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## SoCalGas Comments on SB 100 Joint Agency Draft Results Workshop

*Additional submitted attachment is included below.*

Tim Carmichael
Agency Relations Manager
State Government Affairs
925 L Street, Suite 650
Sacramento, CA 95814
Tel: 916-492-4248
*TCarmichael@semprautilities.com*

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California Energy Commission
Docket Unit, MS-4
Docket No. 19-SB-100
1516 Ninth Street
Sacramento, CA 95814-5512

**Subject: Comments related to the Senate Bill 100 Joint Agency Draft Results Workshop**

Southern California Gas Company (SoCalGas) appreciates the opportunity to comment on the California Energy Commission's (CEC) Senate Bill (SB) 100 Draft Results Workshop held jointly with the California Public Utilities Commission (CPUC) and California Air Resources Board (CARB) on September 2, 2020. SoCalGas commends the Joint Agency Staff and Energy and Environmental Economics (E3) Consultants for demonstrating that a balanced portfolio of resources is necessary to meet the 2045 carbon-free electricity goal. This portfolio includes retaining and maintaining the gas delivery system to enable decarbonization. Further, SoCalGas recommends that the following be incorporated into the SB 100 draft report: (1) inclusion of green hydrogen and carbon capture and storage (CCS) as candidate resources; (2) inclusion of long-duration storage (i.e., multi-day); and (3) incorporation of a power flow analysis.

California is on track to meet its 60 percent Renewable Portfolio Standard Program (RPS) before 2030 with existing technology. The gas system provides a reliable source of dispatchable energy during times of volatile and variable peak demand on the electric grid. The gas system is a critical component in managing the peak ramping needs of the electric grid, which are only expected to increase with increased reliance on intermittent renewables and non-contracted imports. These ramping services and the infrastructure are, and will become, increasingly invaluable to meet the changing reliability requirements of the electric system. Technical experts repeatedly highlight that the future electric system will rely even more on the unique ramping capabilities of the gas system. These important attributes are observed primarily during the morning and evening peaks and throughout the night when output from intermittent renewables such as solar and wind are substantially diminished. Thus, the results from the core scenarios validate the critical role the gas system will continue to play in the coming decades to maintain reliability for gas and electric customers.

**1. Recommendation to include green hydrogen and carbon capture and storage as candidate resources to maintain and support system reliability**

Further, the gas system can play the role as a common carrier of renewable natural gas (RNG) and hydrogen. As such, the gas system must be leveraged as an additional solution to help address climate change. Drop-in renewable fuel resources (i.e. RNG and hydrogen) were mistakenly excluded from E3's core scenario analysis as the Joint Agency Staff asserted that there are inadequate supply and costs data as well as assertions that the technology is not yet commercially available. However, there are findings of multiple, neutral studies evaluating drop-in renewable fuel resources, which demonstrate there are sufficient supplies available, and costs can be driven down over time through incentives to innovate and invest.[1,2,3] SoCalGas requests that the Joint Agencies consider a multifaceted approach that optimizes a diverse portfolio of resources and technologies to meet SB 100 targets.

SoCalGas also requests that the Joint Agencies include hydrogen as a potential candidate resource. A recent study led by former Secretary of Energy Ernest J. Moniz found that "hydrogen is a robust and clean energy carrier, capable of storing and delivering energy on demand."[4] Dr. Moniz asserts that hydrogen "produced in a low-carbon manner (i.e. electrolysis with a clean grid or steam methane reforming of natural gas with CCS) has considerable potential to assist with decarbonization." This aligns with a recent Lawrence Livermore National Laboratory (LLNL) study, which found that producing renewable hydrogen is estimated to cost between $29 to $64 per ton of carbon dioxide.[5] Further, a new global study by BloombergNEF states that before mid-century production of renewable hydrogen could costs $0.8 to $1.6 kilograms (kg).[6] "This is equivalent to gas priced at $6 to $12 per 1 million British Thermal Unit (MMBTU)."[7]

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[1] Dr. Philip Sheeby and Jeffrey Rosenfeld, "Design principles for a renewable gas standard," (ICF International: 2017). Available at: https://www.icf.com/resources/white-papers/2017/design-principles-for-renewable-gas.

[2] Amy M. Jaffe, et al., "The Feasibility of Renewable Natural Gas as a Large-Scale, Low Carbon Substitute," (University of California, Davis Institute of Transportation Studies: June 2016). Available at: https://steps.ucdavis.edu/wp-content/uploads/2017/05/2016-UCD-ITS-RR-16-20.pdf

[3] Oak Ridge National Laboratory, "2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy," (U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, Volume 1, Economic Availability of Feedstocks: 2016). Available at: https://www.energy.gov/eere/bioenergy/downloads/2016-billion-ton-report-advancing-domestic-resources-thriving-bioeconomy.

[4] Dr. Ernest J. Moniz, et al., "Optionality, Flexibility & Innovation," (Energy Futures Initiative: May 2019). Available at: https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5ced6fc515fcc0b190b60cd2/1559064542876/EFI_CA_Decarbonization_Full.pdf.

[5] Sarah E. Baker, et al., "Getting to Neutral: Options for Negative Carbon Emissions in California," (Lawrence Livermore National Laboratory: January 2020). Available at: https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf.

[6] BloombergNEF, "Hydrogen Economy Outlook," (March 2020). Available at: https://about.bnef.com/blog/hydrogen-economy-offers-promising-path-to-decarbonization/.

[7] Ibid., 6.

SoCalGas also asks the Joint Agencies to clarify whether CCS is included in the core scenarios as retrofits for 80 percent of the gas system retained. The Dr. Moniz and LLNL studies both found that CCS technologies have nearly an unlimited negative emission reduction capacity at manageable costs. The Dr. Moniz study found an estimated cost of $264 per metric ton of carbon dioxide, which includes capturing, transporting, and geologically storing the captured carbon. [8] The LLNL study also found that CCS costs between $193 to $201 per ton of carbon dioxide.[9] Accordingly, SoCalGas believes that there are sufficient supply and cost data to support CCS's inclusion as a candidate resource.

**2. Recommendation to include long-duration storage (i.e. multi-day) to support ramping and resiliency needs**

The study accurately projects that the annual average gas use to support electric decarbonization will decrease. However, it does not consider critical information from the Senate Bill 380 Aliso Canyon Order Instituting Investigation (OII) 17-02-002 (SB380) that shows the peak day capability for gas use to support decarbonization will increase in 2030, as the CPUC modeling. Likewise, presenters from both the California Council for Science and Technology (CCST) and E3 expressed similar or supportive observations during a Staff Workshop in the gas system OIR Rulemaking 20-01-007, conducted on July 21, 2020.[10] Thus, it can be predicted that the same increase for peak day capability will occur in 2045. In effect, the modeling implicitly projects the need for a more capable gas grid for meeting long-duration storage as well as dispatchable firm generation to support ramping and resiliency needs. Rather than simply viewing design standards through the traditional lens of total capacity and daily needs, we urge the Joint Agencies to study the increasing need for hourly and intraday ramp up and ramp down capabilities as electric grid resources become increasingly reliant on intermittent and part-day variable renewable resources. Utilizing the gas grid to support firm dispatchable resources for long duration ramping needs of a decarbonized electric grid is part of the lowest risk and least cost strategy shown in a published MIT Energy Initiative study.[11] This capability that the gas system provides to enable electric system reliability is being considered in the Order Instituting Rulemaking to Establish Policies, Processes, and Rules to Ensure Safe and Reliable Gas Systems in California and Perform Long-Term Gas System Planning, R.20-01-007.

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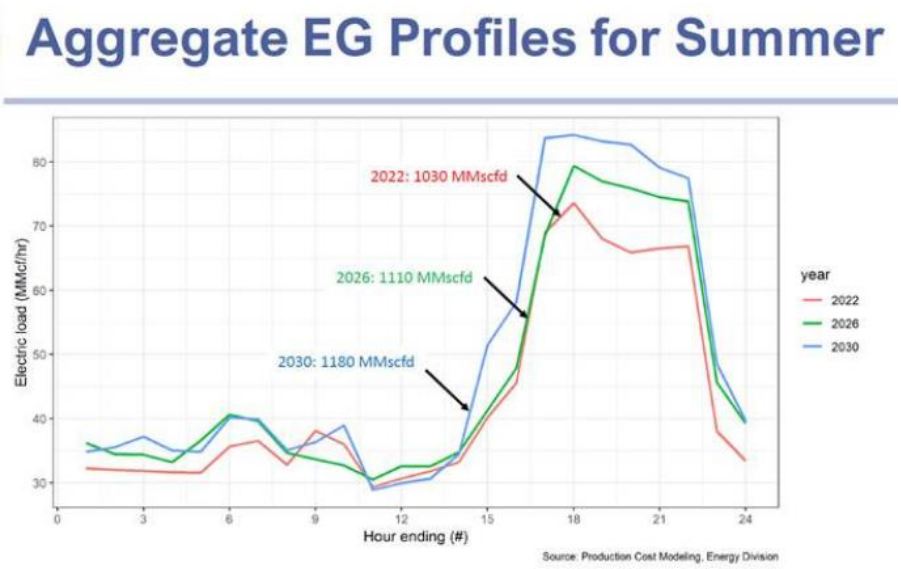
[8] Ibid., 4.
[9] Ibid., 5.
[10] *See*, In Re: Market Structure and Regulations: R.20-01-007 Track 1B Staff Workshop (CCST's Dr. Jane Long stating: "More importantly, as we looked forward to SB 100 and […] the elimination of carbon dioxide emissions from electricity, we have to take into account what happens in the winter. And here I think the important observation of this study is that we have much less renewable energy available in the winter months in California, 60 to 80 percent less in the winter months."); and (E3's Dr. Arne Olson stating: "And I think we would expect to see […] that as heating loads in California are electrified, that we might actually see increased natural gas use during wintertime peak.").
[11] Nestor A. Sepulveda, et al., "The Role of Firm Low-Carbon Electricity Resources in Deep Decarbonization of Power Generation," (Joule Article, Volume 2, Issue 11: September 2018). Available at: https://www.cell.com/joule/fulltext/S2542-4351(18)30386-6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2542435118303866%3Fshowall%3Dtrue.

The study also fails to show the increased demand during times of grid stress or in response to the vagaries of renewable energy. The figure below from the CPUC's analysis in the SB 380 OII shows the projected intraday ramp up and ramp down for years 2022, 2026, and 2030.[12] During the peak hours of the day, up to 30 percent more gas is used for electricity production in 2030 than in 2022. However, gas consumption for electricity during other hours of the day remain quite low. The gas system can provide this reliability backstop for the electric grid and optimizes the use of the existing and increasingly efficient infrastructure. The capabilities of the gas system will play a critical and synergistic role in supporting the increased ramping needs of the electric system towards facilitating the State's goals. Additionally, as demand for fuel becomes more variable and volatile from the ongoing transformation to a zero-carbon energy system, the use of the gas system to support electric reliability is projected to significantly vary from historic usage patterns within the day and during peak usage days.




As more variable intermittent electric capacity is relied upon by the electric grid, the more long-duration, dispatchable capability will be needed. This is a somewhat linear commensurate relationship, which does not necessarily equate to gas generation capacity. However, gas is the current primary means to compliment renewable energy. Some of the model runs seek to displace gas use with an undetermined zero-emission 6-hour duration dispatchable capacity that is estimated to cost $60 per megawatt hour (MWh). The resulting analyses inaccurately apply a downward cost pressure on the model runs because the capacity and its actual costs are currently unknown for this resource. Thus, we ask the Joint Agencies to consider clean molecules such as green hydrogen and CCS for this critical decarbonized supporting role.

[12] *See* I.17-10-002, July 28, 2020 Phase 2 Data and Results Workshop No. 3 for the Senate Bill 380 Aliso Canyon Order Instituting Investigation (SB380 Workshop Presentation) at slide 31. Available At: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2020/Session%204%20Hydraulic%20Modeling%20Updates%202020%20Workshop%203-slide%20deck-final.pdf.

SoCalGas also asserts that the scenario results undervalue the role the gas system can play in helping to achieve the greenhouse gas (GHG) emissions reductions goals set forth in SB 100 by 2045. For instance, the gas system can provide the critical infrastructure needed to transport RNG and green hydrogen. SoCalGas has a goal of adding 20 percent RNG for our core customers by 2030, while our gas system can be further decarbonized as a green hydrogen carrier.[13]

**3. Recommendation to incorporate a power flow analysis to identify additional infrastructure needs.**

SoCalGas further recommends that the Joint Agencies address power flow analysis across the transmission, sub-transmission, and distribution systems, which will help to determine additional grid infrastructure upgrades. Performing analyses like overload, peak load, short circuit duty impacts, thermal loading of conductors, and protection systems across the electric system will likely identify several needs for additional infrastructure projects. Thus, additional costs will also most likely be identified, including building new substations to mitigate low- or high-voltage risks under high electrification scenarios.

Lastly, the modeling further reveals the need for appropriate market regulatory policies that support an integrated energy system. Such policies will make sure the gas system is available and capable of supporting renewable deployment and to advance the tools and means - both currently in the market and in scaling up others - for gas users and suppliers to reduce GHG emissions from the use of gaseous fuels. Ultimately, these regulatory and policy tools are necessary to make sure that renewable deployment and decarbonization may continue to proceed timely.

Given these reasons, SoCalGas supports the important work the Joint Agencies are undertaking with this report. SoCalGas also recommends that the following be considered for the SB 100 draft report: (1) inclusion of green hydrogen and CCS technologies as candidate resources; (2) inclusion of long-duration storage (i.e., multi-day); and (3) incorporation of a power flow analysis. We commend the Joint Agencies for their efforts thus far and look forward to understanding how they incorporate comments into the draft report.

Sincerely,

*/s/ Tim Carmichael*
Tim Carmichael
Agency Relations Manager
Southern California Gas Company

[13] *See* R.13-02-008, January 15, 2020 Phase 4 Hydrogen Webinar Working Group on Hydrogen Injection for Sb 1440. Available at: https://www.cpuc.ca.gov/General.aspx?id=6442455827#R._13-02-008___Phase_4.