

Phase 1 Award Webinar Follow-Up Q&A

The Pacific Northwest Hydrogen Association hosted a webinar on Wednesday, August 21, 2024, from 11 a.m. to 12 p.m. PST to share details of the Hub's plans for Phase 1, including community and tribal engagement, labor opportunities, and other regional benefits. To view the webinar recording, please visit our [YouTube page](#).

During the webinar registration process and throughout the live webinar, we received over 60 questions. We were only able to answer a handful of the most-asked questions in the webinar presentation. This Webinar Follow-Up Q&A includes responses to the remaining questions we received.

For any further questions, please contact us at info@pnwh2.com.

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Phase 1

- **Q: Roughly how much of the \$27.5 million federal funding in Phase 1 will be passed through to industry partners and roughly how much stays with PNWH2 for administration and Hub-level projects?**

A: Approximately \$19.3 million will be passed through to industry partners, Washington State University (WSU), and the Pacific Northwest National Laboratory (PNNL). The balance of the federal funding will be combined with approximately \$5.35 million in Washington State Climate Commitment Act funds to support administration and Hub-level projects, including Hub-level environmental review activities under the National Environmental Policy Act (NEPA).

Projects & Partners

- **Q: Where is Node 1 on the map? Can an update be provided on Node 1 given Fortescue Future Industries (FFI) has deferred its interest in Centralia?**

A: The location of this node is currently being evaluated. We acknowledge that this is an evolving process and we're working closely with Node 1's partners to make enhancements to the project while retaining the community benefits for the region.

This is a very nascent market development space and aspects of the PNWH2 Hub projects and partners are likely to change. PNWH2 is committed to building a green hydrogen value chain in the Pacific Northwest and is excited to begin this work alongside our partners.

We will be able to share more project details as we move into Phase 1 and continue building out our region's hydrogen network.

- **Q: Are you working with potential suppliers? If so, is there preference for USA content?**

A: Hub projects will continue to work with and identify suppliers as their project designs mature. The contract requires projects to obtain waivers from the U.S. Department of Energy (DOE) for any work, including purchases and labor, performed outside the U.S. and, to the extent practicable, equipment and products considered “infrastructure” are expected to be U.S.-made. Furthermore, specific provisions of the Build America, Buy America Act apply to all projects. For more information, see Division G, Title IX of the Infrastructure Investment and Jobs Act, Public Law 117-58 regarding the complete description and requirements.

- **Q: How can firms sign up for RFP notifications and when is the first engineering RFP expected to be released?**

A: All open RFP opportunities with the PNWH2 Hub will be posted on our [Careers & Opportunities](#) page as well as shared via our [LinkedIn page](#).

- **Q: How can entities that have not yet submitted projects to the PNWH2 Hub engage with the Hub development activities? How can renewable developers support the Hub’s renewable power needs?**

A: Renewable developers and others can reach out to [CHARGE](#), our business development lead, to connect and identify potential partners or opportunities. We will get back to you as soon as possible.

- **Q: Will you partner with transportation agencies and organizations (WSDOT, ODOT, BNSF, etc.) for hydrogen-powered trains, especially the East-West route over Stampede Pass to Tri-Cities?**

A: Supporting transportation sector decarbonization is absolutely something PNWH2 is focused on. Partnering with entities like state agencies or large private rail companies are in our plans as we commence Phase 1 and some of those conversations have begun already. It is too early to determine if specific routes will be selected, but there is growing interest from potential rail partners to decarbonize rail operations with hydrogen.

- **Q: Please discuss pros and cons of hydrogen for trains, both inter-city (Amtrak Cascades) and transit (Sounder).**

A: There are many pros to hydrogen for rail for reducing emissions, but presently the cons include cost and availability of fuel which will take some time to impact. The

Regional Clean Hydrogen Hubs program is the first part of accelerating this new hydrogen market which will alleviate those issues.

Specific pros are that hydrogen trains:

- Produce zero emissions and are highly productive – longer range than batteries, faster refueling than re-charging batteries.
- Would fall under technologies that use liquid hydrogen carriers, such as methylcyclohexane, formic acid, potassium formate, ammonia and methanol rather than compressed or liquid hydrogen that are being developed. These solutions can address some of the challenges associated with cryo-compressed or liquid hydrogen for inter-city transport, or compressed hydrogen for transit.

Specific cons are that hydrogen trains:

- Currently have limited hydrogen infrastructure.
 - Require a large amount of hydrogen (both transit and inter-city). Compressed hydrogen can be used for transit, but the tanks take a long time to fill. Cryo-compressed and liquid hydrogen technologies are being developed for both types of applications. Cryo-compressed hydrogen requires cryogenic temperatures of -320F as well as elevated pressures. Liquid hydrogen has a temperature of -423F but is closer to atmospheric temperatures. These technologies introduce a cryogenic risk factor. In addition, they have the potential for boil-off gas hydrogen losses during tank filling and/or during dormancy periods. The technologies and procedures are still being developed for them.
 - Have challenging maintenance for the cryo-compressed and liquid hydrogen.
 - Use liquid hydrogen carriers, which address some of these challenges, but hydrogen carriers require the addition of a chemical reactor increasing the complexity.
- **Q: Will Node 8 (St. Regis) or Node 4 (Richland) be involved in supplying hydrogen commercially? Otherwise, will there be availability for hydrogen supply to the Spokane region by the PNWH2 Hub? How might a private company invested in bringing industry to the Spokane region benefit from/leverage the PNWH2 Hub effort?**

A: We are always interested to learn more about potential projects throughout the Pacific Northwest and expanding the footprint of commercially available hydrogen sources. Contacting [CHARGE](#), our business development lead, directly to express interest in partnering with the PNWH2 is a great way to begin that discussion.

- **Q: Can you provide a bit more specifics about Node 6? I see both electricity generation and heavy-duty transportation related to Node 3 – can you provide more details, particularly about the former?**

A: Node 6 in Boardman, Oregon, aims to develop hydrogen for clean electricity generation and provide hydrogen to Node 3 of the PNWH2 Hub for heavy-duty transportation. Mitsubishi, Portland General Electric, and Williams Field Services Group have proposed to collaborate on a set of facilities that will use an electrolyzer to produce clean hydrogen, which will then be stored and used to generate dispatchable non-emitting electricity during peak times and is also expected to help decarbonize industry and heavy-duty transportation end users along the I-5, I-90, and I-84 corridors. Key infrastructure includes long-duration energy storage capabilities and a hydrogen pipeline.

At Node 3, also in Boardman, AirLiquide intends to serve as a key link in the supply chain, receiving hydrogen from a pipeline for liquefaction and delivery to market for heavy-duty transportation end users along the I-5, I-90, and I-84 corridors. Key technologies will include hydrogen liquefaction, liquid hydrogen storage, hydrogen delivery trailers, heavy-duty hydrogen trucks, hydrogen refueling stations, and cargo handling equipment for ports.

- **Q: When can we expect to see the projects being rolled out on the ground? Will the funds be distributed to all the Nodes simultaneously, or is there a specific order in which projects will receive funding and commence work?**

A: Each project is currently in Phase 1 and eligible to receive Phase 1 funding as soon as they execute their Subrecipient Agreements with PNWH2. We expect that each project will proceed through the four development phases at differing paces based on a number of factors, including current project maturity and complexity.

Broadly, Phase 1 is expected to last 12 to 18 months and will encompass initial planning, permitting, and analysis activities to ensure that the overall Hub concept is technologically and financially viable, with input from relevant local stakeholders. Project partners, who have been engaging with local communities for many months, will build on this groundwork with extensive community and labor engagement in Phase 1. It's important to note that we're still in the beginning stages, and don't anticipate construction to begin until Phase 3. Therefore, it is currently difficult to predict when construction may start on any individual project.

For fund disbursement, the federal dollars from the U.S. Department of Energy will come into the Pacific Northwest Hydrogen Association and then be distributed to the projects. Projects are expected to be reimbursed their share of the federal funds each month for the work they complete that qualifies for federal funding.

- **Q: In what phase are you anticipating projects or Nodes going through the NEPA process? Is that Phase 1?**

A: Yes, the NEPA process for each project will be part of Phase 1's initial planning, permitting, and analysis activities.

- **Q: Can you establish a connection between these investors you mentioned and companies that are working on hydrogen solutions?**

A: We received over 140 submissions to the RFI when we initially sourced projects for the PNWH2 Hub proposal. We narrowed that down to the 17 current projects within the Hub today, that have a vested interest in clean hydrogen in our region. The drive, intent and desire are there to make this region into a leader in clean hydrogen and we are excited to begin this work alongside our partners, stakeholders and community members.

Our project developers are individually engaging directly with global investors. PNWH2 is not itself soliciting additional private investment at this time.

- **Q: The Moses Lake, Washington, Clean Hydrogen Hub had some media on this project. What's happening with that Hub and why is it not mentioned here?**

A: The Obsidian Pacific Northwest Hydrogen Hub is not affiliated with the Pacific Northwest Hydrogen Association. Creating a new clean energy commodity in the Pacific Northwest will be a full-scale effort and we look forward to working with entities across the region in pursuit of this goal.

- **Q: How can we best impact the transition for decarbonizing international market/industries to impact demand and supply?**

A: To impact the transition to decarbonizing international market/industries over the next several decades, there will need to be continued additional incentives. Advocating for continued investments into these programs will help accelerate the transition.

- **Q: Does PNWH2 have any Maritime Hydrogen Projects funded through the Hub?**

A: Yes, the Pacific Northwest Hydrogen Hub is working closely with our partner, the Northwest Seaport Alliance, to address the decarbonization of maritime activities important to our region, such as cruise ships, fishing boats, and port activities.

- **Q: How will the PNWH2 Hub collaborate with the "[Pacific Northwest to Alaska Green Corridor](#)" project to replace ~200 million gallons of cruise ship fossil**

fuels per summer season with ~180,000 million tons of "clean" PNW-sourced hydrogen and/or hydrogen-based fuels?

A: The Pacific Northwest Hydrogen Hub is working closely with our partner, the Northwest Seaport Alliance, to address the decarbonization of maritime activities important to our region, such as cruise ships, fishing boats, and port activities. Those value chains are in the process of being established – boats are being ordered, and some of them are being built – but we recognize that will take a while to replace those huge fleets.

- **Q: For renewable energy developers, how can we get in contact with individual Hubs to learn about their need for energy?**

A: For renewable energy developers, please reach out to [CHARGE](#), our business development lead, to get in touch with PNWH2. There continues to be high demand for new renewable generation assets and PNWH2 is very interested in partnering with large-scale renewable developers.

Community Benefits Plan

- **Q: How can our K-12 schools, especially those serving students furthest from opportunity, begin today to prepare students for related careers?**

A: The Hub will be developing STEM-based education programs from K-12 through college to ensure a pipeline of trained and qualified workers to build, then operate and maintain the Hub's hydrogen projects.

- **Q: As we are building out the hydrogen manufacturing and distribution facilities, where in the funding is the support for the workers insofar as childcare and workforce training?**

A: Our workforce development plan includes stipends for workers to participate in trainings to ensure that transportation and childcare are not a barrier to participation.

- **Q: Can community benefits be channeled through Washington State University for campus Diversity, Equity, Inclusion and Accessibility (DEIA) focused research for the Hub innovative technologies research?**

A: The funding for the hub does not include funds for research but Washington State University has faculty participating in energy and environmental justice. If you are interested in potential collaborations, please reach out to Kate McAteer at kmcateer@wsu.edu for more information.

- **Q: Please consider appointing the local/county Public Health Officer as a member of each Community Advisory Board.**

A: The PNWH2 Hub Nodes/projects will be reaching out to their respective communities for nominations of people to serve on the Community Advisory Boards. More information on how to submit nominations will be forthcoming.

- **Q: Any educational outreach effort at the Nodes? What about tabletop demonstration systems at the green hydrogen production Nodes?**

A: Education is a central facet of the PNWH2 Hub. The Hub will be developing STEM-based education programs from K-12 through college to ensure a pipeline of trained and qualified workers to build, then operate and maintain the Hub's hydrogen projects. The Hub plans to foster a diverse workforce through an Education & Training Coalition, which includes MSIs and Tribal Colleges.

Project partners, who have been engaging with local communities for many months, will build on this groundwork with extensive community engagement in Phase 1.

Each project is continuing to pursue commitments supporting student education, fair wages, and hiring practices with an emphasis on local labor and materials, as well as robust stakeholder engagement to keep groups apprised of project development status.

Hydrogen Production & Transmission

- **Q: I'd like to hear about the production projects, and capacities, as well as off-take type (gaseous, liquid hydrogen, pipeline, ammonia, etc.)**

A: We are still determining the transportation logistics for each project. Some projects will produce hydrogen on-site for immediate use, so no transportation is required. At other projects, the hydrogen will be moved to point of use. For that, we currently plan on using various methods. Primarily we will use compressed hydrogen in tube trailers, but we also plan on short new hydrogen pipelines as well as possibly doing hydrogen liquefaction. We will not be blending hydrogen into any natural gas pipelines. For storage, it is likely that we will be doing some compressed hydrogen gas storage in above ground tanks.

- **Q: Would be interested to learn if hydrogen produced from residual biomass is part of the roadmap of the Hub?**

A: The PNWH2 Hub is focused on producing electrolytic hydrogen from renewable resources. The Hub currently does not have plans for hydrogen production from biomass. However, hydrogen production from biomass may occur outside of the PNWH2 Hub.

- **Q: Will wind energy production in the Browning area of Montana be in the green energy mix?**

A: The individual projects are working with local energy providers for their power needs. The existing wind projects have some kind of long-term contract. For example, the Glacier Wind Farm located near Browning, Montana, has a connection with San Diego Gas & Electric along with being part of a balancing authority. If the existing wind projects have contracts with Bonneville Power Authority, then we may be using some of their power.

- **Q: Will the PNWH2 Hub explore producing "hydrogen anywhere" from "geothermal anywhere" via Earth-ubiquitous deep hot dry rock geothermal (DHDRG) energy, thus avoiding the need to pipeline green hydrogen in repurposed, extant, NatGas steel pipelines subject to dangerous hydrogen embrittlement (HE, HCC)?**

A: The PNWH2 Hub plans on using green power production that is already built, or being built. The PNWH2 Hub is not a research and development project, but a demonstration project. Geothermal anywhere is still in development. Should geothermal resources come online, they may be considered for the projects as part of the green power.

- **Q: Can you provide the anticipated ton-per-day estimate for all of the liquefaction plants?**

A: The Nodes/projects are still under development, so it is too early to provide estimates at this time.

- **Q: Why not use saltwater electrolyzers and also, use atmospheric water generation technology for the water requirement?**

A: While significant progress has been made on direct saltwater electrolyzers, they are still in the development phase. Direct saltwater technologies may produce chlorine gas. They are researching ways to suppress the chlorine production. In addition, the direct saltwater electrolyzers are not as efficient as current electrolyzer technologies. Saltwater can be used by current electrolyzer technology by first doing a desalination through existing technologies such as reverse osmosis (RO). RO is fairly efficient. RO combined current electrolyzers are currently more efficient than

direct seawater electrolyzers. So, it is not clear that there is an advantage to direct saltwater electrolysis. This may change in the future.

Atmospheric water generation technology may be considered. However, it is very energy intensive. The individual projects have been working with local authorities to secure the water required. The water requirements for the PNWH2 Hub are anticipated to be approximately 3-5 gallons of water per kg of hydrogen for water purification, plant cooling and the actual water split to make the product hydrogen. To put this in perspective, this is the equivalent water usage for a 150–200-acre farm in Eastern Washington.

- **Q: Is there interest in green ammonia as a transport carrier within the PNWH2 Hub planning phase?**

A: Currently, in the planning phase, the green ammonia is directed towards fertilizer production. We are still considering the transportation logistics for each project. Hydrogen uses, including for making transport carriers like ammonia, green methanol or others can be considered for off-takers. However, at this point, for the projects that require hydrogen transport, we will primarily use compressed hydrogen in tube trailers, short pipelines and possibly hydrogen liquefaction.

- **Q: How is green hydrogen going to be moved from St. Regis to anywhere it is needed without a pipeline? Will natural gas pipelines be refitted for hydrogen?**

A: We are still determining the transportation logistics for each project. Some projects will produce hydrogen on-site for immediate use, so no transportation is required. At other projects, the hydrogen will be moved to point of use. For that, we currently plan on using various methods. Primarily we will use compressed hydrogen in tube trailers, but we also plan on short new hydrogen pipelines as well as possibly doing hydrogen liquefaction. We will not be blending hydrogen into any natural gas pipelines. For storage, it is likely that we will be doing some compressed hydrogen gas storage in above-ground tanks.

Environmental Impacts

- **Q: Please discuss Health Risk Assessment (separate from NEPA and SEPA) prior to Node openings, to protect the health of workers and nearby residents.**

A: Throughout the life of the Hub, several actions will be taken to protect workforce and local community health. Phase 1 actions include: outlining plans to engage workers in design, implementation, and execution of workplace safety and health plans; developing a plan for how projects will conduct citizen science, third-party, or

project-led baseline air quality monitoring (e.g., criteria air pollutants) in Phase 2 and share the results; and conducting a preliminary Justice40 assessment that initially identifies potential benefits and burdens, including economic, environmental, health, and social impacts and proposes initial strategies to maximize benefits and avoid, minimize, and mitigate the negative impacts on disadvantaged communities.

In addition to the NEPA and SEPA processes, key Hub deliverables include a comprehensive safety plan that specifically addresses hydrogen safety, to be reviewed by the Center for Hydrogen Safety's Hydrogen Safety Panel. Any potential adverse environmental impacts will also be addressed through environmental permitting actions that will occur as the projects approach construction approval.