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Regional Clean Hydrogen Hub Implementation Strategy

Contact Information

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Category 1:

C1.1a: What should qualify as 'close proximity' in context of the hub requirements?
Close Proximity would be projects that connect with Kentucky, within a day's drive of two-thirds of the U.S. population. Kentucky is located at the center of a 34-state distribution area in the eastern United States. Kentucky's location advantage facilitates the distribution of goods and materials to a massive industrial and consumer market. Kentucky's borders are within 600 miles of over 65 percent of the nation's population, personal income, and manufacturing business establishments. Kentucky is the connector state necessary for a nationwide clean hydrogen network.

C1.1b: What existing facilities and infrastructure, including pipelines and storage facilities, could be most easily leveraged by the H2Hubs?
Leveraging America's brownfields as project locations is an essential element in this Hub concept. U.S. EPA has Re-Powering American's Land program but the mapper does not identify potential hydrogen project locations. Feasibility studies on hydrogen project development on reclaimed mine sites also supports recycling our existing energy production lands with new technology. In addition, the interconnection queues in the wholesale power markets like PJM hold the potential for renewable hydrogen project development. Many of those projects are looking for offtake agreements. This is a great opportunity to connect renewable projects with hydrogen production. There are approximately 12 GW of solar and storage projects for Kentucky in the PJM queue. Connecting those to electrolyzer opportunities for a clustering of production potential is critical. Another important infrastructure is the existing network of hydrogen gas suppliers, utilizing their networks to connect to private entities - for new sources of hydrogen production.

C1.1d: What supportive activities would make the hydrogen hubs successful and sustainable (e.g., workforce development, community-based organization engagement, domestic manufacturing, labor standards, etc.)? Supportive activities would be connecting state and local economic development agencies to domestic manufacturing opportunities around hydrogen. Inventorying state economic development site banks and connecting project developers to state Cabinet for Economic Development (CED) resources. Attracting international developers to state economic development agencies. Another essential element is

working with the Appalachian Regional Commission (ARC) to ensure hydrogen project development is eligible and ARC funding can be leveraged. State economic development agencies need to be plugged into project development conversations. A DOE hosted Hydrogen Open Houses for economic development professionals and project developers would be a great supportive step. State economic development agencies need to be connected to an inventory of companies and project opportunities. Project developers need to be connected to state site development opportunities. There needs to be an overarching organizing structure at the federal level to connect hydrogen project development to potential sites. In addition, the DOE should work with NARUC on technical assistance to state Public Service Commissions or equivalent regulatory authority to prepare regulatory staff for reviewing hydrogen related natural gas and electricity generating projects.

C1.2c: 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? 6-10 H2Hubs of varying sizes would be more effective in establishing a national clean hydrogen network. There is strength in diversity of size and location, and varying sizes can capitalize on individual geographic regional uniqueness and enable easier reach of those populations that may have been disproportionately affected by the transition away from fossil fuels.

C1.2d: 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? In addition to developing regional H2Hubs, DOE should consider the importance of strategic connector states in order for a national network to be successful. Kentucky for example, is a connector state enabling Midwest, Appalachian and Southern hubs to work together. Without a connector state like Kentucky, a national clean hydrogen network is not possible. It is essential that “connector” projects be deployed in strategic states like Kentucky for the establishment of a national network. Considerations should be given to a national clean hydrogen network that is supportive and connects with the National Highway Freight Network, and complements the Fixing America's Surface Transportation Act (FAST Act). In addition, The Public Utility Regulatory Policies Act of 1978 (PURPA) should be evaluated to see how hydrogen can be deployed nationally in the context of small power production and cogeneration interconnections. A small power production facility is a generating facility of 80 MW or less whose primary energy source is renewable (hydro, wind or solar), biomass, waste, or geothermal resources. Consistency in PURPA in regards to hydrogen as a primary renewable energy source will allow more consistent application nationally. Finally, for carbon free hydrogen from nuclear, the role of the NRC cannot be understated and reforms to the permitting process to allow micro and small modular reactors that could support distributed hydrogen production. On March 11, the EPA announced it is proposing a federal plan that would cut pollution from power plants and industrial sources

that significantly contribute to unhealthy levels of ground-level ozone, or smog. In addition to power plants, the EPA is proposing to include:

- reciprocating internal combustion engines in Pipeline Transportation of Natural Gas;
- kilns in Cement and Cement Product Manufacturing;
- boilers and furnaces in Iron and Steel Mills and Ferroalloy Manufacturing;
- furnaces in Glass and Glass Product Manufacturing; and
- high-emitting, large boilers in Basic Chemical Manufacturing, Petroleum and Coal Products Manufacturing, and Pulp, Paper, and Paperboard Mills.

Hydrogen should be included as a way to decrease emissions at these sources and the DOE should be coordinating with these sectors on existing locations in states to identify hydrogen deployment opportunities that could support hub development and comply with EPA standards.

C1.3d: 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, the DOE should prioritize the repurposing of historic fossil infrastructure in the regional hub(s) focused on the production from a variety of energy resources. The DOE should incentivize communities, universities, nonprofits and state agencies to work together on a transition strategy based on community engagement. Any transition must be done at the local level first rather than dictating fuel choices.

C1.3e: 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? Hydrogen production could be constrained by the wholesale market interconnection queues in that projects cannot be built that would support renewable hydrogen production. As of February 2022, the nation's largest electric grid operator, PJM Interconnection, is proposing a two-year pause on reviewing more than 1,200 energy projects, most of them solar power. State economic development agencies need funding to establish incentives for natural gas pipeline distribution upgrades to allow for hydrogen blending as well as incentives such as tax credits for manufacturers to foster the utilization of hydrogen in those natural gas intense industries: aluminum, steel, and cement for example. The current level of incentives is not adequate to foster adoption by most manufacturers. Most state-level regulatory agencies have not evaluated utility regulatory frameworks for the inclusion of hydrogen related activities including those that may be tied to

federal funding. There could be a constrained environment around state level approval of hydrogen projects due to the lack of technical assistance to states on hydrogen.
C1.3f: 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? Yes, H2Hub funding should be made available to upgrade or develop new dedicated clean electric or heat generating energy sources.

C1.5a: 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 DOE should allow for the utmost flexibility during the application process in how a region is defined; however, in forming hubs based on the applications received, DOE's role should be of connector and consolidator to form geographic regions. With so many organizations, partnerships, and entities involved in hydrogen in anticipation of the solicitation, DOE's primary objective should be to facilitate the formation of geographic hubs based on all of the interested parties in a specific area.

C1.7b: 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? The DOE should utilize its existing Workforce Accelerator through the Better Buildings Initiative to include hydrogen workforce development. In addition, DOE should partner with local organizations such as eKAMI in Kentucky and community and technical colleges across the nation to deploy standardized hydrogen certification and apprenticeship programs. The DOE could learn from the U.S. NRC in how that agency deployed the Nuclear Safety Professional Development Program. After training, there should be a clear pipeline to hydrogen jobs and job postings for these professionals.

C1.7e: 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? Yes, the DOE should ensure that there is a nationally coordinated effort between hubs to ensure an adequately trained workforce. The DOE could look to the U.S. Chamber of Commerce with their Talent Pipeline Management program to assist with workforce development actions across the various hubs. For those states that show an interest in hydrogen but who may not be selected for inclusion in selected hubs, DOE should consider how these states could receive funding to bolster hydrogen workforce development.

Category 2:

C2.8: 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,[1] Grants, Other Transactions Authority)? Cooperative Agreements appear to be the most logical pathway for state agencies and regional organizations working in selected hubs to coordinate with DOE along with funding mechanisms set aside to drive private sector adoption and incentive program development at the state level to lessen the risk on the private sector for hydrogen project development. The DOE should also take note of a successful program run through the State Energy Program, the TAG pilot. DOE through the SEP funding, is utilizing a Technology Action Group (TAG) Model to coordinate state activities within the state energy offices around a TAG topic. States then receive technical assistance. A TAG represents a voluntary opportunity to participate in a learning and best practices model between the State Energy Program (SEP) and the 56 State Energy Offices (SEOs) of the states, territories and the District of Columbia. The TAG model may be a good way for DOE to coordinate hydrogen activities at the SEO level. DOE may also be interested in utilizing the voucher concept as deployed by the Gateway for Accelerated Innovations in Nuclear (GAIN). The goal of the voucher program at GAIN is to accelerate commercialization of innovative nuclear energy technologies. The same could be said for the concept of regional hydrogen hubs. Finally, DOE should consider capitalization grants for the establishment or support of State Green Banks that can support regional hydrogen project development.

C2.10: **Does offering multiple launches roughly a year apart, as shown above in Figure 2, help facilitate expanding the hydrogen hub concept to more regions? The** DOE should strongly consider a hub "interest and preparation step" to allow for a pipeline of interested states and entities to become prepped and ready to move into Phase 1 or Phase 2. Many state and regional hydrogen groups are in various stages of development and coordination; therefore, necessitating technical assistance to engage with other partners or agencies. Again, this is to enable seamless integration into existing hub partnerships or the creation of new hub partnerships. There should be an integrated framework for moving interested stakeholder into hubs and through the phases. This would involve a robust training and project development tracking platform. There should be readiness checks and "gates" to move through as hubs develop and grow, or as an organization moves into and out of partnerships. Ideally, DOE would need a Regional Hub Online Gateway and Collaboration Hub for participants to interact and enter the pipeline for hub connectivity.

C2.20: The H_2MatchMaker tool[2] 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?

The H2 Matchmaker Tool is just the 1st step to identify interested parties and partnerships. There needs to be an inventory of private sector partners working on hydrogen internationally. Connecting those private developers with state economic development agencies and sites, and

[1] For more information about Cooperative Agreements, see the DOE Guide to Financial Assistance: https://www.energy.gov/management/articles/department-energy-guide-financial-assistance

[2] https://www.energy.gov/eere/fuelcells/h2-matchmaker

again, connecting with EPA's RE-Powering American's land program is essential. DOE can be the conduit by which teams are formed. As interested stakeholders are identified, DOE can host teaming meetings and matchmaking sessions. DOE could help states by creating a screening process to connect states with developers and funding sources.

C2.22: Is there sufficient manufacturing capacity to produce the necessary hydrogen related components/equipment within the U.S. to supply all the eventual H2Hubs? No, there is not enough manufacturing capacity in the U.S. to support the build out of regional hydrogen hubs. First, DOE should start with those manufacturing intense states like Kentucky to examine the hydrogen supply chain and seek out those existing manufacturers that could re-tool or expand to fill the manufacturing gap. In 2020, the manufacturing industry added the most real value to the gross domestic product (GDP) of Kentucky. The manufacturing industry added about 34.98 billion chained 2012 U.S. dollars to the GDP of Kentucky. There needs to be incentives for re-tooling or expansion of existing manufacturers in states like Kentucky along with the manufacturing of generation technologies like solar panels to support clean hydrogen production.

C2.24: 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? DOE should consider partnering with EPRI or other non-profit institutions like Great Plains Institute or the Regional Energy Efficiency Alliances to help with hub formation based on interested applicants. There needs to be an independent third party assisting multiple entities in a geographic region to form a plan and execute on project development. NASEO and NARUC could be valuable partners in helping Hub formation. Funding should be available for independent third-party facilitation with monies available for state personnel time reimbursement and a monetary set aside for private sector project development along with state incentives. The utilization of State Energy Offices could be critical in bringing hubs together and potentially identifying match funding.

C2.26: 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? DOE should consider leveraging the alternative fuel funding for community and corridor development under the BIL as it relates to hydrogen. Having designated hydrogen corridors is an essential first step in a national clean hydrogen network. In addition, DOE should consider specific guidance and workshops on the Advanced Energy Manufacturing funding with the understanding that deployment could spur manufacturing capacity and hydrogen project utilization and development. Funding for states to support grant writing technical assistance could assist with project pipeline development. FEMA Building Resilient Infrastructure and Communities (BRIC) funding could support hydrogen project development at critical facilities or hydrogen in microgrid developments to increase resilience of our communities. Inclusion of

hydrogen should be considered a fuel diversification strategy and one that increases resilience under hazard mitigation planning and FEMA BRIC. BIL funding for building codes technical assistance could be directed to help states with hydrogen code adoption or code work relating to hydrogen projects. The Energy Efficiency Conservation Block Grants under the BIL could also be directed to include local hydrogen project development and utilization by local governments. Again, coordination with the Appalachian Regional Commission is critical to ensure coal impacted communities reap the benefits of regional hydrogen hub formation. ARC could be utilized as a coordinating entity for Appalachian states.

Category 4:

C4.32: 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?
Capitalization grants for the establishment or support of state Green Banks that could support clean hydrogen project development and leverage private sector capital is an existing model that has worked in some states. Bundling of supply or demand projects could be an attractive option for small project developers to access financing and operational assistance. Contract for differences and aggregation services have been successful in other energy areas such as solar and distributed generation. The same structures could potentially benefit hydrogen project development.

C4.38: 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)?
Sustainability metrics can be broken down into three broad categories: people impact, profit impacts, and the impacts on the planet. It is recommended to identify metrics that cover all of these categories other than just GHG emissions. An example of cross cutting metrics can be found with the World Economic Forum's White Paper on "Measuring Stakeholder Capitalism: Towards Common Metrics and Consistent Reporting of Sustainable Value Creation". Inclusion of resilience metrics could also be important but noting that resilience is not the same as sustainability and resilience has yet to have defined common metrics much like sustainability.