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You're the Ones That I Want — Hydrogen Hub Proposals to the DOE

Regions and States Make Their Case for Federal Financial Support



- The DOE is reviewing concept papers for regional clean hydrogen hubs.
- Up to \$8B available to support production and transportation networks.
- Focus on renewablesor nuclear-powered electrolyzers and natural-gas-fed SMRs and ATRs with carbon capture and sequestration.
- DOE to select winners in fall 2023, complete award negotiations in winter 2023-24.

1. Introduction

As part of the U.S.'s ongoing effort to transition to a lower-carbon economy, the Department of Energy (DOE) in the fall of 2023 will select six to 10 proposals for regional hydrogen hubs that will receive a combined \$6 billion to \$7 billion in funding over a five-year period starting in 2024. Another \$1 billion to \$2 billion from the 2021 Bipartisan Infrastructure Law's \$8 billion commitment to hydrogen hubs may be reserved for additional hydrogen hubs or "other supporting activities." The law also set aside \$1 billion to back efforts to reduce the cost of producing clean hydrogen from water via renewables-powered electrolyzers to \$2/kilogram (from the current \$4-plus/kg) by 2026, and another \$500 million to help advance equipment manufacturing technologies and techniques for clean hydrogen processing, delivery, storage, etc.

Given the magnitude of the financial support and the desire of public and private entities to be part of the energy transition, it's understandable that DOE received a bunch of hydrogen-hub concept papers from a host of project proponents by the November 7, 2022, deadline. The department hasn't provided any details, but a number of states, groups of states, public/private partnerships and others have indicated that they submitted proposals — and a small handful have

made at least part of their concept papers public. Over the past several weeks, the DOE has been reviewing the concept papers it received and providing initial feedback. Full-and-final applications must be submitted by April 7, 2023. The department expects to notify the winners in the fall of 2023 and complete award negotiations with them in the winter of 2023-24. It's anticipated that most of the selected proposals will each receive between \$500 million and \$1 billion in federal support, though it's possible that a proposal could receive as little as \$400 million or as much as \$1.25 billion, depending on its size and need.

The DOE's September 22 Funding Opportunity Announcement (FOA), which officially launched the process of receiving and reviewing hydrogen hub proposals, defined a clean hydrogen hub as "a network of clean hydrogen producers, potential clean hydrogen consumers, and connective infrastructure located in close proximity." Clean hydrogen, in turn, is defined as hydrogen produced either by nuclear- or renewables-powered electrolyzers or by running natural gas through SMRs or ATRs — steam methane reformers or auto-thermal reformers, respectively — and capturing and sequestering most of the resulting carbon dioxide, or CO₂.

Figure 1 illustrates the components of a prospective hydrogen hub, beginning with the various sources of energy that might be used to power hydrogen production (nuclear, renewables or fossil fuels — green markers to upper-left); the clean-hydrogen producers (nuclear- or renewables-powered electrolysis or steam-methane or auto-thermal reforming of natural gas with carbon capture and sequestration, or CCS — yellow-bordered area); connective infrastructure (pipelines, storage and other delivery support — green-bordered area at center); and clean-hydrogen customers (industry, power generation, residential/commercial heating, and transportation — blue-bordered area).



Figure 1. Potential Hydrogen Hub Components. Source: DOE

As for criteria DOE will use in its review of the concept papers and full proposals, the department lists these:

- **Feedstock diversity**. At least one hub will use renewable power (and electrolysis) to make hydrogen, another will use nuclear power (and electrolysis), and yet another will use fossil fuels (presumably running natural gas through SMRs or ATRs to produce hydrogen and capturing and sequestering most of the resulting CO₂).
- End-use diversity. At least one hub will use the clean hydrogen produced there in the electric power sector, the industrial sector, the residential/commercial (res/com) heating sector, and the transportation sector.
- **Geographic diversity**. The selected hubs will be in different regions of the U.S. and will use energy sources abundant there.
- Hubs in natural gas production areas. At least two hubs will be in parts of the U.S. with the greatest natural gas resources.
- **Employment**. The DOE will give extra weight to proposals likely to create the most opportunities for skilled training and long-term employment.

In essence, the DOE is seeking to take full advantage of the unique characteristics of different parts of the U.S. regarding energy availability and potential end-users of clean hydrogen. The department also has stated that the proposed hubs will be expected to balance hydrogen supply and demand, include connective infrastructure, and plans for long-term financial viability. Further, the DOE said it will favor proposals that were developed with substantial engagement from local and regional stakeholders and Native American tribes and that will provide significant benefits to disadvantaged communities.

The hydrogen-hub proposals discussed in this Drill Down Report have diversity in spades — in location, size, complexity and many other characteristics. The standout among them may be the HyVelocity Hub proposal for a hydrogen network along the Gulf Coast in Texas and Louisiana, a region that already has an impressive array of hydrogen production, pipeline and storage assets — not to mention natural gas supply, wind farms, solar facilities, carbon-sequestration potential, and hydrogen end-users. The founding proponents of the HyVelocity Hub, which we discuss in detail later in this report, include the Center for Houston's Future, GTI Energy, Chevron, Air Liquide and the University of Texas at Austin.

Among the other hydrogen-hub proponents with seemingly strong cases to make for DOE support are those in the Corpus Christi/Ingleside area in South Texas, California, the Louisiana-Arkansas-Oklahoma region, the Marcellus/Utica Shale, the Midwest/Great Plains, the Rockies, and the Pacific Northwest. None of these offer the same degree of existing hydrogen infrastructure as the Texas-Louisiana coast, but each has one or more important selling points, such as extraordinary solar potential and a huge base of potential hydrogen end-users (California); extensive nuclear or hydroelectric generating capacity (the Midwest and the Pacific Northwest, respectively); and carbon-sequestration potential (the Marcellus/Utica, the Great Plains and the Rockies).

Our expectation is that, much like the build-out of wind and solar generating capacity over the past several years, the financial support provided by the DOE's hydrogen hub program by the late 2020s will help to spur the development of at least a handful of sizable networks where clean hydrogen is produced, transported, stored and consumed.

We should note that the federal government's support for the development of a clean hydrogen industry doesn't begin and end with its hydrogen-hub money. In fact, it could be argued that the primary drivers behind the private sector's efforts to build production facilities and other hydrogen-related assets are (1) a new clean hydrogen production tax credit (PTC) and (2) an expansion of the existing investment tax credit (ITC) for energy projects to include hydrogen-related projects, both of which are in 2022's Inflation Reduction Act (IRA). The PTC, also known as a Section 45V tax credit, applies to the first 10 years of production from a "qualified clean hydrogen" facility and provides a tax credit equal to 60 cents/kg of clean hydrogen produced times a factor of between

0.2 and 1, depending on the lifecycle greenhouse gases (GHGs) generated by the project. That credit is then multiplied by 5 if the project's developer pays "prevailing wages" — generally meaning union-scale wages — and offers a qualifying apprenticeship program for construction, maintenance and repair work. The ITC, in turn, provides a tax credit for the energy portion of the project's cost basis. (See tax and accounting experts for details.)

These new tax credits and the DOE's hydrogen-hub program have surely played roles in the decisions by companies like Air Products, Southern California Gas (SoCalGas) and Clean Hydrogen Works to plan multibillion-dollar clean hydrogen projects in the U.S. Most recently, Air Products and AES Corp. unveiled a \$4 billion plan in early December 2022 to build a production facility in Wilbarger County, TX, whose electrolyzers — powered by 1,400 megawatts (MW) of new wind and solar generating capacity — will be capable of producing more than 200 metric tons per day (MT/d) of clean hydrogen. The Air Products/AES project is expected to begin production in 2027, just as the development of the hydrogen hubs supported by the DOE's program kicks into high gear.

In this report, we will discuss a number of the hydrogen-hub proposals that proponents have been seeking to advance in recent months.

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