40313): Regional Clean Hydrogen Hubs

One challenge in crafting responses to the notice of intent (NOI) is that it lacks clarity on two important aspects. The first is the intended recipients of the subsidies. Would the subsidies be directed, as our reading suggests, only to offtakers within hydrogen hubs, or even a subset of them "chosen competitively" (as stated in the NOI)? Or could the subsidies be used to develop $H_2$ demand outside of the hubs? It is also unclear from the NOI the specific problem that the Department of Energy (DOE) is seeking to address. Do the hub applications not reflect reasonable certainty about offtake demand now and/or after the money runs out? Are $H_2$ prices expected to be too high? Are risks greater than offtakers can tolerate?

Clean hydrogen, by which we mean hydrogen produced with a carbon intensity substantially below that of the 10 million metric tonnes (MMT) of gray hydrogen now produced annually, can replace the gray variety in current uses and be used in a host of new industrial, power sector, and transportation applications, some for which no other substitute to fossil fuels will do. In light of the potential benefits of clean hydrogen, Congress has passed laws creating a variety of incentives to bring production costs down and raise demand, including the $8 billion hydrogen hubs grant program, the 45V clean hydrogen tax credit, the 45Q CCUS tax credit (which would subsidize blue hydrogen), and the 48C manufacturing tax credit, which could be applied to electrolyzer equipment production. Some states, such as **Colorado**, are also sweetening the pot with credits of their own, and while some of these subsidies are not "stackable," others are.

Considering these incentives, as well as the structure of requirements for the hubs, it is unclear if the proposed program in the NOI is needed. The winning hydrogen hubs, which will be subsidized with around $1 billion or more each, are considered responsive to the call for applications if they include producers, offtakers (users of the clean $H_2$ produced) and a means (through co-location, truck, rail or pipelines) to link the two *and* also that the hubs show they will be sustainable after the program is over (which would be ten years from commencement of operations). Thus, a responsive application would be one that has certain contractual assurances between producers and offtakers for the long-term production and use of $H_2$. DOE will permit some $H_2$ to be consumed outside the hub and exported to other countries, though it discouraged an Alaskan hub proposal that would have made exports to Asia the centerpiece of its offtake plans.

The foregoing requirements for the hub applications should, by design, support the necessary demand for hydrogen to make each hub viable. That DOE is considering this new $1 billion demand support program suggests to us that the applications may not reflect adequate firm demand for hydrogen and that the program is thought to be at risk without further support. We do not have access to the applications but speculate that one potential concern could be that the price of the hydrogen produced from the hubs—or perhaps more

importantly, the level of risk for that price—is so high that it is scaring off the needed investment in and commitments for hydrogen offtake. Another could be that offtakers are worried that they will be locked into accepting high prices and miss out on price declines later.

DOE is probably hearing from companies and others that are part of hub applications that additional actions are needed to promote investments in hydrogen consumption. But, before taking these voices at face value, DOE should consider the following points.

First, the hub grants are stackable with the 45Q tax credit (for blue $H_2$ production). Given cost projections in many quarters, our expectation is that blue $H_2$ should be close to cost competitive with gray $H_2$ for existing users of hydrogen. In our own work (Bartlett and Krupnick 2020), we find that the value of the 45Q tax credit is sufficient to bring the price for blue hydrogen to that of gray hydrogen. For uses like hydrogen blending with natural gas to use at power plants, similar competitiveness can be expected. Until we see the planned uses in the applications, we can't judge what else is near market ready and what is not. Until the Treasury Department writes rules for the 45V tax credit, which is also stackable with H2Hub grants but not 45Q, we also can't make inferences about the usefulness of 45V in bringing costs down.

Second, demand for clean $H_2$ from other countries could be quite significant. The EU has recently announced that it intends to import 10 MMT of **green hydrogen by 2030**, with this $H_2$ produced via new renewables and matching the electricity generation mix on a monthly basis. There are issues with building the infrastructure to meet this demand, but in the debate on this proposed demand subsidy program, this avenue should be seriously considered.

Third, there seems to be an **assumption by policymakers** that "supply-side" incentives, such as tax credits, are wholly divorced from $H_2$ pricing. Reductions in effective costs (counting subsidies) can translate into lower $H_2$ prices for offtakers, potentially to the point that no special demand side subsidies are needed.

Fourth, there is a presumption that matching financing for hubs will come from private capital markets. However, there may well be self-financing by the producers and other players involved.

Fifth is concern that declining costs expectations make offtakers reluctant to lock into near-term, higher prices. This concern can be addressed by writing contracts to pass on future cost reductions to offtakers, especially for offtakers that are part of a hub.

And, finally, DOE was wise to provide hub funding in multiple phases, recognizing the huge undertaking facing hub participants in putting all the pieces of this puzzle together, including writing contracts. DOE should consider allowing for additional time for this process to continue rather than leaping to put more money into the hubs.

If we assume, however, that more subsidies are needed, we can next evaluate the most cost-efficient means to shore up demand. In light of the NOI, we specifically assess the question of whether providing a billion dollars to potential offtakers is enough to have a major impact on hydrogen demand and therefore achieve the aims of the program.

There are different ways to look at this question. One is to simply look at DOE's clean hydrogen goal, for example, in 2030, and examine the per kg subsidy implied. A 10 MMT per year goal equates to 10 billion kg of clean $H_2$. The subsidy would therefore only amount to $0.10/kg, and only for one year. Such a small subsidy would clearly not be enough to move the demand needle.

But this calculation could be viewed as unfair, given that the program would be limited to hydrogen produced by the funded hubs. In this case, we could assume that all the produced $H_2$ would be subsidized for offtakers. We don't know how much $H_2$ that would be, however, because DOE has not made this type of information contained in hub applications publicly available, even in the aggregate. One approach is to assume production at the minimum level required of H2Hub producers: 50 metric tonnes of $H_2$ produced per day (18,000 tonnes per year) from each hub. Assuming six such hubs are funded, the subsidy in this case translates into $1/kg for 9 years. But this production level is unrealistically low, given that one SMR plant produces between 88,000 and 225,000 metric tonnes per year. With one "real" SMR plant per hub and six hubs, $H_2$ production of 528,000 to 1,350,000 metric tonnes per year could be expected. The subsidy would then be from $1/kg for 2 years to $0.75/kg for one year.

However, our read of the NOI suggests that DOE seems to want to restrict the subsidy to only a portion of the clean hydrogen produced by the hubs it funds (below, we discuss issues related to different approaches DOE might take to accomplish this). Here, we do a different set of calculations that assume a significant, multi-year subsidy is desirable—say around $1/kg for 10 years after the grant program ends—and ask what fraction of $H_2$ production would be able to receive such a subsidy. We already calculated that about 300 tonnes of $H_2$ per day or 0.1 MMT per year would meet these restrictions. Based on average SMR plant production and six hubs funded, this is from 10 percent to 20 percent of expected hub production. The hubs, with all their existing subsidies, provide the best chance to meet DOE's national goal of 10 MMT clean $H_2$ by 2030. Funding a tiny fraction of this targeted production and a relatively small fraction of hub production is clearly deficient given the assumptions we are making.

Based on our above arguments and calculations, a direct demand subsidy is difficult to justify at the present time, and were it to be implemented, would be unlikely to be effective at achieving its goals.

Using these funds for a direct demand subsidy would come at a huge opportunity cost. We can think of several uses for a $1 billion infusion of funding that would be more effective at helping the market develop. Targeted RD&D funding, on either or both early and late technology readiness level stage technologies, might be productive, for instance. The NOI mentions some alternative ways of spending some of the money which could also be effective, such as developing contract templates and providing funds for feasibility studies.

Additionally, there are impactful actions the DOE could take to develop the market that would not require spending vast sums of money. For instance, DOE can be more involved in efforts to reduce regulatory and permitting barriers to $H_2$ pipelines, $CO_2$ pipelines, and Class VI well delegation, which would use only a fraction of the billion dollars being proposed to be spent here but could have enormous multiplier effects. Working with the financial sector to secure potential sources of financing and to literally reduce barriers to market creation are other options. Our bottom line is that DOE should consider waiting until a clear need for the money arises later in the process, and during that time it should take other actions to support future market growth as noted above.

Next, we turn to the questions in the NOI. There are three potential goals for the proposed program: providing revenue certainty to producers, enabling private sector financing, and catalyzing a clean hydrogen market. These goals are fairly distinct, suggesting that multiple instruments might be called for. Revenue certainty requires contracts with offtakers that are tight enough to give producers a reasonable expectation of selling the $H_2$ they produce. Enabling private sector financing includes working with actors in that sector to convince them that a reasonable return on investment is likely to occur with a manageable and well-understood level of risk. Of course, tight long-term contracts can help with this. Catalyzing a clean $H_2$ market involves reducing barriers to its creation and would also involve multiple hydrogen hubs to get enough "action" to encourage

market makers to move from bilateral transactions to price discovery and market activity. Tight long-term contracts could potentially impede market formation as they lock up hydrogen within the producer-offtaker relationship.

When choosing particular producers or offtakers to subsidize, there is a tension between funding the most viable projects, which risks wasting the money on projects that would have succeeded without support, and funding the projects most in trouble, which could risk too many failures and waste taxpayers' money. Another option is to fund projects that show promise of lowering costs where the additional funding could make a difference between success and failure.

## Here, we provide specific comments on the instruments suggested in the NOI:

**Contracts for differences:** This instrument has the advantage of providing price certainty to producers, offtakers, and capital markets, and therefore meets two of the program's three goals. The difficult issue is setting the strike price and the implicit lack of targeting to specific uses.

**Fixed price support:** Compared to contracts for differences, fixed price support does not permit a reduction in the subsidy as production costs come down over time and, as such, is likely a more inefficient form of support.

**Market maker:** We assume this refers to an entity like Hintco in Europe that can provide long-term offtake contracts to hydrogen producers, reselling the hydrogen to consumers on a shorter-term basis. This mechanism can ensure stability for hydrogen producers while giving flexibility to consumers that may not want to commit to a long-term contract at a high price. In addition, this mechanism can bundle multiple smaller consumers that may not, by themselves, be sufficient to provide the offtake needed by a large hub. However, by purchasing the hydrogen directly, the market maker takes on substantial risk that it can sell the contracted hydrogen at a price not too much lower than the price it pays producers. If that price gap ends up being substantial, the billion dollars used to capitalize the entity could disappear very quickly.

## With respect to the proposed funding allocation mechanisms, we have the following comments:

**Reverse auction:** Under a reverse auction, the lowest bidders receive the funds. Logically, those bidding the lowest are the strongest projects and/or the ones best able to secure funding. So, it is likely that these projects need the money the least. This effect would be inconsistent with the goal of promoting a broader clean hydrogen market and risks "wasting" funding on projects that would proceed in any event.

**A proposal-based process:** Aside from adding another layer to an already bureaucratic process, this defers setting criteria for selection. However, given the advantages of not just funding the lowest bidder, as above, such a process may be unavoidable.

**Eligibility-based process:** This is a "spread the money around" approach that also defers discussion about what makes a project eligible or how much subsidy each eligible project should receive. Filling in the needed details is a substantial challenge.

Note that DOE's funds are relatively small compared to the potential size of a broad hydrogen market, so spreading the money over diverse projects risks getting very low bang for the buck and therefore works against other program goals.

In conclusion, if the intent of this funding is to help the hubs, we suggest that it would be more effective to help the hubs directly, by sending more direct funding their way—for example, giving each winning hub $1.2 billion instead of $1 billion. That money could be dedicated to providing the same sort of support as in these mechanisms, but within the context of the contractual relationships between producers and offtakers in the hubs. Creating a separate entity replete with transaction costs and potentially complicated and restricted funding mechanisms risks inefficiencies and delays.

# References


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