



The U.S. Department of Energy (DOE) Office of Clean Energy Demonstrations (OCED) recently [announced](#) the project recipients selected for negotiation to develop [seven regional clean hydrogen hubs](#) across the United States.

Funded by a \$7 billion investment from the Bipartisan Infrastructure Law (BIL) (otherwise known as the Infrastructure Investment and Jobs Act), the hydrogen hubs, along with significant new tax credits made available under the Inflation Reduction Act, are intended to kickstart a domestic hydrogen market. The hydrogen hubs align with the Biden administration's whole-of-government commitments under the [National Clean Hydrogen Roadmap](#) and DOE's [Pathways to Commercial Liftoff: Clean Hydrogen](#).

This announcement is the first step in a lengthy process to realize benefits from the hubs. The successful hub coalitions will now begin negotiations with DOE for a final funding award. If successful, the coalitions will develop detailed project plans^[2] and enter into cooperative agreements with DOE to implement the hub projects. DOE will retain significant authority over the hubs, including four different "go/no-go" decisions throughout implementation in which DOE will review whether a hub is meeting the goals of its detailed plan and, if not, may halt the project altogether. To ensure successful hub projects, hub coalitions should focus now on the content of detailed project plans, with an eye toward the metrics DOE will consider at each "go/no-go" checkpoint.

Hub coalitions should also stay up to date on regulatory or legal changes that will affect business models or other aspects of these detailed plans. Although the hydrogen hubs are an exciting opportunity for industrial decarbonization, they rely on several uncertain dependencies, including pending federal guidance on 45V production tax credits, the National Environmental Policy Act (NEPA) review process, anticipated pipeline infrastructure regulation and development, and necessary demand-side investment.



What Are "Regional Clean Hydrogen Hubs"?

Spanning 16 states and seven regions, the regional hydrogen hubs will be localized networks of clean hydrogen producers and consumers connected through infrastructure in a way that engages and supports local communities. The hubs will focus on producing either "green hydrogen," which is hydrogen produced through electrolysis powered by renewable energy, or "blue hydrogen," which uses natural gas coupled with carbon capture technologies to produce hydrogen.

Hydrogen Hub	States Involved	Feedstocks	Midstream	End Uses
<u>Appalachian Hydrogen Hub</u>	Ohio			Industry
	Pennsylvania	Natural gas with carbon capture	Pipelines	Transportation (heavy-duty trucking)
	West Virginia			
<u>California Hydrogen Hub (ARCHES)</u>	California	Biomass		Power generation
		Renewables	Freight line	Transportation (heavy-duty trucking, port operations, public transit)
<u>Gulf Coast Hydrogen Hub</u>	Texas	Natural gas with carbon capture	Pipelines	Industry (ammonia, refineries, petrochemicals)
		Renewables	Refueling	Power generation
			Salt cavern storage	Transportation (heavy-duty trucking, marine fuel)
Heartland Hydrogen Hub	Minnesota	Biomass		Heating
	North Dakota	Nuclear	Open access storage	Industry (agricultural fertilizer production)
	South Dakota	Renewables	Pipelines	Power generation
<u>Mid-Atlantic Hydrogen Hub</u>	Delaware		Bus mechanic depots	Heating
	New Jersey	Nuclear		Transportation (aviation, heavy-duty trucking, refuse/sweeper trucks)
	Pennsylvania	Renewables	Pipelines	
<u>Midwest Hydrogen Hub</u>			Refueling	Power generation
	Illinois	Natural gas with carbon capture		Industry (refining, steel, and glass production)
	Indiana	Nuclear	Refueling	Power generation
	Michigan	Renewables		Transportation (heavy-duty trucking, sustainable aviation fuel)

Pacific Northwest Hydrogen Hub	Oregon			Industry (agriculture, refineries, data centers)
	Montana	Renewables	Freight line	Power generation (peaker plants, generators)
	Washington			Transportation (heavy-duty trucking, port operations)

The hubs are intended to leverage the strengths of each region and benefit the industries and communities in each locality. For example, the California Hydrogen Hub plans to build on the state's leadership in clean energy technology to produce hydrogen solely from renewable energy sources and will use that hydrogen to decarbonize the transportation, heavy-duty trucking, and port sectors. In contrast, the Gulf Coast Hydrogen Hub concept plans to leverage low-cost natural gas with carbon capture technology to produce hydrogen for use in industrial ammonia production, refineries, and transportation, including trucking and marine fuel.^[3]

Focus on Community Benefits and Workforce Development

A key focus of the hydrogen hubs is to lead an equitable energy transition and share the prosperity of the hubs with the communities in which they are located. To do this, each hydrogen hub is required to develop a [community benefits plan](#) (CBP) that outlines measurable, specific, and actionable benefits to communities, such as employment and training opportunities.^[4] The [community benefits plans](#) further the Biden administration's priorities to invest in a domestic workforce and engage communities; advance diversity, equity, and inclusion; and implement the [Justice40 Initiative](#), which commits 40% of all benefits realized from the hydrogen hubs to disadvantaged communities. Many hubs have already begun negotiating with labor groups. For example, the California, Mid-Atlantic, and Pacific Northwest Hubs have already committed to implementing Project Labor Agreements (PLAs) for construction contracts. OCED will closely monitor the hubs' success in meaningfully engaging with and enriching their communities. At each "go/no-go" decision point, OCED may decide to halt a project if a hub is not meeting its measurable community benefits and labor goals.

Dependencies That Determine the True Impact of Hydrogen Hub Funding

The Inflation Reduction Act

In the 2022 Inflation Reduction Act (IRA), Congress introduced the [45V Hydrogen Production Tax Credit](#). The IRA leaves several questions unanswered regarding how "lifecycle emissions" are calculated,^[5] the answers to which will almost certainly affect the economics of clean hydrogen projects being planned within each hub. The law requires the Internal Revenue Service (IRS) to publish detailed guidance on Section 45V within one year of enactment, but that guidance has yet to come.

In November 2022, the IRS [requested comments](#) on several issues under Section 45V, including what lifecycle emissions should be counted in the well-to-gate system boundary; how taxpayers should be required to verify energy inputs required to meet the required lifecycle greenhouse emission rate associated with the credit; what degree of time matching (hourly, annual, or other) should be required for those energy inputs used in the clean hydrogen production process; whether taxpayers can use virtual power purchase agreements or book and claim environmental attributes (such as renewable energy certificates) to achieve the required lifecycle greenhouse gas emission rate; and what recordkeeping and reporting requirements should apply to document the emissions associated with the hydrogen production.^[6]

To maximize the full economic and climate potential of each hydrogen hub, the IRS will need to provide clear guidance on these questions. Until then, however, regulatory uncertainty will constrain developers, investors, and buyers seeking to implement the BIL's vision for a hydrogen economy.

NEPA Compliance

All projects within the hubs are required to comply with NEPA. Although DOE is responsible for NEPA compliance, hub recipients are required to assist DOE, which might include covering costs for preparing records or other required documents. Additionally, the scope of the NEPA review will affect a hub's timeline for project implementation and budget. Most likely, DOE will conclude that a hub will need to complete either an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). While an EA is less rigorous and time-intensive than an EIS, either process could take months, if not years, and could have significant impacts on budget. To streamline DOE's NEPA review, hub coalitions should already be developing a detailed understanding of the potential environmental impacts for a project and accurately pricing out NEPA requirements.

Pipeline Regulatory Challenges

One of the largest challenges for each hub will be expanding its options for hydrogen transportation, particularly through hydrogen pipelines. DOE's [2020 Hydrogen Program Plan](#) identified permitting for hydrogen pipelines as one of the [most significant challenges](#) to overcome in hydrogen delivery infrastructure. Permitting raises numerous unanswered regulatory issues, including siting authority with federal-state jurisdictional conflicts, issues of preemption, and uncertainty regarding authority to regulate terms and services. Additionally, debates continue over whether hydrogen pipelines should be regulated like oil pipelines under the Interstate Commerce Act, or whether Congress should assert authority under the Natural Gas Act.

Since many of the hubs rely heavily on hydrogen pipelines as midstream infrastructure connecting hydrogen producers to end users, clarity over the permitting process will be necessary for hub deployment.

Demand-Side Requirements

Finally, while the hubs are a large investment in supply-side hydrogen markets, they will require a complementary investment in demand-side hydrogen initiatives. In September 2023, DOE released a [request for proposal](#) for an independent entity to develop and execute numerous demand-side initiatives funded by DOE that engage with and support the hydrogen hubs. Selected recipients will work closely with hub coalitions to develop demand-side initiatives that are responsive to the particular challenges within each region.

How To Stay Informed

DOE has [opportunities](#) for local engagement in hub development ranging from direct contact with hub-specific teams to facilitated sessions or community engagement planning. Additionally, DOE is hosting hub-specific [community briefings](#) between October 24 and November 1, 2023.

Endnotes

[2] Detailed project plans will provide assurances to DOE through detailed engineering and construction plans, risk management and financial modeling, demonstrated compliance with permitting and regulatory regimes, community development targets and benefit agreements, and project lifecycle analyses, among others. See [DOE FOA 0002779](#).

[3] For more information on the initial hydrogen hub proposals and coalitions, see this previous [Update](#).

[4] DOE requires Community Benefits Plans as part of all BIL and IRA funding opportunity announcements (FOAs).

[5] "The § 45V credit is calculated by multiplying the applicable amount by the kilograms of qualified clean hydrogen produced based on the lifecycle greenhouse gas emissions rate that results from the production of qualified clean hydrogen." IRS, [Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production](#), Notice 2022-58.

[6] To learn more about evolving renewable energy tax credits, please sign up for the [Tax Credit Evolution Webinar Series](#).

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