

**SOUTHERN CALIFORNIA GAS COMPANY (SOCALGAS)
SIERRA CLUB DATA REQUEST 9 (SIERRA CLUB DR-09)
HYDROGEN BLENDING DEMONSTRATION APPLICATION (A.22-09-006)
DATE REQUESTED: October 6, 2025
RESPONSE DUE: October 20, 2025**

QUESTION 1:

Please refer to the Rebuttal Testimony of Blaine Waymire, at page BW-5, lines 9–10. Mr. Waymire states: “Internal research suggests turbulent flow will keep the natural gas/hydrogen blend uniformly mixed.” Please provide the internal research Mr. Waymire is referring to.

RESPONSE 1:

The internal research noted in testimony references research performed by a consortia, and the written study is available only to paying members. As a courtesy, GTI Energy was willing to share a summary (subject to confidentiality provisions) which outlines the executive summary and findings from the project, which are provided in Attachment 01. In sum, the study analyzes natural gas and hydrogen blend separation at 10% and 20% hydrogen by volume under worst case, i.e., stagnant, conditions. The study shows that even under worst case (stagnant) conditions, all differences in gas separation were within the sensor accuracy range.¹ Thus, no significant segregation phenomenon was observed.² The proposed demonstration project in Orange Cove is only blending up to 5% hydrogen by volume, which suggests less potential for separation due to the lower quantity of hydrogen in the mixture. Therefore, under flow conditions (turbulent and laminar), natural gas/hydrogen blends are expected to remain mixed.

¹ GTI: Investigate the Nature and Impacts of Hydrogen Segregation and Stratification in Customer Networks, at 1

² *Id.*

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QUESTION 2:

Please refer to the Rebuttal Testimony of Blaine Waymire, at page BW-5, lines 15–16. Mr. Waymire states: “Research and engineering principles suggest that” dilution of the hydrogen blend will not occur. Please identify the research and engineering principles that Mr. Waymire is referring to.

RESPONSE 2:

Please see response to Question 1 regarding research indicating that once blended, hydrogen and natural gas do not segregate significantly. “Engineering principles” also refers to the notion that flow would be present in the natural gas distribution system, and that the system would not remain stagnant. Whether turbulent or laminar, gas flow would further promote movement of gas constituent molecules. Typically, blending skids incorporate beveled pipe to incite turbulent flow, which promotes mixing of constituents in the gas stream. Once mixed, turbulent (commonly seen in distribution) or laminar flow regimes would keep the gas constituents mixed. Even further, as referenced in Response 1, even under stagnant conditions, hydrogen blends are not expected to segregate significantly.

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QUESTION 3:

Please refer to the Rebuttal Testimony of Blaine Waymire, at page BW-12, lines 10–11. Mr. Waymire refers to: “SoCalGas’s proposal to establish a baseline of zero leaks through upfront leak surveys, and repair any identified leaks if present prior to the introduction of hydrogen into the system.”

- a. Please identify the expected costs of (i) the upfront leak survey, and (ii) repair of any identified leaks prior to introduction of hydrogen.
- b. Does SoCalGas anticipate that it would conduct an upfront leak survey and repair of any identified leaks on all portions of its distribution system prior to implementing a systemwide hydrogen blend?

RESPONSE 3:

- a.** (i) SoCalGas estimates costs for the incremental leak survey included in the project to be based on estimated hourly employee rates and estimated working time. With these parameters, SoCalGas estimates that an upfront leak survey for the project may range from \$800 to \$7,000 depending on pipeline lengths, remediation, and conditions. As with the cost estimates provided in testimony, these are Class 5 estimates.

(ii) Costs for leak repair can vary greatly based on condition or complexity of repairs required or terrain. SoCalGas notes additionally that repair of identified leaks prior to the introduction of hydrogen are not included in the cost estimates provided in the application as SoCalGas has separate obligations through existing standards to address leaks.
- b.** SoCalGas objects to this request on the grounds it is outside the scope of this proceeding as determined in the June 12, 2025 Assigned Commissioner’s Scoping Memo and Ruling and, accordingly, this request is not consistent with Rule 10.1 of the Commission’s Rules of Practice and Procedure. SoCalGas also objects to this request on the grounds it calls for SoCalGas to speculate as to what it may propose in the future, if the Commission were to approve a systemwide hydrogen blend. Subject to and without waiving the foregoing objections, SoCalGas responds as follows.

SoCalGas cannot opine on future leak survey and repair practices for a systemwide hydrogen blend at this time. SoCalGas expects that the process would be similar to that of biomethane injection, where SoCalGas performed system analyses before injecting

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biomethane into its distribution system.³ System analyses conducted prior to interconnection with a hydrogen source can further inform needs for additional leak surveys or material repair.

³ Prepared Rebuttal Testimony of Blaine Waymire on Behalf of Southern California Gas Company, BW-27

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QUESTION 4:

Please refer to the Rebuttal Testimony of Blaine Waymire, at page BW-22, lines 2–3. Mr. Waymire states: “Because of the prevalence of pre-mix burner conditions in common residential and commercial appliances in California, research suggests that hydrogen blends up to 20% will actually create a reduction or steady state presence of NOx rather than an increase in standard appliances.”

- A. Of the following categories of residential and commercial appliances, please identify the ones that. Waymire was referring to when he testified that pre-mix burner conditions are common in “residential and commercial appliances”: (i) stoves/cooktops, (ii) furnaces, (iii) boilers, (iv) water heaters, (v) clothes dryers.
- B. What is SoCalGas’ estimate for the percentage of residential appliances currently in use in California that have pre-mix burners? Please provide the basis for your estimate and a breakdown of the data for the following categories: stoves/cooktops, furnaces, boilers, water heaters, and clothes dryers.
- C. What is SoCalGas’ estimate for the percentage of residential appliances currently in use in Orange Cove that have pre-mix burners? Please provide the basis for your estimate and a breakdown of the for the same categories in Question 1(b).
- D. If SoCalGas does not have the information requested in Questions 1(b) or 1(c), please specify what Mr. Waymire means by “prevalence” and the basis for his statement that pre-mix burner conditions in common residential appliances in California are “prevalent.”

RESPONSE 4:

- A. Pre-mix and partially pre-mix gas burners work by mixing fuel and air before ignition. According to the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), most fuel-fired equipment in North American buildings use partially-premixed combustion approaches.⁴ Further, where there are stringent air quality regulations requiring low-NOx or Ultra low-NOx burners, these are typically of the pre-mix or partially pre-mix burner configuration. SoCalGas cannot guarantee or confirm the existence of every burner type for each piece of equipment listed. However, SoCalGas provides the

⁴ See AHRI: Role of Combustion-Based Building Equipment in Decarbonization, available at <https://www.ahrinet.org/system/files/2023-06/AHRI%208030%20Final%20Report.pdf>; at 87

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following response based on general knowledge/experience with existing end use equipment, air quality standards, and the reference from AHRI noted above:

- (i) stoves/cooktops: typically partially premixed or premixed burners. However other burner types may exist dependent on specific make or model;
- (ii) furnaces: Typically partially premixed or premixed burners are used in order to meet South Coast Air Quality Management District (SCAQMD) or San Joaquin Valley Air Pollution Control District (SJVAPCD) emissions requirements;
- (iii) boilers: see response to 4.a.ii
- (iv) water heaters- see response to 4.a.ii
- (v) clothes dryers: Typically partially premixed or premixed burners.

- B. SoCalGas does not have a means for estimating the percentage of residential appliances currently in use in California that have pre-mix burners. However, as noted above, AHRI indicates that most fuel-fired equipment in North American buildings use partially-premixed combustion approaches.⁵ Further, these burner types are utilized to obtain low-NOx or ultra low-NOx emissions ratings to meet California's air quality management agencies' requirements to operate space and water heating equipment in their region. These requirements are outlined further in response to Question 5, below.
- C. As noted in a prior data request to Sierra Club: "SoCalGas has not compiled a comprehensive inventory of all gas equipment in the community that will receive the blend."⁶ Without having compiled an inventory of all gas equipment, SoCalGas cannot determine the nature of their burner types.
- D. See response to Question 4A. The statement regarding the prevalence of pre-mix burner designs is based on a report compiled by AHRI and the Low-NOx burner requirements for space and water heating equipment in SCAQMD and SJVAPCD territories. Low-NOx burners for common residential appliances are generally of the partially pre-mix or pre-mix burner design to control air-fuel ratios.

QUESTION 5:

Please refer to the Rebuttal Testimony of Blaine Waymire, at page BW-21, lines 15–19, where Mr. Waymire states: "California, particularly the South Coast Air Quality Management District and San Joaquin Valley Air Pollution Control District, have very strict emissions limits

⁵ *Id.*

⁶ See Sierra Club DR-04; available at https://www.socalgas.com/sites/default/files/2025-06/A.22-09-006_Sierra_Club_DR-04_Response_Final_Redacted_.pdf; Response 28

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for stationary combustion equipment, most notably for NOx emissions. These strict limits have created the need and a market for low-NOx burners in combustion equipment, including common appliances.”

- a. Please identify the specific stationary source emissions limits that Mr. Waymire is referring to.
- b. For each of the emissions standards that Mr. Waymire is referring to, please identify what year the standard took effect.
- c. Are the “very strict emissions limits” referenced by Mr. Waymire referring specifically to the South Coast Air Quality Management District 2022 Air Quality Management Plan cited in footnote 88?

RESPONSE 5:

- a. Below are specific stationary source emissions limits for common appliances

Air District Rule	Appliance Type	Year Rule Amended	NOx Limit* (nanograms/Joule)
South Coast AQMD Rule 1111	Residential Furnace	September 1, 2023	14
South Coast AQMD Rule 1121	Residential Water Heater	September 3, 2004	10
South Coast AQMD Rule 1146.2	Instantaneous Water Heater	June 7, 2024	14
South Coast AQMD Rule 1146.2	Pool Heater	June 7, 2024	40
San Joaquin Valley APCD 4905	Residential Furnace	March 21, 2024	14
San Joaquin Valley APCD Rule 4902	Residential Water Heater	March 19, 2009	10
San Joaquin Valley APCD Rule 4902	Instantaneous Water Heater	March 19, 2009	14
San Joaquin Valley APCD Rule 4902	Pool Heater	March 19, 2009	40

* NOx limit as of October 2025

- b. See response to (a) above.
- c. Reference to the South Coast Air Quality Management District (SCAQMD) 2022 Air Quality Management Plan was intended to highlight SCAQMD’s plan to reduce and control emissions in its territory. SCAQMD traditionally sets policies and requirements

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that are performance-based and plans to rely on zero emission and ultra-low NOX technologies.⁷

⁷ 2022 South Coast Air Quality Management District's Air Quality Management Plan, Chapter 4 – Control Strategy and Implementation, available at: https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/07-ch4.pdf?sfvrsn=9dc5bd61_6

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QUESTION 6:

Please refer to the Rebuttal Testimony of Chris Gilbride, at page CG-7, lines 1–4, where Mr. Gilbride states: “SoCalGas partnered with UC Irvine and its National Fuel Cell Research Center in 2016 to implement the United States’ first successful power-to-gas project, which blended clean renewable hydrogen into a natural gas pipeline to help power parts of the UC Irvine campus.”

- a. What percentage hydrogen blends were used in the project referenced by Mr. Gilbride?
- b. What was the duration in time of the referenced project?
- c. What end uses did the referenced project supply blended hydrogen to?
- d. What materials and vintages of pipe received the hydrogen blend in the referenced project?
- e. If the project supplied hydrogen blended gas to a fuel cell, please identify the make, model, and manufactured year of the fuel cell.

RESPONSE 6:

- a. Please see response to SIERRA CLUB DR-04 in A-22-09-006, Question 4. 3.4% hydrogen by volume was safely blended.⁸
- b. Duration disclosed in Attachment 4a, include a 100 Hour run, 600 Hour run, and 1,000 Hour run executed safely.⁹
- c. According to Attachment 4a in SIERRA CLUB DR-04 in A-22-09-006, the end use receiving the hydrogen blend was the UCI Central Plant’s combustion turbine, which operated safely and reliably for the duration of the project.¹⁰
- d. SoCalGas does not currently have access to the vintage or materials of UCI’s gas pipelines on their campus that were involved for the purposes of this demonstration.
- e. See response to Question 6.C.

⁸ SIERRA CLUB DR-04 in A-22-09-006, Response 4; available at https://www.socalgas.com/sites/default/files/2025-06/A.22-09-006_Sierra_Club_DR-04_Response_Final_Redacted_.pdf;

⁹ Id. Attachment 4a, P. 38

¹⁰ Id. Attachment 4a, P.10