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SoCalGas Comments on the CEC Staff Workshop on Research to Support a Climate Resilient Transition to a Clean Electricity System

Additional submitted attachment is included below.

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California Energy Commission
Docket Unit, MS-4
Docket No. 19-ERDD-01
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: Comments on the Staff Workshop on Research to Support a Climate Resilient Transition to a Clean Electricity System

Dear Alexandra Kovalick:

I write on behalf of Southern California Gas Company (SoCalGas) in response to the California Energy Commission's (CEC's) Staff Workshop on Research to Support a Climate Resilient Transition to a Clean Electricity System held on March 5, 2021. SoCalGas appreciates the opportunity to comment on the development of the proposed research outlined by CEC Staff. Given the resiliency role gas assets must play to support the decarbonizing electric grid, SoCalGas supports accelerating the transition to cleaner molecules, thereby complementing wind and solar energy by adding fuels, such as hydrogen, to the energy mix.

As California experiences a changing climate,[1] longer-term shifts and variability in weather patterns will present ongoing and future risks to the electric grid and infrastructure. For instance, the U.S. Government Accountability Office's (GAO's) 2021 report found that more frequent droughts and changing rainfall patterns may adversely affect hydroelectricity while increasing wildfire activity due to warmer temperatures and drier conditions may reduce transmission capacity or damage distribution lines.[2] Further, an increase in the intensity, frequency, and duration of weather events could cost utilities and customers billions, including the costs of power outages

[1] *See* California Department of Resources Recycling and Recovery Webpage: California Has Been Devastated by the Climate Crisis. Available at https://www.calrecycle.ca.gov/organics/slcp.
[2] *See* Statement of Frank Rusco, Director of U.S. Natural Resources and Environment, Before the Committee on Environment and Public Works, U.S. Senate on the U.S. Government Accountability Office's Report Electricity Grid Resilience: Climate Change Is Expected to Have Far-reaching Effects and DOE and FERC Should Take Actions, 2021 March 10. Available at https://www.gao.gov/assets/gao-21-423t.pdf.

and infrastructure damage.[3] As such, scientific research and modeling are needed to assess climatic impacts, risks, and vulnerabilities of the electric infrastructure and operations as well as to the customer. We offer these comments to help CEC Staff craft the scope and structure of a solicitation that supports the State's ambitious climate goals while maintaining the resiliency, reliability, and affordability of electricity in California.

Climate Impacts on Storage

As we transition to a zero-emission electric grid mostly based on variable and intermittent (*e.g.*, hourly, daily, and seasonally) generation, long-duration storage (*e.g.*, seasonal) will be essential to provide clean energy during peak and net hours of the day after the sun sets and during multi-day weather events like the 2020 August heatwaves. It will also be critical during renewable doldrum periods when aggregate output of renewables can be far less depending on the variability of weather. In fact, long-duration (seasonal) storage is not a new phenomenon in California's energy system. The backbone of the energy system has been hydroelectric systems and gas storage because of their ability to store energy for months at a time for use in the distant future. This unique capability of hydroelectricity and gas storage allows for costs hedging to keep costs affordable for end-users.

Hydroelectric generation is the longest running supply side resource in California. In fact, in the 1940s it made up about 60 percent of the electricity supply. Pondage hydro is recognized as long-duration storage (*e.g.*, hourly, or daily). However, climate change could have drastic impacts on the seasonal storage capacity of snowpack, which is invaluable to the hydroelectric system. The late Spring and Summer melt off of the snowpack generates carbon-free electricity and provides power as temperatures and demand rise. As average temperatures increase, it is projected that there will be considerably less snowpack because more precipitation will fall as rain rather than snow. This is important because if there is excess water that dams cannot hold, they will release the water early in the season. Therefore, the electricity is generated early (*i.e.*, winter months) rather than being continuously stored for summer months when demand is high. Climate change will reduce the amount of natural long-duration storage that Californians have relied on. Thus, it is important to model and research alternatives to hydro storage (*i.e.*, snowpack) that will also provide the benefit of zero-emissions.

Further, rather than burning gas to generate electricity (and displace available renewable generation), gas delivered into California is stored for later use when renewables are no longer able to serve the load. This innate characteristic of gas molecules – storage – enables renewable electricity to be both used and exported. Two recent cold weather events exacerbated by climate change impacted customers and illustrated the need for long-duration storage solutions. In 2014, the Midwest and Northeast United States experienced a polar vortex that led to curtailment of gas supplies for electric generation and other related shortages.[4] Further, a 2011 polar vortex impacted the price for a megawatt hour (MWh) of electricity, which increased from $160/MWh to

[3] *Ibid., 2.*

[4] *See* North American Electric Reliability Corporation Report on Polar Vortex Review, 2014 September. Available at https://www.nerc.com/pa/rrm/January%202014%20Polar%20Vortex%20Review/Polar_Vortex_Review_29_Sept_2014_Final.pdf.

$1,800/MWh.[5] In February 2021, a curtailment of gas supply occurred in Texas because of a cold front. Because SoCalGas had ample storage supplies, we were able to supply enough gas to customers, including the electrical grid, without relying on expensive Texas imports. Additionally, a 2018 Western Interconnection Gas – Electric Interface study undertook a quantitative analysis of the probability of such a freeze event and found that there is an estimated 12 percent probability of a disruption in gas supply over a ten-year period.[6] The study also indicated, "[t]he various freeze-off scenarios result in conditions in which the electricity system is stretched to its limits and may face reliability challenges."[7] The Northeast and Texas crises demonstrate that California customers could similarly face a serious safety and reliability risk should a similar climate incidents occur in California. Storage facilities could mitigate these risks; however, it is important to consider that without storage, gas-fueled electric generation will have to operate when renewables are not available because there is currently very limited storage available to capture electricity. Storage assets (*i.e.*, hydroelectricity and gas molecules) essentially provide a safety buffer for customers.

The California Independent System Operator (CAISO) has expressed the need for between 1,000 to 4,000 megawatts of long duration storage for years 2026 and 2030 to maintain reliability.[8] At the same time, the CAISO estimates that the retirement of Diablo Canyon Power Plant and four gas plants along the California coast will cause a nearly 3,500 megawatts deficiency[9] in supply. The electricity system has always depended on long-duration storage (*i.e.*, pondage hydro and snowpack), but those dependable carbon-free resources are diminishing because of climate change. It is imperative that California's electricity system fills in the diminishing capacity with new long-duration carbon-free storage like power-to-gas-to-power resources and not further exacerbate the problem by diminishing the storage capacity and capabilities of the gas infrastructure system. Stored gas molecules need to be ready to jump into action when demand is high, and supply is low.

In 2020, the California Institute of Technology (CalTech) Researchers modeled the potential of long-duration energy storage technologies to enable a reliable and cost-effective renewable dominated electric system.[10] The study results indicated that introducing long-duration storage technologies (*e.g.*, power-to-gas-to-power, pumped hydro storage, and compressed air energy

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[5] *See* Federal Energy Regulatory Commissions and North American Electric Reliability Corporation Report on Outages and Curtailments During the Southwest Cold Weather Event of February 1-5, 2011: Causes and Recommendations, 2011 August. Available at https://www.ferc.gov/sites/default/files/2020-04/08-16-11-report.pdf.

[6] *See* Wood Mackenzie Public Report, Western Interconnection Gas-Electric Interface Study, 2018 June, at 15. Available at https://www.wecc.org/Reliability/Western%20Interconnection%20Gas-Electric%20Interface%20Study%20Public%20Report.pdf.

[7] *Ibid., 5.*

[8] *See* California State Legislators Letter to the California State Legislature on the Need for Urgent Action on Long Duration Energy Storage Procurement, 2021 February 2. Available at https://static1.squarespace.com/static/5e3b69edfd4af10b189254b0/t/602c2b114fcd5f707072b101/1613507345595/Letter+to+CPUC%2C+Long+Duration+Energy+Storage+Letter%2C+2-5-21.pdf.

[9] *See* California Independent System Operator Comments on the Order Instituting Rulemaking 20-05-003 to Continue Electric Integrated Resource Planning and Related Procurement Processes, 2020 October 23. Available at http://www.caiso.com/Documents/Oct23-2020_Comments-on-Integrated-Resource-Planning-R20-05-003.pdf.

[10] Jacqueline A. Dowling, et al., "Role of Long-Duration Energy Storage in Variable Renewable Electricity Systems," 2020, Joule, 4 (9). pp. 1907-1928. Available at https://resolver.caltech.edu/CaltechAUTHORS:20200806-090232377.

storage) for long-term action reduces system costs of the electric grid.[11] While the CalTech study precluded technologies in which generation does not come from zero-carbon resources, a 2020 joint study by Energy Futures Initiative (EFI) and Stanford evaluated alternatives for near-term action. The study found that carbon capture paired with permanent geologic storage (*e.g.*, deep saline reservoir) offers a viable and important option for reducing emissions from the industrial and electricity sectors. Gas plants utilizing carbon capture and storage (CCS), for uninterruptible firm energy, have the potential to decrease costs by $750 million annually than the combination of solar plus utility-scale batteries.[12] Further, battery storage systems can be leveraged with gas combined cycle (NGCC) units to smooth their ramping operation, measurably reducing their emissions profile.[13] The 2019 EFI study also found that gas generation with carbon capture has the potential for achieving the greatest emissions reduction in the electricity sector in the 2030 timeframe.[14] Researchers also noted that "California cannot afford to limit its flexibility by eliminating technology options…that may hinder, rather than accelerate, decarbonization."[15]

Models for climate change, deficiency in supply, and increases in renewable energy resources are critical to ensure a resilient, reliable, and affordable electric grid. SoCalGas encourages CEC Staff to include long-duration storage and the complementary role of the gas grid in the scope of the solicitation to further evaluate and model multiple viable and scalable technologies that will meet the State's greenhouse gas targets and maintain critical grid needs. SoCalGas also encourages CEC Staff to require researchers to evaluate the near-, mid-, and long-term impacts on affordability of different models.

Respectfully,

/s/ Tim Carmichael

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[11] *Ibid., 9.*
[12] Sally M. Benson, et al., "An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges, and Solutions." Energy Futures Initiative, Stanford University's Precourt Institute for Energy, and Stanford Center for Carbon Storage, 2020. Available at https://sccs.stanford.edu/sites/g/files/sbiybj7741/f/efi-stanford-ca-ccs-full-rev1.vf-10.25.20.pdf.
[13] *See* Energy Futures Initiative, "Optionality, Flexibility, & Innovation: Pathways For Deep Decarbonization in California," 2019 May. Available at https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5ced6fc515fcc0b190b60cd2/1559064542876/EFI_CA_Decarbonization_Full.pdf.
[14] *Ibid*., 13.
[15] *Ibid.,* 12.