



## Bipartisan Policy Center Response to Request for Information on Regional Clean Hydrogen Hubs Implementation Strategy

**TO:** Office of Clean Energy Demonstrations, U.S. Department of Energy

**DATE:** March 21, 2022

**RE:** DE-FOA-0002664: Request for Information on Regional Clean Hydrogen Hubs Implementation Strategy

**FROM:** Bipartisan Policy Center  
Prepared by Meron Tesfaye, Senior Policy Analyst

Thank you for the opportunity to provide insights and guidance to the Department of Energy's (DOE) implementation of the bipartisan Infrastructure Investments and Jobs Act (IIJA), Regional Clean Hydrogen Hubs program.

### Background

Congress provided a historic investment of \$9.5 billion to DOE for the development of a clean hydrogen economy including funding of \$1 billion for a Clean Hydrogen Electrolysis Program and \$500 million for a Clean Hydrogen Manufacturing program over the next 5-years. IIJA authorized \$8 billion of this instrumental investment for the demonstration of the production, processing, delivery, storage and end-use of clean hydrogen through the Regional Clean Hydrogen Hubs (H2Hubs) program. Investment in such an integrated economy that incorporates supply and demand in a Regional Clean H2Hub has the potential to address various climatic, economic, and social concerns simultaneously:

- H2Hubs can help scale clean hydrogen production and end-use for a net-zero U.S. by 2050.
- H2Hubs can develop a multi-decade clean, efficient, and modern infrastructure.
- H2Hubs can accelerate energy transition and decarbonize supply chain of various sectors and end-products including heavy industrial, transportation and various chemicals and products critical for everyday use.
- H2Hubs can integrate the power, manufacturing, and transportation sector collectively, de-risking emission reduction and reducing cost of clean energy and fuel.
- H2Hubs can leverage existing regional resources, infrastructure, and local skilled workforce, easing energy transition impacts and creating good paying jobs and local economic growth.
- H2Hubs can strengthen our economy through public-private partnerships and a domestic supply chain that ensures energy security.

To assist the DOE in maximizing the impact of implementing the clean H2Hubs program for both climate and community benefit, we have assembled the following recommendations that will enable a competitive clean hydrogen U.S. economy inclusive of community voices and participation. Recommendation relevant questions from the request for information are provided in text boxes.

**Category 1: Regional Clean Hydrogen Hub Provisions and Requirements**

**Question 1. (a)** 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.” What should qualify as ‘close proximity’ in context of the hub requirements?

**Recommendation 1: Adopt a definition of ‘close proximity’ that optimizes the nation’s resource, provides economies of scale to infrastructure investments, and advances emission reduction and direct community benefits.** H2Hubs can provide a circular network of producers and consumers of clean hydrogen for a lasting success in emission reduction. Statutory language for the Regional Clean H2Hubs also directs the optimization of US’s resources by requiring that at least two H2Hubs be located near natural gas resources. H2Hubs can spur new clean markets that provide direct benefits to local communities through improved economic, health, and environmental conditions. The definition of ‘close proximity’ must, therefore, reflect these multi-benefits without pre-determining winners and losers. The definition of ‘close proximity’ needs to therefore consider resource optimization, the development of infrastructure to accommodate the scale-up of clean hydrogen, and direct community benefits such as near-term local air-quality benefits, emission reduction, clean energy jobs, etc, and should therefore only be constrained by if and how much economies of scale and emissions and community benefits for these hubs decrease with distance rather than any specific distance itself.

**Category 1.2. (a)** 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 CO<sub>2</sub> equivalent emissions?

**Recommendation 2: Develop a clear and consistent definition of clean hydrogen for meaningful emission reduction and performance-based market competitiveness in hydrogen production.** The discourse around hydrogen has been dominated by ambiguous definitions of hydrogen under different color schemes like green, blue, and pink hydrogen. The color of hydrogen, however, says very little about the emission profile of a hydrogen production pathway. The emission profile of a hydrogen production process depends on the system boundary and the constituent processes used to produce the end-product. Unclear and non-standardized definitions for clean hydrogen fail to convey the emissions impacts for a broad range of hydrogen production pathways and creates an uneven marketplace for hydrogen production and end-use that doesn’t reward performance accordingly. IJJA defines the term ‘clean hydrogen’ as hydrogen produced with carbon intensity equal to or less than 2kg of CO<sub>2</sub>-equivalent per 1kg of hydrogen at the site of production—excluding upstream emissions associated with

material acquisition and transportation. Inconsistencies in the formal definition of clean hydrogen will hamper fair marketplace competitiveness. Hydrogen can be produced from various feedstocks, with different technologies and varied emission profiles. Therefore, standardized definitions for clean hydrogen and associated accounting protocols are needed to weigh the performance of these varied pathways to clean hydrogen. DOE should take immediate steps to collaborate with the Environmental Protection Agency (EPA) and create a robust definition and standardized protocol to assess the emission profile of hydrogen production inclusive of emission associated with raw material acquisition, raw material transportation and hydrogen production.

**Category 1. 3 (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?

**Recommendation 3: Enable flexible application of funding to support the broad range of activities necessary for clean hydrogen production.** Statutory language included in IJJA provides a lot of flexibility as to what specific activities the funding can be used for. DOE should support the use of funding for a broad range of activities and investments that support multiple users, support the building of economies of scale, and demonstrably aid the achievement of clean hydrogen production. Especially for electrolytic production of hydrogen, electricity production is an integral component of hydrogen production. According to an analysis by Columbia University, electricity cost of electrolytic hydrogen production using different renewable power sources could be as high 62% of the total levelized cost of production.<sup>1</sup> Additionally, H2Hub and hydrogen production technology deployment at this scale is likely to face unforeseen needs, DOE should allow for funds to be used to fill necessary gaps project developers may face. This could include use of funding for infrastructure support, capital cost of facility construction, upgrades to clean electric or heat generating energy sources needed to produce hydrogen, etc.

**Category 1. 7 (a) and (b)** 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.” 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

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<sup>1</sup> Green Hydrogen in A Circular Carbon Economy: Opportunities and Limits (2021).  
<https://www.energypolicy.columbia.edu/sites/default/files/fileuploads/Green%20hydrogen%20report,%20design ed,%2009.07.21.pdf>

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.

**Recommendation 4: Develop metrics to quantify economic and workforce vulnerability and develop tools to track employment benefits.** According to the Fuel Cell and Hydrogen Energy Association, a clean hydrogen economy in the U.S. can create 700,000 jobs and \$140 billion in revenue by 2030. In a net-zero America, Hydrogen can reduce transportation emission by 30% and total emissions by 16% while providing an estimated 3.4 million jobs by 2050.<sup>2</sup> Hydrogen can also result in job transition opportunities from various fossil fuel and oil and gas sectors—ensuring job security for American workers. Although this is promising, the transition to a clean hydrogen economy may impact different regions and communities in an unequal manner. Additionally, the geographic distribution of new job opportunities is unlikely to align exactly with the distribution of people looking for work. To ensure that Regional Clean H2Hubs are addressing the needs of economically distressed communities and used to facilitate the transition of existing workers into a cleaner economy, DOE should develop proper metrics to capture this vulnerability and outcomes. DOE should develop indicator metrics such as wage information, local worker transitions, worker benefits, regional economic diversity<sup>3</sup>, vulnerability to job loss, community readiness for incoming job opportunity including education level, access to low-cost training, apprenticeship potential, training during employment opportunities, etc. Tracking these indicators should not delay or interrupt H2Hubs solicitation and selection timeline. However, these metrics should inform future funding and track overall success of the Regional Clean H2Hubs program.

**Recommendation 5: Enable robust support for worker transition and worker upskilling in coordination with relevant federal agencies and local public and private actors.** Appropriate worker transition assistance and support for the re-skilling and up-skilling of certain worker trades can help ensure many people are not left behind. Government engagement with existing employers is needed to strategically minimize worker dislocation over time. The Regional Clean H2Hubs program should coordinate across relevant federal agencies, states, local governments, community organizations, education institutions, and other private and public entities to increase existing resources from the federal government to support the upskilling and training of a workforce to enable a lasting clean H2Hubs deployment. While adhering to the statutory requirement for providing long-term employment to the greatest number of residents in a region, priority should also be placed on improving job quality and job mobility.

**Recommendation 6: Ensure that workforce development is a key cornerstone of H2Hubs proposal, planning, construction, deployment and operation.** Review criteria for H2Hub applications should include workforce development plans that partner with local organizations well-versed in workforce

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<sup>2</sup> 2 Road Map to a US Hydrogen Economy. <https://www.fchea.org/us-hydrogen-study>

<sup>3</sup> Research Brief: Measuring Economic Diversity: The Hachman Index, 2017. (2019). <https://gardner.utah.edu/wp-content/uploads/HachmanBriefFinal.pdf?x71849>

training and labor considerations. In the proposed budget for H2Hubs, applicants should demonstrate a commitment to advancing workforce development including proper fund allocation for these activities. Importantly, workforce training partners should include practitioners, such as community colleges and unions, in addition to academic and private sector partners. Relevant activities can include developing curriculum for retraining programs for displaced and new workers, establishing registered apprenticeship programs in coordination with private sector leaders to fill relevant workforce gaps, and creating internship opportunities for college and graduate students. National coordination for workforce programs across all H2Hubs would be beneficial and can be designed similarly to similar programs at Manufacturing USA Institutes, which have both a local and national presence. The Lightweight Innovations For Tomorrow (LIFT) institute has done a particularly admirable job coordinating regional workforce activities of the existing Manufacturing USA institutes and would be a good model to follow for H2Hubs.<sup>4</sup>

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

**Questions: 8, 9 and 26.** 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, Grants, Other Transactions Authority)? 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? 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?

**Recommendation 7: Balance near-term wins with long-term investments when allocating Regional Clean H2Hubs funding.** Currently, almost all hydrogen produced in the US uses fossil fuel feedstocks.<sup>5</sup> With aid from carbon capture and storage (CCS) technologies, the carbon intensity of industrial hydrogen production from natural gas and coal can be reduced by 60% or more.<sup>6</sup> According to the Rhodium Group, investment in CCS retrofits in the existing 40 industrial hydrogen producing facilities can result in near-term benefits of reducing 23 million metric tons of carbon emission every year.<sup>7</sup> Additional immediate emission reductions can also be achieved through energy efficiency measures and pre-capture retrofits of industrial facilities. While these near-term wins are necessary, DOE must balance

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<sup>4</sup> Lightweight Innovations for Tomorrow (LIFT). <https://lift.technology/>

<sup>5</sup> U.S. Energy Information Administration (EIA). "Hydrogen explained; Production of hydrogen". <https://www.eia.gov/energyexplained/hydrogen/production-of-hydrogen.php>

<sup>6</sup> Hydrogen Council. "Hydrogen decarbonization pathways; A life-cycle assessment" (2021). [https://hydrogencouncil.com/wp-content/uploads/2021/01/Hydrogen-Council-Report\\_Decarbonization-Pathways\\_Part-1-Lifecycle-Assessment.pdf](https://hydrogencouncil.com/wp-content/uploads/2021/01/Hydrogen-Council-Report_Decarbonization-Pathways_Part-1-Lifecycle-Assessment.pdf)

<sup>7</sup> Rhodium Group. "The economic benefits of carbon capture: Investment and employment estimates for the contiguous U.S." (2021). <https://rhg.com/research/state-ccs/>

these early wins with investments in H2Hubs that diversify hydrogen production pathways and offer carbon neutral or even carbon-negative emission benefits for the long-term like electrolysis using carbon-free sources and biomass with CCS. The H2Hubs program should have strong coordination with relevant programs and offices at DOE to enable technologies at the appropriate stage in the innovation pipeline to enter. Early-stage and technologies at lower readiness level should continue to be supported by other R&D, pilot projects and demonstration funding while facilitating information sharing and exchange from pilots and demonstration projects to and from regional H2Hubs. Regional clean H2hubs should also facilitate infrastructure sharing to support seamless integration of technically mature hydrogen pilot and demonstration projects.

**Recommendation 8: Account for relevant market dynamics and commercialization challenges in H2Hubs project selection and funding.** DOE has vast experience in funding projects on a technical basis. However, projects that are technically sound can fail due to regional or global energy market dynamics as well as from missed insights into private sector needs and commercialization challenges. DOE should make sure to account for these variables while evaluating the technical aspects of projects. Project reviewers retained by DOE should have the business expertise and market analysis know-how to discern and account for variabilities beyond the technical aspects of an H2hub, including profitability, project planning, market readiness, and regulatory challenges.

**Recommendation 9: Leverage flexible funding agreements to increase participation and enable cooperative relationships in H2Hubs deployment.** DOE should leverage flexible funding agreements for Regional Clean H2Hubs, including grants, cooperative agreements, and Technology Investment Agreements, to ensure strong cooperation and a funding structure that effectively addresses both public and private sector interests. Consideration should also be given for shared funding arrangements with different DOE offices and other federal agencies. DOE should consider reducing the cost share requirements where appropriate. Cost-share requirements should be established at the beginning of a project and if a project is transferred from an Applied Program to HFTO, FECM or OCED, the cost-share should not be renegotiated.

**Recommendation 10: Partner with states to collaboratively fund and develop H2Hubs projects.** Taking congress's historic lead, many states like California, New Mexico, Ohio, Colorado, Wyoming, Texas and Utah are developing multi-state partnerships and beginning to ear-mark funding to support clean H2Hubs. Instead of seeing this as a separate stream of funding that project developers would apply for, DOE should build in flexibility and structures to facilitate memoranda of understanding and shared funding agreements to enable states to be co-leaders with the federal government in developing a clean hydrogen U.S. economy. State level funding and supportive policies (e.g., State Clean Energy Standard, Low or Clean Carbon Fuel Standards, etc.) for hydrogen projects should be taken as a promising indicator of potential for long term success when selecting locations for H2Hubs.

**Recommendation 11: Enable sustained funding mechanisms beyond the 5-years for long-term success of H2Hubs.** Hub deployment projects are complex and likely to be executed over multiple years and multiple stages. Throughout their deployment, DOE may choose to evaluate the success of these hubs at multiple points throughout the multi-stage execution and provide funding accordingly. DOE may also choose to provide additional funding to projects that experience unforeseen challenges, projects enroute to completion or include new projects at a later point in the five-year term of the H2Hubs program. To enable extended support for projects at varied stages of hub development, DOE should ensure sustained and flexible funding mechanisms for the Regional Clean H2 Hubs. DOE can provide sustained support through flexible funding mechanisms, follow-on grants, incorporating private funding sources, and through case-by-case project support.

**Recommendation 12: Provide clear and timely guidance and communication in carrying out hubs.** Broad timelines provided by DOE on this request for information are encouraging. As soon as practicable, DOE should clarify timelines for project solicitation, definitions, selection criteria, funding quantity, milestones, etc. for each phase of hydrogen hub funding opportunity. Hubs are complex large-scale projects, and early clarity on key parameters will be needed to allow applicants the time and certainty needed to appropriately plan and size projects, develop quality proposals, and ensure the most viable projects are proposed and funded. Selection criteria should be identified early on, listed publicly, and include a mix of local engagement qualifications, technical feasibility, financial viability, a demonstrable market, and project management plans. DOE should also leverage the H2Matchmaker tool to publicly flag locations for DOE-funded hub projects. Independent project reviewers to be solicited by DOE, as indicated on the request for information notice, should include personnel with relevant expertise in technology, market analysis and economics, project management, and social and community engagement expertise to enable a holistic review of projects.

**Category 2.17.** What environmental reviews and permitting challenges might H2Hubs encounter? Please provide examples of how community consultation and consent-based siting can successfully be included in the environmental and permitting review process.

**Recommendation 13: Improve regulatory permitting processes efficiency while maintaining robust environmental standards and advancing environmental justice.** DOE should prepare programmatic environmental impact statements for hydrogen production, processing, storing and delivery facility siting, and associated energy production and carbon management activities, to allow shorter and faster environmental assessments on a project-specific basis. DOE and EPA should also provide guidance on proper life cycle accounting of emissions used for various projects within the context of a National Environmental Policy Act (NEPA) review. DOE should also consult with the Bureau of Land Management (BLM) and EPA on approaches to accelerate the development of new Hydrogen and CO2 geologic storage options. FECM should communicate the benefits of using the FAST-41 process of working with the Federal Permitting Improvement Steering Council (FPISC) and the Permitting Dashboard to expedite permitting processes for H2Hubs.

**Recommendation 14: Use Regional Clean H2Hubs funding to stand up state-level permitting, and regulatory offices for timely deployment.** Regional clean H2Hubs are going to require regional permitting and regulatory structures for safe and sound deployment. Many states are not currently empowered and lack the staffing and know-how to facilitate siting and permitting of H2hubs within a reasonable timeline. DOE and EPA should provide funding for staffing state-level permitting programs to complement federal permitting efforts and that are harmonized with an efficient federal permitting system. The federal government should also create and fund a training program to prepare state permitting offices and reviewers to carry out federal regulatory process for permitting. EPA should also provide expeditious guidance and timelines for the state-level grants authorized by the IIJA for state-level underground injection control offices responsible for primary enforcement authority over Class VI wells used for underground CO<sub>2</sub> sequestration. DOE should also provide Technical Assistance to assist project developers, especially those that are small or emerging, with navigating state regulator processes pertaining to H2 Hubs.

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

**Questions 27 – 31.** 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 Justice40 in DACs: (1) decrease energy burden, (2) decrease environmental exposure and burdens; (3) increase access to low-cost capital; (4) increase the clean energy job pipeline and job training for individuals; (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. 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? What EEEJ concerns or priorities are most relevant for the H2Hubs? What measures should H2Hub project developers take to ensure that harm to communities with environmental justice concerns, including local pollution, are mitigated? 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)? How can DOE support meaningful and sustained engagement with H2Hub relevant disadvantaged communities?

**Recommendation 15: Conduct robust local community engagement to build public trust and ensure long-term success H2Hubs.** Environmental justice and addressing the concerns of communities that have been disproportionately impacted by legacy pollution are essential to enabling durable climate solutions. Strategic engagement with communities, educational opportunities, and raising awareness of clean hydrogen as a climate solution is essential to both climate and economic goals. Consistent with recommendations from the EJ 40 initiative, DOE should consider supporting community engagement efforts by creating an Office of Public Participation (similar to that within Federal Energy Regulatory Commission) or a Federal Advisory Committee that will advise on best practices for community



engagement. These efforts should be done in consultation with the Office of Congressional and Intergovernmental Affairs on state and local engagement, the Office of Economic Impact and Diversity, and the Office of Environmental Management. The President’s Budget Request for FY23 should request appropriate funding needed to sustain this effort. Funding should also be made available to project developers to facilitate community organizations and front-line stakeholders’ engagement during the H2Hubs solicitation and selection process. Staffing at the DOE for community-centered efforts in the Regional Clean H2Hubs program should prioritize applicants with career experience in community engagement. DOE should also make funding available for technical experts at national laboratories to provide Technical Assistance and serve as impartial messengers to communicate the technical benefits and challenges H2Hubs to communities.

**Recommendation 16: Defer to experts in community engagement where necessary.** DOE should carefully consider the appropriate role for the Department to play in community engagement, and what responsibilities should be left to project developers and community organizations. At a minimum, applicants should be required to submit community engagement plans during the selection process and relevant experts with knowledge of community engagement strategies should review this portion of the applications. Successful applicants should also be allowed to use H2Hub funding for community engagement using different tools and trusted community partners. Community engagement activity should be monitored during the project management process.

**Recommendation 17: Develop and promote transparent emission and life cycle accounting practices to build community trust and ensure climate benefit.** Hydrogen can be produced using a diversity of feedstock and technologies with varying life cycle emissions. As DOE develops standard protocols to account for associated emissions, transparency measures are needed to ensure promised emission reduction benefits are reaped. Existing federal reporting and monitoring programs, such as Subpart RR for the Greenhouse Gas Reporting Program managed by EPA should be maintained to ensure consistent signals to the private sector and instill public confidence.<sup>8</sup> Best practices and regulations that promote transparency and environmental stewardship exist in the U.S. government - particularly, Class VI and subpart RR. The reporting and transparency components of these successful programs should be integrated into program solicitations and funding selection process. DOE should work closely with relevant agencies to expeditiously issue new rules regarding hydrogen production greenhouse gas accounting inclusive of upstream emissions and Hydrogen and CO2 pipeline protocols relevant to H2Hubs. Further regulatory clarity should also be encouraged from federal land management agencies, including Department of Agriculture and Department of Interior. DOE should ensure these permitting frameworks are as efficient as possible while addressing health and environment concerns and building trust with the community.

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<sup>8</sup> Environmental Protection Agency (EPA) Greenhouse Gas Reporting Program.  
<https://www.epa.gov/ghgreporting/subpart-rr-geologic-sequestration-carbon-dioxide>

**Recommendation 18: Develop tiered transparency measures to ensure technological soundness, knowledge repository building and delivery of promised local benefits.** Some H2Hubs may have greenhouse gas emission in addition to CO<sub>2</sub>. The extent to which these emissions are mitigated are dependent on deployed technology specifications. DOE should consider developing tiered transparency and information sharing protocols to ensure that appropriate emission and technological specs data is made available to the public, researchers, and relevant organizations without exposing critical intellectual property. Such a protocol will also enable knowledge transfer from H2Hubs to universities and research institutions. Additionally, this will empower communities to assess local air quality benefits of a specific H2Hubs project in their community. Data aggregation efforts for lifecycle assessment and monitoring, as well as for local air quality impacts from the installation of carbon management infrastructure, should be promoted with organizations. Metrics and aggregation of this data should be drafted in consultation with frontline communities.

**Category 5: Other**

**Question 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.

**Recommendation 19: Apply a milestone-based approach for managing Regional Clean H2Hubs awards.** Hub deployment projects are complex and must integrate with infrastructure and regional economic sectors. Therefore, deployment will be a multi-stage and long-term process. When awarding funding to Regional Clean H2Hubs, DOE should use a milestone approach for projects including termination criteria, cost thresholds, and hardware, technical and financial milestones.

**Recommendation 20: Build-in an appropriate risk tolerance in H2Hub development and deployment.** As the clean H2Hubs program develops milestones for projects, it should also establish acceptable failure rates and risk levels for each program. As an illustrative example, the Senate has proposed legislation for a Clean Energy Deployment Administration with a 10% project default rate. The H2Hubs program should seek projects at an appropriate level of maturity and risk, commensurate with the size of facility and the purpose of the H2Hub facility being awarded funding.

**Recommendation 21: Develop exit-ramps for underperforming H2Hubs projects.** The recent GAO report on Carbon Capture and Storage demonstration project highlights the need for proper exit-ramp for projects that don't meet their goal.<sup>9</sup> There is much to learn from projects that do not move forward or hit a major barrier during their execution. DOE can ensure that federal dollars add to the knowledge reservoir even when projects fail or underperform by instituting structures that enable smooth exit

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<sup>9</sup> U.S. Government Accountability Office. "Carbon Capture Storage: Action needed to improve DOE management of demonstration projects." (2021)



ramps. When DOE makes the decision to cease project support, a process to obtain and share lessons learned and help support projects through a proper exit should be instituted.