

RFI Response from the Western Inter-States Hydrogen Hub

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This response is submitted in response to Request for Information #DE-FOA-0002664, Regional Clean Hydrogen Hubs Implementation Strategy. It is submitted on behalf of:

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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?

The Western Inter-States Hydrogen Hub was created by an MOU between the governors of Colorado, New Mexico, Utah and Wyoming. This region is characterized by significant assets capable of low-carbon intensity hydrogen production, connective infrastructure (both existing and the potential for new) and compelling markets for hydrogen consumers, but a geographic area of 408,394 sq miles. In fact, if our region was a single state it would be larger than any state other than Alaska. We believe “close proximity” should not be defined by geographic distance, but rather by the ability to economically produce and efficiently move clean hydrogen – and hydrogen-derived products – throughout the region and more broadly. These factors position the Western Inter-States Hydrogen Hub to support a sustainable hydrogen economy in the West. The defining factor should be the “landed cost” of clean hydrogen to markets both within and outside the region, as opposed to trying to arbitrarily define acceptable distances.

Early development of reliable and cost-effective clean hydrogen transportation solutions should be included in the regional clean hydrogen hub selection criteria. Connectivity between projects in different hubs will improve the success of the total program and will mitigate the impact of distance.

- b. What existing facilities and infrastructure, including pipelines and storage facilities, could be most easily leveraged by the H2Hubs?

Adaptation, repowering, or installation of new hydrogen systems at existing power plants is encouraged, as is the adaptation of existing pipelines for hydrogen / natural gas service. However, adaptation of existing facilities must be carefully analyzed to ensure that the projects are safe, economically viable, and equitable. In the western context, availability of water rights from retiring fossil generation, and the ability to repurpose this water for electrolysis may be an important opportunity.

- c. What types of new ‘connective infrastructure’ will be needed by the H2Hubs (e.g., pipelines, storage, etc.)?

Existing infrastructure (electric grid, natural gas pipelines, rail system, interstate highways) and associated “rights of way” will need to be leveraged, as will

¹⁷ 42 USC 16161a(a)

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favorable geology to support underground storage

- 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.)?

A key factor for the long-term success of the H2Hubs will be the development of a workforce that can rapidly and safely design, build, install and operate hydrogen systems. This occurs at a time when there is a shortage of skilled workers servicing related industries such as gas transmission and electric transmission. The hydrogen transition will require training of a new cadre of technicians, engineers, life-cycle practitioners, permitting specialists, business analysts, and the like. Training will take place in community colleges, universities, technical training institutes and through apprenticeship programs. Efforts must be made to ensure that Minority Serving Institutions (MSIs) are well represented and that workforce development programs are available in rural and low-income regions. These workforce development needs must be met as equitably as possible, by considering both the needs of workers displaced by the energy transition and ensuring that the benefits of the hydrogen industry accrue to populations that have traditionally been under-represented in the energy industry.

Training and workforce development needs are broadly distributed across the entire industry. These needs are not compatible with the 50% cost-share requirement, so the Western Inter-States Hydrogen Hub urges the elimination of the cost-share requirement for training and workforce development programs and that consideration of equity and inclusion, and of the needs of workers and communities impacted by the energy transition, be requirements for these programs instead.

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?

It is important that the carbon emission standards laid out in the BIL legislation are the standards to which all of the H2Hubs are held. While additional reductions in upstream emissions intensity should be incentivized in the application criteria, these should not be hard requirements. While it may seem reasonable to expand the efforts of the H2Hubs emissions to the entire value chain, that could lead to conflicting requirements and programs. There are national and state regulatory programs, as well as voluntary programs, in place now to address carbon emissions prior to production, so rather than try to

¹⁸ 42 USC 16161a(b)

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replicate those and risk creating conflicts, it would be better to partner, collaborate, and where appropriate, enforce the programs already in place to achieve overall emissions reduction goals. The preferred way to address upstream emissions is through application of a GHG lifecycle analysis (LCA). These analyses depend upon a number of subjective factors including the establishment of system boundaries and co-product allocation methods. Some examples currently in operation include One Future or Project Canary for reducing methane. Further, robust compliance assurance efforts of existing federal and state laws regarding upstream emissions furthers the point of production measurement for H2Hubs.

Strategies that are available for reducing carbon emissions include structuring the criteria for hubs to incentivize hub proposals that have lower lifecycle carbon emissions, as well as expanding the states that have Class VI Well primacy, such as Wyoming, as these states can then be more streamlined in processing and permitting wells for permanent carbon storage. Additionally, using business friendly legal frameworks for CCUS will encourage companies to capture and store carbon emissions as a “carrot” approach. And given Class VI Well primacy is a regulatory program, there is also a mechanism with which to ensure compliance, too. However, the answer to this question is perhaps best addressed by DOE in a consultation process with both EPA and industry. Lastly, in setting the initial standard, DOE may wish to consider the clean hydrogen production tax credit.

Challenges for measuring CO₂ emissions include defining scope 1, 2, 3 or even 4 emissions, and what part(s) of the processes are included. It is critical that the accounting is done in a fashion that does not double count emissions. We encourage partnering with existing programs through agencies such as the EPA. EPA and state air regulators can help navigate the process from their vantage point and avoid duplications or conflict among various requirements from other agencies.

It is also important to consider the role of hydrogen itself as an indirect greenhouse gas, and to design systems to both track and minimize hydrogen emissions throughout the cycle from production to use. The Western Inter-States Hydrogen Hub encourages the inclusion of hydrogen leakage in the modeling, calculation, and direct measurement of greenhouse gas 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).

This is a complex problem and there are many variables to make a simple solution viable in the timeframe that is allowed for the H2Hubs.

However, one of our member states, New Mexico, points to their planned use of the greenhouse gases, regulated emissions and energy use in technologies

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model (GREET model) developed by Argonne national laboratory to determine the CO₂e/kg H₂. New Mexico plans to use the GREET model for its “life cycle analysis” for clean hydrogen produced there. Specifically, New Mexico defines the life cycle analysis for hydrogen produced from methane, including feedstock extraction, agricultural waste, biomass or municipal solid waste, or from any other source, including water or wastewater, to be the quantity of greenhouse gas emitted through the point of hydrogen production, including all stages of production and distribution, from feedstock generation through the delivery and use of the finished fuel or other product for hydrogen production, as determined under the most recent GREET model.

In addition to New Mexico’s experience, there are national and state-level programs in place to monitor and encourage emission reductions upstream of the point of production.

- 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?

For a variety of reasons, including but not limited to de-risking the program while ensuring that BIL’s broad goals for the program are met, we believe it is imperative that more than four hubs be supported. We support 6-10 H2Hubs of varying size. Success of the national Hydrogen Hubs program is dependent on collaboration between the regional H2Hubs and successful connectivity between them to encourage both producers and end-users. We encourage the notion that more hubs of varying sizes be integrated into planning and funding, while being mindful that available funding is not diluted across too many hubs.

- 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?

Overall Policies, Regulations, and Considerations

- a) *While multiple state agencies have overlapping authority to regulate hydrogen depending on its application, there is no comprehensive hydrogen strategy for the U.S currently. The Department of Energy’s Hydrogen Program Plan is only a strategic framework incorporating the research, development, and demonstration efforts of its various offices. The leadership of the Western Inter-States Hydrogen Hub states will deploy clean hydrogen technology and sustain a comprehensive clean hydrogen economy in a meaningful way for U.S. jobs and climate goals.*
- b) *Specific decarbonization goals that are agnostic with regard to technology or fuel source at the federal level would serve as a guide to specific policy and regulatory actions, including updates to codes and standards. Policies that build on the BIL’s*

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fuel-agnostic definition of “clean energy” in relevant state law and regulation could be supported.

- c) Implement technical standards regarding: the transportation of hydrogen (including natural gas/hydrogen blends) by, at minimum, pipeline, railcar, and truck; and end uses like combustion turbines and other equipment. These activities will require close coordination with the various standard setting organizations and equipment manufacturers.*
- d) Align federal and state funds to incentivize technology transfer at scale.*
- e) Implement federal and state tax incentives related to hydrogen production, such as the pending clean hydrogen production tax credit in the House-passed version of the Build Back Better Act.*
- f) Streamline the NEPA-related considerations for the H2Hubs through collaboration with federal agencies. For example, for new hydrogen and carbon dioxide pipelines, examine best-practices from other countries, such as Australia, to determine if any processes can be streamlined or accelerated, and propose appropriate action. Perhaps a similar structure for this could be taken from the Interagency Working Group on Coal and Power Plant Impacted Communities, where the best problem-solvers from the appropriate federal agencies work together towards common solutions.*
- g) Consider the geographic dispersion of H2Hubs.*
- h) Identify key geographic interconnects for the H2Hub network, such as existing Interstate connections (I-40, I-70, I-80, I-15, I-25).*
- i) Identification and pre-permitting of pipeline corridors.*
- j) Guidelines and policies to limit carbon emissions, which will drive demand and inform the general public.*
- k) Hydrogen export policies and guidelines (both across state lines and globally) via pipeline, truck, and ship.*
- l) Need for an overall regulatory framework for wider implementation of clean hydrogen to ensure safe and reliable production, storage and transportation. There is an urgent need to clarify the role and jurisdiction of FERC, OSHA, EPA, DOE and PHMSA. The regulations of these various agencies provide some guidance on the production, storage, use and transmission of hydrogen, but there is no comprehensive regulatory regime that will guide the development of the entire industry ecosystem. For example, regulators need to address issues such as blending standards and engineering designs and systems for pipelines; and barriers to carbon storage and fit-for-purpose projects such as pore space ownership challenges, long-term CO2 storage liability, and design and monitoring standards.*
- m) Need for both standards and policy/financial incentives to enable businesses to quickly scale-to-market while off-setting their investment and risk associated with the high-cost of R&D, transitioning production facilities, scaling up production and transmission. For example, governments can attract and stimulate investment by implementing scalable and market-based mechanisms.*
- n) A plan to educate and prepare emergency responders.*
- o) Clear regulatory guidelines and financial incentives to encourage developers to promote additional CCUS facilities and to co-locate renewable power production and*

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electrolysis systems closer to fossil fuel clean hydrogen production sites so as to take advantage of shared infrastructure.

- p) Provide government investment in infrastructure (primarily pipeline) to decrease time to market while reducing the investment risks and operational cost burden to companies that are investing at the front end of the market.*
 - q) The Federal Energy Regulatory Commission needs to establish policy/regulatory framework for a participation mechanism for hydrogen in US power markets to provide grid services such as load following power and long-duration energy storage.*
- 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.

The standard should include recommendations regarding standardized GHG measurement methodology(ies) that project owners/operators should apply. Those methodologies, in turn, should be consistent with those in use in related contexts.

For example, with respect to certain CCUS applications, the Internal Revenue Service now allows the use of ISO standard 27916:2019 in lieu of subpart RR of the GHG Reporting Program (<https://www.iso.org/standard/65937.html>). Organizations, such as Verra and the American Carbon Registry, are working on voluntary methodologies for CO₂ injections in deep saline formations. See <https://verra.org/new-initiative-to-boost-carbon-capture-and-storage-solutions-will-develop-a-methodology-under-the-verified-carbon-standard/> and <https://americancarbonregistry.org/carbon-accounting/standards-methodologies/carbon-capture-and-storage>. American Carbon Registry's draft methodology is expected in 1Q2022, while Verra's is expected in the summer of 2022.

California's Low Carbon Fuel Standard includes credit generating opportunities for hydrogen used as a transportation fuel: <https://ww2.arb.ca.gov/resources/documents/lcfs-electricity-and-hydrogen-provisions>.

More broadly, the private sector companies participating in the H2Hubs almost certainly will be reporting in separate channels their Scope 1, Scope 2 and potentially even Scope 3 emissions associated with the projects. Such reporting should be allowed to additionally satisfy DOE's reporting.

For the 2050 goals, it will be essential to consider the lifecycle emissions associated with clean hydrogen production and use, not just emissions at the point of production.

Beyond emission estimates and reporting, H2Hubs should reconcile their actual emissions with estimated emissions to ensure truth in accounting. This may

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mean incorporation of real-time and remote monitoring using cutting edge passive or active technology.

For example, New Mexico has partnered with a private company, called Sceye, that builds and operates High Altitude Platform Stations, or HAPS, to provide environmental monitoring as well as internet access. In a memorandum of understanding signed in August of 2019, the New Mexico Environment Department and Economic Development Department and the U.S. EPA partnered with Sceye to develop a project using airships to monitor and study climate and air quality. Under this partnership, the parties will study pollution sources and their impacts from 65,000 feet above New Mexico. The MOU facilitates collaborative air- and energy-related research on emission sources within New Mexico as well as neighboring states and countries. This partnership could introduce cutting edge emission monitoring approaches to ensure H2Hubs are meeting climate goals.

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?

Rather than specifying a minimum volume, the focus should be on building prospectively economically viable infrastructure networks, with economic viability demonstrated using standard techno-economic methodologies. The chosen metric should not vary according to feedstock type. DOE could incentivize larger capacity hubs by placing the emphasis on the economic performance of the hub, which would be implicitly larger in scale due to the impact of economies of scale. The DOE should acknowledge the diversity of the regions and allow each H2Hubs to build out based on the local resources.

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?

This would seem to be a case for hydrogen storage, where our region excels. How do we look at this? Presumably this is factored into the market price. In

¹⁹ 42 USC 16161a(c)(3)(A)

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the same way that “renewables + storage” are priced higher than “renewables without storage”.

Placing a focus on techno-economic performance, regional infrastructure builds and strategic infrastructure inter-connects would negate the need for a scale minimum as the resiliency would be captured by the economic model.

- b. 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)?

In addition to the examples given, other options could be the acquisition of renewable energy credits (RECs) in lieu of a power purchase agreement or co-location when neither option is available, direct participation in a renewable energy tariff administered by the utility company serving the facility, or contracts for the use of otherwise curtailed renewable generation. In addition, jurisdictions that have committed to carbon-free energy goals and incorporated such goals into law or regulation may serve as another factor.

- c. 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?

Yes, prioritizing the repurposing of historic fossil infrastructure, including water previously used for fossil generation, is an important component of a just energy transition, provided that its use is part of a net-zero emissions energy system. Additionally, the capital that is tied up in these existing fossil fuel assets is significant and should be leveraged on the basis of business principles. As we move towards the energy of tomorrow, we will need to use financial and time resources wisely, so repurposing this infrastructure will allow us to act quickly and have more funds available to invest in other initiatives and to achieve the Administration’s GHG emissions and climate goals. This prioritization should take place over the next 3-5 years, however not to the detriment of other low/no carbon energy sources.

H2Hubs should be agnostic regarding the feedstock for hydrogen production and should focus on the goal of net-zero carbon emissions. It is important to target the carbon emissions goal rather than the fuel source. For economic and energy resiliency, there is value to a diverse portfolio of energy sources. All energy sources have negative as well as positive externalities, so a diverse set of energy sources may reduce concentration of negative externalities. A diversity of feedstocks gives the market the opportunity to determine which

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form of net-zero energy is best for a particular end-use or most suited to a particular region's resource base. However, it is reasonable for DOE to structure criteria to incentivize lower life cycle emissions, in addition to the base requirement on production emissions, and to incentivize a transition over time towards net zero lifecycle emissions, regardless of the feedstock.

- d. 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 to expand clean electricity generation or natural gas production capacity available, necessary, or adequate?
- e. 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?

Given the favorable economics of renewable generation, we would generally discourage using the H2Hubs funding for this purpose. Investments in H2Hubs will also spur collateral investment in these areas without diluting the intent of Congress to directly invest in 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?

The Western Inter-States H2Hub states could envision entering into nondisclosure agreements with industry to facilitate a realistic discussion with industry to fully answer this question. Some degree of public-private partnership agreements may also be useful to ensure off-taker, supply/demand issues.

- c. The climate value of displacement may vary across end uses. How should the

²⁰ 42 USC 16161a(c)(3)(B)

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climate benefit of different hydrogen end uses be considered?

We concur that the climate value of displacement varies by use and geography and believe the H2Hubs should be asked to quantify the anticipated climate benefits of proposed projects using well-validated LCA models.

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.

The identification of a region would best be determined by the entities in the region - those that are proposing the H2Hub – rather than DOE defining a set geographic size or area. Regional attributes that contribute to or detract from the success of the region are important and would best be defined by applicants. There is no default minimum or maximum size that defines those attributes.

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

The availability of sufficient energy, feedstocks, and water resources (which may include fresh, brackish, or produced water) are the resource inputs into a hydrogen hub. However, for a successful, long-term endeavor, a holistic assessment that considers economic and environmental factors is also necessary. Life-cycle analysis of the technologies, as well as the impacts on communities will provide a more realistic picture and reduce the potential of unintended consequences. Specific to the economy, the current economic conditions of the locations involved and the potential economic impact of a hub are important considerations. While the traditional measurement of success may be the aggregate impact, the more micro-level impacts are also important. Do individual locations currently have robust economies? Are these economies multi-dimensional? What will be the impact of a hydrogen hub on communities? In essence, what are the trade-offs for individual communities?

²¹ 42 USC 16161a(c)(3)(B)

What are the synergies?

The successful endeavor would include technological feasibility, economic viability, and social acceptance at the community and regional level. Knowledge of potential market and non-market impacts, as well as potential negative impacts at the community level provides a more complete assessment. In short, a spatial, temporal assessment is needed.

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?

A2) 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?

The availability of natural gas resources in a region is as important as the region’s current production volume because these locations already have the infrastructure and workforces in place to get their products to the consumer. While infrastructure and workforces can be built to facilitate the expansion of natural gas production, it would be costly to build from scratch. However, from a long-term perspective, it is advisable to ensure there will continue to be a consistent supply of natural gas available to create a reliable supply of clean hydrogen, even if the production levels and infrastructure are not currently fully realized.

A3) How should DOE consider the volatility of natural gas prices and its effect on production levels when defining these regions?

Short term price fluctuations will always be part of an open market system; a long-range market outlook will help guide prudent long-term investment decisions. Volatility in natural gas prices should be treated no differently than price volatility in other types of clean energy production. While volatility in the market will impact all natural gas production, some regions may be impacted more than others due to geology, current infrastructure and other characteristics unique to each region. While market and price volatility should be a consideration, more weight should be given to the amount of natural gas resources still available in the region for future energy production.

²² 42 USC 16161a(c)(3)(D)

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- 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?

B2) Should annual (or average over a five-year period) production and/or available proven reserves be the criteria for the above provision?

Proven, available resources should be the criteria for the above position. Many things can impact annual production including changes in ownership of production industries, difficulties securing financial backing, changes in the international market, infrastructure breakdown and a variety of other issues that directly affect production. These issues may negatively impact production one year but not the next. If annual production must be considered, an average over a five-year period would present the most accurate picture of a region's natural gas production.

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?

*H2Hubs should project jobs created by the entire hydrogen value chain across the life cycle of the investment. These projections should include jobs created in all employment sectors, including: **1) Construction** – Project construction is the sector where there is the highest representation of the skilled trades including pipefitters, welders, electricians, and steelworkers; these trades are the most likely to be represented by unions, **2) Operations** – Participation of unions in*

²³ 42 USC 16161a(c)(3)(E)

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*operations jobs will reflect the employment landscape in the region, **3) Supply Chain** – The hydrogen industry will require manufacturing and supply of commodity items such as piping, tanks, steel, etc., but also specialized components such as electrolyzers, fuel cells, hydrogen turbines, etc.; for the supply chain segment, job creation associated with export of products to other region and other countries should be included, **4) Business and Finance** – The employment analysis should recognize that multiple non-union jobs in business operations are created for every job in the technical skills represented by unions, **5) Education and Training** – The hydrogen industry will require new skills, which will require setting up training, education, and certification program; all of these programs will add jobs in the region. The DOE H2Hubs solicitation should request documentation of employment projections across all sectors over the life 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?

DOE can offer additional consideration for projects which provide new opportunities for unemployed and underemployed workers in their affected communities. In addition, DOE should ensure that communities that are most impacted by fossil fuel “boom and bust” cycles should benefit the most from H2Hub opportunities. DOE should also offer consideration for projects that directly support the tax base in communities affected by the energy transition.

- c. How should short-term build-out (i.e., construction phase) employment and long-term operational employment opportunities be measured and evaluated?

There are well-established tools, such as IMPLAN for projecting employment from short-term construction jobs and long-term operational jobs. Actual employment performance can then be evaluated during operation of the H2Hubs.*

- d. What would “success” look like, especially related to Diversity, Equity and Inclusion (DEI) and support for union and energy transition jobs?

Success could look like the communities most impacted by the energy transition benefit to the greatest extent in terms of clean hydrogen jobs and revenues. H2Hubs should provide engagement plans to document how their projects would provide employment opportunities for diverse populations and displaced workers in their region. The engagement plan may include consideration of training and workforce development and should include a plan for engaging with Minority Serving Institutions (MSI) and education / training institutions (community colleges, technical training institutes, regional colleges, universities)

* <https://implan.com>

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in rural areas and in areas most affected by the energy transition.

- 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?

We encourage coordination on training and workforce development, i.e. sharing of curriculum, coordination of certification requirements, etc. We urge that education, training and workforce development activities be exempt from the cost-share requirements.

- 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?

The Western Inter-States Hydrogen Hub encourages issuance of clear guidelines for eligibility to transition to Phase 2. We suggest the use of metrics that document:

- a) The connectivity / linkages of projects across a proposed H2Hub region;*
- b) The demonstrated ability to supply hydrogen to a variety of markets and use cases within and outside the proposed H2Hub region;*
- c) Demonstrating economically viable production and distribution of hydrogen;*
- d) The demonstrated ability to support EEEJ goals in the proposed region;*

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 EPLA 2005

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- e) *The impact of the portfolio to support jobs in communities affected by the energy transition (i.e., retiring fossil generation resources);*
 - f) *The ability of the portfolio to enhance the reliability and decarbonization of the electric power sector in the region;*
 - g) *The role of innovation in the region to help build the supply chain of new products to support the hydrogen industry; and*
 - h) *The connections with adjacent H2Hubs to help support a national hydrogen network.*
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?

In order to develop and design the partnerships and infrastructure needed for robust H2Hubs and the associated networks, we recommend that funding amounts for Phase 1 be \$2 million - \$10 million at a 20% cost share.

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)?
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?

²⁶ <https://h2tools.org/hsp>

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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 EPCA 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?

We urge maximum flexibility in cost-share accounting, including allowing cost-share to be met over a longer period than a single invoice period, and allowing differing activities to have differing cost share as long as the total cost share achieves the 50% requirement.

We also advise consideration of a reduced cost-share requirement of 20% for supportive activities that would qualify as research, and for participation on implementation projects by universities, community colleges, and technical training institutes. Cost Share should be eliminated for education, training, workforce development, curriculum development, community outreach, etc.

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

Incentive programs should be based on long-term incentives that would stimulate and support new end uses. Payments for demonstrated performance through programs such as the Low Carbon Fuel Standard in California or the proposed Hydrogen Production Tax Credits are seen as effective for the taxpayer and will help incentivize industry to make early investments in this nascent industry. However, our region has several non-profit and not-for-profit public power utilities and contains dozens of rural distribution cooperatives. Because of their tax-exempt status, these organizations would not be able to benefit from tax credits for clean hydrogen production. We encourage consideration of direct payments for non-profit and not-for-profit organizations that cannot utilize tax credits.

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

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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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?

The H2Hubs would benefit from access to the national labs and other federal agencies for: technical assistance on life cycle analysis and technoeconomic analysis, access to emerging technology, NEPA analysis support, permitting assistance, pilot projects, etc. While some national lab resources should be available to any H2Hub teams, we believe that national labs should also be allowed to actively participate in H2Hubs in their specific geographic region.

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, EPCA 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?

Other funding opportunities in the BIL that can be leveraged to maximize funding are Carbon Capture Large-Scale Pilot Programs, Carbon Capture Demonstration Projects, and Carbon Storage Validation and Testing.

Previous DOE programs that can be leveraged include: 1) Regional CO₂ partnerships and initiatives, 2) lessons learned from the CarbonSAFE program (site characterization and commercialization plans), and 3) Clean Hydrogen Production, Storage, Transport and Utilization to Enable a Net-Zero Carbon Economy.

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

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DOE's implementation of Justice40²⁹ in DACs: (1) decrease energy burden;^{30 31 32 133 34} (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 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?

The solicitation should encourage development of EEEJ / Justice40 plans that are best suited for the region. For example, the Western Inter-States H2Hub is characterized by:

- a) High percentage of Native American and Latinx populations in parts of the region*
- b) Large percentage of tribal lands*
- c) Large percentage of rural land*
- d) A high percentage of potentially-displaced fossil fuel workers and energy transition communities.*

We encourage the exemption of EEEJ engagement activities from the requirement for mandatory cost-share.

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?

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>

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?

Addressed in Question #22

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?

In markets where hydrogen is competing directly with natural gas, hydrogen is expected to generally carry a higher cost on an energy basis, unless hydrogen allows for operational efficiencies sufficient to overcome the cost differential. The adoption of a carbon tax would help to address price disparity, but the US has not adopted a carbon tax and adoption in the near future appears unlikely. However, many companies have now adopted the use of internal carbon accounting in their decision-making and more are expected to adopt a similar approach in order to meet their corporate carbon goals. In essence, the internal cost of carbon for a company is baked into any offtake agreement. The implementation of a Hydrogen Production Tax Credit would help to bridge the gap between production cost and what the markets are able/willing to pay. The analysis should also take into account state regulatory requirements for GHG emissions reductions which may drive market demand for clean hydrogen.

35. What can DOE provide/do that would be helpful to a project to facilitate its collaborations with potential financing partners?

We encourage streamlined access to the DOE Loan Program for large capital projects.

36. How can DOE support the H2Hubs in working together to increase competitiveness and scale?

We recommend an annual H2Hubs Summit, similar to the ARPA-E Summit. This would help to build the H2Hubs “community”.

37. Which regional and site-specific metrics should DOE track to estimate the impact of hydrogen production on regional water availability?

We reiterate the value of the requirement for rigorous life cycle analysis (LCA) of projects. Although water is often included in LCA, we recommend that it be mandatory. LCA tools often look at water on a regional level, but there is a potential to create local water scarcity; we therefore suggest assessing impacts of water consumption using the “available water remaining” (AWARE) method to assess the water scarcity footprint of a project.

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)?

We recommend inclusion of:

- a) H₂ as a greenhouse gas*
 - b) Emissions of NO_x and other criteria pollutants*
 - c) Impacts on local water availability*
 - d) Emissions related to transportation*
 - e) Community impacts: workforce, economic activity, tax revenue, infrastructure impacts*
 - f) Impacts on resilience; a working definition of resilience should be provided, as it applies to a hub*
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?

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.
- a) Clearly define the eligibility and roles of the DOE national laboratories in terms of the design and implementation of the hydrogen hubs. The national labs offer a wealth of knowledge, unique capabilities, best practices, and networks that can be leveraged to enhance the hydrogen hub impacts.*
 - b) It is clear that the H2Hubs will have a primary focus on scaleup to produce significant quantities of hydrogen and then utilize it in markets to build the clean hydrogen economy. However, the hydrogen economy needs to be supported consistently with new solutions to reduce cost, improve performance, and accelerate scaleup. This implies a role for innovation in the form of applied (translational) research and support for early-stage companies and projects. We strongly endorse the consideration of allowing a portion of the funding to support these innovation activities and encourage that such funding carry no more than a 20% cost-share requirement. We also encourage inclusion of universities, colleges, community colleges, and training institutes on projects to assist with workforce development. We recommend that the cost-share requirement be segregated so that the participation by educational, training, and research institutions on projects would only bear the lower 20% rate – or preferably carry no cost-share requirement at all.*