Notice of Intent No. DE-FOA-0002231

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0002229

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Fuel Cell Technologies Office, a Funding Opportunity Announcement (FOA) entitled "H2@Scale New Markets FOA".

Hydrogen and fuel cells represent an emerging industry with potential across sectors and applications to enable resiliency, energy security, pollution emission reductions, and economic growth. Today, the United States produces over 10 million tons of hydrogen, nearly one-seventh of global production, primarily for oil refining and fertilizer production. In 2018, 800 megawatts (MW) of fuel cell power—nearly 70,000 units—were shipped worldwide.[1]

Hydrogen can be produced from a variety of sources. This includes producing hydrogen during periods of wind or solar overproduction or from nuclear power during periods of low system demand. This hydrogen can be used for power generation at a later time, injected into the gas grid, or used for an additional revenue stream in applications such as vehicle refueling, steel manufacturing, or with CO_2 for synthetic fuel production.

With increasing opportunities for hydrogen across applications, there is potential for large increases in hydrogen demand. However, key challenges around affordability, durability and reliability still must be addressed. More RD&D is needed to realize DOE's "H2@Scale" vision and develop these opportunities.

H2@Scale[2] supports innovations to produce, store, transport, and utilize hydrogen across multiple sectors, covering collaborations between various industry stakeholders and national laboratories. The initial H2@Scale FOA, released by EERE in FY19, focused on enabling R&D for hydrogen production, transport, and storage, as well as first-of-kind pilot demonstrations of integrated systems with on-site nuclear power and multiple renewable energy sources.

The keys to continued advancement of H2@Scale are *scaling up* affordable hydrogen production and developing new uses for hydrogen, to grow the overall market size and develop technology that integrates hydrogen into the energy system. FCTO intends to release the

[1] https://www.hydrogen.energy.gov/pdfs/review19/plenary_overview_satyapal_2019.pdf
[2] https://www.energy.gov/eere/fuelcells/h2-scale

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"H2@Scale New Markets FOA," featuring novel demonstration opportunities, as well as R&D, for several emerging new markets and applications.

EERE anticipates that the FOA may include the following Areas of Interest (AOI):

1) Electrolyzer Manufacturing R&D
This potential area would advance large-scale electrolyzer manufacturing in the U.S, focusing on manufacturing R&D to produce advanced components and systems for multi-megawatt-scale electrolyzers at high production volumes to lower hydrogen production costs. The R&D would be executed in collaboration with DOE's Advanced Manufacturing Office (AMO) and would enable large-scale domestic electrolyzer manufacturing focused on reducing the cost of megawatt- and gigawatt-scale electrolyzers for diverse end uses.

2) Advanced Carbon Fiber for Compressed Hydrogen and Natural Gas Storage Tanks
This potential area, coordinated with AMO and the Vehicle Technologies Office (VTO), would focus on R&D to reduce the cost of hydrogen and natural gas storage tanks through development of low-cost, high-strength carbon fiber (CF). Projects would seek to achieve targeted high-strength CF properties progressing from small, laboratory-scale to industry relevant scales. Applicants would be highly encouraged to partner with Oak Ridge National Laboratory's (ORNL) Carbon Fiber Technology Facility (CFTF) on the conversion optimization of precursor fibers to CF.

3) Fuel Cell R&D for Heavy-Duty Applications
This potential area may include two focus areas to advance fuel cells for emerging heavy-duty applications relevant to trucks, marine, rail, and data centers, as well as enable competitive domestic fuel cell system development. One potential focus area would develop membranes for heavy-duty applications, focusing on higher temperature operation (up to 120 °C) and enhanced durability (over 6x increase to meet 25,000 hour target), while meeting performance and cost needs. Another potential focus area would be R&D to enable advanced low-cost, domestically manufactured stacks and systems for applications such as trucks, rail, marine, and data centers.

4) H2@Scale New Markets R&D—HySteel
This potential area would enable the use of hydrogen in steel manufacturing/iron refining applications, aligned with FCTO and H2@Scale priorities for fostering new markets for hydrogen. R&D may include improving the kinetics of emerging approaches for hydrogen use as a reductant, addressing thermal optimization, materials issues and systems challenges, and foundational R&D on early stage approaches such as the use of hydrogen plasmas. Applicants ideally would propose a "center of excellence" approach which would involve a team of multiple partners from industry and/or academia, including national labs if appropriate, to advance concepts that could enable a pilot scale demonstration in future years.

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5) H2@Scale New Markets Demonstrations
This potential area may include two focus areas to develop first-of-a-kind demonstrations in emerging new markets for hydrogen, aligned with H2@Scale priorities. Work funded would include integrated systems to demonstrate hydrogen production, delivery, dispensing, storage, and utilization, tailored to new applications. One potential demonstration area would jumpstart the emerging market opportunity for hydrogen and fuel cells in the maritime sector that could include the integration of applications such as marine vessels, drayage and shipyard trucks, cargo lift trucks, cranes, shore power for marine vessels, large-scale energy transport/hydrogen export, or other industrial applications. Another potential area would demonstrate fuel cell systems for primary and/or backup power at data centers at a scale relevant to enable this new market (e.g. up to 2 MW).

6) Training and Workforce Development for Emerging Hydrogen Technologies
This potential area would create cohesive, strategic, and well-coordinated regional efforts to develop the skills necessary for supporting the growing hydrogen and fuel cell market. Material would be developed and disseminated to address key issues such as safety, codes, standards, maintenance, and certification. Ideally, this area of interest would result in projects which pave the way for future efforts to foster a competent and skilled workforce for the emerging industry.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 1-5 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about January of 2020 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting

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as a team or a single entity, use only one account as the contact point for each submission.

Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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