



U.S. DEPARTMENT OF ENERGY

DOE Hydrogen Program Request for Information # DE-FOA-0002664.0002 Regional Clean Hydrogen Hubs Implementation Strategy

DATE: February 15, 2022
SUBJECT: Request for Information (RFI)

Description

This is a Request for Information (RFI) issued by the U.S. Department of Energy's (DOE) Hydrogen Program, on behalf of the Energy Efficiency and Renewable Energy (EERE) Hydrogen and Fuel Cell Technologies Office (HFTO), the Office of Fossil Energy and Carbon Management (FECM), the Office of Nuclear Energy (NE), and in collaboration with DOE's newly formed Office of Clean Energy Demonstrations (OCED). The intent of this RFI is to obtain public input regarding the solicitation process and structure of a DOE Funding Opportunity Announcement (FOA) to fund regional clean hydrogen hubs, in accordance with the Infrastructure Investment and Jobs Act.¹ Specifically, this RFI seeks input on:

- Regional Clean Hydrogen Hub Provisions and Requirements
- Solicitation Process, FOA structure, and Implementation Strategy
- Equity, Environmental and Energy Justice (EEEJ) Priorities
- Market Adoption and Sustainability of the Hubs

Information collected from this RFI will be used by DOE for planning purposes to develop the Regional Clean Hydrogen Hubs FOA. The information collected will not be published.

Background

On November 15, 2021, President Joseph R. Biden, Jr. signed the Infrastructure Investment and Jobs Act (Public Law 117-58), also known as the Bipartisan Infrastructure Law (BIL). The BIL is a once-in-a-generation investment in infrastructure, which will grow a more sustainable, resilient, and equitable economy through enhancing U.S. competitiveness in the world, creating good jobs, and ensuring stronger access to these economic benefits for underserved communities. The BIL appropriates more than \$62 billion to DOE² to deliver a more equitable clean energy future for the American people by:

¹ Infrastructure Investment and Jobs Act, Public Law 117-58 (November 15, 2021), Subtitle B – Hydrogen Research and Development, Section 40314 – Additional clean hydrogen programs. <https://www.congress.gov/bill/117th-congress/house-bill/3684>

² U.S. Department of Energy. November 2021. "DOE Fact Sheet: The Bipartisan Infrastructure Deal Will Deliver For American Workers, Families and Usher in the Clean Energy Future." <https://www.energy.gov/articles/doe-fact-sheet-bipartisan-infrastructure-deal-will-deliver-american-workers-families-and-0>

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- Investing in American manufacturing and workers.
 - Expanding access to energy efficiency and clean energy for families, communities, and businesses.
 - Delivering reliable, clean, and affordable power to more Americans.
 - Building the technologies of tomorrow through clean energy demonstrations.

As part of this effort, the BIL authorizes appropriations of \$8 billion for the five (5) year period encompassing fiscal years (FYs) 2022 through 2026 for the development of regional clean hydrogen hubs that demonstrate the production, processing, delivery, storage, and end-use of clean hydrogen.³

Clean hydrogen and related technologies, such as electrolyzers, fuel cells, and turbines, can play a key role in decarbonizing many sectors, including medium- and heavy-duty transportation, residential and commercial heating, power generation, and hard-to-decarbonize industries such as ammonia and steel. This will support the Biden Administration's goal to achieve a carbon-free electric grid by 2035 and a net zero emissions economy by 2050.⁴

Strengthening prosperity – by expanding good, safe union jobs and supporting job growth through investments in domestic manufacturing – are key goals set by President Biden, discussed in depth in his Executive Orders on Ensuring the Future Is Made in All of America by All of America's Workers (EO 14005), Tackling the Climate Crisis at Home and Abroad (EO 14008), Worker Organizing and Empowerment (EO 14025), and Promoting Competition in the American Economy (EO 14036). The regional clean hydrogen hubs will support the creation of good-paying jobs with the free and fair choice to join a union, the incorporation of strong labor standards, and training and placement programs, especially registered apprenticeship.⁵

³ 42 USC 16161a(d)

⁴ FACT SHEET: President Biden sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/>

⁵ A Registered Apprenticeship Program (RAP) is a proven model of apprenticeship that has been validated by the U.S. Department of Labor or a State Apprenticeship Agency." Registered Apprenticeship is the term used for apprenticeship programs that have a formal structure, in which employers have established learning standards that meet national and state quality expectations. When individuals successfully complete a Registered Apprenticeship program, they receive a national credential that is recognized anywhere in the industry." <https://www.apprenticeship.gov/employers/registered-apprenticeship-program;> [https://www.dol.gov/sites/dolgov/files/ETA/apprenticeship/pdfs/Pre Apprenticeship GuideforWomen.pdf](https://www.dol.gov/sites/dolgov/files/ETA/apprenticeship/pdfs/Pre_Apprenticeship_GuideforWomen.pdf)

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One key pathway to achieving large-scale, commercially viable deployment of clean hydrogen is through matching the scaleup of clean hydrogen supplies with a concomitant and growing regional demand. Co-locating large scale clean hydrogen production with multiple end-uses can foster the development of low-cost hydrogen and the necessary supporting infrastructure to jumpstart the hydrogen economy in various market segments, create both near-term and long-term jobs and tax revenues for regional economies, and realize emissions reduction benefits. The regional clean hydrogen hubs (referred to as “H2Hubs” throughout the rest of this document) will contribute to achieving DOE’s goals for H2@Scale,⁶ which provides an overarching vision for how clean hydrogen can enable energy pathways across applications and sectors in an increasingly interconnected energy system (see Figure 1). The H2Hubs will also contribute to achieving, or exceeding, the clean hydrogen cost reduction targets for electrolyzers called for in the BIL (\$2 per kilogram of H₂ by 2026)⁷ and help to put the Hydrogen Program on track to reach the Hydrogen Shot⁸ goal of \$1 per 1 kilogram in 1 decade (“1 1 1”).

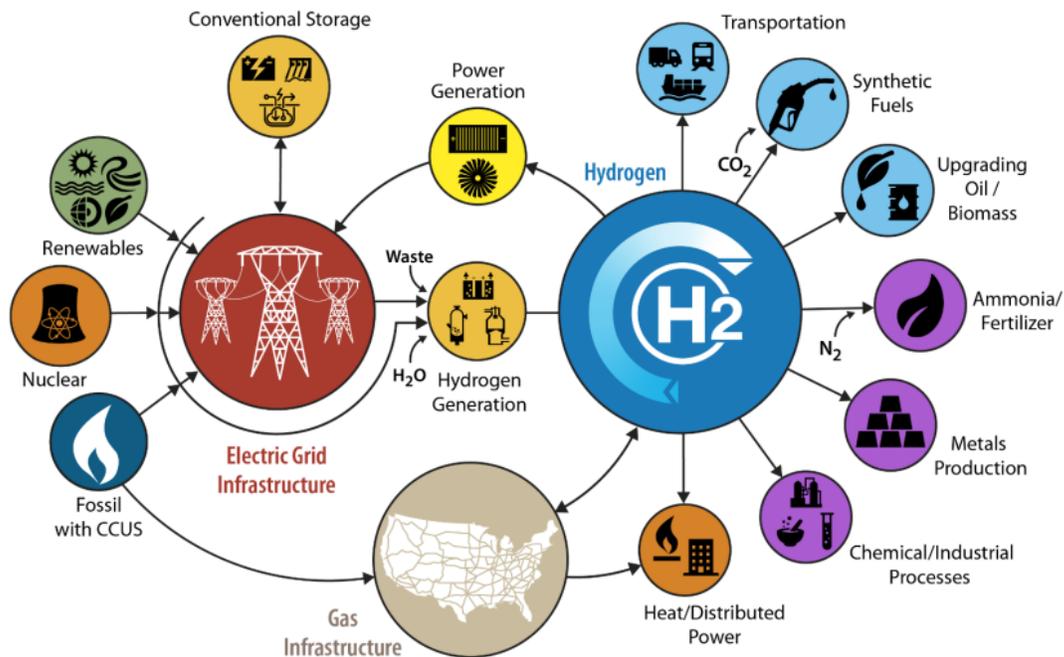


Figure 1 The H2@Scale concept is based on hydrogen’s potential to meet existing and emerging market demands across multiple sectors. It envisions how innovations to produce, store, transport, and utilize hydrogen can help realize that potential and achieve scale.

⁶ U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Hydrogen and Fuel Cell Technologies Office. <https://www.energy.gov/eere/fuelcells/h2scale>

⁷ 42 USC 16161d(c)(1)

⁸ <https://www.energy.gov/eere/fuelcells/articles/hydrogen-shot-introduction>

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Regional Clean Hydrogen Hubs – BIL Provisions

The specific provisions for H2Hubs are set forth in Section 40314 of the BIL, which amends Title VIII of the Energy Policy Act of 2005 (EPAct 2005)⁹ by adding a new “Section 813 – Regional Clean Hydrogen Hubs.” Section 813(a) defines the term “regional clean hydrogen hub” as “a network of clean hydrogen producers, potential clean hydrogen consumers, and connective infrastructure located in close proximity.” Under Section 813(b), DOE “shall establish a program to support the development of at least four (4) regional clean hydrogen hubs that:

- (1) demonstrably aid the achievement of the clean hydrogen production standard developed under section 822(a)¹⁰
- (2) demonstrate the production, processing, delivery, storage, and end-use of clean hydrogen, and
- (3) can be developed into a national clean hydrogen network to facilitate a clean hydrogen economy.”

Section 813(c)(3) directs DOE to solicit proposals for the H2Hubs within 180 days of the BIL’s enactment, and to make at least four hub selections within a year of receiving proposals. The BIL defines the following specific criteria that DOE shall use to the maximum extent practicable in making its selections for H2Hubs:

- **Feedstock diversity** – at least one hub shall demonstrate the production of clean hydrogen from fossil fuels, one hub from renewable energy, and one hub from nuclear energy.
- **End-use diversity** – at least one hub shall demonstrate the end-use of clean hydrogen in the electric power generation sector, one in the industrial sector, one in the residential and commercial heating sector, and one in the transportation sector.
- **Geographic diversity** – each regional clean hydrogen hub shall be located in a different region of the United States and shall use energy resources that are abundant in that region.
- **Hubs in natural gas-producing regions** – at least two regional clean hydrogen hubs shall be located in the regions of the United States with the greatest natural gas resources.

⁹ Energy Policy Act of 2005, Public Law 109–58, Title VIII – Hydrogen

¹⁰ Section 40315 of the BIL, which amends EPACT 2005 to add Section 822 – Clean Hydrogen Production Qualifications, requires DOE to consult with the Environmental Protection Agency and account for input from industry and other stakeholders to develop an initial standard for the carbon intensity of clean hydrogen production within 180 days (May 14, 2022), using a definition of “clean hydrogen” to mean hydrogen produced with a carbon intensity equal to or less than 2 kilograms of carbon dioxide-equivalent produced at the site of production per kilogram of hydrogen produced (kg CO₂e/kg H₂). Following development of the initial standard, and, as before, in consultation with the Environmental Protection Agency and accounting for input from industry and other stakeholders, DOE will determine whether the standard should be lowered below 2 kg CO₂e/kg H₂.

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- **Employment** – DOE shall give priority to regional clean hydrogen hubs that are likely to create opportunities for skilled training and long-term employment to the greatest number of residents in the region.
 - **Additional Criteria** – DOE may take into consideration other criteria that are necessary or appropriate to carry out the regional clean hydrogen hubs program.

In addition, Section 40314 of the BIL amends EAct 2005 to add “Section 814 – National Clean Hydrogen Strategy and Roadmap.” Under this section, DOE shall develop a technologically and economically feasible national strategy and roadmap to facilitate widescale production, processing, delivery, storage, and use of clean hydrogen. DOE will use this roadmap in carrying out the Regional Clean Hydrogen Hub program.

Regional Clean Hydrogen Hub Implementation Strategy

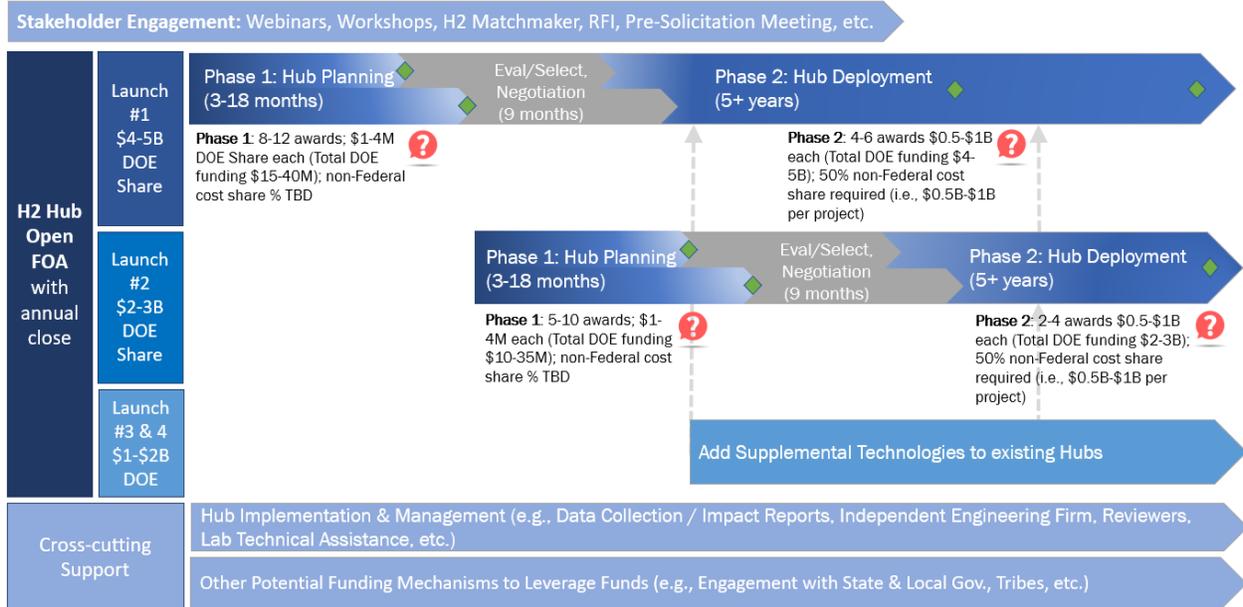
This section provides a high-level draft plan for DOE’s current vision to meet the BIL requirements by conducting a competitive solicitation to select and deploy H2Hubs. Please note this is a preliminary plan and it will likely evolve as DOE gathers feedback through the RFI and other stakeholder processes.

DOE envisions that the H2Hubs solicitation could be structured as a single, multi-year FOA with annual open and close dates for different “launches” over the FY 2022 – 2025 timeframe. Launches 1 and 2 would solicit, select, and deploy the H2Hubs, while Launches 3 and 4 would solicit and select new technologies, capabilities/end-uses, or partners that could be incorporated into and supplement the selected H2Hubs formed through Launches 1 and 2. Figure 2 below illustrates DOE’s vision for what a future funding opportunity strategy could be. Potential funding amounts and the number of awards are all approximate and subject to change as noted in red in the figure.

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Potential H2 Hub FOA Strategy (DRAFT) ****All funding amounts are approximate and subject to change**

◆ "Go/No-Go" Decision Points



*Notional timeline - allows flexibility for each project to be on own timeframe

In this draft strategy, Launches 1 and 2 would be essentially identical in structure and would consist of two main phases. DOE expects to evaluate applications based on detailed plans for Phase 1, as well as planned Phase 2 activities, partnerships/commitments, along with the long-term vision and strategy for the proposed H2Hub.

- Phase 1 – Hub Planning:** This phase would focus on initial hub planning, which may include activities such as analysis of key metrics such as the decarbonization potential and energy resources/infrastructure/workforce in the proposed region, hub design, financing, and preliminary National Environmental Policy Act (NEPA) and related reviews. This Phase is expected to be approximately \$1 to \$4M DOE share for each potential H2Hub, plus required cost share (% cost share TBD)¹¹ and be administered over approximately 3-18 months depending on how much detailed advanced planning and analysis each team has already completed and how quickly the awardee can complete Phase 1 and submit to Phase 2. Phase 1 would likely include the key partners for each potential H2Hub (additional partners can be added in the Phase 2 proposal). This planning phase should include meaningful engagement by the H2Hub teams with

¹¹ 2 CFR § 910.130 Cost sharing (EPACT)

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all communities in the region, with a focus on disadvantaged communities (DACs),¹² tribal communities and communities with environmental justice concerns, and communities facing the transition away from fossil fuel economies, as well as with labor unions and other key stakeholders. This would allow teams to gather input during the in-depth planning and design of potential hubs, including value proposition and benefits analyses, as well as the potential role of communities and community engagement throughout the project. The goal at the end of Phase 1 would be to have a full plan ready for the roll-out of the hub in Phase 2 as well as insight that potential critical reviews, approvals, or negotiations such as NEPA, financing, permitting, safety, partnering agreements, power purchase agreements, long-term hub sustainability, etc. have been evaluated and addressed as much as practical (given the funding and timing) to minimize potential risk.

- **Phase 2 – Hub Construction and Deployment:** This phase would be focused on the development and build-out of the Phase 1 design after completing NEPA reviews, permitting, etc. during the early stages of Phase 2. Phase 2 would include multiple Budget Periods with defined activities per Budget Period. DOE is in the process of defining activities for each Budget Period; however, for example, Phase 2 may include:
 - Phase 2a: Project Development (e.g., Front-End Engineering Design, completed NEPA reviews, siting, permitting, finalizing off-taker agreements and volumes, etc.)
 - Phase 2b: Hub Construction/Deployment
 - Phase 2c: Operation

Go/No-Go reviews would be held between each Budget Period to evaluate the progress and readiness of the H2Hub to move to the next Budget Period. This Phase is expected to be \$500 million to \$1 billion DOE share for each H2Hub plus 50% cost share¹³ (50% of the total project cost including both DOE share and recipient cost share, for a total project cost of \$1 billion to \$2 billion) and executed over approximately five or more years depending on the size and complexity of the H2Hub. Additional partners can be added as part of the Phase 2 continuation application.

DOE expects to retain the services of an independent engineering firm to review all the Phase I and Phase 2 deliverables from planning through H2Hub operation. This could

¹² The Justice40 initiative, established by E.O. 14008, states that 40% of the overall benefits of certain federal investments should flow to disadvantaged communities (DACs). The Justice40 Interim Guidance provides a broad definition of DACs (Page 2): <https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf>

¹³ Recipient cost share is exclusive of other federal sources of funding and may not be applied to more than one federal cost share requirement.

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include, but is not limited to, the review of: 1) quarterly reports and project milestones; 2) engineering construction and deployments designs; 3) financial plans and recipient's ability to meet cost sharing requirements; 4) risk management plans; and 5) an evaluation of the commercial readiness of proposed hub technologies.

To be considered for Phase 2 funding, H2Hub projects must successfully complete all Phase 1 planning activities and analysis, which may include, but are not limited to:

- Ability to meet or exceed the clean hydrogen production standard developed under Section 822(a)
- Ability to create and sustain jobs, particularly high paying union jobs, and support long-term jobs for local residents
- Ability to employ workers currently employed in the fossil industry or those that may no longer have jobs as a result of the clean energy transition, in regions where applicable
- Capacity to demonstrate the complete value chain at scale for production, processing, delivery, storage, and end-use of clean hydrogen
- Ability to drive sustained regional specific economic growth, including through demonstrated connections to the value chain at scale for production, processing, delivery, storage, and end-use of clean hydrogen
- Potential for the proposed H2Hub to be developed into a national clean hydrogen network to facilitate a clean hydrogen economy, including potential for replicability
- Quantification of decarbonization potential compared to alternate pathways
- Quantification of criteria pollutant emission reductions, compared to alternate pathways
- Project financial model and analysis including total project cost with revenue potential and pathway to private sector investment and commercial sustainability beyond the DOE funding
- EEEJ strategy, including significant and meaningful community engagement plans, connection to hubs and post-hub benefit, to ensure EEEJ goals are achieved
- Cost, quantity, and purity of hydrogen produced/demanded
- Potential for U.S. manufacturing of components/equipment across the hydrogen supply chain
- Reliability, availability, capacity of clean energy source(s)
- Availability of necessary hydrogen infrastructure including storage of hydrogen, energy feedstocks, and/or permanently sequestered CO₂, where applicable
- Commitment (or at least identification) of specific off-taker agreements (e.g., power purchase agreements)
- Creation of clear workforce education and training pathways, including registered apprenticeships, into high quality jobs (including union jobs)

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- Effective use of regional resources/markets
 - Market analysis that includes current and future supplier/off-take potential
 - Plan to ensure environmental impacts such as water use, impact on DACs or adjacent regions, etc., are minimized
 - Complete list of project partners with letters of commitment or MOUs
 - Formal partnership with and support from relevant local labor unions, where applicable
 - Potential for longevity and sustainability after DOE FOA funding ceases

During Phase 1, H2Hub recipients would also complete their preliminary engineering, construction and deployment designs, secure non-federal cost sharing and financial commitments for the full H2Hub deployment, obtain/identify land use rights and site access, begin preliminary NEPA and related reviews, identify permitting and regulatory requirements, as well as conduct preliminary hydrogen safety reviews to ensure a successful Phase 2. Specific Phase 1 activities will be tailored based on the status of each H2Hub.

In addition to the items noted above, the transition from Phase 1 to Phase 2 would require successful completion of established Go/No-Go decision points (similar to stage gate reviews), which will be specific to each H2Hub (developed during Phase 1 negotiations). The Phase 1 to Phase 2 Go/No-Go review will require the submission of a continuation application, which is expected to include a full Phase 2 technical proposal with a Phase 2 budget justification, as well as documentation showing successful completion of all Phase I requirements. Independent reviewers will review and score the continuation application. DOE will also utilize the services of an independent engineering firm to review the deliverables associated with the continuation application. This independent review will include an evaluation of each H2Hub technology to determine commercial deployment readiness. The Go/No-Go timing will be based on the proposed project's readiness to start the full hub construction/deployment and can be initiated as soon as the H2Hub project is ready during Phase 1. This approach allows flexibility for each project to progress on its own schedule for completion of the Phase 1 deliverables and Go/No-Go criteria. For example, proposed projects that have already completed their project development activities and related analysis prior to selection may be able to accelerate through Phase 1 faster than other projects that have not completed these activities.

As Figure 2 illustrates, DOE anticipates awarding approximately four to six Phase 2 projects in Launch 1 (pending the number of applicants with qualified hub proposals), and an additional two to four Phase 2 projects in Launch 2 (pending the outcome of Launch 1), with a goal of awarding a total of six to ten Phase 2 projects from Launches 1 and 2. DOE anticipates that the FOA will allow for a range of awards from \$500 million to \$1 billion, in order to allow for a range of regional hub sizes and complexities that meet the intent of the BIL. DOE anticipates funding a

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portfolio of H2Hubs that captures to the maximum extent practicable the full feedstock, end-use, and geographic diversity requirements in the BIL as noted above. Applicants not awarded funding in Launch 1 (FY22) may reapply alongside new applicants in the Launch 2 (FY23) FOA cycle.

To facilitate hydrogen hub team formation and to support the overall connection between hubs and the broader hydrogen economy, DOE announced the launch of H₂MatchMaker,¹⁴ a voluntary online tool created to aid in fostering partnerships among key stakeholders by allowing potential partners to self-identify. H₂Matchmaker will include an interactive map containing self-reported clean hydrogen producers, hydrogen consumers, infrastructure provider/operators, and other key stakeholders (e.g., Government, Tribal, Labor, Workforce Development, Safety Codes and Standards, Financier/Investor, Environmental Justice Organizations). The H₂Matchmaker tool is intended to help foster partnerships by increasing awareness and aligning potential needs in specific regions of the United States. DOE will not give preference to entities for use of the tool as it is completely voluntary (i.e., its use or non-use will have no impact on the eventual H2Hub selections).

In addition to this RFI, DOE has conducted other stakeholder outreach activities to help inform the development of the Regional Clean Hydrogen Hub FOA. For example, DOE hosted an H2IQ Webinar¹⁵ on December 8, 2021, to provide an update on Hydrogen Shot, results of a previous RFI on potential regional clean hydrogen demonstrations, summary of hydrogen provisions in the BIL, and the H₂Matchmaker tool. DOE may conduct future outreach events to get input from various stakeholder groups (e.g., labor groups, state/local governments, tribes, communities with environmental justice concerns, communities with retiring or decommissioned fossil assets, etc.) throughout February and March. Finally, DOE plans to issue a draft FOA in the May 2022 timeframe and hold a Pre-Solicitation Meeting to solicit additional public input before publishing the FOA later in 2022.

Purpose

The purpose of this RFI is to solicit feedback from industry, government agencies, state and local coalitions, academia, research laboratories, labor unions, community-based organizations (CBOs),¹⁶ and other stakeholders on issues related to the Regional Clean Hydrogen Hub FOA strategy.

¹⁴ <https://www.energy.gov/eere/fuelcells/h2-matchmaker>

¹⁵ <https://www.energy.gov/eere/fuelcells/hydrogen-and-fuel-cell-technologies-office-webinars>

¹⁶ Community-Based Organizations (CBOs) are public or private not-for-profit resource hubs that provide specific services to the community or targeted population within the community.

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You may answer as few or as many of the questions below as you would like. Please use the bolded Category numbers and subnumbers as headings in your response to the greatest extent possible and refer to the questions (C1.1a, C2.12 etc.) in the body of your responses. This helps save time both for the responder and the reviewers.

Specifically, DOE is requesting input on the following categories and questions:

Category 1: Regional Clean Hydrogen Hub Provisions and Requirements

1. The BIL defines a “regional clean hydrogen hub” as “a network of clean hydrogen producers, potential clean hydrogen consumers, and connective infrastructure located in close proximity.”¹⁷
 - a. What should qualify as ‘close proximity’ in context of the hub requirements?
 - b. What existing facilities and infrastructure, including pipelines and storage facilities, could be most easily leveraged by the H2Hubs?
 - c. What types of new ‘connective infrastructure’ will be needed by the H2Hubs (e.g., pipelines, storage, etc.)?
 - d. What supportive activities would make the hydrogen hubs successful and sustainable (e.g., workforce development, community-based organization engagement, domestic manufacturing, labor standards, etc.)?
2. The BIL states that H2Hubs must (1) demonstrably aid the achievement of the clean hydrogen production standard developed under Section 822(a) [defined as 2 kg CO₂e/kg H₂ at the point of production]; (2) demonstrate the production, processing, delivery, storage, and end-use of clean hydrogen; and (3) can be developed into a national clean hydrogen network to facilitate a clean hydrogen economy.¹⁸
 - a. What CO₂ equivalent emissions should be met within the project and its supply chain? What strategies are available for, and how can DOE incentivize, the H2Hubs to reduce emissions not only at the point of production but also including upstream emissions? What challenges are there in measuring CO₂ equivalent emissions?
 - b. Please specify CO₂e/kg H₂ you anticipate at the point of production in addition to well to gate (i.e., including upstream emissions).
 - c. Given the level of funding, and with the ultimate goal of developing a national clean hydrogen network, would four (4) large H2Hubs that each produce more than a certain amount of hydrogen (e.g., more than 1,000 tonnes/day, see question 3 to specify amount) or 6-10 H2Hubs of varying size be more effective?

¹⁷ 42 USC 16161a(a)

¹⁸ 42 USC 16161a(b)

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- d. What policies, infrastructure, or other considerations could be put in place to enable the H2Hubs to develop into a national clean hydrogen network in the future?
 - e. How should the H2Hubs be asked to measure progress toward the administration's goal of transforming the economy by 2050 to achieve net-zero emissions goals? Please be as specific as possible.
3. FEEDSTOCK DIVERSITY: "To the maximum extent practicable— (i) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from fossil fuels; (ii) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from renewable energy; and (iii) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from nuclear energy."¹⁹
- a. Should DOE require a minimum level of hydrogen production per regional clean hydrogen hub, and if so, what should that minimum amount be (i.e., X tonnes/day)? Should this requirement vary for clean hydrogen produced from fossil fuels with carbon capture and storage (CCS), renewable energy, and nuclear energy? If a minimum is not specified, how may DOE incentivize larger capacity hubs?
 - b. Related to 3a, how should DOE take into account specifying minimum required hydrogen production when considering capacity factors and the potential intermittency of generation, which would increase the cost and requirement for hydrogen storage?
 - c. What terms should be required for an H2Hub powered by renewable energy to demonstrate clean production (e.g., a power purchase agreement with a renewable generator, or direct connection to a co-located renewable generator)?
 - d. Should DOE prioritize the repurposing of historic fossil infrastructure in the regional hub(s) focused on production from fossil fuels and if so, over what time frame? If yes, should DOE incentivize an eventual transition from fossil fuels to another fuel source? What conditions should DOE place on the carbon intensity of the fossil fuels (with CCS) used in this hub other than what is already specified in the BIL?
 - e. How might hydrogen production be constrained by the availability of clean electricity or natural gas supply and distribution? Will hydrogen producers provide a sustainable market/revenue stream for clean electricity and natural gas that encourages new investments to expand electricity generation and natural gas production capacity? Are separate federal, state, or local incentives

¹⁹ 42 USC 16161a(c)(3)(A)

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- to expand clean electricity generation or natural gas production capacity available, necessary, or adequate?
- f. Should H2Hub funding be made available to upgrade or develop new dedicated clean electric or heat generating energy resources (e.g., renewables or other clean generation sources) needed to produce clean hydrogen?
4. END-USE DIVERSITY: “To the maximum extent practicable– (i) at least 1 regional clean hydrogen hub shall demonstrate the end-use of clean hydrogen in the electric power generation sector; (ii) at least 1 regional clean hydrogen hub shall demonstrate the end-use of clean hydrogen in the industrial sector; (iii) at least 1 regional clean hydrogen hub shall demonstrate the end-use of clean hydrogen in the residential and commercial heating sector; and (iv) at least 1 regional clean hydrogen hub shall demonstrate the end-use of clean hydrogen in the transportation sector.”²⁰
- a. What are the ideal timing and desirable features, terms, and conditions of off-taker agreements that would encourage construction and development of hydrogen hub infrastructure and long-term sustainability leading to local economic prosperity including union jobs and benefits to disadvantaged communities? Would hubs that supply multiple end users provide advantages, and in what ways?
- b. What approaches can applicants use to guarantee off-taker commitments and matching of supply and demand?
- c. The climate value of displacement may vary across end uses. How should the climate benefit of different hydrogen end uses be considered?
5. GEOGRAPHIC DIVERSITY: “To the maximum extent practicable, each regional clean hydrogen hub– (i) shall be located in a different region of the United States; and (ii) shall use energy resources that are abundant in that region.”²¹
- a. A region could be defined as anything from a city, a state, multiple states, tribal communities, or a geographic area. Should DOE define the regions or allow applicants to define them within their proposal? If a definition is preferred, explain how regions should be defined for the purposes of this FOA and provide the rationale.
- b. In addition to sufficient energy and feedstock/water resources, what other regional factors should be considered when identifying and selecting regional hubs (e.g., economic considerations, policy considerations, environmental and energy justice considerations, geology, workforce availability and skills, current industrial and other relevant infrastructure and storage available/repurposed/reused, industry partners, minority-serving institutions

²⁰ 42 USC 16161a(c)(3)(B)

²¹ 42 USC 16161a(c)(3)(C)

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[MSIs], minority-owned businesses, regional specific resources, security of supply, climate risk, etc.)?

6. HUBS IN NATURAL GAS-PRODUCING REGIONS: “To the maximum extent practicable, at least 2 regional clean hydrogen hubs shall be located in the regions of the United States with the greatest natural gas resources.”²²
 - a. What level of natural gas resources should be required to qualify as a region with the “greatest natural gas resources”? How should DOE consider the difference between the available natural gas resources and the current natural gas production of an area when considering hub candidates? How should DOE consider the volatility of natural gas prices and its effect on production levels when defining these regions?
 - b. How should DOE consider the volatility of natural gas prices and its effect on production levels when defining these regions? Should annual (or average over a five-year period) production and/or available proven reserves be the criteria for the above provision?
7. EMPLOYMENT: DOE “shall give priority to regional clean hydrogen hubs that are likely to create opportunities for skilled training and long-term employment to the greatest number of residents of the region.”²³

In keeping with the administration’s goals, and as an agency whose mission is to help strengthen our country’s energy prosperity, the Department of Energy strongly supports investments that expand union jobs, improve job quality through the adoption of strong labor standards, increase job access, strengthen local economies, and develop a diverse workforce for the work of building and maintaining the country’s energy infrastructure and growing domestic manufacturing. The Department intends to use the H2Hubs to support the creation of good-paying jobs with the free and fair choice to join a union and the incorporation of strong labor standards and training and placement programs, especially registered apprenticeship. Respondents to this RFI are encouraged to include information about how this program can best support these goals.

- a. What tools should H2Hubs utilize to meet the goals of creating good union jobs and work opportunities for local residents in the construction phase of the project and in the long-term operations phase of the project?
- b. What tools should H2Hubs utilize to meet the goals of providing opportunities for workers displaced from fossil industries and other industrial or resource-based industries in decline?

²² 42 USC 16161a(c)(3)(D)

²³ 42 USC 16161a(c)(3)(E)

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- c. How should short-term build-out (i.e., construction phase) employment and long-term operational employment opportunities be measured and evaluated?
 - d. What would “success” look like, especially related to Diversity, Equity and Inclusion (DEI) and support for union and energy transition jobs?
 - e. How should H2Hubs include workforce development and training activities (e.g., by including institutions of higher education, such as MSIs, community-based organizations, registered apprenticeship programs, joint labor-management apprenticeship programs and quality community-based pre-apprenticeship programs, as project partners)? In addition to each H2Hub having its own workforce development and jobs plan, should there be a nationally coordinated effort between hubs (and other hydrogen activities) to ensure an adequately trained workforce is available? If so, how should this be designed?
 - f. How will the H2Hub training model offer opportunities for a range of jobs across the hydrogen supply chain?
 - g. How should labor standards be incorporated in project planning stages to support the creation of high-quality, good-paying jobs?

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

8. DOE is evaluating funding mechanisms for the H2Hubs projects in accordance with the BIL. What applicable funding mechanisms are best suited to achieve the purposes of the H2Hubs (e.g., Cooperative Agreements,²⁴ Grants, Other Transactions Authority²⁵)?
9. What are the key review criteria (e.g., technical merit, workplan, market transformation plan, team and resources, financial, regional economic benefits, environmental justice, DEI) that DOE should use to evaluate and select the H2Hubs as well as evaluate readiness to move from Phase 1 to Phase 2?
10. Does offering multiple launches roughly a year apart, as shown above in Figure 2, help facilitate expanding the hydrogen hub concept to more regions?
11. What specific activities should be conducted in Phase 1 vs. Phase 2? Should Phase 2 be further broken into multiple sub-phases, and if so, what should be included in each sub-phase?
12. How much time will be needed to complete the Phase 1 activities? Have some regional teams already completed analysis and design activities?
13. Are the proposed funding levels for Phase 1 and Phase 2 appropriate/adequate?
14. How much funding should DOE allocate for adding new technologies, capabilities/end-uses, or partners to the existing hubs (i.e., Launches 3 and 4)?

²⁴ For more information about Cooperative Agreements, see the DOE Guide to Financial Assistance:

<https://www.energy.gov/management/articles/department-energy-guide-financial-assistance>

²⁵ Agreements under the Other Transactions Authority (OTA), Section 1007 of EPOA 2005

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15. What safety criteria (e.g., safety plan reviews, outreach to Authority Having Jurisdiction [AHJ] entities such as code/fire officials, training) should DOE use to evaluate readiness to move from Phase 1 to Phase 2?
 16. What resources might H2Hubs need regarding safety, permitting, and siting, particularly in relation to the Hydrogen Safety Panel²⁶ and submission of safety plans.
 17. What environmental reviews and permitting challenges might H2Hubs encounter? Where can approaches such as “dig once” relating to buried conduits, pipelines, and other infrastructure (e.g., CO₂ pipelines) be developed and incentivized to reduce impact? Please provide examples of how community consultation and consent-based siting can successfully be included in the environmental and permitting review process.
 18. Are there existing draft or final federal NEPA documents (e.g., environmental assessments and/or environmental impact statements) for similar or related proposals that could inform DOE NEPA reviews for the H2Hubs?
 19. What external non-project partners/stakeholders (e.g., CBOs, DACs, tribal groups, state and local governments, economic development organizations, labor representatives) will be critical to the success of the H2Hubs? What types of outreach and engagement strategies are needed to make sure these stakeholders are involved during each phase of the H2Hubs? Are there best practices for equitably and meaningfully engaging stakeholders?
 20. The H₂MatchMaker tool²⁷ will be available to help identify potential regional project partners. What specific fields/information would be valuable to include in the tool? What other mechanisms can DOE use to help facilitate teaming?
 21. Based on EAct 2005, Section 988, the cost share requirement for demonstration and commercial application projects is 50% cash and/or in-kind and must come from non-Federal resources (50% of the total project cost which includes both DOE share and recipient cost share). For example, a \$1B award for the Phase 2 Hub Deployment will require \$1B in matching cost share. Is it feasible for projects to meet this 50% cost share requirement on an invoice-by-invoice basis?
 22. Is there sufficient manufacturing capacity to produce the necessary hydrogen related components/equipment within the U.S. to supply all the eventual H2Hubs? What incentives/programs exist or can be put in place to encourage and foster U.S. manufacturing? What potential challenges or opportunities might exist to meet the new Buy American requirements in the BIL?²⁸

²⁶ <https://h2tools.org/hsp>

²⁷ <https://www.energy.gov/eere/fuelcells/h2-matchmaker>

²⁸ New Buy American requirements are located in Division G – Other Authorizations; Title IX – Build America, Buy America of the Infrastructure Investment and Jobs Act (IIJA), Public Law 117-58, which was enacted into law on November 15, 2021. <https://www.congress.gov/bill/117th-congress/house-bill/3684>

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23. Please identify any iron, steel, manufactured goods, or construction materials that will be crucial for building out the H2Hubs that would not typically be procured domestically. For each, please specify how H2Hubs could work to procure these items domestically, and any potential barriers to domestic procurement, such as lack of availability or cost.
 24. What types of cross-cutting support (e.g., technical assistance) would be valuable from the DOE/national laboratories, and/or from other federal agencies, to provide in proposal development or project execution? Are there other entities that DOE could fund to provide technical assistance across multiple H2Hubs?
 25. What data should DOE collect from the H2Hubs to evaluate the impact of the program? How should this data and the program outcomes be disseminated to the public? In addition, EAct 2005 Section 817 requires that three national labs (the National Energy Technology Laboratory, the Idaho National Laboratory, and the National Renewable Energy Laboratory) will work together to serve as a ‘clearinghouse’ for the H2Hubs and for the Clean Hydrogen Manufacturing and Recycling Program (Section 815). What data or information should be part of this ‘clearinghouse’?
 26. How could funding under other BIL provisions (e.g., Section 40303, Carbon Capture Technology Program) be leveraged by the H2Hubs to maximize the impact of BIL funding?

Category 3: Equity, Environmental and Energy Justice (EEEJ) Priorities

EEEJ benefits will be a high priority as the H2Hubs are developed. For the purposes of this RFI, DOE has identified the following non-exhaustive list of policy priorities as examples to guide DOE’s implementation of Justice40²⁹ in DACs: (1) decrease energy burden;^{30,31,32} (2) decrease environmental exposure and burdens;³³ (3) increase access to low-cost capital; (4) increase the clean energy job pipeline and job training for individuals;³⁴ (5) increase clean energy enterprise

²⁹ The Justice40 Initiative states that 40% of the overall benefits of certain federal investments will flow to DACs, and that projects will have minimal negative impacts on communities with environmental justice concerns. The Justice40 Interim Guidance defines benefits as direct and indirect investments (and program outcomes) that positively impact disadvantaged communities and provides examples (Page 4): <https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf>

³⁰ The Initiative for Energy Justice https://iejusa.org/glossary-and-appendix/#glossary_of_terms

³¹ DOE’s LEAD tool illustrates energy burden in U.S. <https://www.energy.gov/eere/slsc/maps/lead-tool>

³² Drehobl, A., Ross, L., and Ayala, R. 2020. How High are Household Energy Burdens? Washington, DC: ACEEE.

³³ Tessum, C., et al., 2019. Inequity in consumption of goods and services adds to racial–ethnic disparities in air pollution exposure. Proceedings of the National Academy of Sciences.

³⁴ DOE’s US Energy & Employment Jobs Report (USEER), <https://www.energy.gov/us-energy-employment-jobs-report-useer>; Department of Labor, Civilian Labor Force by Sex, <https://www.dol.gov/agencies/wb/data/facts-over-time/women-in-the-labor-force>

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creation (e.g., minority-owned or diverse business enterprises); (6) increase energy democracy, including community ownership; (7) increase parity in clean energy technology access and adoption; and (8) increase energy resilience.

27. What strategies, policies, and practices can H2Hubs deploy to support EEEJ goals (e.g., Justice40)? How should these be measured and evaluated for the H2Hubs?
28. What EEEJ concerns or priorities are most relevant for the H2Hubs?
29. What measures should H2Hub project developers take to ensure that harm to communities with environmental justice concerns, including local pollution, are mitigated?
30. How can H2Hubs ensure community-based stakeholders/organizations are engaged and included in the planning, decision-making, and implementation processes (e.g., including community-based organizations on the project team)?
31. How can DOE support meaningful and sustained engagement with H2Hub relevant disadvantaged communities?

Category 4: Market Adoption and Sustainability of Hubs

32. What mechanisms (e.g., tax/other incentives, offtake structures, prizes, competitions, alternative ownership structures for hydrogen production bundling demand, contracts for difference, etc.) would be valuable to incentivize market-based supply and demand?
33. What role/actions can DOE take to support reliable supply and demand for potential hydrogen producers and customers?
34. If DOE asks for a market analysis as part of the application process, what should the analysis include so that DOE can be confident that a proposed project will be successful?
35. What can DOE provide/do that would be helpful to a project to facilitate its collaborations with potential financing partners?
36. How can DOE support the H2Hubs in working together to increase competitiveness and scale?
37. Which regional and site-specific metrics should DOE track to estimate the impact of hydrogen production on regional water availability?
38. Other than greenhouse gas emissions, what sustainability metrics should DOE include in evaluating the hubs (e.g., impact on regional water resources, availability of decarbonized electricity production resources, climate risk impacts on the resilience of the H2Hubs)?
39. The goal is for the H2Hubs to be sustainable beyond the BIL funding (i.e., without additional government funding). To what extent will the H2Hubs be capable of demonstrating a path to economic viability after the BIL funded phases and how should the FOA and project (once awarded) be structured to ensure this outcome?

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Category 5: Other

40. Please provide any additional information or input not specifically requested in the questions above that you believe would be valuable to help DOE develop a Regional Clean Hydrogen Hub FOA, including any specific criteria that DOE may take into consideration in implementing the Hub program.

Disclaimer and Important Notes

This RFI is not a Funding Opportunity Announcement (FOA); therefore, DOE is not accepting applications at this time. DOE may issue a FOA in the future based on or related to the content and responses to this RFI; however, DOE may also elect not to issue a FOA. There is no guarantee that a FOA will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if DOE chooses to issue a FOA regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of DOE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. DOE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. DOE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that DOE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind DOE to any further actions related to this topic.

Confidential Business Information

Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery two well-marked copies: one copy of the document marked “confidential” including all the information believed to be confidential, and one copy of the document marked “non-confidential” with the information believed to be confidential deleted. Submittal via email is the preferred method, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Evaluation and Administration by Federal and Non-Federal Personnel

Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal

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personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to DOE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to H2Hubs@hq.doe.gov no later than 5:00pm (ET) on March 21, 2022, with subject line “**H2Hubs RFI response.**” Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as a Microsoft Word (.docx) or Adobe PDF (.pdf) attachment to the email, and no more than 15 pages in length (plus any additional pages necessary to include the original questions), 12-point font, 1-inch margins. Only electronic responses will be accepted. For ease of replying and to aid categorization of your responses, **please copy and paste the RFI questions, including the question numbering, and use them as a template for your response.** Respondents may answer as many or as few questions as they wish.

DOE will not respond to individual submissions or publish publicly a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the start of their response to this RFI:

- Company / institution name
- Company / institution contact
- Contact's address, phone number, and e-mail address

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