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Comments on IEPR Workshop on Potential Growth of Hydrogen

Additional submitted attachment is included below.

September 22, 2023

Commissioner Patricia Monahan
California Energy Commission
Docket Unit, MS-4
Docket No. 23-IEPR-06
715 P Street
Sacramento, CA 95814-5512

Subject: Comments on the CEC IEPR Workshop on Potential Growth of Hydrogen

Dear Commissioner Monahan:

Southern California Gas Company (SoCalGas) and San Diego Gas and Electric Company (SDG&E) appreciate the opportunity to provide comments on the California Energy Commission's (CEC) Integrated Energy Policy Report (IEPR) Commissioner Workshop on the Potential Growth of Hydrogen (Workshop) held on September 8, 2023. Sending clear signals, establishing policy and market direction, and clearing up misconceptions related to hydrogen safety and environmental integrity are in the public interest, as hydrogen will be a necessary tool to help achieve California and global decarbonization. With Governor Gavin Newsom's steadfast vision and directive to the Governor's Office of Business and Economic Development (GO-Biz) to develop California's Hydrogen Market Development Strategy, "California is all in on clean, renewable hydrogen – an essential aspect of how we'll power our future and cut pollution."[1]

SoCalGas and SDG&E appreciate the CEC's leadership and efforts to support the Joint Agencies, the California Air Resources Board (CARB), California Public Utilities Commission (CPUC), and California Independent System Operator (CAISO), in fulfilling the requirements of the IEPR and SB 1075. In addition, SoCalGas and SDG&E thank the CEC for the opportunity to share their perspectives during the IEPR workshop on the potential adoption of hydrogen in decarbonizing

[1] *See* "Governor Newsom Announces New Strategy to Develop a Hydrogen Economy of the Future," August 8, 2023, available at: https://www.gov.ca.gov/2023/08/08/governor-newsom-announces-new-strategy-to-develop-a-hydrogen-economy-of-the-future/.

the electric sector, as well as an overview of SoCalGas' proposed clean renewable hydrogen pipeline system called Angeles Link, and to provide an overview of SoCalGas' recently published analysis *The Evolution of Clean Fuels in California.*[2]

SoCalGas and SDG&E offer the following comments: 1) Clear regulatory support, oversight and market signals are critical to developing hydrogen's role in California's energy future; 2) The CEC should work with the Joint Agencies to establish clear, technology neutral definitions of hydrogen that focus on carbon intensity to provide market certainty, help the state achieve decarbonization goals and leverage federal incentives; 3) CEC preliminary analysis of challenges related to hydrogen delivery and the geographic and footprint limitations of co-located onsite production at power plants suggest dedicated open access pipelines are the best option for the power sector; 4) Excess renewable energy that is currently being curtailed can and should be eligible to produce hydrogen; and 5) The CEC can consider using additional weight classes from CARB's Emission Factor (EMFAC) model for SB 1075 hydrogen scenarios for medium and heavy-duty trucks.

1) **Clear regulatory support, oversight and market signals are critical to developing hydrogen's role in California's energy future.**

The nascent hydrogen market is still emerging and therefore needs greater market and regulatory certainty to further develop and encourage investment. Current regulatory signals for the power sector are inconsistent. For example, local regulators overseeing publicly owned utilities, such as Los Angeles Department of Water and Power (LADWP) and the Northern California Power Agency (NCPA), are approving investments today that will enable clean, dispatchable hydrogen power at scale to be available in the next 5-10 years. Meanwhile, the backbone transportation network needed to supply clean renewable hydrogen for power sector demand—as well as industrial, transportation and commercial sector demand—must be built out, yet lacks clear regulatory incentives and direction.

The SB 1075 process can facilitate signaling strong support to market participants for hydrogen as a tool to be used across broad sectors of our economy. Hydrogen's multi-sector usage will require developing and deploying the build-out of hydrogen transmission, distribution and storage networks to connect producers and end-users. Through the SB 1075 process, the Joint Agencies should recommend policies that support the development of an open-access, common carrier hydrogen network. According to the United States Department of Energy (DOE), "for the clean hydrogen economy to reach its full potential we need open access infrastructure," and that "[o]pen access infrastructure would help to drive a competitive market by helping producers and off-takers,

[2] "The Evolution of Clean Fuels in California," SoCalGas, July 2023, available at https://issuu.com/stfrd/docs/cleanfuelsreliabilityreportjuly23?fr=sNDA4OTYwNzQ4NTk

both small and large, to access the advantages of infrastructure scale including via pipeline delivery and salt cavern storage."[3]

SoCalGas and SDG&E believe that building a successful hydrogen market will require the support of a broad range of end-users, including, but not limited to the hard-to-decarbonize sectors. This broad hydrogen demand is needed to grow the market so that hydrogen supply and delivery will become available to support the decarbonization of the power generation sector and other hard-to-decarbonize sectors of the economy, including the mobility and hard-to-electrify industrial sectors. The SB 1075 process should identify strategies to help bolster hydrogen supply, demand, and delivery and to support the development and commercialization of hydrogen end-use technologies (e.g., fuel cells, turbines, etc.). The DOE last week released a request for proposal (RFP) to seek an independent entity to administer a demand-side initiative working in collaboration with Regional Clean Hydrogen Hubs ("H2Hubs"). The DOE understands that supply and demand both need to be supported to create market certainty: "[t]he demand-side initiative seeks to ensure that both producers and end users in the H2Hubs have the market certainty they need during the early years of production to unlock private investment and realize the full potential of clean hydrogen."[4]

Achieving broad hydrogen demand, can in part be supported by using hydrogen to generate clean dispatchable firm power resources within the electric sector. CARB's Scoping Plan identified the need of about 4 gigawatts (GW) of hydrogen combustion capacity in 2035, and 9 GW to meet 2045 targets.[5] Independent third-party modeling analysis has also shown the need and value of clean firm power to maintain reliability in a cost-efficient manner in an increasingly decarbonized future.[6] SoCalGas' *The Evolution of Clean Fuels in California* analysis, which includes a Loss of Load Expectation (LOLE) reliability analysis[7], found that deployment of clean fuels, like

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[3] *See* "Pathways to Commercial Liftoff: Fireside Chat and Clean Hydrogen Deep-Dive Video," Department of Energy, March 23, 2023, at 34:00, available at: https://www.youtube.com/watch?v=3i7qZfJ5G9Q.

[4] "U.S. Department of Energy Seeks Independent Entity for New Demand-Side Initiative to Accelerate Clean Hydrogen Economy", U.S. Department of Energy (DOE), September 14, 2023, available at: https://www.energy.gov/oced/articles/us-department-energy-seeks-independent-entity-new-demand-side-initiative-accelerate. See also "Biden Harris Administration to Jumpstart Clean Hydrogen Economy with New Initiative to Provide Market Certainty and Unlock Private Investment," DOE, July 5, 2023, available at: https://www.energy.gov/articles/biden-harris-administration-jumpstart-clean-hydrogen-economy-new-initiative-provide-market.

[5] 2022 Scoping Plan for Achieving Carbon Neutrality, CARB, December 2022, p. 203, available at: https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf.

[6] "California needs clean firm power, and so does the rest of the world," Environmental Defense Fund (EDF), Clean Air Task Force, Harvard Center for the Environment, p.2, available at: https://www.edf.org/sites/default/files/documents/SB100%20clean%20firm%20power%20report%20plus%20SI.pdf. Modeling done in the study specifically looked at what resources could replace natural gas in order to reach 100% carbon-free clean electricity supply by 2045 while maintain cost-effectiveness. The study found, "An ambitious but achievable investment in clean firm power, with installed capacity similar in magnitude to our existing gas fleet—or roughly 25-40 gigawatts— could eliminate the need for ten times that amount of wind and solar capacity, and significantly reduce associated transmission expansion and the land area required for electricity generation facilities."

[7] The North American Electric Reliability Corporation's (NERC) industry standard for evaluating electric system reliability is "one day in ten year" or 1-in-10 LOLE analysis.

hydrogen, to support a reliable electric sector can catalyze clean fuels adoption in other hard-to-abate sectors of the economy by leveraging the build out of shared clean fuels infrastructure. The modeling results indicated that while more battery, solar, and wind resources will be needed, additional clean, firm generation and its unique ability to follow energy consumption fluctuations are critical to balancing the grid and preventing service disruptions.[8] SoCalGas found that up to 10 GW of additional clean renewable hydrogen generation could be needed in the CFS electric portfolios for reliability purposes. SDG&E's *The Path to Net Zero*[9] decarbonization study, which also incorporated LOLE reliability assessment, concluded similarly that clean fuels like hydrogen will play a significant role in reporting reliable electricity sector decarbonization. The Joint Agencies should support investment in dispatchable clean firm power resources and supporting infrastructure, including common carrier pipeline transportation infrastructure; it will support electric reliability and help develop the hydrogen market for all hydrogen end-users.

Given multiple analysis supporting the need for clean firm power, the Joint Agencies should explore the use of hydrogen combustion as a dispatchable clean firm power resource. Use of hydrogen in the power generation sector will not only support energy system reliability, but also help achieve significant air quality and greenhouse gas (GHG) emissions reductions benefits. In addition, scaling up the use of hydrogen in power generation will facilitate its adoption in a number of hard-to-electrify sectors.

[8] SoCalGas' July 2023 *The Evolution of Clean Fuels in California* Reliability Analysis, available at https://issuu.com/stfrd/docs/cleanfuelsreliabilityreportjuly23?fr=sNDA4OTYwNzQ4NTk, reveals how clean fuels like clean hydrogen and renewable natural gas (RNG) offer a solution to keep the electric grid reliable as California scales up intermittent renewable resources and electric demand. The Analysis expands on the company's 2021 Clean Fuels Study (CFS) finding that infrastructure development for the delivery of clean fuels like hydrogen could support critical power generation and drive further adoption of clean fuels solutions for other hard-to-electrify sectors in California. The Reliability Analysis specifically modeled the High Clean Fuels Scenario, which was a scenario designed to understand the impact of high reliance on clean fuels for decarbonization. It is assumed in this scenario that drop-in fuels would help to decarbonize the system.

[9] *The Path to Net Zero: A Decarbonization Roadmap for California,* SDG&E, April 2022, available at: https://www.sdge.com/netzero.

2) **The CEC should work with the Joint Agencies to establish clear and where possible technology neutral definitions of hydrogen to provide market certainty.**

CEC should work with the Joint Agencies to establish clear and consistent definitions of renewable and clean hydrogen to help provide market certainty and be used throughout the IEPR, SB 1075 and SB 100 processes. Clear definitions will help establish guidelines in funding opportunities, procurement, and modeling efforts which will help set boundaries and drive the market forward. Such definitions should be crafted to align with the ability of California power generators to use hydrogen sourced from out of state and delivered via pipeline to their facility. Definitions should focus on well-to-gate carbon intensity, rather than production pathways, as decarbonization is the ultimate goal. Therefore, any definition should allow hydrogen that meets allowable carbon intensity standards to participate in California's power sector. In order to do so, definitions will have to remain technology and production pathway neutral. Further, alignment of clean fuel and carbon management terminology and rules, need to run in parallel with other state planning efforts such as SB 100, SB 905, the CPUC Integrated Resource Planning (IRP), and the CARB SB 1075 proceeding.[10]

3) **CEC preliminary analyses of hydrogen delivery and onsite production suggest dedicated pipelines as a promising option for power plants.**

During the Workshop, SDG&E presented that between the CARB Scoping Plan and SDG&E's own analysis, the grid will need between 9 and 20 GW of clean, dispatchable hydrogen power generation by 2045. It is fair to assume most of this generation will come from existing natural gas power plants that have been repowered to accommodate hydrogen, such as the NCPA power plant in Lodi, CA that was highlighted during the Power Generation panel.

Therefore, the results shared by the CEC on its morning presentation "Hydrogen Analysis for Electricity Generation in the 2023 IEPR" were particularly interesting.[11] CEC identified that there are challenges around generating and transporting sufficient quantities of hydrogen for consumption at power plants. The CEC found the following:

[10] SB 1075 Joint Agency Kickoff Workshop, CARB, September 5, 2023, available at: https://ww2.arb.ca.gov/our-work/programs/sb-1075-hydrogen/meetings.
[11] *Ibid.,* CEC, IEPR Commissioner Workshop on the Potential Growth of Hydrogen.

- Trucking in hydrogen is unsuitable as a delivery option due to the high delivery volumes required. Cooling infrastructure and liquefaction for trucking also adds cost.
- Geographic information system (GIS) review of existing California gas-fired generators showed only a limited set of power plants have space nearby to co-locate electrolyzers.
- Other challenges exist for co-located production of hydrogen at power plants including: (1) hydrogen storage space requirements, (2) water availability, and (3) land availability for dedicated, co-located renewable generation that may be needed to power the electrolysis process.[12]

SoCalGas and SDG&E observe that these findings clearly suggest dedicated hydrogen pipelines will likely be the best option for delivering hydrogen to power plants and urge the CEC under SB 1075 to continue to investigate options for realistic delivery and storage of hydrogen at power plants and to make recommendations that support the development of an open-access, common carrier hydrogen network that connects multiple hydrogen producers and end users.

4) Renewable energy curtailment can be utilized to produce hydrogen that serves as seasonal energy storage to meet electricity demand.

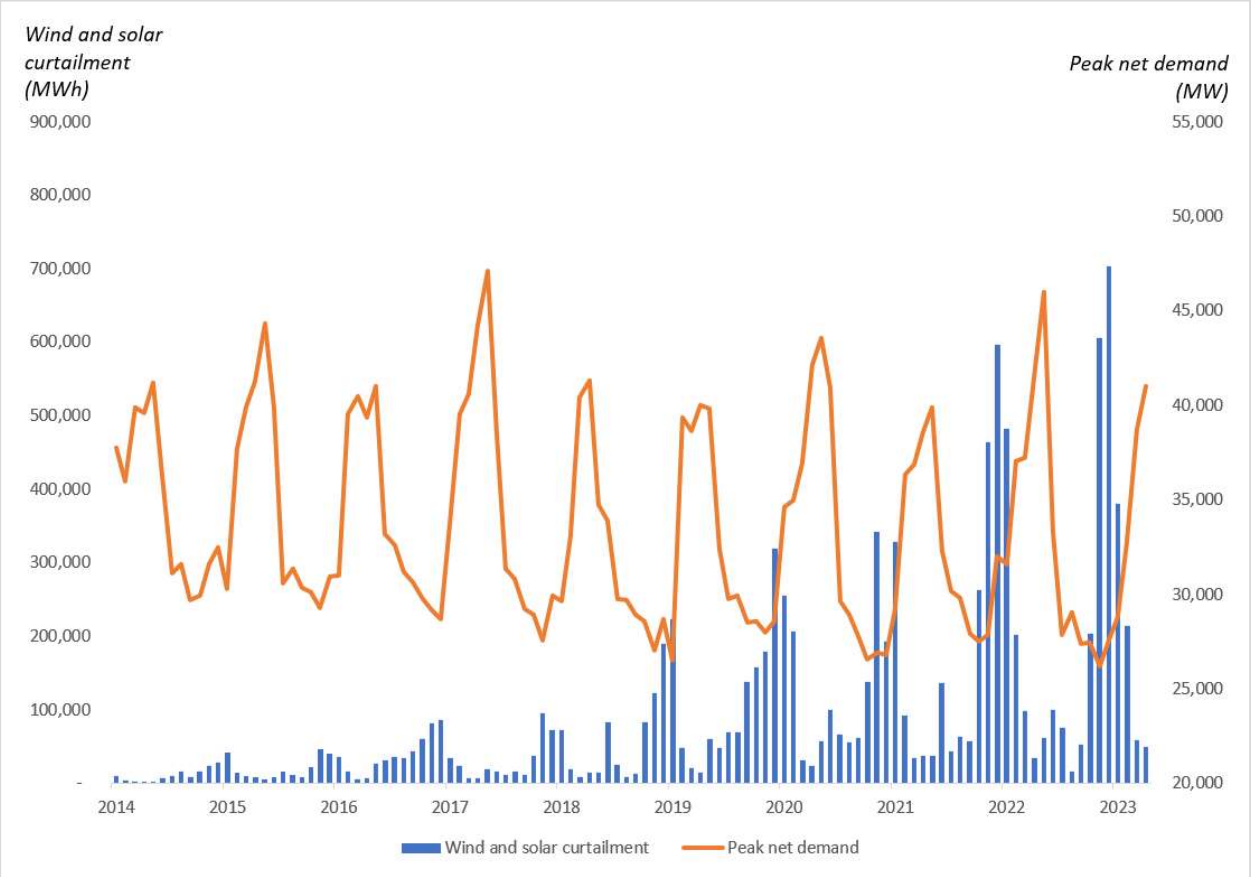
During the Workshop, the CEC presented on the preliminary analysis on the amount of renewable capacity needed to produce hydrogen and stated that "1 megawatt (MW) of renewable power produces enough hydrogen to replace only 0.142 MW of natural gas combined cycle (NGCC) power," resulting in a seven times difference in capacity needed. We commend the CEC for its analysis to understand the characteristics and impacts of hydrogen production and agree that these conversion inefficiencies necessitate the electricity market to choose renewable power when possible, and to reserve hydrogen-generated power as a tool to provide reliability when renewables are unavailable. However, this analysis should be supplemented by consideration of the role that hydrogen can play in electric system reliability and in utilizing otherwise curtailed renewable energy. Moreover, as California transitions toward higher levels of intermittent renewable energy, steeper evening ramps and greater shortfalls on high-demand days and during the winter season are anticipated. This suggests there will be a critical need for seasonal and long-duration energy storage resources such as hydrogen in addition to battery storage.

[12] *Ibid.*

Another consequence of higher levels of intermittent renewable power is increased renewable curtailments. Figure 1 below shows CAISO's total monthly wind and solar curtailment for 2014-2023. As renewable capacity in the state grows, so does the amount of curtailed power. Peak curtailment typically happens during mild, sunny days in spring months, such as March or April. Failing to store this Springtime curtailed power is akin to a 0 percent efficiency or reducing 1 MW of renewable power to 0 MWs. Instead, converting otherwise curtailed energy to hydrogen will result in retaining 0.142 MW that can be saved for utilization during future high demand days or months of low renewable production. Of the high demand days, the annual peak net demand tends to occur during the peak heat season in the late summer months. Renewable or Clean hydrogen created from excess renewable energy that would have otherwise been curtailed can be a seasonal energy storage resource able to better match supply to meet demand at a later time. Hence, as California increases its buildout of renewable resources, seasonal energy storage can play a bigger role by making use of excess renewable capacity.[13]

[13] Part of SB 1075 requires that CARB and CAISO analyzing how curtailed electric generation can be better utilized to help meet state goals to produce green hydrogen. See requirement 4.

Figure 1: CAISO data on wind and solar curtailment and net demand[14]



5) The CEC can consider using additional weight classes from EMFAC model for SB 1075 hydrogen scenarios for medium and heavy-duty trucks.

Per the requirements of SB 1075, the CEC is to "study and model the potential growth of hydrogen and its role in decarbonizing the electrical and transportation sectors of the economy" as part of the 2023 and 2025 IEPR.[15] During the Workshop, the CEC presented its preliminary SB 1075 hydrogen scenarios for medium and heavy-duty trucks using CARB's Emission Factor (EMFAC) model.[16] The CEC noted it only used two weight classes, Class 6 and 8, to model hydrogen demand for fuel cell electric vehicles (FCEV) and the potential number of these vehicles which can be in

[14] CAISO data on wind and solar curtailment and net demand, available at: http://www.caiso.com/informed/Pages/ManagingOversupply.aspx#dailyCurtailment.
[15] California SB 1075, Public Resources Code (PRC) Section 25307 (b), Skinner, 2022, available at: https://legiscan.com/CA/text/SB1075/id/2600230#:~:text=This%20bill%20would%20require%20the%20state%20board%2C%20by%20June%201,authorize%20the%20use%20of%20the.
[16] CARB EMission FACtor (EMFAC) model, available at: https://arb.ca.gov/emfac/.

use in 2040. The CEC did note their modeling parameters were limited and CEC staff are open to receiving feedback on other potential weight classes to be included in modeling. Indeed, the data presented by the CEC showed the CARB Scoping Plan Scenario found hydrogen-fueled fuel cell electric truck count to be approximately 325,000 in 2039 whereas the CEC IEPR 2022 Baseline Scenario found the count to be approximately 20,000[17], a sixteen-fold difference. SoCalGas and SDG&E suggest the CEC expand modeling to include additional weight classes as the CEC continues to develop hydrogen transportation forecasts for SB 1075. Furthermore, we suggest the CEC align the IEPR 2022 Baseline Scenario assumptions with that of the CARB Scoping Plan Scenario in terms of vehicle classifications included.

Conclusion

SoCalGas and SDG&E appreciate the opportunity to provide input as the CEC begins its preliminary modeling on potential hydrogen adoption in decarbonizing the power generation and transportation sectors. Many important questions still need to be answered on regulatory incentives and policy for an emerging hydrogen market and establishment of clear and consistent definitions of hydrogen to be used across many functions that can lead to substantial decarbonization that is reinforced by equity benefits for energy communities and society as a whole. Energy equity, energy justice, and access to energy are crucial for transparency in this deliberation.

We look forward to continuing to actively engage with agencies and stakeholders throughout the IEPR and SB 1075 process. Thank you for your consideration of our comments.

Respectfully,

/s/ Adam Jorge

Adam Jorge
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/s/ Sarah M. Taheri

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[17] See "IEPR Commissioner Workshop on the Potential Growth of Hydrogen," SB 1075 Preliminary Hydrogen Scenarios for Medium and Heavy-Duty Trucks presentation, CEC, September 8, 2023, slide 5, available at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=252209&DocumentContentId=87215.