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PREPARED DIRECT TESTIMONY OF

EDWIN HARTE

ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY

(HYDROGEN FUELING STATION RATE)

September 30, 2022

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CHAPTER 12

PREPARED DIRECT TESTIMONY OF EDWIN HARTE

(HYDROGEN FUELING STATION RATE)

I. PURPOSE

The purpose of my direct testimony is to request authority for the Southern California Gas Company (SoCalGas) to offer a new pilot hydrogen fueling station rate, "G-FCEV", for utility-owned public access hydrogen fueling stations.

II. BACKGROUND

As described in the 2024 SoCalGas General Rate Case (GRC), SoCalGas has requested authority to construct, own and operate hydrogen fuel cell electric vehicle (FCEV) fueling stations at utility operating bases that will serve both the utility fleet and the general public.[1] My testimony in this proceeding complements the request in the 2024 SoCalGas GRC by requesting authority to offer a new pilot hydrogen fueling station rate, G-FCEV, at utility owned public access hydrogen fueling stations. The request for a new pilot hydrogen fueling station rate is supported by both state policies and customer demand for utility products and services.

State policies advancing the adoption of zero emission vehicles (ZEVs), such as FCEVs, include but are not limited to, the following:

- In 2018, Governor Brown issued Executive Order B-48-18 that states, in part, "It is further ordered that all State entities work with the private sector and all

[1] *See* A.22-05-015/016 (cons.) Exhibit SCG-19-R Revised Direct Testimony of Brenton K. Guy (August 2022) at BKG-35, BKG-37-38; *see also,* Exhibit SCG-12-R Revised Direct Testimony of Armando Infanzon (August 2022) at AI-59.

appropriate levels of government to spur the construction and installation of 200 hydrogen fueling stations...by 2025."[2]

- In 2020, Governor Newsom issued Executive Order N-79-20 that states, in part, "It shall be a goal of the State that 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035. It shall be a further goal of the State that 100 percent of medium-and heavy-duty vehicles in the State be zero-emission by 2045 for all operations where feasible and by 2035 for drayage trucks. It shall be further a goal of the State to transition to 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible."[3]
- The California Air Resources Board (CARB) 2020 Mobile Source strategy states, "a key focus of the 2020 Strategy is advancing the use of zero-emission technologies wherever feasible," and "deployment of approximately 1.4 million medium and heavy-duty zero-emission vehicles (ZEVs) in California by 2045" and for "on-road light-duty vehicles … 100 percent of sales will be ZEVs by 2035…."[4]

When California established a goal to have 200 hydrogen fueling stations in operation by 2025, it signaled the importance of adequate hydrogen fueling infrastructure. However, meeting this goal will be extremely challenging. As of September 12, 2022, there were only fifty-five

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[2] State of California, Executive Department, *EO B-48-18* (January 26, 2018), *available at:* https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-48-18.pdf.

[3] State of California, Executive Department, *EO N-79-20* (September 23, 2020), *available at:* https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf.

[4] CARB, *Proposed 2020 Mobile Source Strategy* (September 28, 2021) at 4, *available at:* https://ww2.arb.ca.gov/sites/default/files/2021-09/Proposed_2020_Mobile_Source_Strategy.pdf.

(55) retail, public access hydrogen fueling stations operating in the state of California.[5] Of these stations, thirty-one (31) were in operation in SoCalGas's service territory. Moreover, 94% of the retail hydrogen fueling stations in operation in SoCalGas' service territory rely on transportation (trucking) of hydrogen (gaseous or liquid) to the station instead of producing hydrogen on-site. This places these stations at risk of supply transport disruptions, as evidenced by hydrogen station fuel outages in the past few years.[6] Authorizing the proposed G-FCEV pilot hydrogen fueling station rate for stations approved in the GRC will provide additional hydrogen fueling stations for customers in support of state policies and help the state in its endeavor to meet these goals.

In March 2022, SoCalGas commissioned a market research study to quantify customer interest in proposed utility hydrogen-related products and services, including utility-owned public access hydrogen stations.[7] Among 323 respondents surveyed, ninety-four percent (94%) stated SoCalGas's proposed hydrogen products and services would be beneficial. Eighty-one percent (81%) of respondents stated SoCalGas' proposed hydrogen products and services would motivate them or their company to adopt the use of hydrogen vehicles sooner. Respondents ranked the need for more hydrogen fueling stations as well as affordable hydrogen fuel as the most appealing aspects of SoCalGas's proposed hydrogen products and services. In August 2022, SoCalGas commissioned another market research study to survey retail prices at public

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[5] California Fuel Cell Partnership, *California Fuel Cell Partnership Hydrogen Station List* (September 12, 2022), *available at:* https://cafcp.org/sites/default/files/h2_station_list.pdf.

[6] Car and Driver, *Running on Empty: There's a Lot to Like about Hydrogen, If You Can Find It* (April 4, 2021), *available at:* https://www.caranddriver.com/features/a36003212/hydrogen-mirai-california-shortage/.

[7] Q-Insights, *Clean Air Intercept Study* (March 2022).

access hydrogen fueling stations in the state of California.[8] Based on this on-going survey, during the week of September 7, 2022 the average retail price of H35 and H70 in the state of California was $19.50 per kg and $20.01 per kg, respectively.[9] These results did not change significantly based on feedstock or station size.[10] These survey findings are consistent with the most recent California Energy Commission (CEC) Assembly Bill (AB) 8 report on hydrogen fueling stations, which states "general barriers … to overall widespread FCEV commercialization and deployment remain" and include "high hydrogen fuel and FCEV prices, hydrogen station downtime due to equipment failures and other factors, and the lack of vehicle models and consumer options…. The need for a reliable hydrogen supply and reliable stations also presents a barrier to widespread FCEV commercialization and deployment, as does expanded geographic coverage of the stations. FCEV adoption may increase at a higher pace when these barriers are addressed."[11] Once the CPUC approves SoCalGas's request to own and operate hydrogen fueling stations at utility operating bases serving both the utility fleet and the general public, the proposed G-FCEV pilot hydrogen fueling station rate would provide customers with additional hydrogen fueling options.

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[8] Lundberg Survey, Survey of hydrogen retail prices in the state of California, week of September 7, 2022.

[9] H35 refers to hydrogen dispensed at a pressure of 350 bar (approximately 5,000 psi). H70 refers to hydrogen dispensed at a pressure of 700 bar (approximately 10,000 psi).

[10] Hydrogen feedstocks observed in the survey included gaseous hydrogen transport, liquid hydrogen transport, hydrogen electrolyzer, and a hydrogen pipeline. Only a single station using a hydrogen pipeline showed significantly lower costs at $15.99 per kg.

[11] California Energy Commission, *Joint Agency Staff Report on Assembly Bill 8: 2021 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California, CEC-600-2021-040* (December 2021) at 55, *available at:* https://www.energy.ca.gov/sites/default/files/2021-12/CEC-600-2021-040.pdf.

As the cost of hydrogen fuel drops, demand for hydrogen to fuel hydrogen FCEVs will likely increase, which should in turn result in additional demand for hydrogen fueling infrastructure. A 2021 Bloomberg NEF forecast states "the costs of producing green hydrogen from renewable electricity should fall by up to 85% from today to 2050, leading to costs below $1/kg ($7.4/MMBtu) by 2050 in most modeled markets."[12] Because 1 kg of hydrogen is approximately equal to a gallon of gasoline and hydrogen FCEVs are expected to be more efficient than internal combustion engines, this forecast suggests that renewable hydrogen will likely be less costly than petroleum fuels in the next thirty years.[13] Declining hydrogen prices are also reflected in fuel price forecasts used in the California Energy Commission 2020 IEPR and shown below in Figure 1 - CEC Hydrogen Fuel Price Forecast.

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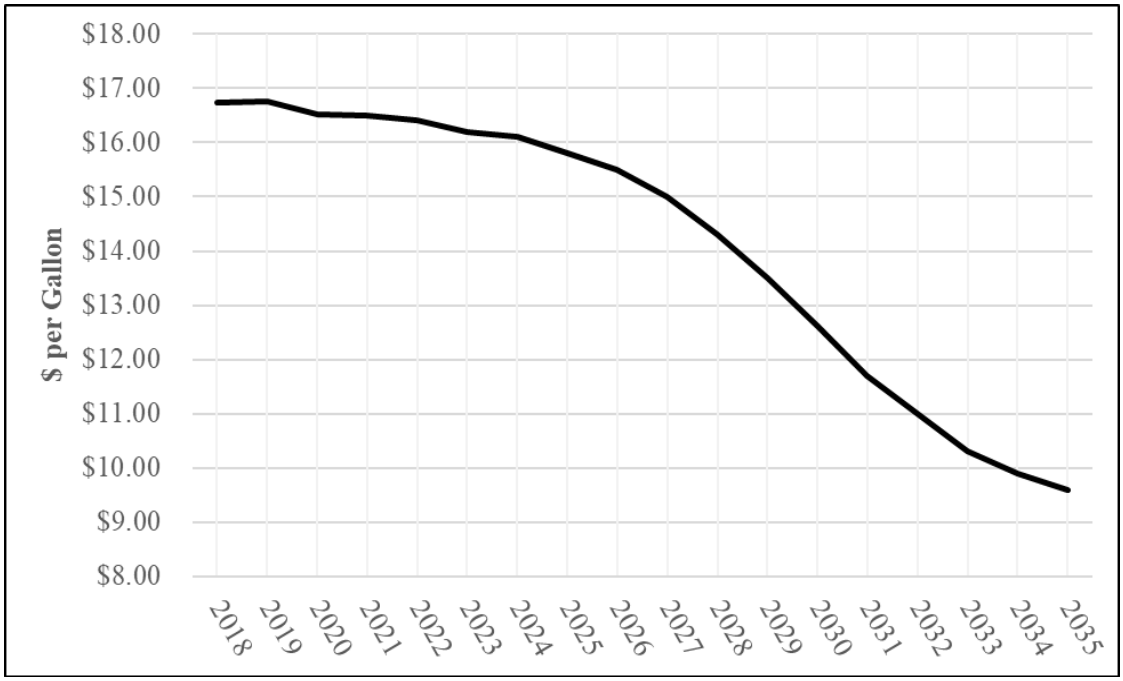
[12] Green Car Congress, *BloombergNEF Forecasts Green Hydrogen Should be Cheaper Than Natural Gas by 2050 in Some Markets; Falling Costs of Solar PV Key* (April 7, 2021), *available at:* https://www.greencarcongress.com/2021/04/20210407-bnef.html.

[13] RMI, *Run on Less with Hydrogen Fuel Cells* (October 2, 2019), *available at:* https://rmi.org/run-on-less-with-hydrogen-fuel-cells/.

Figure 1 – CEC Hydrogen Fuel Price Forecast[14]



According to the U.S. Energy Information Administration, the average cost of gasoline and diesel in California over the past three (3) years was $4.07 per gallon and $4.33 per gallon, respectively.[15] Based on the higher efficiency of fuel cell electric vehicles, this equates to hydrogen prices of $7.35 per kg when compared to diesel (fueling heavy-duty vehicles) and $10.21 per kg when compared to gasoline (fueling light- and medium-duty vehicles).[16] However, in order to accelerate adoption of hydrogen FCEVs, the cost of hydrogen fuel should

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[14] Hydrogen Fuel Price Forecasts provided by Ysbrand van der Werf, California Energy Commission Transportation Energy Forecasting Unit, November 19, 2021.

[15] U.S. Energy Information Administration, *Gasoline and Diesel Fuel Update, Weekly Los Angeles All Grades All Formulations Retail Gasoline Prices* and *Weekly California No 2 Diesel Retail Prices through September 19, 2022*, *available at:* https://www.eia.gov/petroleum/gasdiesel/.

[16] Pricing conversion based on constants established in the CARB Low Carbon Fuel Standard (LCFS) Regulation; including energy density (hydrogen = 120 MJ/kg, gasoline = 119.53 MJ/gallon, and diesel = 134.47 MJ/gallon) and hydrogen fuel cell electric vehicle EER (heavy-duty = 2.5, light- to medium-duty = 1.9)

fall below the cost of traditional fuels (gasoline and diesel) to offset the expected higher initial cost of hydrogen fuel cell electric vehicles.

SoCalGas has requested in the GRC authority to construct hydrogen fueling stations using on-site generation of hydrogen to help increase supply for consumers, avoid the risk associated with supply transport disruptions and reduce the cost of hydrogen to consumers. If the GRC request is approved, SoCalGas will require an appropriate rate design to recover costs associated with this utility service.

As these would be the first hydrogen retail fueling stations constructed and operated by SoCalGas, historical costs and volumes are unavailable for use in forecasting rates. As an alternative, SoCalGas commissioned a cost study of potential hydrogen fueling stations using a variety of feedstock and station capacities for use in establishing the new pilot hydrogen fueling station rate. In the next cost allocation proceeding, SoCalGas will review the implementation of this pilot hydrogen fueling station rate and propose any changes at that time to account for actual costs and volumes as well as any changes in the hydrogen FCEV market.

III. PROPOSAL

As noted previously, SoCalGas proposed in the 2024 GRC to own and operate FCEV fueling stations at utility operating bases that will serve both the utility fleet as well as provide access to the general public. While the capital-related costs for these stations would be embedded in SoCalGas's base margin revenue requirement, all operating costs as well as incremental revenue from the public-access operation of the retail station will be recorded in a balancing account, the Hydrogen Refueling Station Balancing Account (HRSBA), with any

surplus or shortfall balanced each year and shared with all ratepayers.[17] Any Low Carbon Fuel Standard (LCFS) or other green credit value generated by the hydrogen FCEV stations would also be credited to the HRSBA.[18]

If SoCalGas's GRC proposal is approved, SoCalGas will need to establish a rate for customers who use the public access capabilities at these new hydrogen fueling stations. SoCalGas therefore proposes in this cost allocation proceeding to establish a new rate schedule – the G-FCEV. While similar in concept to SoCalGas's G-NGV compression rate surcharge, this rate schedule will charge customers a single volumetric rate per kilogram of dispensed hydrogen.[19] For the purposes of establishing an initial, pilot hydrogen fueling station rate applicable during this cost allocation proceeding cycle, and given the uncertainty in actual station costs as well as uncertainty in relative utilization between SoCalGas fleet and the public, SoCalGas proposes to set the G-FCEV rate at the level required to collect the total estimated incremental operating costs (less LCFS credit revenue) as well as 50% of the illustrative capital costs developed in the accompanying benchmarking cost study.[20] As noted previously, all revenue received from public access utilization will be credited to the HRSBA and returned to

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[17] *See* A.22-05-015/016 (cons.) Exhibit SCG-38-R Revised Direct Testimony of Rae Marie Yu (August 2022) at RMY-20.

[18] *See* A.22-05-015/016 (cons.) Exhibit SCG-12-R Revised Direct Testimony of Armando Infanzon (August 2022) at AI-59.

[19] Similar to SoCalGas's current practice at public-access compressed natural gas vehicle stations, SoCalGas would charge customers at the point of sale using third-party credit cards, as opposed to issuing customer bills.

[20] The initial retail dispenser price does not include any applicable taxes, such as state and federal motor fuel use taxes or utility user taxes. These taxes will be applied prior to posting retail prices at the pump.

ratepayers, partially offsetting the capital costs embedded in SoCalGas's base margin revenue requirement.[21]

Since the dispenser prices will vary based on hydrogen feedstock, SoCalGas proposes to use the average dispenser cost of all hydrogen fueling stations in operation based on capacity (kg per day) and feedstock.

SoCalGas will use the hydrogen costs shown in Table 1 to calculate and establish an average dispenser cost for use at all stations.

[21] Notably, this approach is more conservative than the treatment of capital costs for similar electric vehicle charging infrastructure projects authorized under Decision (D.) 18-01-024. D.18-01-024 authorized utilities to rate-base the capital costs of electrical vehicle charging infrastructure projects and recover those costs from all ratepayers.

Table 1 – Hydrogen Costs by Feedstock

Hydrogen Feedstock	Post-LCFS Dispenser Cost[22] ($ per kg)	GHG Emission Reduction[23]
On-Site Electrolysis (grid electricity)	$14.06	34%
On-Site Electrolysis (100% renewable grid electricity)	$11.92	96%
On-Site Steam Methane Reformation (100% renewable natural gas)	$7.58	104%
Liquid Hydrogen - Transported	$9.41	38%

As an example of how the average retail dispenser cost would be calculated, assume the utility has two (2) hydrogen public access stations, each with a capacity of 1,200 kg per day. One station uses on-site electrolysis (with 100% renewable electricity) and one station uses on-site steam methane reformation (with 100% renewable natural gas). Based on the feedstock costs in Table 1 and the station capacities, the retail dispenser cost at both stations would be $9.75 per kg, which is the average of the two retail dispending costs.[24] This value would fall

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[22] Capital costs, operating costs and LCFS revenue provided by Black and Veatch, "SoCalGas Hydrogen Station Cost Study", Phase 1A Report, August 29, 2022, Table 1-1 and Table 4-3. SoCalGas G-NGV compression surcharge rate model used to develop post-LCFS dispenser costs. See Witness Workpapers for additional information on pricing calculations. Please see the Workpaper

[23] GHG emission reduction % when compared to a baseline fuel (gasoline). GHG emission reduction calculations based on current CARB LCFS Regulation, "2020_lcfs_fro_oal-approved_unofficial_06302020.pdf", Table 1, 2, and 5 as well as Black and Veatch, "SoCalGas Hydrogen Station Cost Study", Phase 1A Report, August 29, 2022, at 58 and 60. See Witness Workpapers for additional information on GHG emission calculations.

[24] Average retail dispensing cost = (1,200 kg per day * $11.92 per kg + 1,200 kg per day * $7.58 per kg)/(1,200 kg per day + 1,200 kg per day) = $9.75 per kg.

within the range required to achieve price parity with traditional fuels (gasoline, diesel). The retail dispenser cost would remain unchanged until another station was added to the portfolio and a new average retail dispenser cost was calculated.[25] Upon completion of the first hydrogen fueling station, SoCalGas would submit a Tier 2 Advice Letter establishing the rate schedule and notifying the Commission as well as customers of the initially effective retail dispenser rate. SoCalGas would submit subsequent Tier 2 Advice Letters for any additional stations that may come online before the following cost allocation proceeding.

The hydrogen feedstock listed in Table 1 is not an exhaustive list of all possible feedstocks. If SoCalGas anticipates using a feedstock not included in Table 1 in one or more hydrogen fueling stations, SoCalGas proposes to submit a Tier 2 Advice Letter requesting authority to establish an additional hydrogen feedstock for use in the establishment of average dispenser prices for use at all stations. The Tier 2 Advice Letter will include justification for the cost associated with the additional hydrogen feedstock. Likewise, if there are significant changes in the utility hydrogen fueling station costs and/or customer adoption/feedback, SoCalGas proposes to submit a Tier 2 Advice Letter to the Commission requesting authority to change existing, authorized hydrogen feedstock costs. The Tier 2 Advice Letter will include justification for the new cost and/or methodology associated with the existing hydrogen feedstock.

This new pilot hydrogen fueling station rate will be used to gather information on actual costs while also encouraging the adoption of hydrogen fuel cell electric vehicles. It is expected this rate will evolve over time as experience is gained in operating retail hydrogen stations,

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[25] The new average dispenser cost would be made effective the next month following the start of operation of the new station.

especially those stations with on-site production. SoCalGas will track actual capital costs, operating costs and revenue for use in future cost allocation proceedings.

This concludes my prepared direct testimony.

IV. QUALIFICATIONS

My name is Edwin Harte. My business address is 555 West Fifth Street, Los Angeles, California 90013-1011. I am employed by SoCalGas as the Clean Transportation Product Development Manager in the Clean Energy Innovations Department. My current responsibilities include developing and providing customers with new utility products and services to facilitate the use of hydrogen fuel cell electric vehicles, hydrogen fuel cell electric vehicle fueling stations, natural gas vehicles, and natural gas vehicle fueling stations. Additional responsibilities include management of regulatory and legislative issues impacting customers operating hydrogen and natural gas vehicles and associated fueling stations, and management of utility-owned, public access natural gas vehicle fueling stations. I have been employed by SoCalGas in numerous positions, including Associate Engineer, Region Associate Engineer, Market Advisor, Senior Market Advisor, and Low Emission Vehicle Program Manager. I have been responsible for various aspects of engineering and design, project management, sales and marketing, regulatory matters, and customer relations throughout my career. I graduated in 1989 from the University of California Los Angeles with a Bachelor of Science Degree in Mechanical Engineering and in 1997 from the University of California Los Angeles with a Master of Business Administration. I am a Professional Mechanical Engineer registered in the state of California.

I have previously testified before the California Public Utilities Commission.