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U.S. Department of Energy
Clean Hydrogen Production Standard (CHPS) Draft Guidance
Stakeholder Feedback

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Via Electronic Filing Submission

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Onward Energy (Onward) appreciates the opportunity to submit comments to the U.S. Department of Energy (DOE) regarding its draft guidance for a Clean Hydrogen Production Standard (CHPS). Onward's comments focus on the appropriate way to measure the lifecycle greenhouse gas (GHG) emissions of hydrogen production and the standards for third-party verification of qualified clean hydrogen production. *See* Feedback Requests (3)(a) and (4)(a).

Background on Onward

Onward brings unique experience and expertise for DOE's consideration. As one of North America's premier independent power producers, Onward is committed to rapidly decarbonizing the grid while providing safe, reliable, and clean electricity. Onward has a fleet of 56 electrical generating facilities, including wind, solar, and natural gas, totaling over six gigawatts (GW) and spanning 22 states. Onward is ideally situated to address the energy market's transition to lower carbon emissions while maintaining reliability and affordability. In pursuit of that vision, Onward is actively pursuing opportunities to develop projects that will enhance grid reliability in a sustainable manner, including through batteries and hydrogen generation, storage, and use.

Of particular relevance to these comments, Onward owns and operates the Arapahoe natural gas-fired power plant in Denver, Colorado. Arapahoe has a total capacity of 125 megawatts (MW) and consists of two 40 MW General Electric (GE) LM6000 natural gas aeroderivative combustion turbines, two heat

recovery steam generators with supplemental firing, one steam turbine, and selective catalytic reduction emissions controls. Arapahoe is highly effective in integrating increased penetration of wind, solar, and other renewable energy in Colorado's largest load pocket.

Onward is evaluating a hydrogen electrolyzer and storage facility to be co-located with the Arapahoe generating unit. It is Onward's intention to bid this project into the current Electric Resource Plan (ERP) of Public Service Company of Colorado (PSCo) (an Xcel Energy Company). Subject to selection by PSCo and approval by the Colorado Public Utilities Commission, the project would be among the first of its kind in the world.

Under the plan, the electrolyzer would be powered by the electric grid operated by PSCo, but only during periods of excess renewable energy generation, when zero-carbon renewable generators would otherwise be curtailed. The electrolzyer would produce hydrogen that would then be blended with natural gas. When the Arapahoe facility is called upon, primarily to provide renewable integration and reliability services to the local grid, it would use the hydrogen-natural gas blend to the greatest extent possible, thereby reducing the GHG emissions profile of the resulting electricity.

Response to Specific Requests for Comments

Onward is responding specifically to Feedback Requests (3)(a) ("How should the GHG emissions of hydrogen commercial-scale deployments be verified in practice?") and (4)(a) ("Please provide any other information that DOE should consider related to this BIL provision if not already covered above.").

The draft guidance asks for stakeholder comment on "adopting a CHPS that . . . supports diverse feedstocks and allows for consideration of technological and economic feasibility of achieving overall emissions reductions by establishing a lifecycle greenhouse gas emissions target for clean hydrogen production." Page 2. In Feedback Request (2)(a), the draft guidance notes that it looks to the IPHE HPTF Working Paper to inform its understanding of lifecycle emissions. The Working Paper, in turn, states that "GHG emissions associated with electrolysis are subject to the nature of electricity supply for electrolysis as electricity can be sourced from the grid (noting that this may be impacted by contracting

of renewable electricity supply and associated instruments)."[1]

With this in mind, Onward urges DOE to look at grid systems holistically when establishing a CHPS. The draft guidance already does this in part—acknowledging that "electrolysis systems that primarily use clean energy . . . are all generally expected to be capable of achieving 4.0 kgCO2e/kgH2 on a lifecycle basis using technologies that are commercially deployable today." Page 3. Onward expects its Arapahoe generating unit to meet this target comfortably, so long as lifecycle calculations are developed so as to appropriately consider grid-powered production. In particular, when developing standards for measuring and verifying the lifecycle GHG emissions rate of hydrogen production, DOE should recognize that in some circumstances, hydrogen can be produced with no net system-wide GHG emissions, even when it receives power from the grid rather than from a co-located renewable facility.

The final CHPS guidance should confirm that hydrogen production for use as a fuel in power generation should be certified to meet the BIL's and IRA's clean hydrogen verification requirements if (among other scenarios): (i) it is generated using grid electricity from zero-carbon electrons produced during periods of excess renewable generation on the grid that would otherwise be curtailed, and (ii) the hydrogen is burned as a fuel at times when it is not displacing generation from renewable resources.

Grid-Sourced Power to Generate Hydrogen

Some commenters may advocate that any hydrogen produced using grid electricity should be assigned the GHG emissions of the grid-average electricity at the time of production for purposes of calculating the lifecycle GHG emissions rate. Such an approach would be overly simplistic and highly short-sighted. This approach would fail to properly incentivize hydrogen generation and storage facilities that have great potential to advance decarbonization objectives. Moreover, this approach would flout the statutory requirement in the BIL for DOE to "take into consideration technological and economic feasibility" when developing the CHPS.[2]

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[1] IPHE HYDROGEN PRODUCTION ANALYSIS TASK FORCE, METHODOLOGY FOR DETERMINING THE GREENHOUSE GAS EMISSIONS ASSOCIATED WITH THE PRODUCTION OF HYDROGEN 40 (Int'l P'ship for Hydrogen and Fuel Cells in the Econ. 2021), *available at* https://www.iphe.net/iphe-working-papermethodology-doc-oct-2021.

[2] *See* 42 U.S.C. 16166(b)(1)(C).

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If a grid operator—whether an Independent System Operator, a Balancing Authority, or other similar grid operator—cannot increase beneficial load (such as energy storage) during periods of excess renewable generation on a system, then it typically must curtail some renewable generation.[3] Accordingly, if a grid-powered hydrogen facility is operated such that electrolysis only occurs during periods of excess renewable generation, then it would increase the load on the system and reduce the amount of renewable generation that would otherwise be curtailed. The facility would put the excess renewable energy to a productive use, transforming it into hydrogen that could then be used to lower future emissions. In such situations, the hydrogen should be assigned no GHG emissions associated with its production, rather than the GHG emissions for the grid-average electricity during the time of charging, because the excess renewable generation and associated losses can be measured and tracked by the grid operator.

Generating hydrogen during times of system renewable curtailments or otherwise using "surplus" renewable energy has been increasingly recognized as key strategy in decarbonizing the broader grid.[4] Requiring that hydrogen production be collocated with renewable energy production to qualify as clean hydrogen would severely limit the effectiveness of this strategy. Guidance issued by DOE should therefore recognize that the power to run a hydrogen electrolzyer should count as zero-carbon—and not be assigned the grid-average carbon emissions—if the hydrogen facility operator can demonstrate that electrolysis occurs at a time when excess renewable energy in the same balancing area would otherwise be curtailed.

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[3] *See, e.g.,* Bethany Frew et al., *The Curtailment Paradox in the Transition to High Solar Power Systems*, 5 JOULE 1143 (2021) (describing basics of curtailment and analyzing effect of various grid flexibility options on amounts of renewable curtailment), *available at* https://doi.org/10.1016/j.joule.2021.03.021.

[4] *See, e.g.,* Tyler H. Ruggles et al., *Opportunities for Flexible Electricity Loads such as Hydrogen Production from Curtailed Generation*, 3 ADVANCES IN APPLIED ENERGY 1, 8 (2021) (finding that unused and curtailed generation capacity can be cost-effectively exploited with flexible loads such as hydrogen electrolysis), *available at* https://doi.org/10.1016/j.adapen.2021.100051; *see also* SASAN SAADAT & SARA GERSEN, RECLAIMING HYDROGEN FOR A RENEWABLE FUTURE: DISTINGUISHING OIL & GAS INDUSTRY SPIN FROM ZERO-EMISSION SOLUTIONS 13 (Earthjustice 2021) ("To deliver meaningful environmental benefits, green hydrogen production must be paired with the build-out of new renewable resources *and/or use surplus renewable energy*.") (emphasis added), *available at* https://earthjustice.org/sites/default/files/files/hydrogen_earthjustice_2021.pdf.

Use of Hydrogen as a Fuel in Power Production

Although electrolysis results in necessary power costs,[5] it will play a critical role in grid decarbonization. For example, hydrogen that is produced and used strategically for grid capacity, reliability, and stability purposes can facilitate overall decarbonization, so long as the hydrogen displaces natural gas or other fossil fuels and does not displace renewable fuels in significant amounts.

Grid systems in the United States are not yet prepared to run both cost-effectively and reliably with zero- or near-zero GHG emissions. It simply is not yet affordable for grid operators to acquire enough firm dispatchable zero-carbon generation and storage in sufficient quantities and of sufficient duration to fully replace all thermal resources, especially during extreme weather events.[6]

Accordingly, if hydrogen fuel—generated using either co-located renewable power or grid power during periods of excess renewable generation—can displace some fossil fuels in thermal resources, there will be a net GHG emissions benefit, so long as those thermal resources are not being dispatched *in lieu of* renewable or other lower-emissions generation. When a thermal unit is instead being dispatched either because all available lower-emissions generation is operating at peak capacity, or to provide grid balancing or reliability services that cannot be provided by other renewable resources, blending in hydrogen fuel will only serve to reduce system-wide GHG emissions.

[5] *See, e.g.,* Chao Zheng, *Hydrogen Round Trip Efficiency*, 2 FRONTIERS OF MECHATRONICAL ENG'G 79, 80 (describing the inefficiency of electrolysis generally), *available at* http://dx.doi.org/10.18282/fme.v2i3.1272.

[6] For example, during an early September 2022 heat wave, the California Independent System Operator (CAISO) used natural gas for as much as 60%—and never less than 30%—of the generation mix to meet electricity demand, despite the state's deep investment in renewable generation and energy storage. *See California Fuel Mix Changes in Response to September Heat Wave*, U.S. ENERGY INFO. ADMIN. (Sept. 21, 2022), *available at* https://www.eia.gov/todayinenergy/detail.php?id=53939.

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Conclusion

Onward appreciates the opportunity to submit comments to DOE. As discussed above, Onward requests the CHPS guidance confirm that hydrogen production for use as a fuel in power generation should be certified to meet the CHPS if: (i) it is generated using grid electricity from zero-carbon electrons produced during periods of excess renewable generation on the grid that would otherwise be curtailed, and (ii) the hydrogen is burned as a fuel at times when it is not displacing generation from renewable resources.

Sincerely,

Rob Witwer
SVP, General Counsel, Regulatory & Government Affairs
Onward Energy