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Hydrogen Policy

Clean Hydrogen Hubs: A Crucial Instrument in the US Hydrogen Strategy

The European continent dominated the global hydrogen race before 2022, with France, the Netherlands, Norway, Germany, Spain, Portugal, and the European Union all presenting ambitious hydrogen strategies by 2020 that outlined their major areas of action and objectives, along with key policy interventions to achieve those goals. Nonetheless, in the fall of 2022, the world's attention shifted to the United States. An initial draft of its long-awaited Clean Hydrogen Strategy and Roadmap was published by the US Department of Energy (DOE), and in the summer of 2023, the final version of the strategy was issued (U.S. National Clean Hydrogen Strategy and Roadmap, referred to hereafter as "the strategy").

The strategy sets three main policy objectives i) Produce 5 million tonnes of clean hydrogen per year by 2030; ii) Enable cost of clean hydrogen production by electrolysis at \$2/kg by 2026 and \$1/kg of hydrogen by 2031 (as per the strategy, it is possible to drive down costs rapidly and achieve scale within a decade by leveraging the innovative and entrepreneurial spirit of Americans, and world-class National Laboratories, industry, and academic facilities. Moreover, in order to reach scale strategically, regional networks can be leveraged, hydrogen production can be ramped up in close proximity, transportation costs can be driven down, and holistic ecosystems can be created for local development (DOE, 2023)), and iii) Develop and scale up regional clean hydrogen hubs (DOE, 2023). Attracting even more attention from both the public and private sectors across the world than the strategy itself, has been the passage of the Inflation Reduction Act (IRA) with its Production Tax Credit, a tax break granted for low-carbon hydrogen that is based on the volume of production and level of CO₂ emissions per kg of hydrogen. This offers a simple, tax-based approach that has proven extremely popular with investors and is a central vehicle for ramping up US hydrogen production. While the IRA represents a central vehicle for delivering the deployment and cost-related targets of the US hydrogen strategy, it is important to see it in conjunction with the third main objective of the DOE, which focuses on the development of clean hydrogen hubs. As defined by the US Infrastructure Investment and Jobs Act, clean hydrogen hubs are clusters of hydrogen producers, consumers, and their associated infrastructure situated in close proximity to each other and are intended to target specific end-use sectors to maximize clean hydrogen use (DOE 2022, p. 26). Clean hydrogen hubs could be seen as a complement to the Production Tax Credit and as a catalyst for innovation, cooperation and knowledge exchange throughout the hydrogen value chain. They offer important potential for supporting the further development of the US hydrogen eco-system.

Key success factors in the implementation of clean hydrogen hubs

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Whether the potential of the US hydrogen hub concept can be realized will depend on how these are implemented in practice. Based on [survey data](#) collected by the global information sharing platform Hydrogen Valley Platform (Weichenhain et al., 2021) and the analysis of a [case study](#) on the development of a hydrogen valley in the Netherlands (Heerema, 2021), we have identified three key success factors in the development of Clean Hydrogen Hubs: a) business model and financial support, b) political support and stakeholder cooperation, and c) the project concept.

The survey data collected from hydrogen hubs around the globe shows that a core success factor for the development of hydrogen hubs is the design of the business model and the financial support that the hub can count on (Weichenhain et al., 2021). By carrying out feasibility studies and business case analyses (financed and commissioned by government and carried out by universities, research institutions and/or private companies) that accurately assess the project's costs at an early stage, the economic attractiveness of the project can be strongly increased. In this way, hydrogen hub projects can also increase their chances of receiving financial support. This factor minimizes the probability of unexpected expenses and prevents the need to raise new funds at later stages. Furthermore, it helps establish guidelines for how the project will operate, how it will generate revenues, who its potential customers will be, and other details regarding the financing, thus helping to develop a clear business model for the project.

Another key aspect necessary for the success of hydrogen hub projects is political support and stakeholder cooperation. By engaging multiple stakeholders — ranging from political actors to regulators, and civil society — from an early stage of the project and determining common interests, both political support and public acceptance can be secured. It is also important to develop a common vision and related goals for the future of the region and to integrate them into the project concept. The involvement of potential partners and civil society increases the likelihood of obtaining financial support throughout the project, while removing political and regulatory hurdles to its development (Heerema, 2021).

Finally, successful hydrogen hubs require the development of well-rounded project concepts that address both local as well as national needs and take into account the specific geographical circumstances of the region. Adapting the project and its scope to the needs of both local and national stakeholders will also increase the likelihood of securing political and financial support. Furthermore, projects should be situated in places with beneficial geographical conditions, such as high renewable energy potential, vast water resources, closeness to port terminals for import and/or export of hydrogen, well established industry in the region, among others. This lowers production costs and increases the efficiency of the hydrogen hub. A clear strategy for this can attract more investors and therefore leverage more funding.

Policy instruments to promote success factors in the development of Clean Hydrogen Hubs

The success of the US hydrogen hub concept will depend on the collaboration of public and private stakeholders and their ability to incorporate the lessons outlined above in their efforts. Our research on hydrogen policy in the US shows that the country already has over 100 policy instruments for the development of the hydrogen economy in place. Building on this, the next section explores to what extent existing policy measures provide the type of support suggested by the success factors outlined above, and based on that, identifies a number of areas that still require more targeted efforts by the public sector.

As outlined above, the first success factor suggests the need for feasibility studies and business case analyses at early stages of the project to determine its commercial viability and accurately assess its costs. Governments can encourage the development of feasibility studies by providing funding for and commissioning these types of studies. [According to the International Energy Agency's \(IEA\) hydrogen projects database](#) (2022), more than 20 feasibility studies for the development of hydrogen-related technologies are in preparation in the US, but no government funding could be linked to these existing feasibility studies. Through the Infrastructure Investment and Jobs Act, the US Government has provided 8 billion dollars for the development of regional clean hydrogen hubs in the "Regional Clean

Hydrogen Hubs Program” (DOE, 2022). Investing a share of this in the development of early-stage feasibility studies would make an important contribution to this success factor.

Regarding the second success factor - political support and stakeholder cooperation - the inclusion of the high-level policy objective on the development of hydrogen hubs represents an important strength. The presence of a unified goal at the national level not only demonstrates political support and encourages continued support from public actors at different levels of governance but also motivates private actors to invest in hydrogen hubs. Moreover, the DOE has implemented the [H2 Matchmaker](#) online platform to support the formation of regional hydrogen teams, including hydrogen producers, end-users, and other stakeholders. This represents an important contribution to promotion of stakeholder engagement and collaboration (DOE, 2023, a). In addition, the government could develop a framework that all hydrogen hubs in each region should adhere to, so stakeholder cooperation and interaction are assured throughout the entire project lifecycle.

Lastly, the third success factor involves creating a project that adapts to specific geographical conditions and addresses local as well as national needs. As part of the Hydrogen Shot initiative, a research and development program whose objective is to reach one dollar for one kilogram of clean hydrogen in one decade, the DOE launched a request for information (RFI) to identify potential areas according to their regional resources. Based on the RFI, nine potential zones were identified (DOE, 2021). Additionally, as part of the national hydrogen strategy, the DOE will continue carrying out regional analyses throughout the country, considering the availability of water and other resources to locate the regions with the highest potential (DOE b, 2023 & DOE, 2022). Furthermore, the DOE's Regional Clean Hydrogen Hubs solicitation considers environmental justice factors, such as community benefits in evaluating applicants.

Likewise, all federally funded projects, including the Regional Clean Hydrogen Hubs, are reviewed in accordance with the National Environmental Policy Act. (NEPA; 42 U.S.C. 4321, et seq.). NEPA mandates that federal agencies consider the impact of proposed actions on the environment and society as part of their decision-making processes (DOE b, 2023). These measures represent important steps towards supporting the development of hydrogen hub concepts that harness local geographic conditions and mobilize benefits for local communities. To facilitate their effective implementation, it would be important to develop common guidelines to support stakeholders in their efforts to fulfill the above-mentioned mandates within the context of clean hydrogen hub development.

Concluding remarks

With the recent launch of the official U.S. Clean Hydrogen Strategy and Roadmap, the deployment of clean hydrogen hubs in the country has received an important signal of political support. Moreover, the U.S. has made efforts to facilitate the development of these hubs through the provision of public funding as well as support for private investment. Also, the Clean Hydrogen Production Tax Credit is likely to offer important synergies with the Clean Hydrogen Hub concept. While the tax credit directly supports clean hydrogen production, the regional clean hydrogen hubs program has the potential to promote the downstream value chain, i.e. usage, transport and storage).

Nonetheless, the US could make additional efforts to ensure their success and enhance their benefits for society and the environment. Such efforts could entail: i) the development of specific clean hydrogen hubs guidelines that harness particular conditions of specific regions and ensure their sustainability, ii) the creation of a common framework to guarantee the cooperation and interaction of different stakeholders throughout the process of constructing hydrogen hubs, and iii) the funding and commissioning of feasibility studies to assess the potential of clean hydrogen hubs.

References

DOE a. (2023). H2 Matchmaker. <https://www.energy.gov/eere/fuelcells/h2-matchmaker>

DOE b . (2023). U.S. National Clean Hydrogen Strategy and Roadmap.

<https://www.hydrogen.energy.gov/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf>



- DOE. (2021). DOE Hydrogen Program. Request for Information #DE-FOA-0002529. <https://www.energy.gov/eere/fuelcells/articles/doe-hydrogen-program-request-information-de-foa-0002529>
- DOE. (2022). DOE National Clean Hydrogen Strategy and Roadmap. <https://www.hydrogen.energy.gov/pdfs/clean-hydrogen-strategy-roadmap.pdf>
- Heerema, K. (2021). Strategic Niche Management for hydrogen: analysing the Hydrogen Hub Twente. http://essay.utwente.nl/88577/1/Heerema_MA_BMS.pdf
- IEA. (2022). Hydrogen Projects Database. <https://www.iea.org/data-and-statistics/data-product/hydrogen-projects-database>
- Moore, D., Slowey, E. & Gottlieb, I. (2022). The New Clean Hydrogen Production Tax Credit, Explained. <https://news.bloombergtax.com/daily-tax-report/the-new-clean-hydrogen-production-tax-credit-explained>
- Weichenhain, U., Kaufmann, M. & Benz, Anja (2021). Hydrogen Valleys. Insights into the emerging hydrogen economies around the world. <https://h2v.eu/media/7/download>