

March 22, 2022

U.S. Department of Energy Offices of EERE, Electricity, Policy, Fossil Energy and Carbon Management, and Economic Impact and Diversity Communities LEAP Pilot <u>CommunitiesLEAPInfo@hq.doe.gov</u>

SUBJECT: Comments from the Connecticut Green Bank – Regional Clean Hydrogen Hubs Implementation Strategy Request for Information - #DE-FOA-0002664.0002

To Whom it May Concern:

The Connecticut Green Bank ("Green Bank") appreciates the U.S. Department of Energy's ("DOE") efforts through the Office of Energy Efficiency and Renewable Energy ("EERE"), Hydrogen and Fuel Cell Technologies Office ("HFTO"), Office of Fossil Energy and Carbon Management ("FECM"), Office of Nuclear Energy ("NE"), and the new Office of Clean Energy Demonstration ("OCED") issuing this request for Information ("RFI") – Regional Clean Hydrogen Hubs ("H2Hubs") Implementation Strategy – which will provide \$8 billion from FY22-FY26 for the development of at least four (4) regional clean hydrogen hubs¹ that demonstrate production,² processing, delivery, storage, and end-use of clean hydrogen. The successful implementation of the H2Hubs supports the Biden Administration's goal to achieve a carbon free electric grid by 2035, net zero carbon economy by 2050, and creating good-paying domestic manufacturing jobs – while delivering on the Hydrogen Earth Shot goal of producing clean hydrogen at \$1 per 1 kilogram in 1 decade ("111").

Connecticut is excited by the prospect of continuing to build on the Northeast region's clean hydrogen and fuel cell industries. The presence of Connecticut's defense industry has created a strong and vibrant hydrogen and fuel cell manufacturing industry and supply chain. Fuel cells manufactured in Connecticut have been present on NASA's Apollo and space shuttle missions since the 1960's and innovative applications of fuel cells manufactured in the state have demonstrated the ability to produce electricity, waste heat, and hydrogen.³ Connecticut is a global center for clean hydrogen and fuel cell innovation.

¹ A network of clean hydrogen producers, potential clean hydrogen consumers, and connective infrastructure located in close proximity.

² Standard for the carbon intensity of clean hydrogen production equal to or less than 2 kilograms of carbon dioxide-equivalent produced at the site of production per kilogram of hydrogen produced (kg $CO_2e/kg H_2$)

³ "Energy Department Applauds World's First Fuel Cell and Hydrogen Energy Station in Orange County" (August 16, 2011)

Connecticut Governor Ned Lamont has set a public policy goal of a zero-carbon electric sector by 2040,⁴ which would be supported by various public policies.⁵⁶ The executive order is now Governor Bill No. 10 "An Act Concerning Climate Change Mitigation," which would expand the bipartisan-supported Public Act 08-98 "An Act Concerning Global Warming Solutions" and Public Act 18-82 "An Act Concerning Climate Change Planning and Resiliency" that established greenhouse gas emission reduction targets for 2010, 2020, 2030, and 2050, and proposes the establishment of a zero-emission electricity sector by 2040. Connecticut has ambitious clean energy⁷ and climate change policies consistent with the Biden Administration's goals, including proposed legislation focused on clean hydrogen to unify the public and private sectors.⁸

Connecticut's clean energy policies will demonstrate the production of clean hydrogen from all of the H2Hub recognized feedstocks, including zero-emission renewable energy resources (e.g., solar PV, offshore wind), low-emission renewable energy resources (e.g., biogas,⁹ natural gas¹⁰), and carbon-free nuclear power; and many of the H2Hub end-uses, including electric power generation, residential and commercial heating sector, and transportation sector. Connecticut's hydrogen and fuel cell industry contains 10 OEMs, over 600 supply chain companies, nearly 3,000 direct, indirect and induced jobs, over \$600 million in investment, including nearly \$300 million in labor income.¹¹

Connecticut looks forward to working with its Northeast regional partners to submit a proposal into the pending DOE H2Hubs request for proposals to continue to build on our nation-leading clean hydrogen and fuel cell industries.

With respect to the RFI, the following are comments by the Green Bank broken down into the four (4) categories within the RFI. Please note that the Green Bank did not respond to every question, but instead focused on those areas of competence.

<u>Category 1— Regional Clean Hydrogen Hub Provisions and Requirements</u>

Question 1 — The Northeast Electrochemical Energy Storage Cluster ("NEESC"),¹² funded by the United States Small Business Administration to drive economic development, innovation, and job creation in the nation's increasingly important energy sector, may be instructive in providing some practical guidance to this question.¹³ NEESC consists of New England, New Jersey, and New York, and comprises over 6,500 jobs, \$1.4 billion of total revenues-investment, \$620 million in OEM revenues-investment, and a supply chain consisting of nearly 1,200 companies within the hydrogen and fuel cell cluster. In terms of (a) close proximity, it should be "demonstrably evident" when the OEMs, suppliers, producers, and end-users are mapped, what constitutes a

⁴ Executive Order 3

⁵ Public Act 17-3 "An Act Concerning Zero Carbon Solicitation Procurement" (i.e., nuclear power)

⁶ Public Act 19-71 "An Act Concerning the Procurement of Energy Derived from Offshore Wind

⁷ CGS 16-245a Renewable Portfolio Standards

⁸ Representative David Arconti (Co-Chair of the Energy & Technology Committee) has proposed House Bill 5200 "An Act Establishing a Task Force to Study Hydrogen Power"

⁹ Proposed House Bill 5118 "An Act Concerning Waste Management and Anaerobic Digestion" would allow for the procurement of renewable natural gas from anaerobic digestion facilities

¹⁰ Given the strength of fuel cell manufacturing in Connecticut, fuel cells are recognized as clean renewable energy resource per the state's Class I RPS. Delaware, Indiana, Maine, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, and Utah are the only other states that recognize fuel cells powered by natural gas within their RPS.

¹¹ Connecticut Hydrogen Fuel Cell Coalition "2021 Annual Report" (March 2022)

¹² Administered by the Connecticut Center for Advanced Technology

¹³ Northeast Electrochemical Energy Storage Cluster — Annual Report (2015-2016)

hub, (b) pipelines and storage, including production facilities and end-uses (i.e., deployment of fuel cells) should be existing facilities and infrastructure that can be leveraged by H2Hub, (c) no comment, and (d) in addition to those noted, state and regional policies, and financial services (including green banks) in support of clean hydrogen production and end-uses should be a primary supportive activity to make H2Hubs successful and sustainable.

- **Question 2** (a) consideration should be given to investigating the lifecycle analysis of measuring CO_2 equivalent emissions by the various energy sources producing hydrogen, (b) no comment, (c) 6-10 H2Hubs of varying sizes would be more effective to support a national clean hydrogen network to facilitate a clean hydrogen economy, (d) several federal policy initiatives will support H2Hubs develop into national clean hydrogen network including continuing investment tax credits (as well as enhancement of these credits for investment in underserved communities to achieve EEEJ priorities) and enabling increased resilience for state and local hubs for critical facilities (e.g., fuel cells at town halls), perhaps with an across federal government approach (e.g., including FEMA); a national price for carbon or other national "cap and invest" system integrating clean hydrogen – leveraging off of the success of models like the Northeast and Mid-Atlantic Regional Greenhouse Gas Initiative ("RGGI") which was developed more than a decade ago by environmental leaders like then Connecticut Department of Environmental Protection Commissioner Gina McCarthy (President Biden's National Climate Advisor and former EPA Administrator); and a national hydrogen pipeline system which could well leverage the existing network of aging natural gas pipelines, and (e) the Hydrogen Earth Shot is an excellent way to measure progress (i.e., by various clean energy input resources), as is CO_2/kWh of electricity production or $CO_2/MMBtu$ of heat generation from end-uses.
- Question 3 demonstrating not only how H2Hubs can demonstrate the production of clean hydrogen from fossil fuels, renewable energy, and nuclear energy individually is important, but so too is demonstrating how collectively such resources can be produced all together within an H2Hub (e.g., Northeast). (a) No comment, (b) no comment, in terms of (c) the energy project should contain the associated environmental attributes (e.g., renewable energy credit, zero-emission credit) in order for the clean hydrogen to be considered as such, (d) including biogas (e.g., anaerobic digester gas from food and farm waste, and wastewater treatment facilities injected into natural gas pipelines) should be considered alongside solar, wind, and nuclear power, (e) no comment, and (f) H2Hub funding should be made available to upgrade or develop new dedicated clean electric or heat generating energy resources to generate clean hydrogen as long as there is as associated non-DOE match.
- Question 4 again, demonstrating not only how H2Hubs can demonstrate the end-use diversity of electric power generation, use in the industrial sector, use in the residential and commercial heating sector, and the transportation sector individually is important, but so too is demonstrating how collectively these end-uses are being demonstrated all together within an H2Hub (e.g., Northeast). (a) No comment, in terms of (b), long-term agreements for renewable energy credits between a developer and utility or power purchase agreements between a developer and off-taker should be an approach, and (c) if clean hydrogen is used in multiple ways (e.g., combined heat and power), then its associated benefits should be appropriately valued (e.g., displacing consumption of fossil fuel, reducing air emissions, avoided adverse health impacts, etc.).

Question 5 — the Northeast is an existing regional H2Hub, and therefore (a) the term
 "region" feels more appropriate for states (i.e., multi-state efforts) as opposed to a region
 within a state, however, one can see how a large state like California or Texas could have
 several "regions," and (b) end-uses that increase a regions resilience against the impacts of
 climate change (e.g., prevent power outages, resilient transmission infrastructure from
 localized distributed energy resources).

Category 2 – Solicitation Process, FOA Structure, and H2Hubs Implementation Strategy

- <u>Questions 6-8</u> no comment
- <u>Question 9</u> to ensure the long-term viability and sustainability of H2Hubs given the importance of public and private partnerships, key review criteria should also include "current market context" (including existence of OEMs, supply chain, and deployment of clean hydrogen and fuel cell technologies as well as local and state policies and financial services industry to support deployment of such technologies).
- <u>Question 10</u> local, state, and regional clean hydrogen economies are ready for the full regional clean hydrogen hub solicitation to come out. Those who have existing hydrogen and fuel cell clusters (e.g., Northeast) are ready to compete. Phase 1 of planning, leading to Phase 2 of deployment, can be done together under one solicitation as opposed to having multiple launches. Having multiple Launches feels like it would create a "race to the bottom" effect.
- <u>Questions 11-12</u> no comment
- <u>Question 13</u> the proposed funding levels for Phase 1 and Phase 2 are appropriate. However, successful proposals in the \$1 billion area should be unique, sustainable, and incredibly impactful so as to garner a majority of the resources from the program.
- Questions 14-18 no comment
- Question 19 DOE's Communities Local Energy Action Plan ("LEAP") Program
- <u>Question 20</u> no comment
- <u>Question 21</u> a 50% cost share is reasonable, although proposals that submit greater cost share should be provided better scoring, and it is feasible for projects to meet the cost share target on an invoice-by-invoice basis as long as the regular invoicing of funds to the DOE is equally as responsive. Cost share should include the value of local and state policies.
- <u>Questions 22-23</u> no comment
- <u>Question 24</u> DOE's Communities LEAP Program
- <u>Questions 25-26</u> no comment

<u>Category 3 – Equity, Environmental and Energy Justice ("EEEJ") Priorities</u>

- Question 27 the eight (8) EEEJ policy priorities the DOE has identified to guide the implementation of Justice 40 are appropriate. In terms of strategies, policies and practices that H2Hubs can deploy, the DOE should press H2Hub recipients to collect and analyze data and report out on all of the EEEJ policy priority areas noted above. Transparency is always good strategy, policy and practice and an independent perspective (or audit) is even better.
- **Question 28** the Green Bank would prioritize the EEEJ policies in the following order:
 - 1. Increase energy democracy, including community ownership
 - 2. Decrease environmental exposure and burdens
 - 3. Increase parity in clean energy technology access and adoption
 - 4. Increase access to low-cost capital
 - 5. Decrease energy burden
 - 6. Increase energy resilience
 - 7. Increase clean energy job pipeline and job training for individuals
 - 8. Increase clean energy enterprise creation
- <u>Question 29</u> no comment
- <u>Questions 30</u> seek technical assistance (e.g., Communities LEAP Program)
- <u>Question 31</u> ongoing engagement with leaders within relevant disadvantaged communities through peer-to-peer networks (e.g., HUD Partnership for Sustainable Communities¹⁴ and Solar Market Pathways¹⁵).

Category 4 – Market Adoption and Sustainability of Hubs

- <u>Question 32</u> beyond the importance of federal tax credits and local offtake structures, the USDA's "Partnership for Climate-Smart Commodities" Notice of Funding Opportunity (i.e., USDA-NRCS-COMM-22-NOF0001139), provides another useful example of a mechanism that can be used to measure, certify, and verify "clean hydrogen" co-benefits (e.g., emission reductions, resilience, social determinants of health, etc.) from the supply of and demand for clean hydrogen could be valued through upfront and ongoing performance-based incentive structures (e.g., renewable energy credits, renewable natural gas).
- Question 33— if the DOE could set a floor price on such "clean hydrogen" co-benefit commodities as noted above (e.g., clean hydrogen gas credits), or procure "clean hydrogen" through long-term contracts from the natural gas infrastructure. Using the purchasing power of the federal government, would go a long way to securing the supply of "clean hydrogen" knowing that there is a market demand for its production.

¹⁴ <u>https://sustain.org/program/scln/</u>

¹⁵ <u>https://sustain.org/program/solar-market-pathways/</u>

 <u>Question 34</u> — in the least, the market analysis should include the market potential for clean hydrogen and fuel cell applications showing various locations for production and end-use applications, as well as proximity within the cluster — see Figure 1.¹⁶



Figure 1. Connecticut: Market Potential for Hydrogen and Fuel Cell Stationary Applications

The analysis should also look at state and local policies and incentives.

- <u>Question 35</u> the DOE's Loan Program Office, in collaboration with state-level "green banks," can partner to unlock regional private investment from the financial services industry in clean hydrogen production facilities and end-use applications.
- <u>Questions 36-38</u> no comment
- Question 39 it is important for the DOE to recognize that H2Hubs exist in the United States today. For example, in the Northeast, as a result of decades of industrial investment in the defense industry, in conjunction with local, state, and federal policies, New England, New Jersey, and New York have industrial scale hydrogen and fuel cell clean energy economies. If the DOE were to pick H2Hubs that aren't as mature, then it is "picking winners" that can have a profound impact on the H2Hubs that have developed over the past 50+ years, and an adverse impact on the long-term viability of the clean hydrogen and fuel cell industries in the United States.

<u>Category 5 – Other</u>

 <u>Question 40</u> — Together with our recommendation that the DOE would be well-served focusing on mature H2Hubs in existence today, it should also be appreciated that as state-

¹⁶ "2020 Hydrogen and Fuel Cell Development Plan – Connecticut Hydrogen Economy: Economic Development, Environmental Performance, and Energy Reliability" by the Northeast Electrochemical Energy Storage Cluster

level cost share through Phase 1 and Phase 2 could easily exceed \$1 billion, consideration should be afforded to those regions that have demonstrated exceptional financial capacity to invest in other forms of clean energy. In Connecticut, for instance, our Green Bank has raised nearly \$1 billion from the private sector for a variety of clean energy technologies such as solar PV, wind, hydro, fuel cells, anaerobic digestors and microgrids as well as funding programs for energy efficiency and EV charging networks. In 2021, our legislature gave us authority to issue green bonds up to 50 years in maturity for environmental infrastructure which could assist in the deployment of H2Hub projects. We are the first (and only) green bank in the world to have securitized revenue streams to support solar PV deployment, and we accomplished this in the asset backed securities market and the municipal bond market with investment grade ratings from Kroll and S&P. New York also has exceptional green investment capacity – with its billion dollar green bank and NYSERDA agency which has issued bonds for a variety of purposes including its solar and Green Jobs Green New York program. The importance of the H2Hubs that will be brought forward must be capable not only of development of clean hydrogen, but also of deployment to the end-users identified for Phase 2. This will require harnessing the capability of green banks and other state-level financing authorities to leverage public resources with private investment capital that green banks, such as the Connecticut Green Bank and the New York Green Bank, have demonstrated they can accomplish.

The Green Bank appreciates the DOE's efforts to solicit public comment on the pending H2Hub request for proposals. We look forward to working with our state and regional partners to submit an application for consideration into the Regional Clean Hydrogen Hubs solicitation.

Sincerely,

Bryan Garcia

Bryan Garcia President and CEO

About the Connecticut Green Bank

.Bert Hunter

Bert Hunter Chief Investment Officer

As the nation's first state-level green bank, the Connecticut Green Bank leverages the limited public resources it receives to attract multiples of private investment to scale up clean energy deployment. Since its inception, the Green Bank has mobilized \$2.14 billion of investment into Connecticut's clean energy economy at a 7.4 to 1 leverage ratio of private to public funds, supported the creation of 25,612 direct, indirect and induced jobs, reduced the energy burden on over 63,000 families and businesses, deployed over 494 MW of clean renewable energy, helped avoid 9.9 million tons of CO₂ emissions over the life of the projects, and generated \$107.4 million in individual income, corporate, and sales tax revenues to the State of Connecticut.

Attachments

Green Bank – Fact Sheet Decennial Societal Impact Report – Fact Sheet The Impact of Federal Funds in Connecticut – Fact Sheet





Connecticut Green Bank is the nation's first green bank. Our mission is to confront climate change and provide all of society with a healthier and more prosperous future by increasing and accelerating the flow of private capital into markets that energize the green economy. Established in 2011 as a quasi-public agency, the Green Bank uses limited public dollars to attract private capital investment and offers green solutions that help people,

businesses and all of Connecticut thrive.

our solutions

The Green Bank is helping Connecticut flourish by offering green solutions for homes and buildings, and by creating innovative ways to invest in the green economy.





homes

Empowering all Connecticut families and households with accessible and affordable green solutions that bring them comfort and security. Find incentives for battery storage or use the Green Bank's flexible financing to reduce costs with health and safety improvements and the newest energy efficient technologies.





buildings

Creating stronger, more resilient communities with green solutions for buildings of all types, from businesses and nonprofits to multifamily housing and local government. Leverage Green Bank financing to save money and realize the benefits of more modern, sustainable buildings.





investments

Securing a healthier planet with smart ways for individuals and businesses to invest in green solutions – and our future – while also earning a return. Energize the green economy by investing in it today. Buy a Green Liberty Bond, invest through a crowdfunding offering, or join the movement by finding other ways to invest.





Decennial Societal Impact Report

FY12 FY21

Since the Connecticut Green Bank's inception through the bipartisan legislation in July 2011, we have mobilized more than **\$2.14 billion of investment** into the State's green economy. To do this, we used **\$288.4 million** in Green Bank dollars to attract \$1.85 billion in private investment, a leverage ratio of **\$7.40 for every \$1**. The impact of our deployment of renewable energy and energy efficiency to families, businesses, and our communities is shown in terms of economic development, environmental protection, equity, and energy (data from FY 2012 through FY 2021).



Learn more by visiting ctgreenbank.com/strategy-impact/impact

Winner of the 2017 Harvard Kennedy School Ash Center Award for Innovation in American Government, the Connecticut Green Bank is the nation's first green bank.

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The Impact of Federal Funds in Connecticut

Through our partnership with the Department of Energy & Environmental Protection, Connecticut Green Bank deployed \$8.25 million of American Recovery and Reinvestment Act of 2009 (ARRA) funds to create more than \$176.4 million of investments into residential clean energy projects. (All data as of 12-31-2021)





Financing Programs with Federal Funds



The Green Bank's ARRA funded programs combined innovative financial tools and partnering with private capital to create programs that **promote clean energy**, **economic growth**, **a healthier environment**, **and greater equity** in Connecticut.



Program models, proved successful through the deployment of ARRA funds, evolved to focus on additional markets and larger investment beyond the Green Bank.

