BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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COMMENTS OF THE GREEN HYDROGEN COALITION ON THE ADMINISTRATIVE LAW JUDGES' RULING ISSUING DRAFT WORKSHOP REPORT AND SEEKING COMMENTS

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In accordance with the Rules of Practice and Procedure of the California Public Utilities Commission ("Commission"), the Green Hydrogen Coalition ("GHC") hereby submits these comments on the Administrative Law Judges' Ruling ("Ruling") issuing Draft Workshop Report ("Report"), issued March 1, 2022.

I. INTRODUCTION.

GHC[1] is a California educational 501(c)(3) non-profit organization. GHC was formed in 2019 to recognize the game-changing potential of "green hydrogen" to accelerate multi-sector decarbonization and combat climate change. GHC's mission is to facilitate policies and practices that advance green hydrogen production and use in all sectors of the economy to accelerate a carbon-free energy future. Our sponsors include renewable energy users and developers, utilities, and other supporters of a reliable, affordable green hydrogen fuel economy for all.

The GHC defines green hydrogen as hydrogen produced from non-fossil fuel resources and has climate integrity – emits zero or de minimis[2] greenhouse gases on a life cycle basis. Green hydrogen can be used as a fuel for electricity production and a means for multi-day and seasonal renewable energy storage. In addition, once scaled, green hydrogen can help California move away

[1] https://www.ghcoalition.org/

[2] "De minimis" means an insignificant amount of non-renewable energy resources (does not exceed 10 percent of the total energy inputs) allowed to be counted as RPS-eligible. See Green, Lynette, Christina Crume. 2017. Renewables Portfolio Standard Eligibility Guidebook, Ninth Edition. California Energy Commission, Publication Number: CEC-300-2016-006-ED9-CMFREV.

from fossil fuel use in other applications such as transportation, industrial, maritime, and aviation. Considering that hydrogen is a mainstream commodity that can be utilized in many applications across many sectors of the economy, the production and use of green hydrogen will be essential to decarbonize sectors beyond electricity, further enabling the attainment of our climate goals.

GHC appreciates the opportunity to comment on the Commission's Ruling. In general, GHC considers that the Commission is correct in beginning to determine an action plan for the future of California's gas infrastructure. As the State moves towards an increasingly decarbonized electric sector and invests in cross-sectoral electrification, the Commission is tasked with better understanding which gas facilities will remain critical in the mid-term and what type of investments will prove useful in a rapidly changing energy landscape.

In this context, GHC urges the Commission to recognize the findings of recent joint modeling efforts across California, indicating a significant need for zero-carbon firm dispatchable generation as the State moves towards full decarbonization. While several alternative fuels could provide said benefit, GHC considers that green hydrogen is uniquely positioned to cost-effectively provide zero-carbon firm dispatchable generation while accelerating cross-sectoral decarbonization. Thus, GHC recommends the Commission further study and analyze which gas facilities will be critical and merit investments that will extend their usefulness and spur the transition to this zero-carbon fuel.

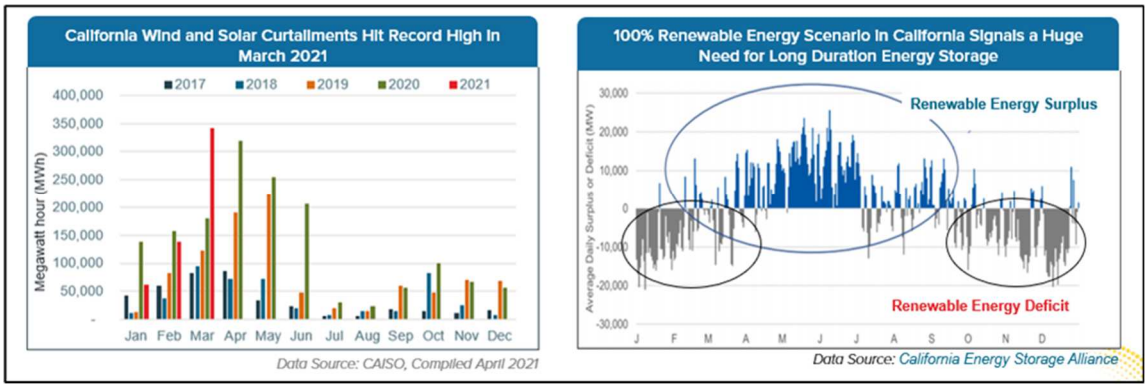
II. PLANNING STUDIES DEMONSTRATE THERE IS SIGNIFICANT VALUE IN ZERO-CARBON FIRM DISPATCHABLE GENERATION.

Considering the changing role of the gas sector regarding the overall energy outlook is a timely decision. Undoubtedly, the energy sector has changed profoundly in the last 20 years. Since the wake of the energy crisis, intermittent renewable capacity has grown tenfold, from 1,924 MW in 2002 to 19,977 MW in 2020.[3] This dramatic increase in intermittent renewable capacity suggested that a transition towards decarbonization might be easily attainable. Unfortunately, it has been paired with a significant rise in the amount of energy curtailed because renewable energy is often generated in periods of low demand. According to the California Independent System Operator ("CAISO"), California's wind and solar curtailments hit a record high of nearly 350,000

[3] *See* CEC, *Electric Generation Capacity and Energy*, available at https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/electric-generation-capacity-and-energy

MWh in March 2021.[4] As seen in Figure 1, renewable hydrogen can harness this abundant renewable resource for later use in the power sector (even a different season) and concurrently harness this abundant energy source to displace fossil fuels in other sectors.

Figure 1. Substantial storage capacity will be needed to support a 100% renewables scenario in California



Today, California's most stringent climate goal is enshrined in SB 100, which requires the decarbonization of 100% of retail electricity sales by 2045. To better understand the investments, benefits, and costs related to SB 100, the Commission is collaborating with the California Energy Commission ("CEC") and the California Air Resources Board ("CARB") (together, "the Joint Agencies") to identify a portfolio mix that can attain this goal. In 2021, the Joint Agencies released the first SB 100 Joint Agency Report ("SB 100 JAR"), identifying a series of portfolios that may meet this target.

While the SB 100 Core scenario was selected as a type of benchmark to meeting SB 100 goals, the JAR also identifies other alternatives dependent on certain sensitivity factors. The SB 100 Core portfolio selects 145 GW of incremental utility-scale capacity additions by 2045, including 70 GW of solar PV, 4 GW of pumped storage, and 49 GW of battery storage.[5] This portfolio has an estimated total resource cost of 66 billion USD by 2045.[6] To better understand the benefits of zero-carbon firm capacity, the Joint Agencies also considered a generic Zero-Carbon

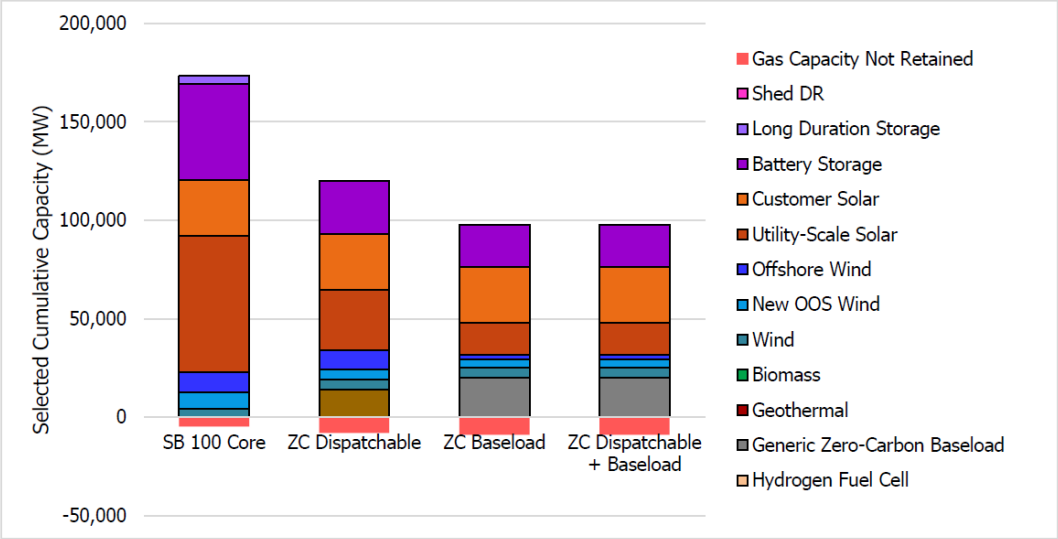
[4] CAISO Managing Oversupply. Data compiled April 2021. http://www.caiso.com/informed/Pages/ManagingOversupply.aspx#dailyCurtailment

[5] 2021 SB 100 JAR, at 75.

[6] *Ibid,* at 83.

Firm Resource scenario in which "generic dispatchable" resource and "generic baseload" candidate resources were included to represent a wide variety of emerging technologies, such as natural gas with 100% carbon capture, 100% green hydrogen combustion, or other renewable fuels. In scenarios where either the generic dispatchable resource, generic baseload resource, or both are included as a candidate resource, the model selects about 15 GW of either or both resources in total. Including the lower-cost zero-carbon firm resources significantly lowers the utility-scale solar and battery storage selected in the model and reduces total resource cost in 2045 by $2 billion, or about 3 percent.[7] These figures demonstrate that the cost of meeting our policy targets is directly contingent on California's investment in zero-carbon firm assets, such as green electrolytic hydrogen.

Figure 2. Cumulative Capacity Additions for SB 100 Core Scenario and Generic Zero-Carbon Firm Resource Scenarios in 2045 [8]



Source: CEC staff and E3 analysis

[7] *Ibid,* at 13.

[8] *Ibid,* at 13.

III. THE COMMISSION SHOULD DETERMINE THE APPROPRIATE GAS INFRASTRUCTURE PORTFOLIO NEEDED BASED ON LOCAL AREA NEEDS AND THE EXPECTED CROSS-SECTORAL NEED FOR ZERO-CARBON FUELS.

Given the estimated need for zero-carbon firm dispatchable generation and its affordability benefits, the Commission should prioritize identifying critical gas infrastructure before discussing derating and decommissioning existing infrastructure. Specifically, GHC submits that the Commission should consider the needs of local load pockets, local reliability areas ("LRAs"), and hard-to-electrify customers and sectors to construct a cohesive landscape of the assets that merit continued investment to repurpose and timely switch them towards green hydrogen.

Just as the 2021 SB 100 JAR, this proceeding must acknowledge that thermal generation will remain essential to provide reliability, resiliency, and resource adequacy in a future decarbonized California to support weather-dependent intermittent renewable resources and fluctuations in demand. Ultimately, the critical value of thermal generation will be to deliver the capacity backup needed to help ensure reliability during multi-day periods where renewable production is significantly lower than demand. Local, onsite green hydrogen generation produced with renewable electricity can serve as a fuel and long-duration energy storage for thermal generation resources to produce local dispatchable resilient clean electricity. It can also address the opportunity to repurpose existing gas infrastructure while maintaining reliability. Once 100% green hydrogen pipeline transport is possible, these turbines can be converted to 100% hydrogen turbines in the long term.

Even in the absence of 100% green hydrogen pipeline transport, repurposing gas infrastructure with green hydrogen is still feasible today, with major turbine manufacturers such as MHPS, GE, and Wartsila offering high power (800 MW+) hydrogen-ready gas turbines. GE's 9F.03 gas turbines can routinely run on 50% hydrogen and, in some specific cases, have run on up to 70-90% fuel-blend.[9] GE has 70 of these plants installed worldwide that currently provide flexible energy. Additionally, MHPS has been developing high efficiency, low NOx combustion

[9] Noon, Chris. "The Hydrogen Generation: These Gas Turbines Can Run on The Most Abundant Element in the Universe." General Electric, Jan. 2019, www.ge.com/news/reports/hydrogen-generation-gas-turbines-can-run-abundant-element-universe.

systems, which can use up to a 30% hydrogen/70% natural gas fuel mixture, and has announced the capability to use 100% hydrogen in its turbines by 2025.[10]

Furthermore, prominent public studies highlight the importance of green hydrogen and a supporting distribution network. The Los Angeles 100% Renewable Energy Study by LADWP and NREL ("LA100") expresses the need for "renewably produced and storable fuels" to maintain reliability in the power sector. The study shows that pathways to 100% decarbonization diverge on how to meet the last 10%-20% of energy demand that existing renewable and conventional storage technologies cannot meet. The LA 100 study further identified that the leading solution currently available to maintain a reliable system that can withstand extreme events is to store and use renewable fuels, with green hydrogen and biofuels among the leading alternatives.[11]

In this context, the Commission errors by focusing the current conversation on how to decommission assets before even determining which assets might merit being retained. The conversation regarding which assets merit retention should commence from a needs and capabilities point of view. The needs analyses, as stated above, should focus on identifying the areas, loads, and sectors that will continue to necessitate some form of liquid fuel and/or firm dispatchable generation for reliability and resiliency. The capabilities analyses should identify infrastructure that can feasibly transition away from natural gas and towards green hydrogen. Blending green hydrogen with natural gas would allow for the existing natural gas pipeline network with minimum infrastructure investment. The presence of up to 15% hydrogen by volume in natural gas pipelines can safely allow for delivery of the gas blend without affecting the integrity of the natural gas pipeline network.[12] The transition to partially decarbonized pipeline gas would continue using the existing natural gas pipeline distribution network's valuable pre-existing energy infrastructure. Furthermore, as other jurisdictions have proven, much of today's infrastructure, including rights of way, can be repurposed to be dedicated to hydrogen. For example, 69% of the

[10]https://www.greenhydrogenny.com/wp-content/uploads/2020/09/MHPSA-Hydrogen-Turbine Brochure.pdf

[11] Cochran et al., "LA100: The Los Angeles 100% Renewable Energy Study," National Renewable Energy Laboratory, NREL/TP-6A20-79444, Executive Summary, p. 14, available at: https://maps.nrel.gov/la100/report.

[12] Melaina, M W, et al. National Renewable Energy Laboratory, 2013, Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues

pipelines needed to build a European Hydrogen Backbone could come from repurposing existing natural gas pipelines.[13]

For these reasons, the GHC urges the Commission to collaborate with gas utilities, industry stakeholders, academics, and policymakers to identify the facilities and assets that will continue to play a critical role in meeting California's reliability and resiliency needs. This step should precede the decommissioning stage to ensure cost-effective outcomes are achieved. GHC is certain that just as the SB 100 JAR suggests, promoting green hydrogen today represents a least-cost, best-fit approach to ensuring reliability and achieving California's decarbonization goals.

IV. TO IDENTIFY CRITICAL GAS INFRASTRUCTURE AND ENSURE THE USEFULNESS OF INVESTMENTS, THE COMMISSION SHOULD REQUIRE GAS UTILITIES TO SUBMIT A DECARBONIZATION AND RELIABILITY PLAN WITH A 10-YEAR OUTLOOK.

In the context of identifying the critical gas infrastructure needed for the continued reliability and resiliency of California's energy sector, GHC reiterates its request that the Commission direct the gas utilities to develop a decarbonization and reliability plan ("plan") with a 10-year outlook to address transitioning to green hydrogen where feasible, safe, and cost-effective. The plan should provide stakeholders with a comprehensive understanding of the overall long-range decarbonization and reliability transition and allow the stakeholders to understand the transition's implications and requirements, particularly in the near term. The plan's analytical approach should include the potential of increased green hydrogen demand to help drive multi-sectoral decarbonization, including displacing natural gas with green hydrogen and opening new opportunities for displacing liquid fossil fuel use in other sectors with green hydrogen. In addition, the plan should consider fundamental physical requirements and technological options, economics, environmental justice impacts, sectoral impacts, a range of pathway options, and objective scientific-based findings. This plan should also be a comprehensive statewide outlook that recognizes the intersect of electricity and green hydrogen for clean firm dispatchable generation and how they complement each other for achieving decarbonization and reliability requirements.

[13] Gas for Climate: A path to 2050, "Extending the European Hydrogen Backbone: A European Hydrogen Infrastructure Vision Covering 21 Countries," p. 11, April 2021, available at: https://gasforclimate2050.eu/wp-content/uploads/2021/06/European-Hydrogen-Backbone_April 2021_V3.pdf.

V. CONCLUSION.

GHC appreciates the opportunity to submit these comments to the Ruling and looks forward to working with the Commission and stakeholders in this proceeding.

Respectfully submitted,

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GREEN HYDROGEN COALITION

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