

Meeting Summary and Feedback Report

Emerging Resources: Hydrogen public webinar

Meeting details

- Thursday, December 7, 2023, 4:00 p.m. - 5:00 p.m.
- Virtual webinar hosted by PSE and facilitated by Triangle Associates
- Links to:
 - [Presentation](#)
 - [Meeting recording](#)
- Participants: 45 via Zoom, 83 YouTube views as of December 18, 2023

Meeting summary

Agenda Topic	Summary
<p>Hydrogen Basics and Use Within the Utility Industry</p> <p>Steve Schueneman, Development Manager, Strategic Energy Initiatives, PSE</p>	<ul style="list-style-type: none">• Hydrogen is an organic material that releases no direct carbon emissions when burned, unlike fossil fuels.• The Department of Energy’s definition of clean energy opens more production pathways and is different than the Clean Energy Transformation Act’s (CETA) definition.• There are four types of hydrogen: grey, blue, turquoise, and green.<ul style="list-style-type: none">• Turquoise (generated from natural gas for use in industrial application) and green (a zero-carbon fuel generated from renewables like wind and solar) will be the bulk of hydrogen produced in the future.• Hydrogen has been used as a fuel source for decades. Going forward its dominant markets include aviation fuel, chemical manufacturing, and shipping.

Agenda Topic	Summary
Meeting PSE's Clean Energy Goals Safely with Hydrogen Niece Weatherby, Manager, Gas Systems Integrity, PSE	<ul style="list-style-type: none"> Renewable hydrogen for electricity generation is a clean energy source that can play a role in balancing the electric grid to keep it running reliably and safely. Hydrogen can also be blended into the natural gas system from the supplier or at the customer end to lower carbon content. PSE's hydrogen injection strategy is a long process and includes addressing safety concerns such as leakage, flammability, material compatibility, end use appliances, and the accumulation of hydrogen through pilots and studies. Currently, the most PSE is comfortable with is 15% blend which would be an estimated 5% reduction in emissions.
Hydrogen in the Integrated Resource Plan (IRP) Jennifer Coulson, Manager, Operations and Gas Analysis, PSE	<ul style="list-style-type: none"> PSE is modeling clean hydrogen in the 2025 IRP to look at the feasibility and availability of hydrogen based on time frame, volume, and price. PSE is continuing to refine assumptions and lessons learned from the 2023 Gas Utility IRP and 2023 Electric Progress Report as they build their analysis for the 2025 IRP. In 2023 PSE modeled hydrogen and found it optimal and cost effective in some cases.
Next Steps and Public Comment Opportunity Sophie Glass, Facilitator, Triangle Associates	<ul style="list-style-type: none"> PSE asked participants for feedback about how hydrogen can support PSE's clean energy goals and current and future hydrogen pilots/studies. <ul style="list-style-type: none"> To what degree should PSE model blending hydrogen into the natural gas system to decarbonize our gas system and bridge to electrification? To what degree should PSE explore hydrogen for peak power production and distributed resource applications at this time?

Feedback report

The following table records participant questions and PSE responses from the webinar Q&A feature, public comment period, and comments submitted via online [feedback form](#) or irp@pse.com. Meeting materials are available on the IRP [website](#).

No.	Date	Interested party	Submitted via	Question or comment	PSE response
1	12/07/23	Don Marsh, Washington Clean Energy Coalition (WCEC)	Q&A	Can you let us know how many people are online today? Thanks.	We have 36 participants right now and more than 20 watching on YouTube.
2	12/07/23	Don Marsh, WCEC	Q&A	We support use of hydrogen for shipping, aviation, and heavy industry. PSE should	<i>Answered live at 17:20</i>

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				create hydrogen with excess renewable capacity and sell it to these very high-value uses. PSE should not consume hydrogen to create retail energy or mix in with natural gas, because these are lower value uses of hydrogen, producing less emission reduction per unit of hydrogen. We need to work together across industries to maximize emissions benefits.	One thing that is very helpful about electrolyzer operations is that they do really help the adoption of renewable energy when there are too many renewables on the grid. Ramping up electrolyzer production is a great way to increase the adoption of renewable energy.
3	12/07/23	Virginia Lohr, WCEC	Q&A	PSE should be looking at producing green hydrogen made with excess renewable energy, such as solar, to run peakers to generate electricity when needed for customers. This is prudent for PSE as a utility. It also has the potential to be a revenue source for PSE to sell excess hydrogen in where it is produced in industrial areas where it is needed to reduce the carbon footprint of other industries. PSE could use the production and sale of hydrogen to replace the sale of gas.	<i>Answered live at 18:24</i> Jennifer will address how PSE sees hydrogen fitting into the peaking future later in the presentation.
4	12/07/23	Jim Dennison, Sierra Club	Q&A	What would PSE's role be in hydrogen production for the applications Steve described (industry, aviation, etc.)? As far as I know PSE doesn't currently provide things like aviation fuel, so I'm just trying to understand how it would fit into that situation.	<i>Answered live at 34:08</i> PSE is currently looking into hydrogen as a means to provide peaking capacity in the electric utility and/or blended with natural gas in the gas utility. PSE is not currently considering pursuing hydrogen production for industry or aviation. However, there are a couple roles PSE could potentially play in regional hydrogen production; supplying the electricity itself, which is several gigawatts, to be able to create the hydrogen when electrolysis is located at the refineries. The other way is through our pipeline if our demand exceeds our ability to supply locally there

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					is a pathway for bringing in supply using pipeline along existing transmission routes from out of state and take advantage of hydrogen electrolysis that may be occurring in other parts of the country.
5	12/07/23	Christine Bunch	Q&A	Can you share the safety research sources you mentioned? Thank you	<p>Here are some of the key reference materials we have used.</p> <ul style="list-style-type: none"> • Hydrogen's Impact on End-Use Appliances - Sensus - North America • Hydrogen Blending into Natural Gas Pipeline Infrastructure: Review of the State of Technology (nrel.gov) • Hydrogen Blending in Delta Utah Dominion Energy • CPUC Issues Independent Study on Injecting Hydrogen Into Natural Gas Systems (ca.gov) • Hydrogen Pipeline Safety (pstrust.org) • Microsoft Word - 11-28-22 Final Accufacts Hydrogen Pipeline Report.docx (pstrust.org) • Hydrogen (atco.com)
6	12/07/23	Rosemary Moore	Q&A	Given how bad "natural" gas is for the environment a 5% (or even 15%) reduction in emissions doesn't seem worth pursuing.	Thank you for your feedback.
7	12/07/23	Don Marsh, WCEC	Q&A	Figure 2.11 of PSE's 2023 Gas IRP shows the very minor role hydrogen can play in emissions reductions. Only about 10% emissions reduction each year from now until 2050. That small benefit is not worth the effort. It is a distraction from the real work PSE needs to do to meet the goals of the Climate Commitment Act and hasn't committed to do yet. Furthermore, this use of hydrogen is not nearly	Thank you for your feedback, please also see response to #8.

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				as valuable and beneficial as using the gas for more urgent uses in other industries.	
8	12/07/23	Don Marsh, WCEC	Q&A	I see a lot of work to blend hydrogen safely, and that is going to cost customers. When you look at the amount of emissions reduction compared to other strategies, this looks too expensive. Do you have any estimates of cost effectiveness?	<p><i>Answered live at 36:08</i></p> <p>This is part of PSE's decision analysis as we go through the IRP process. We will return to this question.</p> <p><i>Post meeting follow-up:</i> Please refer to the 2023 Electric Progress Report and 2023 Gas Utility IRP results. As discussed during the meeting, the current model framework considers least cost resources to meet each scenario; if hydrogen was selected, it was deemed least cost. Also mentioned during the presentation, as with all IRPs, PSE is updating its inputs and hydrogen pricing is one of those items. This will be reflected in future analysis.</p>
9	12/07/23	Virginia Lohr, WCEC	Q&A	In my question about pruning the PSE gas pipeline system in a previous webinar (PSE moved it to a feedback form), PSE responded by saying the law required PSE to supply gas. The IRP is a 20-year plan. It should be obvious to PSE that the law requiring you to supply gas everywhere is likely to be changed. Not considering that as a possibility in the next 20 years is not prudent, especially when the legislature and the UTC have already begun looking at it. Adding hydrogen to the gas system is not prudent, as it both continues emissions beyond a reasonable time-scale and increases the risks of disasters. I'm asking again, when will PSE begin including an examination of a planned reduction in the size	As stated in our feedback form from the November 6, 2023 webinar, in accordance with RCW 80.28.010 PSE is legally obligated to provide customers with "safe, adequate, and sufficient" gas and related services." We modeled electrifying gas demand in our 2023 Gas Utility IRP, and the results suggest that large scale customer electrification is unlikely under current or known future policies due to costs. Additionally, PSE's electrification analysis did not include the additional costs of decommissioning the gas system that would be born by ratepayers. You can read more about PSE's electrification study in the 2023 Gas Utility IRP Chapter Two: Resource Plan Decisions on our past IRP website .

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				of its gas distribution system? How can PSE reasonably plan for disadvantaged households relying on gas in the future without considering the option of reducing the size of their system, so that disadvantaged populations are not the only ones left paying for an unnecessarily large and leaking system.	PSE will consider this recommendation as we develop scenarios for the gas utility IRP and will clarify how the feedback was incorporated.
10	12/07/23	Virginia Lohr, WCEC	Q&A	Does PSE forecast how much hydrogen will be needed by other industries, potentially bidding up the cost of hydrogen as many industries rely on it to achieve their emission reduction targets? If PSE is competing for this resource, it might raise the cost for everyone and reduce our ability to meet climate targets.	<p><i>Answered live at 46:51</i></p> <p>I would encourage everyone to keep an eye out for the Department of Commerce’s upcoming hydrogen report. It was commissioned out of Senate Bill 5910 a couple of years ago which created funding for the hydrogen hub. We got a preliminary look at it through the Renewable Hydrogen Alliance a couple weeks ago; I don’t want to misrepresent their numbers, but it is substantial. I think it’s in the 250gigawatt hour range, which is a tremendous amount of energy. The questions are, “how do you pay for it?” and “can we meet demand?” I think those are questions the region is going to have to wrestle with at a policy level.</p> <p>It is much bigger than PSE; this is about how much energy and transmission capacity we have, not just in PSE but within the Bonneville Power Administration (BPA) system as well as all the local public utilities. If we really want to take meaningful steps to decarbonize, PSE’s applications are very minor in relative comparison, and the economics become much better for everyone if we don’t build out the capacity to generate it.</p>

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					<p>It will probably be too expensive for the foreseeable future and only those markets that can afford to pay a premium will end up adopting hydrogen. It comes down to how we want to decarbonize multiple industrial segments. The Commerce report will be out in a couple weeks and I would encourage people to look for it.</p> <p><i>Post-meeting follow-up:</i> The report will be available through Commerce's Office of Renewable Fuels website.</p>
11	12/07/23	Don Marsh, WCEC	Q&A	Can you share a reference to that report when it is available?	<p>Yes, we can share the public report in our feedback report.</p> <p><i>Post-meeting follow-up:</i> We expect the Department of Commerce to publish their hydrogen report at the end of 2023. The report will be available through Commerce's Office of Renewable Fuels website.</p>
12	12/07/23	Virginia Lohr, WCEC	Q&A	I support Rosemary's statements also. Her name wasn't coming to me as i was speaking,	Noted, thank you.
13	12/07/23	Don Marsh	Public comment	50:28 – I really liked Steve's answer to my question about how other industries are going to use hydrogen and that it really is a bigger question than just PSE can tackle all by itself; it's complicated. I think it's important for everyone to realize that just as there are good and bad sources for hydrogen as pointed out at the beginning of the presentation, I wouldn't say "good" and "bad" consumption of hydrogen, but there are some uses that are much more valuable and much more impactful	Thank you for your feedback.

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				<p>for cleaning up our emissions. We had big debates a few months ago on a social media site about the relative benefits of hydrogen powered cars versus battery powered cars. The round-trip efficiency for hydrogen in just moving around individual cars is really not impressive. So, that's one use that seems like there might be some advantages to just filling up your car with hydrogen but when you look at the total use of energy throughout the life cycle it's really not that great. I'd really like to see hydrogen, a really valuable resource, put to its best use. I think PSE could play a role in helping the public understand what the best uses are. Again, I'm very skeptical about mixing it in with natural gas. I don't think that really moves us towards our goals as efficiently as using hydrogen in other ways. Thank you for listening to my comment.</p> <p><i>1:00:13 – PSE allowed participants another opportunity to provide public comment as we had initially skipped over a key feedback prompt slide by mistake.</i> Of these uses I'm much more interested in using hydrogen for peak power production because I believe it is possible to run a peaker plant at a very high level of hydrogen. So if you could displace natural gas completely and run a peaker plant completely on hydrogen then that would be a 100% reduction in emissions and that's pretty exciting. There's a big need, because we know we will sometimes need peakers in the next</p>	

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				couple of decades and decarbonizing that seems to be a much more valuable use of hydrogen than mixing it in with the retail gas system. Thanks for letting me make that comment.	
14	12/07/23	Thomas Kraemer	Public comment	<p>53:09 – Your slide mentioned hydrogen as a bridge to electrification, but hydrogen is not treated as a bridge to complete electrification in the 2023 Gas IRP. Both the preferred IRP portfolio and the electrification scenario show significant amounts of gas and hydrogen being used through 2050, when all carbon emissions should end. For the 2025 IRP update, there should be a scenario in which the gas distribution system is progressively pruned back, converting whole neighborhoods one-by-one from gas to electricity for heating and cooking. In this scenario, hydrogen blending would only be useful for those parts of the system that are converted later in a gas phaseout period leading up to zero emissions in 2050 or sooner. By 2050, no more gas and no more hydrogen blending would be used as electrification is completed.</p> <p>The pruning approach should also improve the cost-effectiveness of electrification by progressively reducing maintenance and replacement of the gas system as it is pruned away. Such a scenario could help inform legislators and regulators considering modification to PSE's obligation to serve.</p>	<p>Thank you for your feedback.</p> <p>Please see response to #9, above.</p>
15	12/07/23	Rosemary Moore	Public comment	56:11 – I just wanted to repeat the comment that I made in the question and answer that a	Thank you for your feedback.

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				5% reduction in emissions, or even 15% doesn't seem worth adding hydrogen, especially as this could be used as a reason to perpetuate the use of natural gas, which is clearly a strong emitter of greenhouse gases. I do have a question; I know that there is a bill that is likely to be before the Washington State legislature and was before the legislature last year which would actually end the requirement on PSE to provide gas and I am wondering how far PSE is planning for that eventuality?	Please refer to our response to question 9 above.
16	12/07/23	Virginia Lohr, WECEC	Public comment	1:01:55 – I agree with what Don said. Using hydrogen for peakers is what's important. We are at a critical stage in terms of what we have done to the climate by ignoring this problem burning fossil fuels for so many decades. Doing something like putting a tiny bit of hydrogen in the gas system to go to people's houses is just crazy to spend time and energy and money on. Using hydrogen for peakers is an example of how we need to make these big changes. I support the other comments like the people like Thomas have made and we just need to get serious about making changes and not making silly little changes around the edges and not worrying about spending time in an IRP saying we will not spend time and energy doing things that the current law written years ago said and not plan for a future where those laws will change where we all get serious about cleaning up the world. I care about the future and I hope you all do too.	Thank you for your feedback

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17	12/11/23	Thomas Kraemer	irp@pse.com	<p>53:14 – Puget Sound Energy's slide 19 in the December 7, 2023, public meeting requested input on two questions. Our responses to these questions are below.</p> <p>“To what degree should PSE model blending hydrogen into the natural gas system as a way to decarbonize our gas system and bridge to electrification?”</p> <p>Blending hydrogen into the current system is at best a temporary solution to a problem that needs a permanent solution. If hydrogen in gas pipelines is necessary to reasonably achieve State mandated emission reductions, then it should not be done as it was in the 2023 Integrated Resource Plan for the Gas Utility (Gas IRP). The Gas IRP did not treat hydrogen as a bridge to electrification, which is the only way it should ever be considered for use. Both the preferred IRP portfolio (Figure 2.11 in the Gas IRP) and the electrification scenario (Figure 6.11 in the Gas IRP) show significant amounts of gas and blended hydrogen being used through 2050, when all carbon emissions should end. Continued use of gas to produce electricity in 2050 and beyond is not compatible with the intent of the Climate Commitment Act, as it inevitably produces carbon dioxide emissions.</p> <p>For the 2025 IRP update, there should be a scenario in which the gas distribution system is</p>	Thank you for your feedback.

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				<p>progressively pruned back, converting whole neighborhoods one-by-one from gas to electricity for heating and cooking. In this scenario, hydrogen blending would only be useful for reducing emissions in those parts of the system that are converted later in a gas phaseout period leading up to zero carbon dioxide emissions in 2050 or sooner. By 2050, no more gas and no more hydrogen blending would be used as electrification is completed. The final branches of the gas distribution system would be dismantled.</p> <p>The pruning approach would also improve the cost-effectiveness of electrification by progressively reducing maintenance and replacement of the gas system as it is pruned away. Without shutting down gas infrastructure strategically (neighborhood-by-neighborhood) in tandem with electrification, an ever-shrinking number of gas customers will face ever-ratcheting costs to maintain a sparsely populated distribution system.</p> <p>Other jurisdictions are evaluating this approach to switching from gas to electricity.¹ The California Energy Commission is funding a roughly \$2 million, two-year body of research to identify potential pilot sites in northern and southern California for strategic gas decommissioning and neighborhood electrification. The New York Public Service Commission adopted new gas planning rules in May 2022 that require gas utilities to file</p>	

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				<p>long-term plans every three years. As part of the rules, utilities must annually identify “the locations of specific segments of LPP [leak-prone pipes] that could be abandoned in favor of NPAs.” [non-pipe alternatives, such as electrification] On December 6 of this year, the Massachusetts Department of Public Utilities ruled that “there must be a significant increase in the use of electrified and decarbonized heating technologies,” and that “gas utilities must consider NPAs, specifically including electrification, ...to minimize investments in the gas pipeline system that may be stranded costs in the future as decarbonization measures are implemented,”² Renewable natural gas, including hydrogen blending are discouraged in the announcement.</p> <p>Development of a strategic pruning scenario in the Gas IRP could help inform legislators and regulators considering modification to PSE’s obligation to serve. Experts in utility law suggest that most obligation to serve laws would allow utilities, with public utilities commission approval, to progressively reduce their gas service areas as they electrify, removing the obligation to serve with gas.³ In the Washington legislature, proposed HB 1589 Section 3 would simply exempt gas companies with more than 500,000 retail customers (i.e. Puget Sound Energy) from the obligation to serve. This bill did not pass in the 2023 legislative session, but similar measures</p>	

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				<p>regarding the right to serve could be considered in future sessions.</p> <p>“To what degree should PSE explore hydrogen for peak power production and distributed resource applications at this time?”</p> <p>Using hydrogen to fuel electrical generation peaking plants makes sense. It is fundamentally different from using hydrogen in the gas system. Hydrogen should not be blended with other gases for this use, and it should be produced electrolytically at the generating station with zero emissions. Hydrogen production by electrolysis and use in peaking plants should be treated as an energy storage technology, and evaluated in comparison with battery storage.</p> <p>¹Sightline Institute, https://www.sightline.org/2023/06/07/its-time-for-cascadia-to-start-pruning-the-gas-system-and-electrifying-whole-neighborhoods/</p> <p>²https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/18297602</p> <p>³Payne, Heather, Unservice: Reconceptualizing the Utility Duty to Serve in Light of Climate Change (March 17, 2022). 56 University of Richmond Law Review 603</p>	

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				(2022), Seton Hall Public Law Research Paper Forthcoming, Available at SSRN: https://ssrn.com/abstract=3796398	
18	12/18/23	Stephanie Celt, Washington State Department of Commerce	irp@pse.com	Deployment of green electrolytic and renewable hydrogen will be an important part of decarbonizing certain key aspect of Washington's economy in the coming decades. However, in order to use valuable clean energy efficiently, it will be critical to prioritize the use of green hydrogen in strategic sectors that are hard to decarbonize. In addition, when combustion of hydrogen is being considered (either pure hydrogen or blended with natural gas), it is extremely important to minimize NOx emissions, and avoid such emissions taking place in overburdened communities. These issues and others will be addressed in the Washington State Department of Commerce's forthcoming legislative report on deployment of green electrolytic hydrogen and renewable fuels, and we look forward to working with PSE and others to consider findings and recommendations when this report is published. We also look forward to working with PSE, the Utilities and Transportation Commission, and others in the case of any proposals to replace natural gas with hydrogen to serve customers as outlined in RCW 80.28.435. It will be important to ensure that energy and financial costs required to produce, store, transport, and use green hydrogen, as well as any potential impacts on overburdened communities, are thoroughly evaluated.	Thank you for your feedback.

Attendees (alphabetical by first name)

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|---------------------|----------------------|-----------------------|----------------------|
| 1. Abbie Krebsbach | 9. Jaclynn Simmons | 17. Kristin Wild | 25. Shannon Pressler |
| 2. Alexander Echele | 10. Jim Dennison | 18. Mahon Walsh | 26. Sina Zhen |
| 3. Byron Harmon | 11. Joel Nightingale | 19. Marissa Petrovich | 27. Sommer Moser |
| 4. Christine Bunch | 12. John Deese | 20. Matt Chill | 28. Stephanie Celt |
| 5. Don Marsh | 13. John Robbins | 21. Matt Kirsch | 29. Stephanie Chase |
| 6. Elyse Hammerly | 14. Jose Cisneros | 22. Matthew Doyle | 30. Taylor Nickel |
| 7. Gabe Forrester | 15. Keith Quinata | 23. Mike Hopkins | 31. Thomas Kraemer |
| 8. Haixiao Huang | 16. Ken Pratt | 24. Rosemary Moore | 32. Virginia Lohr |

PSE presenters

- | | | |
|---------------------------|-------------------------|--------------------------|
| 1. Elizabeth Hossner, PSE | 3. Meredith Mathis, PSE | 5. Ray Outlaw, PSE |
| 2. Jennifer Coulson, PSE | 4. Niece Weatherby | 6. Steve Schueneman, PSE |

Facilitation staff

- | | | |
|---|--|------------------------|
| 1. Claire Moerder, Maul, Foster, and Alongi (MFA) | 3. Jack Donahue, MFA | 6. Will Henderson, MFA |
| 2. Emilie Pilchowski, Triangle Associates | 4. Pauline Mogilevsky, Triangle Associates | |
| | 5. Sophie Glass, Triangle Associates | |