

Company: Southern California Gas Company (U 904 G)
Proceeding: Hydrogen Blending Demonstration Projects
Application: A.22-09-006
Witness: B. Waymire
Chapter: 10

PREPARED REBUTTAL TESTIMONY OF
BLAINE WAYMIRE
ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

September 29, 2025

Executive Summary

I hereby submit this prepared rebuttal testimony in response to intervenor critiques of Southern California Gas Company's (SoCalGas) proposed hydrogen blending demonstration projects in Orange Cove and at University California, Irvine (UC Irvine or UCI). These projects were developed in alignment with CPUC Decision D.22-12-057, which calls for real-world demonstrations to inform the development of a statewide hydrogen injection standard. The testimony emphasizes that the proceeding is not intended to debate the policy of hydrogen blending, but rather to evaluate the technical, safety, and community engagement aspects of the proposed pilots.

The Orange Cove project is designed as a closed system with a single gas feed, allowing for uniform hydrogen dilution. SoCalGas plans to validate this occurrence with strategically placed measurement devices and third-party oversight. Both projects will use clean renewable hydrogen generated via solar-powered electrolysis, with systems sized specifically for operational demand. The company has cataloged and reviewed the pipeline materials involved with the proposed demonstration projects to better understand any impacts to the pipeline system and will implement engineering safeguards where necessary.

Safety protocols include enhanced leak detection, monthly and quarterly surveys, odorant efficacy testing, and continuous monitoring at hydrogen production sites. SoCalGas has proposed robust stakeholder engagement and community outreach for both projects, particularly in Orange Cove, a disadvantaged community. Benefits that could accrue to the community if the demonstrations are approved include use of solar and battery infrastructure which may be given to the City at the conclusion of the project, awareness of appliance upgrade programs for qualifying customers, and enhanced safety monitoring. The company also addresses concerns about hydrogen embrittlement, appliance performance, and NOx emissions, citing research that supports the safety and environmental viability of the percentage hydrogen blends being proposed.

The pilots are designed to provide localized operational data on key topics addressed by prior studies, such as the UC Riverside Hydrogen Impact Study. They will validate research under California-specific conditions, including appliance emissions and pipeline behavior. Baseline metrics will be established before hydrogen injection, and success will be measured by

completion of the proposed demonstrations, the completion of a final report that contains data collected in alignment with the Data Collection Plan, and continued engagement within the project communities. The pilots are prudent investments that offer ratepayer benefits, including data to inform future standards for hydrogen use in natural gas pipeline infrastructure and infrastructure improvements.

In conclusion, the CPUC should approve the demonstration projects because they meet regulatory requirements, prioritize safety, engage communities, and would contribute meaningfully to advancing California's decarbonization goals.

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1 **PREPARED REBUTTAL TESTIMONY OF BLAINE WAYMIRE**
2 **ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY**

3 **I. INTRODUCTION**

4 My prepared written rebuttal testimony responds to intervenor testimony addressing
5 topics that are scoped into the proceeding pursuant to the Assigned Commissioner’s Scoping
6 Memo and Ruling dated June 12, 2025, i.e., those that pertain to the projects SoCalGas proposed
7 in the Amended Application in this proceeding, pursuant to the Decision Directing Biomethane
8 Reporting and Directing Pilot Projects to Further Evaluate and Establish Pipeline Injection
9 Standards for Clean Renewable Hydrogen, Decision (D.) 22-12-057 (Decision).

10 The demonstrations proposed in the Amended Application in this proceeding are
11 pursuant to the Commission’s consistent directives to the Joint Utilities over the years in the
12 *Order Instituting Rulemaking to Adopt Biomethane Standards and Requirements, Pipeline Open*
13 *Access Rules, and Related Enforcement Provisions*, Rulemaking (R.) 13-02-008 (Biomethane
14 Rulemaking) to support the Commission’s development of an injection standard for the blending
15 of renewable gases, including hydrogen, into the existing natural gas system.

16 With respect to renewable hydrogen specifically, in the July 5, 2018 Assigned
17 Commissioner’s Scoping Memo and Ruling in the Biomethane Proceeding, Commissioner
18 Clifford Rechtschaffen noted, “[i]n accordance with Section 399.24 and with Executive Order B-
19 48-18 issued on January 26, 2018, it is my future intention to consider issues within this, or a
20 successor proceeding, that pertain to the safe, cost-effective development of other renewable
21 gases, such as renewable hydrogen.”¹

22 Thereafter, on November 21, 2021, in the Assigned Commissioner’s Scoping Memo and
23 Ruling Opening Phase 4 of Rulemaking 13-02-008, Commissioner Rechtschaffen recounted the
24 reasons why “[t]his proceeding will provide the opportunity to expand hydrogen use to offset the
25 use of fossil fuels by establishing standards and interconnection protocols for injecting renewable
26 hydrogen into natural gas pipelines,”² including that “California has been advancing the

¹ R.13-02-008, Assigned Commissioner’s Phase 3 Scoping Memo and Ruling at 7 (March 13, 2023).

² R.13-02-008, Assigned Commissioner’s Scoping Memo and Ruling Opening Phase 4 of Rulemaking 13-02-008 (November 21, 2019) (Phase 4 Scoping Ruling) at 1.

1 deployment of hydrogen throughout the state as a zero-emissions fuel.”³ Since that time, the
2 2022 CARB Scoping Plan, which serves as the state’s comprehensive strategy for achieving its
3 greenhouse gas emissions reduction goals, echoed the role that renewable hydrogen could play in
4 decarbonization.⁴

5 The Phase 4 Scoping Ruling also acknowledged, consistent with SoCalGas’s and
6 SDG&E’s recommendation at the time, that “more technical expertise is needed to determine the
7 maximum safe level of hydrogen blend in pipelines” and, accordingly, ordered Energy Division
8 to “arrange, and oversee an independent technical study to address the potential impacts of
9 increased hydrogen concentration in California’s natural gas storage and delivery system”⁵—
10 which resulted in the UC Riverside Study.

11 In the Decision, the Commission found, among other things, that: Senate Bill “1075
12 requires the evaluation of the role of green hydrogen in achieving California’s climate
13 objectives;”⁶ “[t]o address knowledge gaps in several areas, the UC Riverside Study emphasizes
14 the need to conduct real world demonstrations of hydrogen blending under safe and controlled
15 conditions;”⁷ “[t]he UC Riverside Study provides support for pursuing hydrogen blending as part
16 of a decarbonization strategy, while at the same time, outlining thoughtful and prudent steps
17 before establishing a system wide injection standard;”⁸ and “[a]dditional testing through pilot
18 hydrogen blending projects is needed, as discussed in this decision, to continue the process that
19 began in D.14-02-034 to establish safe injection standards for all identified constituents of
20 concern using best scientific data.”⁹ The Decision further states that “[b]roader policy issues

³ *Id.* at 6.

⁴ California Air Resources Board, *2022 Scoping Plan for Achieving Carbon Neutrality* (December 2022) at 78 (“Injecting up to 20 percent hydrogen into the existing natural gas system is being explored as a transitional strategy to reduce the carbon intensity of gas used in buildings and industry.”).

⁵ R.13-02-008, Phase 4 Scoping Ruling at 13. The Joint IOUs were also ordered to submit an application that included, among other things, a preliminary renewable hydrogen injection standard; however, the Joint IOUs did not believe they had sufficient information at the time to do so. The subsequent UC Riverside Study and Compendium Report have provided additional information since that time.

⁶ D.22-12-057 at 54 (Finding of Fact (FOF) 3).

⁷ *Id.* at 56 (FOF 14).

⁸ *Id.* at 57 (FOF 19).

⁹ *Id.* at 59 (FOF 36).

1 related to long term gas planning, including the potential role of clean renewable hydrogen, are
2 being addressed in R.20-01-007 (as well as other agency processes, including implementation of
3 SB 1075)”¹⁰ and “SB 1075 (Skinner, 2022) requires CARB, in conjunction with the CPUC and
4 the CEC, to provide policy recommendations on the use of hydrogen to help achieve California’s
5 climate, clean energy, and clean air objectives.”¹¹ Accordingly, the Decision concludes “[t]he
6 Commission should direct the Joint Utilities to file a joint application for testing of hydrogen
7 blended into natural gas concentrations above the existing trigger level in increasing increments
8 from 0.1 to five and five to twenty percent”¹² and “[t]he Joint Utilities should propose hydrogen
9 blending pilot projects, taking into account the findings and recommendations of the UC
10 Riverside Study, existing and ongoing hydrogen research, development, and demonstration
11 activities, and stakeholder feedback as well as all guidance set forth in this decision.”¹³ Based on
12 the foregoing, the Decision orders, “[w]ithin two years from the issuance of this decision, [Joint
13 Utilities] shall file a new application or amend an existing application in an appropriate
14 proceeding proposing pilot programs to test hydrogen blending in natural gas at concentrations
15 above the existing trigger level...” consistent with the requirements set forth in the Decision.¹⁴

16 The Joint IOUs filed such an application consistent with the Decision, i.e., the Amended
17 Application in this proceeding. The Scoping Memo, consistent with both the Phase 4 Scoping
18 Ruling and the Decision, recognizes that the purpose of this proceeding is not to challenge the
19 policy of hydrogen blending, but rather to identify demonstrations that could further inform the
20 development of a proposed renewable hydrogen injection standard. Accordingly, it does not
21 scope into this proceeding the question of whether blending hydrogen into the natural gas system
22 should be conducted as a matter of policy.¹⁵ Notably, the Scoping Memo states that the issues
23 identified to be within the scope of this proceeding are based on the record of the proceeding to
24 date, including but not limited to “the extensive briefing associated with the [Motion to
25 Dismiss]” filed by certain intervenors, which included, among others, arguments regarding the

¹⁰ *Id.* at 59 (FOF 39).

¹¹ *Id.* at 60 (FOF 45).

¹² *Id.* at 60 (Conclusion of Law (COL) 4).

¹³ *Id.* 61 (COL 7).

¹⁴ *Id.* at 69-70 (OP 7).

¹⁵ *See* Assigned Commissioner’s Scoping Memo and Ruling (June 12, 2025) at 11-13.

1 policy of blending hydrogen into the natural gas system—the same testimony that is offered
2 extensively in intervenor testimony.¹⁶ It is evident that the policy, and the role of clean
3 renewable hydrogen in California, is driven by the Legislature, CARB, the CEC, and this
4 Commission. While there may be proceedings in the future where parties may comment on
5 hydrogen blending into the natural gas system as a matter of policy, this is not that proceeding.¹⁷

6 Accordingly, SoCalGas does not address intervenor testimony challenging hydrogen
7 blending as a matter of policy; it is outside the scope of this proceeding and SoCalGas will, at the
8 appropriate time, object to introducing proffered evidence on such extraneous topics into the
9 record in this proceeding.

10 **II. Scoping Issue 1: Do the pilots conform to regulatory requirements?**

- 11 ***a. How does each pilot comply with specific requirements set forth in Public***
12 ***Utilities Code and D.22-12-057?***
- 13 ***b. If there are any exemptions or waivers being requested for any pilot project,***
14 ***are there sufficient justification?***
- 15 ***c. Does each pilot project align with broader state energy and climate goals? If***
16 ***so, how?***

17 **A. Scoping Issue 1a: SoCalGas’s Proposed Demonstration Projects Comply with** 18 **D.22-12-057**

19 **1. SoCalGas’s Proposed Project in Orange Cove Adequately Consider** 20 **Dilution Rate of Hydrogen Blends (OP7a)**

21 Leadership Counsel for Justice and Accountability (LCJA) indicates that SoCalGas’s
22 Orange Cove Project does not adequately consider dilution rate of the hydrogen blend across the
23 distribution system.¹⁸ They note that a gas measurement analyzer unit located at the blending
24 skid and select points throughout the system does not provide assurance or verification that the
25 blended gas will remain uniform and well mixed.¹⁹ However, because the system is isolated,

¹⁶ See Assigned Commissioner’s Scoping Memo and Ruling (June 12, 2025) at 5-6.

¹⁷ The Phase 4 Scoping Ruling additionally identifies that “both potential environmental benefits and potential impacts on ratepayers” will be considered in connection with “the Commission’s determination of an appropriate standard for injection of hydrogen.” R.13-02-008, Phase 4 Scoping Ruling at 8-9.

¹⁸ Prepared Direct Testimony of Clayton Bodell on behalf of Leadership Counsel for Justice & Accountability and Orange Cove United (jointly, OCU/LCJA) (hereinafter “Exhibit (Ex.) OCU/LCJA 2”) at 1.

¹⁹ *Id.*

1 with only one feed into the system, the gas flowing into the system will be blended to the
2 designated percentage via a blending skid.²⁰ The gas measurement analyzer will measure and
3 confirm the hydrogen blend percentage as it leaves the blending skid. Once entering the system,
4 the blended gas will not be introduced into other streams of natural gas entering the system, as
5 there is only one feed into the system, as indicated earlier. Because there are several end users
6 throughout the Orange Cove community, the gas is continuously flowing and does not stay
7 stagnant within the system. Once under flow, the gas mixture will experience turbulent flow,
8 which is the most common flow regime experienced in the natural gas distribution system.
9 Internal research suggests turbulent flow will keep the natural gas/hydrogen blend uniformly
10 mixed. As outlined in testimony, a detailed data collection plan, which includes specific
11 monitoring points in the system, will be developed alongside an independent third party upon
12 application approval.²¹ This will advise the appropriate location and number of such
13 measurement devices. Lastly, this very topic is one of the objectives of the demonstration--to
14 verify whether there are changes to dilution rates throughout various points in a gas distribution
15 system as the gas travels more broadly. Research and engineering principles suggest that this
16 phenomenon would not occur, and this demonstration aims to validate this notion.

17 **2. Both of SoCalGas's Proposed Demonstration Projects Would Use** 18 **Clean Renewable Hydrogen**

19 Most intervenors correctly acknowledge that SoCalGas's Orange Cove Project proposes
20 to use clean renewable hydrogen, as defined in D.22-12-057.²² Sierra Club, however, questions
21 whether the Orange Cove project will use clean renewable hydrogen on the notion that the
22 electrolyzer would be connected to the electric grid, which, according to Sierra Club, may
23 contain fossil resources as a feedstock. This is a misguided assumption. Chapter 2 testimony
24 clarifies that the solar array is interconnected to the electric grid for the purposes of over

²⁰ Prepared Direct Testimony of Blaine Waymire on behalf of SoCalGas (SoCalGas's Hydrogen Blending Demonstration - Open System Project), Chapter 2 (hereinafter "Joint Utilities Chapter (Ch. 2)") at 3.

²¹ Joint Utilities Ch. 2 (SoCalGas, Waymire) at 14, 19.

²² Public Advocates Office (Cal Advocates) Prepared Testimony on Application of Southern California Gas Company, San Diego Gas & Electric Company, Pacific Gas and Electric Company, and Southwest Gas Corporation to Establish Hydrogen Blending Demonstration Projects (hereinafter "Cal Advocates Testimony") at 1-8; Rebuttal Testimony of Robert Freehling on behalf of Wild Tree Foundation (WTF) (hereinafter "Ex. WTF-01") at 9.

1 production, i.e., if the solar array produces more electricity than is needed to operate the
2 electrolyzer, that excess will be contributed to the electric grid. From this perspective, the
3 electrolyzer is not intended to utilize electricity from the grid. SoCalGas has preliminarily
4 designed the solar array to cover the entirety of the load of the electrolyzer, and all associated
5 auxiliary equipment, including compression, storage, blending, and controllers. Therefore, and
6 particularly when coupled with the battery storage system, SoCalGas fully expects the electricity
7 produced from the solar array will exceed the electricity consumed by the electrolyzer.

8 Sierra Club and Wild Tree Foundation (WTF) further question whether SoCalGas's
9 proposed project on the campus of University of California, Irvine (UC Irvine or UCI) would
10 utilize clean renewable hydrogen.²³ This position is based on the notion that the solar array and
11 electrolyzer will be interconnected to UC Irvine's campus microgrid, which includes a
12 combustion turbine. This is another misguided assumption. SoCalGas has carefully sized the
13 proposed solar array so that its electrical production would offset the load of the proposed
14 electrolyzer. Each component will be individually metered so that the renewable energy
15 production is validated against the electrolyzer's consumption. For example, preliminary
16 calculations indicate that the solar array will produce 467.5 MWh of energy over the 18-month
17 period, which more than offsets the energy use of the electrolyzer. The electrolyzer and
18 auxiliary equipment combined are calculated to consume approximately 458 MWh over 18
19 months. In this case, UC Irvine's microgrid is acting as an energy storage medium for the
20 production of the solar array. SoCalGas will individually meter the solar array production and
21 electrolyzer electricity and water consumption. Lastly, while SoCalGas pursued clean renewable
22 hydrogen use for its proposed demonstration projects, clean renewable hydrogen use was not a
23 decision requirement regardless of intervenor's stance on the projects' hydrogen source.²⁴

24 **3. SoCalGas Has Documented Key Components of Its Proposed**
25 **Demonstration Projects to Better Understand Long Term Safety of**
26 **the Gas Pipeline System. (OP7a)**

27 LCJA asserts that SoCalGas has not ensured long term safety of the gas pipeline system

²³ Prepared Testimony of Sara Gersen on behalf of Sierra Club on the Joint Amended Application to Establish Hydrogen Blending Demonstration Projects (hereinafter "Ex. SC-01") at 196; Ex. WTF-01 (Freehling) at 9.

²⁴ Joint Opposition of Southern California Gas Company, San Diego Gas & Electric Company, Pacific Gas and Electric Company, and Southwest Gas Corporation to Joint Motion to Dismiss at 16.

1 because they have not catalogued and disclosed the materials and components of the pipeline
2 infrastructure involved in the demonstration projects.²⁵

3 SoCalGas has performed an initial analysis of the existing pipeline materials in the area,
4 which are catalogued as follows:

5 UCI

6 Approximate total length of existing polyethylene pipe by year installed, to the 100th
7 decimal of mileage.

8 **Table 1: Existing PE Pipe Involved For Proposed Project at UC Irvine**

Installation Year	Total Mileage
1999	0.52
2003	0.51
2005	0.01
2019	0.02

9
10 Orange Cove²⁶

11 Approximate total length of existing steel pipe by year installed, to the 100th decimal of
12 mileage.

13 **Table 2: Existing Steel Pipe Involved For Proposed Project in Orange Cove**

Installation Year	Total Mileage
1946	7.68
1947	1.19
1948	0.73
1949	0.31
1950	0.13
1951	0.04
1952	0.17
1954	0.07

²⁵ Ex. OCU/LCJA 2 (Bodell) at 3.

²⁶ See Sierra Club Data Request 6 (SIERRA CLUB DR-06) Response 8, available at:
https://www.socalgas.com/sites/default/files/2025-06/A.22-09-006_Sierra_Club_DR-06_Response_%20Final.pdf.

1955	0.03
1956	0.06
1958	0.03
1959	0.01
1960	0.04
1961	0.18
1962	0.11
1963	0.08
1964	0.52
1965	0.07
1966	0.04
1967	0.05
1969	0.16
1971	0.02
1972	0.08
1978	<0.00
1984	<0.00
1999	<0.00
2006	0.01
2014	<0.00
2017	0.38

Approximate total length of existing PE plastic pipe by year installed, to the 100th decimal of mileage; includes non-Aldyl-A plastic pipe installed after 1992.

Table 3: Existing PE Pipe Involved For Proposed Project in Orange Cove

Installation Year	Total Mileage
1993	0.75
1994	0.08
1995	0.51
1997	0.29
1999	0.08
2000	0.97
2002	0.29
2005	0.82
2006	0.70
2007	1.15
2008	0.65
2009	<0.00
2013	0.05

2014	0.08
2015	0.36
2017	0.01
2022	0.12

Approximate total length of existing Aldyl-A pipe by year installed, to the 100th decimal of mileage; includes plastic pipe installed from late 1960s to 1992.

Table 4: Existing Aldyl-A Pipe Involved For Proposed Project in Orange Cove

Installation Year	Total Mileage
1973	0.19
1975	0.16
1976	0.04
1980	0.03
1981	0.05
1982	0.05
1983	0.24
1984	0.37
1986	0.09
1987	0.03
1990	0.04
1991	0.36

SoCalGas has a strong foundation and understanding of the materials in its distribution system, and extensive knowledge on impacts to components with hydrogen blends up to 20%. As such, SoCalGas will develop appropriate engineering solutions and mitigation strategies, if necessary, for system components that may require additional safeguards when hydrogen blends are introduced.

4. SoCalGas’s Orange Cove Project Conforms to the Definition of a “Closed System”

Several intervenors assert that SoCalGas’s proposed project in Orange Cove violates decision requirements because it is “not in a closed system” nor in a “mock up of a real world system.”²⁷ As explained in the Joint Utilities’ opposition to the motion to dismiss, the proposed project is indeed a closed system.²⁸ The project area is served by a single natural gas feed into

²⁷ Ex. SC-01 (Gersen) at 69; Cal Advocates Testimony at 1-2.

²⁸ Joint Opposition of Southern California Gas Company, San Diego Gas & Electric Company, Pacific Gas and Electric Company, and Southwest Gas Corporation to Motion to Dismiss (July 30, 2024) at 12.

1 the system, where one singular regulator station regulates a high pressure supply line down to a
2 medium pressure distribution system. Due to the pressure differential across the regulator
3 station, and the singular feed into this portion of the distribution system, this area is closed off to
4 the broader natural gas pipeline system. Further, part of the project design will incorporate back
5 flow prevention measures so that hydrogen blends would not be able to flow back into other
6 portions of the broader natural gas pipeline system. These features render it an isolated or
7 “closed system” as contemplated by the Decision. The proposed project in Orange Cove is titled
8 the “Open System Project” not because it *is* an open system, but rather because it is intended to
9 demonstrate how blending could work in the natural gas distribution system as a whole, i.e., in
10 an open system. A demonstration without end uses for distribution system projects like Orange
11 Cove and UC Irvine would not result in key data collection pieces, such as appliance emissions
12 and performance. Lastly, witnesses from Sierra Club contend that “it is questionable that pilots
13 testing such a limited amount of pipelines and equipment will provide sufficient data to
14 extrapolate to the entire gas system”²⁹ while also indicating that “Performing research in a small
15 closed system or mock-up would reduce the potential scale of risks to public health and safety,
16 utility infrastructure, and customer property.”³⁰ It appears that no matter the size of the scale of
17 the demonstration, that either scenario will not be satisfactory to some intervenors.³¹

18 **5. SoCalGas Proposes Robust Leak Detection Protocols, Which Will Be** 19 **Coordinated with an Independent Third Party (OP7k)**

20 SoCalGas has proposed various leak detection protocols for each of its proposed
21 demonstration projects, which includes continuous monitoring of the hydrogen production and
22 blending facilities, use of odorant (while validating odorant efficacy), and distribution pipeline
23 and meter surveys. The proposed distribution pipeline and meter leak surveys would be

²⁹ Prepared Testimony of Rick Brown on behalf of Sierra Club on the Joint Amended Application to Establish Hydrogen Blending Demonstration Projects (hereinafter “Ex. SC-02”) at 13.

³⁰ Ex. SC-01 (Gersen) at 69.

³¹ This is emblematic of a broader, consistent issue in intervenor testimony: parties criticize the proposed projects, but they offer no constructive solutions to make the projects better designed to serve the purpose that was ordered in the Decision—namely, to propose demonstration projects that ultimately would enable proposal by the Joint IOUs of a hydrogen blending injection standard. This proceeding does not concern discretionary projects where intervenors can merely poke holes in the project to demonstrate a lack of prudence; these projects were proposed at the direct request of this Commission. If intervenors expect to contribute substantially to this proceeding and any resulting decision, they, too, should be responsive to the directive that led to this proceeding.

1 conducted on a monthly basis for the project at UC Irvine, and on a quarterly basis for the project
2 in Orange Cove. While intervenors summarize these plans as insufficient, claiming that methods
3 for odorant testing are not disclosed,³² base line leak rates are not measured,³³ leak detection
4 equipment is not disclosed and may not be compatible with hydrogen blends,³⁴ and that the
5 proposed frequency is insufficient to maintain safety.³⁵ SoCalGas respectfully responds that the
6 proposed approach reflects a thoughtful and safety focused strategy. The protocols, as described
7 in more detail below, are designed to align with the objectives of the Decision to incorporate best
8 practices for monitoring and mitigation in real-world conditions.

9 Odorant Testing Methods

10 As outlined in Chapter 1 and Chapter 2 testimony, SoCalGas proposes to perform odorant
11 sampling on a monthly basis to confirm that hydrogen does not affect the efficacy of the current
12 natural gas odorant.³⁶ SoCalGas intends to utilize existing practices for confirming odorant
13 efficacy in natural gas for these processes, which may include use of an odorometer or a physical
14 sniff test. A number of research studies and demonstration projects alike have shown that
15 common odorants that are used in California's system are compatible with hydrogen blends up to
16 20%.³⁷ This includes tetrahydrothiophene (THT) which is used alongside tert-butyl mercaptan
17 (TBM) in California's existing gas system.³⁸ Further, SoCalGas evaluates the odorant efficacy
18 of a 20% hydrogen blend at its Hydrogen Innovation Experience³⁹ and has found no impact to
19 odorant efficacy. All data collection plans, including means for testing odorant efficacy, will be

³² Ex. OCU/LCJA 2 (Bodell) at 6.

³³ *Id.* at 4.

³⁴ *Id.* at 4-5 .

³⁵ Cal Advocates Testimony at 1-6, Ex. OCU/LCJA 2 (Bodell) at 8; Ex. SC-02 (Brown) at 12

³⁶ Corrected Revised Prepared Direct Testimony of Blaine Waymire on behalf of SoCalGas (SoCalGas's Hydrogen Blending Demonstration - Closed System Project), Chapter 1R (hereinafter, "Joint Utilities Ch. 1R") at 13; *see also* Joint Utilities Ch. 2 (SoCalGas, Waymire) at 12.

³⁷ Hydrogen Blending Compendium Report Literature Review at 8, *available at*:
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M556/K896/556896659.PDF>.

³⁸ *Id.*, Chapter Summary 19

³⁹ *See* SoCalGas's [H2] Innovation Experience, *available at*:
<https://www.socalgas.com/sustainability/hydrogen/h2home>.

1 coordinated with an independent third party.⁴⁰ An objective of the demonstration is to validate
2 these findings in the field.

3 Baseline Leak Rates

4 LCJA contends that because the baseline leak rate of the Orange Cove system is not
5 disclosed, there is not adequate validation for the performance of the system with hydrogen
6 blends.⁴¹ Intervenors also contend that the natural gas system inherently has leaks, and thus
7 starting from a baseline of “zero leaks” is not representative of the California Gas pipeline
8 infrastructure.⁴² At the same time, intervenor witnesses also contend that there is a concern for
9 safety if leakage were present.⁴³ These notions are not only contradictory, but they ignore
10 SoCalGas’s proposal to establish a baseline of zero leaks through upfront leak surveys, and
11 repair any identified leaks if present prior to the introduction of hydrogen into the system.⁴⁴ The
12 intent of the demonstration is to validate what research has suggested under California operating
13 conditions--that a pipeline that is leak tight for natural gas would be leak tight for a hydrogen
14 blend. This conclusion is drawn from the findings that hydrogen does not leak preferentially in a
15 hydrogen blend scenario.⁴⁵ Investigating leak rates of hydrogen blends versus natural gas is
16 difficult to perform in situ with underground pipelines, and has been preliminarily investigated in
17 the CPUC’s Hydrogen Impacts Study.⁴⁶ For the purposes of safety and proper data collection,
18 SoCalGas plans to start with a baseline leak rate of zero before beginning the demonstration
19 project.

20 Leak Detection Equipment

21 Intervenors contend that SoCalGas has not addressed specific equipment, and their

⁴⁰ Joint Utilities Ch. 1R (SoCalGas, Waymire) at 15; Joint Utilities Ch. 2 (SoCalGas, Waymire) at 14.

⁴¹ Ex. OCU/LCJA 2 (Bodell) at 4

⁴² Ex. SC-02 (Brown) at 10

⁴³ Ex. OCU/LCJA 2 (Bodell) at 4

⁴⁴ Joint Utilities Ch. 1R (SoCalGas, Waymire) at 11; Joint Utilities Ch. 2 (SoCalGas, Waymire) at 11.

⁴⁵ Source: W. J. Jasionowski and H. D. Huangt, *Gas Distribution Equipment in Hydrogen Service – Phase II*, 5 J. Energy 298, 298–301 (1981) (finding that “Hydrogen in the gas blends does not leak preferentially over methane”) (*Jasionowski et al.*, 1981).

⁴⁶ CPUC, *Hydrogen Blending Impacts Study* (July 18, 2022), available at: <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF>.

capability to detect leakage.⁴⁷ Preliminary equipment to be evaluated for purposes of detecting hydrogen/natural gas blends are disclosed in Exhibit 1A and Exhibit 2A, of Chapters 1 and 2 of direct testimony, respectively⁴⁸:

Table 5. Leak Survey Technologies and Frequency

Demo Project	Examples of Leak Survey Technologies to Explore	Leak Survey Frequency
UC Irvine	<ul style="list-style-type: none"> • Portable gas detectors • Fiber optic technology • Ground vehicle • Mass balance method 	<ul style="list-style-type: none"> • Pipeline: monthly • Pipe connections to appliances: monthly or by customer call
Orange Cove	<ul style="list-style-type: none"> • Portable gas detectors • Ground vehicle • Aerial detectors 	<ul style="list-style-type: none"> • Pipeline: quarterly • Pipe connections to appliances: by customer call

SoCalGas will select final leak survey technologies and specific models in collaboration with an independent third party upon authorization of the proposed demonstration projects.⁴⁹ The notion that existing leak survey equipment may not be compatible with hydrogen blends⁵⁰ is unfounded. SoCalGas has certified some of its own natural gas leak detection equipment that is currently in use in the field for use with hydrogen blends up to 20%. Several manufacturers of natural gas leak detection equipment are also actively working on updating equipment for use with hydrogen blends, or cross sensing for both natural gas and hydrogen.⁵¹ SoCalGas will utilize equipment proven to detect the appropriate hydrogen blend percentage (0-5% or 5-20%) in their respective demonstration project for accuracy, field validation, and safety.

⁴⁷ Ex. OCU/LCJA 2 (Bodell) at 8

⁴⁸ Joint Utilities Ch. 1R (SoCalGas, Waymire), Exhibit 1A; Joint Utilities Ch. 2 (SoCalGas, Waymire), Exhibit 2A.

⁴⁹ Joint Utilities Ch. 1R (SoCalGas, Waymire) at 24.

⁵⁰ Ex. OCU/LCJA 2 (Bodell) at 1-5.

⁵¹ Detcon's Model 700 series include a dedicated hydrogen sensor (DM-700-H2) and combustible sensors that detect H₂ while Dräger's X-am 5000 is available in a hydrogen-specific configuration with a hydrogen-compensated CO sensor. See *Teledyne Gas & Flame Detection – Detcon Model 700 Series Gas Detector* (Brochure GF30186E-EN), <https://www.teledynegasandflamedetection.com/en-us/Products/docs/fixedgas-700series-model700-brochure-english.pdf>; see also Dräger, *X-am 5000 Datasheet* (GasDetectorsUSA), https://www.gasdetectorsusa.com/gdusa/download/Draeger_X-AM_5000_Datasheet.pdf.

1 For leak detection surrounding the hydrogen production, storage, and blending facility,
2 SoCalGas will employ 24/7 continuous monitoring.⁵² Hydrogen leak detection devices are
3 commercially available and will be selected during system design. Final specifications –
4 including equipment type, model, location, and alarm thresholds – will be defined during
5 detailed engineering prior to demonstration start. Further, SoCalGas proposed to perform in-
6 depth hazard analyses for the hydrogen production, storage, and blending facilities.⁵³ These
7 hazard analyses will inform leak detection equipment needs, equipment location, and alarm
8 trigger thresholds for pure hydrogen. All safety plans, including leak detection plans for the
9 hydrogen production, storage, and blending facilities will also be reviewed and coordinated with
10 an independent third party.

11 Leak Detection Frequency and Practices

12 Intervenors contend that the proposed leak detection frequencies and practices proposed
13 for each demonstration project are insufficient, with some calling for the inclusion of continuous
14 monitoring.⁵⁴ LCJA points out that federal minimum leak survey and detection requirements
15 would not meet the rigor intended by the UC Riverside study.⁵⁵ There is no merit to these
16 concerns. First and foremost, SoCalGas is proposing *more frequent* leak surveys than required
17 by Title 49 Code of Federal Regulations (CFR) Part 192.723⁵⁶, which sets leak survey standards
18 for natural gas. Leak surveys for SoCalGas’s pipeline system and its components are proposed
19 to occur monthly for the UCI demonstration and quarterly for the Orange Cove demonstration.⁵⁷
20 This is in excess of the requirements of the Federal Code. Further, as mentioned above,
21 SoCalGas will evaluate leak survey equipment that has been approved to be utilized with
22 hydrogen blends, and will coordinate with an independent third party on equipment selection.

⁵² Joint Utilities Ch. 1R (SoCalGas, Waymire) at 16; Joint Utilities Ch. 2 (SoCalGas, Waymire) at 16.

⁵³ See SoCalGas Response to Appendix B of Assigned Commissioner’s Scoping Memo and Ruling (August 11, 2025) at 15, 31.

⁵⁴ Cal Advocates Testimony 1-6, Ex. OCU/LCJA 2 (Bodell) at 8, Ex. SC-02 (Brown) at 12

⁵⁵ Ex. OCU/LCJA 2 (Bodell) at 5

⁵⁶ 49 CFR § 192.723: Distribution System: Leakage Surveys, which identifies federal leak survey requirements, available at: <https://www.ecfr.gov/current/title-49/subtitle-B/chapter-I/subchapter-D/part-192/subpart-M/section-192.723>.

⁵⁷ Joint Utilities Ch. 1R (SoCalGas, Waymire), Exhibit 1A; Joint Utilities Ch. 2 (SoCalGas, Waymire), Exhibit 2A.

1 Further, SoCalGas has not ruled out continuous monitoring for its proposed project at UC Irvine.
2 As noted in Exhibit 1A, one of the leak detection technologies in consideration is fiber optic.
3 Fiber optic leak detection uses light signals to measure temperature, strain, and acoustic events
4 along a fiber-optic (FO) cable near or attached to a pipeline, which would allow for continuous
5 leak monitoring.⁵⁸ This technology could feasibly be utilized in the UC Irvine project, as new
6 pipelines are being installed, and thus fiber optic cabling could be incorporated easily when
7 installing the new pipeline. However, this technology would not be feasible for the Orange Cove
8 project, as it would require digging up all existing pipelines throughout the community.
9 Regardless, in either scenario, SoCalGas still intends to perform traditional forms of leak
10 inspection on a monthly and quarterly basis, respectively, to validate and verify traditional leak
11 inspection practices and equipment in the field. As previously noted, no final leak inspection
12 technology has been chosen, as final plans will be coordinated during detailed engineering
13 design phases and with an independent third party. Coordinating safety and data collection plans
14 with an independent third party provides an extra layer of mitigation and industry input to
15 maximize safety and collection of relevant data.

16 **6. SoCalGas Has Performed Robust Stakeholder Engagement to Date,**
17 **and Intends to Do So Continuing into Subsequent Project Phases**
18 **(OP 7h)**

19 Rebuttal testimony on stakeholder engagement activities can be found in Chapter 11,
20 Prepared Rebuttal Testimony of Chris Gilbride.

21 **7. SoCalGas's Orange Cove Project Is Proposed to Provide Community**
22 **Benefits, Not Risks**
23

24 SoCalGas recognized that Orange Cove is a disadvantaged community well before Sierra
25 Club or LCJA noted it in their testimony.⁵⁹ Several Intervenors claim that the proposed
26 demonstration project in Orange Cove violates D.22-12-057's order to evaluate impacts to
27 disadvantaged communities, further citing harm or risks to the community. These risks are

⁵⁸ DNV, *Leak detection using Distributed Fibre-Optic Sensing (DFOS)*, available at:
<https://www.dnv.com/article/leak-detection-using-distributed-fibre-optic-sensing/>

⁵⁹ *Id.* at 68, *see also* Prepared Opening Testimony of Ryan Sinclair on behalf of OCU/LCJA on the Application of Southern California Gas Company, San Diego Gas & Electric Company, Pacific Gas and Electric Company and Southwest Gas Corporation to Establish Hydrogen Blending Demonstration Project (hereinafter, "Ex. OCU/LCJA 3") at 2.

1 summarized as: impacts to vintage pipeline materials, impacts to end use equipment, and the
2 potential to increase nitrogen oxides (NOx) in the community.⁶⁰

3 Impacts to Materials

4 Intervenor insinuate that adding hydrogen to natural gas will make the gas infrastructure
5 more prone to leaks, pointing to the fact that hydrogen is a smaller molecule and thus has more
6 of a propensity to leak than natural gas.⁶¹ This notion fails to acknowledge that, when blended,
7 hydrogen natural gas blends do not automatically cause leaks due to the presence of the smaller
8 molecule. In fact, research has shown that hydrogen does not preferentially leak once blended
9 (i.e., the hydrogen does not separate from the natural gas for the purpose of leaking; an analogy
10 may help illustrate: once cream is blended into coffee, the cream does not separate from the
11 coffee).⁶² Therefore, where there is no natural gas leak, hydrogen, too, is not expected to leak in
12 the amounts proposed to be blended by SoCalGas (up to 5% for Orange Cove and up to 20% for
13 UCI).

14 Similarly, the impacts of potential embrittlement, including accelerated fatigue crack
15 growth, are not expected under the conditions of the proposed demonstrations, which involve
16 low blends of hydrogen and low pressure/stress. Literature is clear that the presence of hydrogen
17 has the potential to embrittle steel pipeline materials. However, that same research indicates that
18 pressure, stress, and hydrogen blend percentage greatly drive the impacts from embrittlement.⁶³
19 The ratio of the hydrogen blend percentage and the pressure inside the pipe is referred to as the
20 “partial pressure” of hydrogen. Partial pressure refers to the pressure exerted by a gas alone (in
21 this case hydrogen) in a mixture of gases, essentially representing its contribution to the total

⁶⁰ Ex. SC-01 (Gersen) at 68-72, Ex. OCU/LCJA 3 (Sinclair) at 5; Prepared Direct Testimony of Michael Colvin on the Application of Southern California Gas Company, San Diego Gas & Electric Company, Pacific Gas and Electric Company and Southwest Gas Corporation to Establish Hydrogen Blending Demonstration Project on behalf of Environmental Defense Fund (hereinafter, “Ex. EDF-01”) at 9-10.

⁶¹ Ex. SC-01 (Gersen) 1; Ex. EDF-01 (Colvin) at 5.

⁶² Source: W. J. Jasionowski and H. D. Huangt, *Gas Distribution Equipment in Hydrogen Service – Phase II*, 5 J. Energy 298, 298–301 (1981) (finding that “Hydrogen in the gas blends does not leak preferentially over methane”) (*Jasionowski et al.*, 1981); see also Hormaza Mejia, et. al, *Hydrogen Leaks at the same rate as natural gas in typical low-pressure gas infrastructure* (finding H2 does not preferentially leak from typical faulty low-pressure NG piping infrastructure when mixed with NG); available at: <https://www.sciencedirect.com/science/article/abs/pii/S0360319919347275>.

⁶³ R.13-02-008, Hydrogen Blending Compendium Report, Chapter Summary at 1-4, available at: <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M556/K896/556896659.PDF>.

1 pressure of the mixture.⁶⁴ A phenomenon called accelerated fatigue crack growth can result from
2 embrittlement. This is the propagation or advancement of cracks in a material when a material is
3 repeatedly loaded and unloaded (under stress or strain) and cracks initiate or grow progressively
4 under that repeated stress or strain.⁶⁵ As noted in testimony from EDF, embrittlement, when
5 coupled with stress, can lead to an accelerated fatigue crack growth rate, which over time can
6 lead to the potential for leakage from cracks in the pipeline material.⁶⁶ Medium pressure
7 distribution pipelines⁶⁷ operate at much lower stress levels, with piping in residential areas at
8 even much lower pressures, generally operating at less than 0.5 pounds per square inch (PSI).⁶⁸
9 Additionally, for the Orange Cove project, SoCalGas would only blend up to 5%, i.e., what the
10 literature considers to be a very low concentration of hydrogen that would not contribute to
11 accelerated fatigue crack growth. For example, many medium pressure pipelines operate in a 45
12 PSI range. With a 5% hydrogen blend, the partial pressure of the hydrogen on that pipeline is
13 only 2.5 PSI.⁶⁹ In a residential setting, delivery pressure is generally 8" Water Column (or
14 approximately 0.3 PSI) the partial pressure impact to pipes within a customer's home is
15 approximately 0.015 PSI. The Hydrogen Blending Compendium Report notes, "Fatigue crack
16 growth rate can be accelerated even at small partial pressures of hydrogen such as 1 bar (14.5
17 psi); however, it generally increases with increasing hydrogen concentration and it is more
18 pronounced at higher stress levels."⁷⁰ Therefore, pipeline operations with partial pressures of
19 hydrogen as low as those expected with a 5% hydrogen blend in the medium pressure

⁶⁴ Khan Academy, *Dalton's Law of Partial Pressure*, available at:
<https://www.khanacademy.org/science/ap-chemistry/gases-and-kinetic-molecular-theory-ap/ideal-gas-laws-ap/a/daltons-law-of-partial-pressure>.

⁶⁵ R.13-02-008, Hydrogen Blending Compendium Report, Chapter Summary at 2, available at:
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M556/K896/556896659.PDF>.

⁶⁶ Ex. EDF-01 (Colvin) at 6.

⁶⁷ Joint Utilities Ch. 1R (SoCalGas, Waymire) at 1, (Medium Pressure Distribution for these purposes is defined as 60 pounds per square inch gauge or lower).

⁶⁸ See SoCalGas Rule No. 20 (The standard delivery pressure at the point of delivery is eight inches of water column), available at:
<https://tariffsprd.socalgas.com/view/tariff/?utilId=SCG&bookId=GAS&tarfKey=119>.

⁶⁹ $P_{total} = PH_2 + PNG$; at 5% hydrogen 95% Natural gas, 45 PSI = $0.05 PH_2 + 0.95 PNG$, $PH_2 = 0.05 * 45 \text{ PSI} = 2.25 \text{ PSI}$, $PNG = 0.95 * 45 \text{ PSI} = 42.75 \text{ PSI}$

⁷⁰ Hydrogen Blending Compendium Report, Literature Review at 4, available at:
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M556/K896/556896659.PDF>.

1 distribution system are unlikely to have an impact on accelerating fatigue crack growth. Further,
2 literature identifies cyclic loading as another driver for increased fatigue crack growth rates.⁷¹
3 Meanwhile, distribution pipeline systems do not typically cycle pressures like transmission
4 pipeline systems do. Given these characteristics, the impact to medium pressure distribution and
5 residential house lines is minimal.

6 EDF indicates that hydrogen has a higher potential to permeate through polymer
7 materials than natural gas, referencing reports that consider impacts of hydrogen volume
8 *approximately 1 billion times* that of the demonstrations.⁷² UC Riverside's Hydrogen Impacts
9 Study discusses this phenomenon further. Hydrogen/natural gas blends may permeate through
10 polymer pipeline material faster than traditional natural gas, but research has indicated it is not to
11 a degree in which safety should be of concern.⁷³ SoCalGas's initial plans calculated to produce
12 approximately 3,500 kilograms (Kg) of clean hydrogen over the course of 18 months for its UCI
13 project and 13,000 KG of clean hydrogen over 18 months for its Orange Cove Project. In
14 contrast, reports cited by EDF consider climate impacts from hydrogen on a global potential for
15 hydrogen demand on the scale of 100 *teragrams* (Tg) to 3,000 Tg.⁷⁴ With the relatively small
16 amount of hydrogen used in this demonstration project, and the low rate of permeation noted in
17 literature, it is unlikely that the small amount of hydrogen blend lost through permeation could
18 lead to an environmental impact and negatively impact a community. Further, San Diego Gas &
19 Electric (SDG&E)'s proposed project will further explore permeation rates of hydrogen blends in
20 polyethylene materials commonly used in California's distribution system.

21 Sierra Club and LCJA note concerns with use of Aldyl-A pipeline materials in the
22 proposed demonstration project in Orange Cove due to the material's susceptibility to brittle-like
23 cracking.⁷⁵ LCJA notes that the impacts of hydrogen blends on Aldyl-A pipeline materials have

⁷¹ Hydrogen Blending Compendium Report, Chapter Summary at 4; *available at*:
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M556/K896/556896659.PDF>.

⁷² Ex. EDF-01 (Colvin) at 5-6.

⁷³ American Gas Association; *Impacts of Hydrogen Blending on Gas Piping Materials* at 8; *available at*: https://www.aga.org/wp-content/uploads/2023/08/Impacts-of-Hydrogen-Blending-on-Gas-Piping-Ma_.pdf.

⁷⁴ Ocko, I. B. and Hamburg, S. P. Climate consequences of hydrogen emissions. *Atmos. Chem. Phys.* 2022; 22: 9349–9368. Figure 6. *Available at*: <https://doi.org/10.5194/acp-22-9349-2022>.

⁷⁵ Ex. SC-02 (Brown) at 14; Ex. OCU/LCJA 2 (Bodell) at 3.

1 not been studied, then resorts to conjecture, making an assumption that hydrogen blends might
2 make the propensity for this material to leak more prevalent. One cannot assume negative
3 impacts from hydrogen blends on a material that has not yet been reviewed in literature. Even if
4 Aldyl-A has higher propensity for permeation, as noted by LCJA⁷⁶, permeation rates are so low
5 that it will not be enough to cause a safety concern or environmental harm, particularly at 5%
6 hydrogen blends or less. As mentioned above, the entire system, including segments containing
7 Aldyl-A, will be operating at very low stress levels, and thus, the introduction of a hydrogen
8 blend up to 5% is not expected to pose additional risk with Aldyl-A material. Further, SoCalGas
9 conducts annual leak surveys as part of its asset maintenance and protection program. The
10 Orange Cove community is included in this program.

11 Regardless, SoCalGas will perform leak surveys of the pipeline system to confirm it is
12 free of leakage and perform material repair or replacement needed on SoCalGas's system prior to
13 injecting hydrogen.⁷⁷

14 *End Use Equipment*

15 Several intervenors express concerns over the vintage of customer appliances in Orange
16 Cove, and how hydrogen blends may cause them to fail.⁷⁸ However, research has extensively
17 shown that common appliances can operate on hydrogen blends up to 20% without impacts to
18 safety.⁷⁹ There is no evidence to suggest that blending hydrogen at 5% would negatively impact
19 the safety or operability of common appliances. This is in part true because the characteristics of
20 a hydrogen/natural gas blend with 5% hydrogen are very similar to that of traditional natural gas.

⁷⁶ Ex. OCU/LCJA 2 (Bodell) at 3.

⁷⁷ Joint Utilities Ch. 2 (SoCalGas, Waymire) at 11.

⁷⁸ Ex. OCU/LCJA 3 (Sinclair) at 8; Ex. SC-01 (Gersen) at 69-70.

⁷⁹ Hydrogen Blending Impacts Study at 8, *available at*
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF>; Hydrogen
Blending Compendium Report, Chapter Summary at 14, *available at*:
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M556/K896/556896659.PDF>.

Most notably, The Wobbe index⁸⁰ of a 5% hydrogen blend (1,332) closely aligns with that of standard natural gas (1,347), supporting interchangeability and consistent appliance performance. See characteristic comparison below:

Table 6: Natural Gas Properties vs. 5% Hydrogen Blend

Property	Natural Gas	5% Blend
Flammability Range (vol% in air)	5-15	4.8-17
Higher Heating Value (BTU/scf)	1,010	985
Lower Heating Value (BTU/scf)	909	887
WOBBE	1,347	1,332

Further, CSA Group, a leading certification body in North America, confirms that existing product certifications remain valid with natural gas blends of up to 5% hydrogen.⁸¹ This certification clarified that natural gas containing up to and including 5% hydrogen falls within the scope of the Z21/83 standards using Test Gas A, which is the test standard for appliance certification. LCJA provides photos of Orange Cove residents' appliances.⁸² As SoCalGas outlined in response to the Scoping Memo's Appendix B questions, SoCalGas intends to conduct outreach to Orange Cove customers to encourage participation in existing customer assistance and energy efficiency programs prior to and during the demonstration so aging and/or faulty

⁸⁰ The Wobbe Index (WI) is the main indicator of the interchangeability of fuel gases such as natural gas LPG and Town Gas and is frequently defined in the specifications of gas supply and transport utilities. See ChemEurope, *Wobbe Index*, available at: https://www.chemurope.com/en/encyclopedia/Wobbe_index.html.

⁸¹ ASGE, *CSA Group Revised Position on Certifying Hydrogen & Natural Gas Products in Canada and the US – Recognizes Acceptability of Natural Gas Containing Up to and Including 5% of Hydrogen* (December 12, 2022), available at: <https://asge-national.org/agaupdate-20230428/>.

⁸² Prepared Opening Testimony of Jamie Zweifler-Katz on behalf of Orange Cove United and Leadership Counsel for Justice and Accountability on the Application of Southern California Gas Company, San Diego Gas & Electric Company, Pacific Gas and Electric Company and Southwest Gas Corporation to Establish Hydrogen Blending Demonstration Project (hereinafter "Ex. OCU/LCJA 4"), Exhibit B.

1 appliances identified can be replaced with safe, functional, and more energy efficient ones.⁸³
2 These types of programs are intended to address replacement of these very types of appliance,
3 and are available separate from the proposed hydrogen blending demonstration. Further
4 information on outreach for customer assistance programs can be found in Chapter 11 Testimony
5 of Chris Gilbride.

6 NOx Emissions

7 Several intervenors note that hydrogen blending has the potential to negatively impact
8 NOx emissions, which could unduly burden an already underserved and environmentally
9 burdened community due to impacts to health.⁸⁴ LCJA further details the supposed state of
10 health in the community,⁸⁵ while also providing research on potential NOx impacts.

11 As noted in LCJA Testimony Exhibit 1, one key function in the formation of thermal
12 NOx is flame temperature.⁸⁶ The exhibit further notes several factors beyond the degree of
13 hydrogen blend can impact flame temperature, including burner geometry and the degree of air-
14 fuel pre-mixing.⁸⁷ These factors are indeed important considerations when considering potential
15 impacts to NOx emissions. California, particularly the South Coast Air Quality Management
16 District and San Joaquin Valley Air Pollution Control District, have very strict emissions limits
17 for stationary combustion equipment, most notably for NOx emissions.⁸⁸ These strict limits
18 have created the need and a market for low-NOx burners in combustion equipment, including
19 common appliances. Low-NOx burners control emissions by modifying the combustion process
20 to lower peak flame temperature, usually by closely optimizing the air and fuel ratio in the

⁸³ See SoCalGas Response to Appendix B of Assigned Commissioner's Scoping Memo and Ruling (August 11, 2025) at 11.

⁸⁴ Prepared Direct Testimony of Professor Alastair Charles Lewis on behalf of OCU/LCJA (hereinafter, "Ex. OCU/LCJA 1") at 3-5; Ex. OCU/LCJA 3 (Sinclair) at 5-6; Ex. SC-01 (Gersen) at 72; Direct Testimony of Tyson Siegle on Hydrogen Blending Application 22-09-006 on behalf of Utility Consumers' Action Network (UCAN) (hereinafter, Ex. UCAN-01) at 15.

⁸⁵ Ex. OCU/LCJA 4 (Zweifler-Katz), Exhibit B; Ex. OCU/LCJA 3 (Sinclair) at 5.

⁸⁶ Ex. OCU/LCJA 1 (Lewis), Exhibit 1: Potential air pollution impacts arising from blending hydrogen into natural gas for domestic heating and cooking: an initial physical science review at 6.

⁸⁷ *Id.* at 7

⁸⁸ South Coast Air Quality Management District, *2022 Air Quality Management Plan Executive Summary* at ES-2; available at: <https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/03-es.pdf>.

1 combustion chamber. When considering residential and commercial appliances, these burner
2 types are generally referred to as “pre-mix” burner conditions. Because of the prevalence of pre-
3 mix burner conditions in common residential and commercial appliances in California, research
4 suggests that hydrogen blends up to 20% will actually create a reduction or steady state presence
5 of NOx rather than an increase in standard appliances.⁸⁹

6 Hydrogen blending into natural gas is expected to either reduce or sustain consistent NOx
7 emissions primarily due to changes in combustion characteristics. Since hydrogen requires less
8 oxygen to combust than methane, burning hydrogen-rich fuels under the same air flow
9 conditions results in a leaner mixture with more excess oxygen.⁹⁰ This excess air lowers the
10 flame temperature, which in turn suppresses thermal NOx formation, a major source of NOx in
11 high-temperature combustion. These are all important considerations, particularly in larger
12 industrial equipment where burner conditions may be more customized, which may need
13 modifications to remain within NOx limits. However, NOx emissions from standard appliances
14 are not expected to increase. Lastly, SoCalGas intends to perform emissions monitoring in end-
15 use appliances, which will be determined based on a comprehensive customer survey.⁹¹ The
16 customer survey will help determine how many customers will allow us to perform emissions
17 monitoring in their home, and what frequency of checks might be appropriate. The final data
18 collection plan will also be coordinated with an independent third party.⁹² This data collection
19 will look to validate findings on NOx emissions and better understand the impacts on emissions
20 from appliances under conditions locally in California during the live operating conditions.

21 Benefits

22 Notwithstanding the claims of intervenors, the proposed project in Orange Cove actually
23 provides benefits to a Disadvantaged Community--communities like these are often overlooked
24 when siting clean energy projects like this. The proposed project in Orange Cove intends to

⁸⁹ MDPI, *Impact of Hydrogen/Natural Gas Blends on Partially Premixed Combustion Equipment: NOx Emission and Operational Performance* (2022), available at: <https://www.mdpi.com/1996-1073/15/5/1706> (Glanville, et. al., 2022).

⁹⁰ See DOE, *Does the use of hydrogen produce air pollutants such as nitrogen oxides?*, available at: <https://www.energy.gov/eere/fuelcells/does-use-hydrogen-produce-air-pollutants-such-nitrogen-oxides>.

⁹¹ Joint Utilities Ch. 2 (SoCalGas, Waymire) at 13.

⁹² *Id.* at 24.

1 install solar panels and a battery energy storage system for the creation of clean renewable
2 hydrogen, which will then be blended into the existing natural gas system serving the
3 approximately 2,000 meters in the community.⁹³ The solar array and battery energy storage
4 system are proposed to be turned over to the city at the conclusion of the project, unless the
5 Commission determines that the blending facility should remain in place for its useful life.⁹⁴
6 Blending clean renewable hydrogen into the Orange Cove community will produce benefits in
7 the form of reduced carbon dioxide (CO₂) emissions during the project's operation, and reduced
8 Carbon Monoxide (CO) emissions where combustion end use equipment is present.⁹⁵ Research
9 indicates there should not be adverse impacts to NO_x emissions, but NO_x emissions will be
10 monitored, as noted above, nevertheless. A new solar array and battery energy storage system in
11 the community offers the potential for renewable electricity assets sited locally to help reduce
12 emissions from the electric sector, and provide potentially enhanced reliability through localized
13 electricity generation. The project brings benefits in the form of clean energy investments in a
14 disadvantaged community, in alignment with the CPUC's Environmental Social Justice (ESJ)
15 Action Plan.⁹⁶ This one-of-a-kind demonstration project will also bring visitors and recognition
16 to the community, as energy professionals will want to see the demonstration site.

17 Lastly, the community will see benefits in the realm of safety and efficiency. There will
18 be proactive home inspections to help verify customer appliances are operating safely. During
19 this time, technicians may tune appliances so that they are operating more efficiently as well.
20 SoCalGas will be actively promoting its energy efficiency and customer assistance programs to
21 help replace outdated or inefficient appliances with new, energy efficient ones. LCJA notes that
22 some of the homes surveyed have not been weatherized.⁹⁷ SoCalGas's Energy Savings
23 Assistance Program (ESA Program) offers no-cost weatherization services to customers who

⁹³ *Id.*, n.3.

⁹⁴ *Id.* at 15.

⁹⁵ Ex. OCU/LCJA 1 (Lewis), Exhibit 1: Potential air pollution impacts arising from blending hydrogen into natural gas for domestic heating and cooking: an initial physical science review at 1.

⁹⁶ Goal #2 of the ESJ Action Plan is to Increase investment in clean energy resources to benefit ESJ communities, especially to improve local air quality and public health, *see* CPUC's ESJ Action Plan, *available at*: https://epicpartnership.org/resources/Strat_Goal_Kickoff_Amanda_Krantz_CPUC.pdf.

⁹⁷ Ex. OCU/LCJA 4 (Zweifler-Katz), Exhibit B.

1 qualify.⁹⁸ Moreover, SoCalGas will have enhanced leak monitoring in the community due to the
2 proposed demonstration project,⁹⁹ which will help promote overall safety in the community.

3 **B. Scoping Issue 1.C: Does each pilot project align with broader state energy**
4 **and climate goals? If so, how?: SoCalGas’s Proposed Demonstration Projects**
5 **Align with Broader State Energy and Climate Goals**

6 SoCalGas’s proposed demonstration projects align with broader state energy and climate
7 goals, and will serve to inform a safe, reliable and affordable energy transition under a variety of
8 scenarios. Indeed, SoCalGas/the Joint Utilities were directed to file this demonstration project
9 application-- the foremost indication these projects are categorically aligned with the state’s
10 needs. Additionally, this direction from the Commission informed this Amended Application
11 such that it was unnecessary to further deliberate this alignment, and the scope of this proceeding
12 as set forth in the Scoping Memo reflects that. Notably, whether it is good policy to blend
13 hydrogen into the natural gas system—at whatever percentage the Commission may deem
14 appropriate—is not an issue scoped into this proceeding. The question specifically inquires
15 about the alignment of state energy and climate goals with “each pilot,” not hydrogen blending
16 on a wholesale basis.

17 However, with respect to the consistency of the proposed projects with state energy and
18 climate goals, it is important to note that the intent of this proceeding is not limited to informing
19 hydrogen blending as a singular solution to decarbonize the existing gas system, nor is the intent
20 of this proceeding to immediately scale this solution at the expense of other potential solutions
21 such as building electrification. If such immediate scaling of this solution were at issue in this
22 proceeding, it may be more relevant to introduce an alternatives analysis as some parties (e.g.,
23 Sierra Club, UCAN, EDF) offer as the reason to reject these projects. However, even then, it is
24 SoCalGas’s expectation—and consistent with the CARB Scoping Plan--that a multitude of
25 diverse solutions will be necessary for California to succeed at decarbonizing while maintaining
26 a robust economy and a safe, reliable, and affordable energy system. Therefore, it is imprudent to
27 pit these solutions against one another in this narrowly scoped proceeding, and especially to

⁹⁸ Statewide Energy Education and Resource Guide, *Energy Assistance Program* at 2, available at <https://www.socalgas.com/billing-payment/assistance-programs/energy-savings-assistance-program>. (Several measures listed are referred to broadly as “weatherization” measures”).

⁹⁹ Joint Utilities Ch. 2 (SoCalGas, Waymire) at 20.

prematurely curtail support for opportunities to understand and validate the characteristics of emerging solutions, such as hydrogen blending, based on speculation.

It is also important to consider that hydrogen blending can enable a suite of options for the state, and its application is not limited to addressing the same challenges as [fuel substitution/appliance electrification] or even renewable natural gas. The state's existing natural gas system offers significant energy transportation and storage capacity today, and enabling hydrogen blending in the natural gas system can provide value to the overall economy by helping to manage and balance the hydrogen energy system and marketplace. In fact, the CARB Scoping Plan recognizes 20% blending of hydrogen into the natural gas system in its set of solutions to reach carbon neutrality by 2045. Falsely equating hydrogen blending and other building decarbonization solutions as tradeoffs or speculating that solutions like building electrification are and will always be universally superior to hydrogen blending rendering it useless are inappropriate and do not form a reasonable, accurate, or complete rationale to dismiss or otherwise limit hydrogen blending demonstration activities that were specifically ordered to be proposed by the Commission.

III. Scoping Issue #2: Are the Pilots Useful and Well Designed?

- a. What specific knowledge gap does each pilot project address that isn't covered in the Hydrogen Blending Impact Report and Hydrogen Blending Compendium Report? How would the findings of each pilot project complement the research summarized in those reports***
- b. How will the knowledge, contributed by each project, be useful to utility operators and state policy makers?***
- c. How is success defined and measured for each pilot project? How will pilot project's progress toward project success and desired outcome be reported to the Commission?***
- d. What alternative approaches or experimental sites were considered for studying the specific problem being addressed by each pilot project? Why was the specific site and experimental design chosen among the alternatives considered?***
- e. How will the ultimate findings from these pilot projects be document, validated, and shared with stakeholders and the Commission?***
- f. What would be needed to move from a pilot project to full implementation if the pilot project was successful?***

1 **A. Scoping Issue 2.a SoCalGas’s Projects Are Intended to Be Representative of**
2 **the Statewide Gas Pipeline System, Especially When Paired with the Other**
3 **Demonstrations Proposed in A.22-09-006**

4 Intervenors assert that SoCalGas’s proposed project at UC Irvine is neither useful nor
5 well-designed based on the length of pipeline and material associated with the demonstration.
6 These arguments are summarized as follows: the steel involved is newly installed rather than
7 vintage,¹⁰⁰ and no Aldyl-A is present.¹⁰¹

8 *New Steel Pipeline*

9 When scoping the proposed demonstration projects at UC Irvine, SoCalGas worked with
10 its end-use partner to determine an ideal demonstration site. The proposal to blend to the
11 Anteater Recreation Center (ARC) was closely coordinated with UCI facilities personnel and
12 was selected based on the facility’s consistent gas load, location, ability to isolate from other
13 campus buildings and residences, pipeline components, and end use equipment.¹⁰² No SoCalGas
14 steel pipeline materials were present in that area. In order to make a mixed material
15 demonstration project, SoCalGas scoped in new steel infrastructure. The new steel infrastructure
16 is representative of approximately the last decade of steel pipeline infrastructure and will be
17 representative of other steel infrastructure moving forward. Utilizing new steel pipe material
18 also provides a clean baseline for long-term monitoring of hydrogen effects, corrosion rates, and
19 mechanical integrity.

20 *Aldyl-A*

21 Intervenors further argue that SoCalGas’s proposed demonstration project at UCI is not
22 well designed because it does not evaluate Aldyl-A. SoCalGas is demonstrating Aldyl-A in the
23 proposed Orange Cove project, which will demonstrate blending up to 5%. Aldyl-A is a vintage
24 plastic pipe material manufactured by DuPont, and there are programs through Distribution

¹⁰⁰ Ex. WTF-01 (Freehling) at 15; Cal Advocates Testimony at 3-4; Ex. SC-02 (Brown) at 15.

¹⁰¹ Ex. SC-02 (Brown) at 15.

¹⁰² See Data Request CAL ADVOCATES-SCG-A2209006-001, available at:
https://www.socalgas.com/sites/default/files/2025-08/Cal_Advocates-SCG-A2209006-001_UCI-7-21-25_FINAL.pdf.

1 Integrity Management Projects (DIMP) to actively replace Aldyl-A material over time.¹⁰³
2 Nonetheless, SoCalGas will likely perform system analyses before hydrogen is injected into its
3 distribution system, much like it does with biomethane with the adoption of the Standard
4 Renewable Gas Interconnection Tariff.¹⁰⁴

5 Regarding SoCalGas's proposed project in Orange Cove, intervenors argue just the
6 opposite--that the project is not well designed because it *includes* Aldyl-A, and thus may pose a
7 safety risk.¹⁰⁵ Obviously this is inconsistent with the argument that the UCI project is not
8 representative of the statewide gas pipeline system because it does not include Aldyl-A. One
9 cannot call for it to be included in one project and then call for it to be unsafe to be used in a
10 different project (albeit at a lower blend percentage).

11 **B. Scoping Issue 2. B, C: SoCalGas's Projects Intend to Verify a Base Case of**
12 **Existing Research in a Localized Setting, and Provide Key Operational**
13 **Insights**

14 Intervenors claim that the demonstration projects will not provide any additional
15 information to fill knowledge gaps that are not already provided by UC Riverside's Hydrogen
16 Impacts Study, the Hydrogen Blending Compendium Report, or through data considered by
17 hydrogen blends performed in other jurisdictions.¹⁰⁶

18 First and foremost, UC Riverside's recommendation in both its Hydrogen Impact Study
19 and subsequent Literature Review in the Hydrogen Blending Compendium Report highlight a
20 need for demonstration projects that can simulate the conditions and environments of
21 California's natural gas infrastructure to validate existing research in a real world setting.¹⁰⁷
22 Intervenors point to vast research on NOx emissions, and how they have been well studied;

¹⁰³ D.24-12-074 at 248-249.

¹⁰⁴ See SoCalGas Rule 45: Standard Renewable Gas Interconnection at Sheet 39-40, *available at*:
<https://tariffsprd.socalgas.com/view/tariff/?utilId=SCG&bookId=GAS&tarfKey=600> (“[T]he Utility
will evaluate requests for safely blending into the pipeline to determine whether injection of any new
or modified supply source can be safely injected into the Utility's pipeline system”).

¹⁰⁵ Ex. SC-01 (Gersen) at 69.

¹⁰⁶ Cal Advocates Testimony at 4, Ex. OCU/LCJA 2 (Bodell) at 8; Prepared Testimony of Ariel Strauss
on behalf of Small Business Utility Advocates (SUBA) (hereinafter “Ex. SBUA-01”) at 8.

¹⁰⁷ Hydrogen Blending Impacts Study at 5, *available at*:
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF>, Hydrogen
Blending Compendium Report, Literature Review at 3, *available at*:
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M556/K896/556896659.PDF>.

1 however, as noted above, California has specific air quality limits which create a need for
2 specific burner conditions in end use equipment, which in turn means that the research
3 intervenors cite may not be applicable here. The purpose of the proposed projects is to validate
4 the research findings on California-specific equipment in live operations. LCJA further notes
5 that the demonstration projects aim to measure leakage of hydrogen/natural gas blends for
6 purposes of safety mitigation rather than the potential greenhouse gas impact.¹⁰⁸ Again, as noted
7 above, the purpose of the demonstration is to validate material compatibility and operability of
8 the natural gas pipeline system with a baseline of zero leaks. From this perspective, SoCalGas's
9 proposed demonstration projects aim to provide key insights on hydrogen impact to pipelines
10 and components (i.e., did it cause a leak to form that wasn't previously there) and procedures for
11 leak surveys with hydrogen blends. Further, quantifying hydrogen leakage *in situ* (particularly in
12 buried pipelines) and in an expanded pipeline area can be difficult and may be better done in
13 laboratory settings or smaller scale demonstration projects, where component level leak rates can
14 be analyzed and understood. Beyond leakage and end use emissions, the proposed projects are
15 intended to measure various other operational characteristics of the California natural gas
16 pipeline system with hydrogen blends including pressure, flow rates, heating value, and
17 validating meter performance.¹⁰⁹ Lastly, Small Business Utility Advocates (SBUA) denotes that
18 the proposed project at UC Irvine should not be funded, citing a superseded scope for the project,
19 i.e., one that was supplied in a data request in October 2022--prior to filing of the Amended
20 Application.¹¹⁰ The scope of the project described in SBUA's testimony, including the buildings
21 and use equipment, does not reflect the current scope for the proposed project at UC Irvine.

22 **C. Scoping Issues 2.c, 2.e SoCalGas Intends to Establish Baseline Metrics to**
23 **Produce Relevant Data**

24 Several intervenors argue that the projects are not well designed because there is no
25 definition of success or established baseline for performance.¹¹¹

¹⁰⁸ Ex. OCU/LCJA 1 (Lewis) at 5.

¹⁰⁹ Joint Utilities Ch. 1R (SoCalGas, Waymire) at 13; Joint Utilities Ch. 2 (SoCalGas, Waymire) at 13.

¹¹⁰ Ex. SBUA-01 (Strauss) at 7-8.

¹¹¹ Ex. OCU/LCJA 2 (Bodell) at 4, 11, 14, Ex. UCAN-01 (Siegele) at 40, WTF-01 (Freehling) at 2.

1 Baseline Performance

2 SoCalGas does intend to establish baselines to measure for both the pipeline system and
3 end-use equipment. However, it is too early to establish those baseline standards, i.e., without
4 authority to proceed with the demonstration. As mentioned above, for each proposed project,
5 SoCalGas will baseline the pipeline area with natural gas prior to the introduction of
6 hydrogen.¹¹² Leak surveys will be performed to verify the system is leak tight, and any
7 necessary material repair or replacement will be performed prior to injection of any hydrogen
8 blends.¹¹³ This is intended to create a baseline of no detectable leaks, against which SoCalGas
9 then will be able to measure in the event a leak is identified. SoCalGas also intends to baseline
10 end-use equipment through proposed inspections prior to the demonstration. In the case of
11 Orange Cove, personnel will perform inspections of the relevant end-use equipment in customer
12 homes and businesses for those customers who accept a courtesy inspection.¹¹⁴ At UC Irvine, all
13 end use equipment will be inspected in the Anteater Recreation Center prior to introduction of
14 hydrogen. This will allow SoCalGas to obtain a baseline of the condition of end-use equipment
15 prior to the demonstration. In the case of Orange Cove, this baseline and inspection period will
16 provide an opportunity to address problem appliances through Customer Programs or with
17 technicians troubleshooting appliances. Similarly, SoCalGas would be able to address any
18 operational anomalies with end use equipment at UC Irvine with UC Irvine staff. As discussed
19 throughout, a finalized data collection plan will be coordinated with an independent third party.
20 SoCalGas will work accordingly with selected independent research organizations to provide
21 necessary data and coordinate results that can be published for independent evaluation. A report
22 will be published and made available to the general public.¹¹⁵

23 Definition of Success

24 SoCalGas provided a response on the definition of success in Data Request responses to
25 Cal-Advocates.

¹¹² Joint Utilities Ch. 1R (SoCalGas, Waymire) at 11; Joint Utilities Ch. 2 (SoCalGas, Waymire) at 11.

¹¹³ *Id.*

¹¹⁴ Joint Utilities Ch. 2 (SoCalGas, Waymire) at 13.

¹¹⁵ Joint Utilities Ch. 1R (SoCalGas, Waymire) at 15; Joint Utilities Ch. 2 (SoCalGas, Waymire) at 15.

1 For the proposed project at UC Irvine:¹¹⁶

2 SoCalGas defines success of the Closed System Project as (1) completion of the proposed
3 demonstration, which is intended to fill knowledge gaps; (2) completion of a final report that
4 contains data collected in alignment with the Data Collection Plan; and (3) continued stakeholder
5 engagement activities within the UC Irvine Community throughout the duration of the project.

6 Success will be measured in the following ways:

- 7 • Completion of the proposed demonstration project;
- 8 • Completion of the final report containing data collected from the demonstration
9 project;
- 10 • Implementation of the American Petroleum Institute's Recommended Practice
11 1173 (API RP 1173) Pipeline Safety Management System (PSMS) Plan-Do-
12 Check-Act approach throughout the project life cycle;
- 13 • Continued community engagement throughout the demonstration project cycle,
14 including engagement with first responders;
- 15 • Construction, commissioning, and operation of the demonstration equipment;
- 16 • Hands-on experience for workforce and end-users;
- 17 • Completion of the data collection plan, which includes scoping a plan with an
18 independent third party, and collection of data in alignment with the approved
19 plan; and
- 20 • Sharing contributions from a real-world demonstration project to help advise the
21 creation of a statewide hydrogen injection standard.¹¹⁷

22 For the proposed project in Orange Cove:

23 SoCalGas defines success of the Orange Cove demonstration project as: (1) completion
24 of the proposed demonstration, which is intended to validate existing research in a real-world

¹¹⁶ See Data Request CAL ADVOCATES-SCG-A2209006-001, available at:
https://www.socalgas.com/sites/default/files/2025-08/Cal_Advocates-SCG-A2209006-001_UCI-7-21-25_FINAL.pdf.

¹¹⁷ See Data Request CAL ADVOCATES-SCG-A2209006-002, available at:
https://www.socalgas.com/sites/default/files/2025-08/Cal_Advocates-SCG-A2209006-002%20Orange_Cove-7-21-25_FINAL.pdf.

California setting; (2) completion of a final report that contains data collected in alignment with the Data Collection Plan; and (3) continued stakeholder engagement within the Orange Cove Community throughout the duration of the project. Success will be measured in the following ways:

- Completion of the proposed demonstration project;
- Completion of the final report containing data collected from the demonstration project;
- Implementation of the American Petroleum Institute’s Recommended Practice 1173 (API RP 1173) Pipeline Safety Management System (PSMS) Plan-Do-CheckAct approach throughout the project life cycle;
- Continued community engagement throughout the demonstration project cycle, including engagement with first responders;
- Construction, commissioning, and operation of the demonstration equipment;
- Hands-on experience for workforce and end-users;
- Completion of the data collection plan, which includes scoping a plan with an independent third party, and collection of data, in alignment with the approved plan; and
- Sharing contributions from a real-world demonstration project to help advise the creation of a statewide hydrogen injection standard.

IV. Scoping Issue #3 Are the Pilots Prudent?

- a. What is the detailed cost breakdown for each pilot project, including equipment, monitoring, safety system, and administration?**
- b. What specific benefits will gas ratepayers receive from investment in these pilot projects?**
- c. What cost-sharing arrangements have been made or pursued with potential non-ratepayer beneficiaries of this research?**
- d. How will cost overruns be handled?**
- A. Scoping Issue 3.b: SoCalGas’s Projects Intend to Provide Ratepayer Benefits**

Cal Advocates contends that benefits to ratepayers will not be realized through the proposed demonstration projects, stating there are no incremental knowledge gaps being

1 filled.¹¹⁸ SoCalGas addresses the claim of projects being duplicative of other efforts such as the
2 Compendium Report or other hydrogen blending demonstration in section III.D.

3 SoCalGas contends that there will be ratepayer benefits from the proposed installation of
4 renewable energy assets. Particularly, for the project in Orange Cove, the investment in a solar
5 array that will later be turned over to the community serves as investment in localized renewable
6 energy assets in a Disadvantaged Community. As contemplated by the Decision, the largest
7 ratepayer benefit is likely to come in the form of data gathering that, in the future, can help to
8 inform a proposal for an injection standard for clean renewable hydrogen into the natural gas
9 infrastructure.

10 SoCalGas acknowledges the importance of understanding the lifecycle greenhouse gas
11 (GHG) emissions associated with hydrogen production and use. However, SoCalGas respectfully
12 disagrees with Cal Advocates' recommendation that all pilot projects be required to conduct full
13 lifecycle analyses (LCA) at this stage. Cal Advocates states, "The commission should require the
14 utilities to gather all hydrogen and greenhouse gas emissions data relevant to their pilot projects
15 and conduct lifecycle analyses estimating the resulting climate impact."¹¹⁹

16 While LCA can be a valuable tool in evaluating long-term climate impacts, it is a broad
17 and complex methodology that often requires extensive data inputs, modeling assumptions, and
18 third-party validation. These analyses can be time- and resource-intensive, and their scope may
19 extend beyond the operational boundaries of a demonstration-scale project. Typically, LCA for
20 GHGs are not required for demonstration projects, as demonstration projects are not intended to
21 operate for the entirety of the useful life of the equipment involved. Imposing such a requirement
22 uniquely on hydrogen blending pilots may introduce unnecessary cost and complexity at this
23 early stage of technology validation.
24

25 **V. Scoping Issue #4 Are the Pilot Projects Safe?**

- 26 ***a. What comprehensive risk assessment has been conducted (i) for each pilot***
27 ***project; (ii) for the specific hydrogen blend percentages attempted in each***
28 ***project; and (iii) for each segment of the California gas infrastructure for***
29 ***which the pilot project was designed?***

¹¹⁸ Cal Advocates Testimony at 2-3, 3-1.

¹¹⁹ *Id.* at 3-1.

- 1 ***b. Beyond monitoring, what automated safety systems and shutdown protocols***
2 ***are in place for each pilot project?***
3 ***c. What baseline testing of infrastructure integrity has been and will be***
4 ***completed prior to pilot project implementation?***
5 ***d. How have emergency response plans been updated specifically for hydrogen***
6 ***incidents at each pilot project?***
7 ***e. What specific outreach has been conducted with communities potentially***
8 ***affected by each pilot project and how has informed consent been***
9 ***documented?***
10 ***f. How does each utility plan to monitor and assess hydrogen embrittlement of***
11 ***the gas components within its pilot projects?***

12 **A. Scoping Issues 4.a, 4.b, 4c: SoCalGas Has Proposed Comprehensive Risk**
13 **Assessments and Robust Safety Systems for Its Demonstration Projects**

14 LCJA contends that the proposed demonstration project in Orange Cove is not safe
15 because SoCalGas has not disclosed the baseline Distribution Integrity Management Program
16 (DIMP) results for the Orange Cove system and does not provide details for its proposed
17 Comprehensive Risk Assessment.¹²⁰ However, SoCalGas does provide its baseline DIMP results
18 for their medium pressure distribution system in response to Appendix B, which can be
19 summarized as follows:¹²¹ SoCalGas evaluates baseline risk for asset failure of its medium
20 pressure system as outlined in the Risk Assessment Mitigation Phase (RAMP) report with an
21 established threshold of annual probability greater than 6×10^{-6} of a serious incident.¹²² The
22 anticipated risk at the proposed hydrogen blending level of 0.1%-5% hydrogen by volume is
23 extremely low, and the following research supports that conclusion:

- 24 • The U.S. Department of Energy (DOE) has determined that hydrogen is as safe as
25 other fuels like natural gas.¹²³

¹²⁰ Ex. OCU/LCJA 2 (Bodell) at 12.

¹²¹ See SoCalGas Response to Appendix B of Assigned Commissioner's Scoping Memo and Ruling (August 11, 2025) at 3-5.

¹²² SoCalGas, 2025 RAMP Report (May 15, 2025), available at:
<https://www.socalgas.com/sites/default/files/2025-05/SCG-RAMP-REPORT-final.pdf>.

¹²³ DOE, Hydrogen Safety, available at:
https://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/h2_safety_fsheets.pdf.

- The Hydrogen Impact Study, commissioned by the CPUC, summarized that hydrogen blends of up to 5% are generally safe.¹²⁴
- The Hydrogen Blending Compendium Report (Compendium Report) found that common appliances can operate safely with blends up to 20% hydrogen.¹²⁵
- The Canadian Standards Association (CSA) Group, a leading certification body in North America, confirms that existing product certifications remain valid with natural gas blends of up to 5% hydrogen.¹²⁶

As such, SoCalGas did not pursue a Comprehensive Risk Assessment for the specific hydrogen blend proposed in this demonstration as the hydrogen blend percentage falls well within the thresholds supported by these safety research and certification standards. Further, SoCalGas has successfully performed demonstration projects with hydrogen blends,¹²⁷ providing industry knowledge on how to successfully roll out a larger scale hydrogen blending demonstration. Despite that low risk assessment, there are several measures that SoCalGas proposes to undertake to address safety and risk. These include but are not limited to:¹²⁸

- Odorant sampling to confirm that blending hydrogen does not affect the efficacy of current natural gas odorant;
- Hydrogen safety education for residents, students and first responders;

¹²⁴ CPUC, *Hydrogen Blending Impacts Study* (July 18, 2022) at 4, available at: <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF>.

¹²⁵ *Id.* at 8 see also R.13-02-008, Compendium Report; Hydrogen Blending Compendium Report, Literature Review at 65-66, available at: <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M556/K896/556896659.PDF>.

¹²⁶ ASGE, *CSA Group Revised Position on Certifying Hydrogen & Natural Gas Products in Canada and the US – Recognizes Acceptability of Natural Gas Containing Up to and Including 5% of Hydrogen* (December 12, 2022), available at: <https://asge-national.org/agaupdate-20230428/>.

¹²⁷ UC Irvine, *In a national first, UCI injects renewable hydrogen into campus power supply* (December 6, 2016), available at: <https://news.uci.edu/2016/12/06/in-a-national-first-uci-injects-renewable-hydrogen-into-campus-power-supply/>; SoCalGas, *SoCalGas Among First in the Nation to Test Hydrogen Blending in Real-World Infrastructure and Appliances in Closed Loop System* (September 30, 2021), available at: <https://www.socalgas.com/newsroom/press-release/socalgas-among-first-in-the-nation-to-test-hydrogen-blending-in-real-world>; see also SoCalGas, *[H2] Innovation Experience*, available at: <https://www.socalgas.com/sustainability/hydrogen/h2home>.

¹²⁸ Joint Utilities Ch. 2 (SoCalGas, Waymire) at 13-17.

- Offering courtesy inspections of end-use customer equipment to confirm present behind-the meter equipment is free of leakage and is operational, both prior to the introduction of hydrogen and during the demonstration period;
- Conducting pre-, during, and post-implementation leak surveys;
- Installing automatic and remote shutdown capabilities for the hydrogen production and blending facility in case an alarm is triggered or a leak is detected; and
- Testing the operations of end use equipment.

Additionally, SoCalGas intends to develop an in-depth asset failure analysis for the hydrogen production and blending equipment within the demonstration project,¹²⁹ hire experienced third party engineering firms to conduct safety studies,¹³⁰ and integrate feedback from SoCalGas subject matter and third-party industry experts.¹³¹ Upon authorization of the project, SoCalGas will create detailed engineering designs in accordance with existing codes and standards that promote safety such as NFPA 2 and ASME B31.8, and perform these safety studies to identify potential hazards and mitigation measures that can be included in the final design for this project. In addition to these safety and risk assessments, independent third parties will be engaged during the pre-commissioning process to review final design and commissioning safety protocols¹³² with SoCalGas and appropriate first responders.

Though not explicitly raised by intervenors, SoCalGas does intend to take similar risk assessment procedures for its proposed project at UC Irvine, which similarly includes:

- Asset failure analysis for the hydrogen production and blending facility, situated adjacent to the ARC facility;

¹²⁹ *Id.* at 5.

¹³⁰ This includes Hazard Identification (HAZID), Quantitative Risk Assessment (QRA), and Hazard and Operability Study (HAZOP).

¹³¹ UCI, *Recommendations for the Proposed “Hydrogen Blending Demonstration Project @ UCI”* (February 14, 2024) at Exhibit H, available at: <https://uci.edu/hydrogen/uci-h2-project-report.pdf>.

¹³² Pre-Startup Safety Review (PSSR).

- Independent third-party safety reviews for Process Hazard Analysis (HAZID, QRA, HAZOP) and Pre-Startup Safety Review (PSSR);
- Coordination with UCI and local fire authorities to develop site-specific emergency protocols; and
- Compliance with existing Codes and Standards intended to promote safety, such as NFPA 2 and ASME B31.8 to guide project design.

In addition, UCI's provost formed a committee of independent professors in the field of Material Science, Civil and Environmental Engineering, and Chemistry to review and vet SoCalGas's proposed project.¹³³ The recommendations from this committee were to move forward with the project and for UCI staff to create an administrative team to oversee the engineering design and build out of the demonstration project.¹³⁴ The professional opinion from these professors is that the proposed demonstration project could be executed safely in the ARC.¹³⁵

1. SoCalGas Has Proposed Enhanced Leak Survey Frequencies

Intervenors contend that the frequency of leak surveys proposed for both of SoCalGas's proposed projects is insufficient for safety purposes, with some proposing continuous monitoring.¹³⁶ Frequency of leak survey implementation is addressed in section II.A.5 above.

Further, SoCalGas proposed monthly leak inspection for the project located at UC Irvine due to the hydrogen blend percentage ranging from 5-20%, and that the pipeline system was appropriately sized for a technician to perform traditional leak survey practices on a monthly basis. Conducting traditional leak surveys on a monthly basis is at least twelve times more frequent than required by 49 CFR 192.723¹³⁷ for natural gas. Odorant would still retain its efficacy with hydrogen blends up to 20%, so a major leak would still be detectable by scent.

¹³³ UCI, *Recommendations for the Proposed "Hydrogen Blending Demonstration Project @ UCI"* (February 14, 2024), available at: <https://uci.edu/hydrogen/uci-h2-project-report.pdf>.

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ Cal Advocates Testimony at 1-6, Ex. OCU/LCJA 2 (Bodell) at 8, Ex. SC-02 (Brown) at 12.

¹³⁷ 49 CFR § 192.723: Distribution System: Leakage Surveys, which identifies federal leak survey requirements, available at: <https://www.ecfr.gov/current/title-49/subtitle-B/chapter-I/subchapter-D/part-192/subpart-M/section-192.723>.

1 Further, as mentioned above, SoCalGas is considering continuous monitoring of the newly
2 installed pipeline assets via fiber optic technology. Even if continuous monitoring is selected,
3 SoCalGas will still employ monthly leak detection surveys for purposes of validating and
4 verifying traditional leak inspection practices and equipment in the field.

5 SoCalGas proposed quarterly leak surveys for its Orange Cove project because the
6 hydrogen blend will ramp up from 0.1% to 5% in intervals throughout the course of the
7 demonstration, with the first quarter of the project only blending up to 1% hydrogen by volume.
8 Implementing traditional leak surveys on a quarterly basis is still at least four times more
9 frequent than required by 49 CFR 192.723¹³⁸ for natural gas. Odorant would still retain its
10 efficacy with hydrogen blends up to 20%, so a major leak would still be detectable by scent.
11 Further, the Orange Cove infrastructure consists of over 100,000 feet of distribution pipeline. It
12 would not be practical to request a technician to survey all 100,000 feet of pipe on a monthly
13 basis. Further, SoCalGas currently operates and maintains Electronic Pressure Monitors (EPMs)
14 at discrete points throughout its distribution system on pipeline and regulation assets, which can
15 help detect fluctuations in pressure on a real-time basis. Continuous monitoring for leakage of
16 the entire pipeline or all end-user appliances would not be practical or cost effective for a short-
17 term temporary project in an entire community. Continuous monitoring of the pipeline system
18 would require alternative technology, such as fiber optic leak detection. Like most medium-
19 pressure distribution systems, pipelines in Orange Cove are underground. More than 100,000
20 feet of existing distribution pipe network would have to be excavated to install fiber optic leak
21 detection along all pipelines in Orange Cove, which would substantially increase the costs of the
22 project. Existing research identifies that hydrogen blends up to 5% would not impact safety,¹³⁹
23 which suggests leak detection protocols over and above existing protocols for natural gas are not
24 necessary.
25

¹³⁸ *Id.*

¹³⁹ CPUC, *Hydrogen Blending Impacts Study* (July 18, 2022) at 4, available at:
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF>.

1 **B. Scoping Issue 4.d SoCalGas’s Performance Standards for Leak Detection**
2 **and Emergency Response will be Determined During Phase 1**

3 Intervenors argue that SoCalGas does not identify its performance standard for leak
4 detection or emergency response, including what tolerance will trigger equipment shut down or
5 what specific leak detection equipment will be utilized.¹⁴⁰

6 Details regarding leak detection equipment tolerance for equipment shut down is
7 addressed in section II.A.5 above. To reiterate, final leak detection equipment types, models,
8 locations, and trigger levels for pure hydrogen will be determined during the detailed engineering
9 phase before the demonstration commences. Further, SoCalGas proposed to perform in-depth
10 hazard analyses for the hydrogen production, storage, and blending facilities,¹⁴¹ which will
11 inform leak detection equipment needs, equipment location, and alarm trigger thresholds for pure
12 hydrogen. All safety plans, including leak detection plans for the hydrogen production, storage,
13 and blending facilities will also be reviewed and coordinated with an independent third party.

14 **C. Scoping Issue 4.e: SoCalGas Has Performed Robust Stakeholder Outreach in**
15 **Communities Where Pilot Projects Are Proposed**

16 Stakeholder Engagement activities are addressed in the Chapter 11 Testimony of Chris
17 Gilbride.

18 **D. Scoping Issue 4.f Monitoring of Hydrogen Embrittlement**

19 LCJA contends that SoCalGas has not communicated details for plans to monitor or
20 assess the embrittlement of steel materials in the Orange Cove distribution system.¹⁴² As stated
21 in opening testimony, “the effect of hydrogen on materials will be continuously monitored
22 through leak surveys at various points within the system. If any leaks are detected during leak
23 surveys, the affected section of the pipeline or specific components may be isolated for further
24 material testing to assess any potential impact of hydrogen on the material's integrity. If an
25 opportunity arises to remove specific sections of the pipeline or components at the conclusion of
26 the demonstration, further material testing may be conducted.”¹⁴³ As discussed throughout, a
27

¹⁴⁰ Ex. OCU/LCJA 2 (Bodell) at 13.

¹⁴¹ See SoCalGas Response to Appendix B of Assigned Commissioner’s Scoping Memo and Ruling (August 11, 2025) at 15, 25.

¹⁴² Ex. OCU/LCJA 2 (Bodell) at 13.

¹⁴³ Joint Utilities Ch. 2 (SoCalGas, Waymire), Exhibit 2A.

1 detailed data collection plan will be coordinated with an independent third party, which will also
2 consider impacts to material.

3 **VI. Scoping Issue #5: SoCalGas’s Proposed Demonstration Projects Create Community**
4 **Benefits a.**

5 ***a. How were the pilot projects selected?***

6 ***b. What measures ensure equitable distribution of risks and benefits for each***
7 ***project?***

8 ***c. How were community stakeholders in each pilot project included in the***
9 ***planning process?***

10 ***d. What ongoing community engagement is planned during implementation of***
11 ***each pilot project?***

12 ***e. What, if any are the impacts on environmental and social justice***
13 ***communities, including the extent to which these pilots impact of***
14 ***achievement of any of the nine goals of the Commission’s Environmental and***
15 ***Social Justice Action Plan.***

16
17 **A. Scoping Issue 5.a How were the pilot projects selected?**

18 LCJA contends that the choice to select the city of Orange Cove generates concern from
19 a public health perspective, identifying the community as “low-income” and a “CALEPA-
20 designated Disadvantaged community.”¹⁴⁴ Intervenors do not, however, question how the pilot
21 project was selected from a technical perspective. The distribution system included in the
22 demonstration scope has one natural gas feed coming into it, which allows for full control of the
23 hydrogen blend that it receives because there will be only one point of interconnection to the
24 pipeline system.¹⁴⁵ The size and makeup of the system was identified as an ideal candidate due
25 to the variety of pipeline materials and vintages it contains.¹⁴⁶ Other factors considered included
26 constructability, community location, and customer facility type. Additionally, SoCalGas has
27 served the Orange Cove community safely and reliably for 90 years.¹⁴⁷ City leadership

¹⁴⁴ Ex. OCU/LCJA 3 (Sinclair) at 2-3.

¹⁴⁵ Joint Utilities Ch. 2 (SoCalGas, Waymire) at 2.

¹⁴⁶ *Id.*

¹⁴⁷ Data Request Cal Advocates-SCG-A2209006-002, Question 1.e, available at:
https://www.socalgas.com/sites/default/files/2025-08/Cal_Advocates-SCG-A2209006-002%20Orange_Cove-7-21-25_FINAL.pdf.

1 welcomed and supported the project concept in their community, making Orange Cove an ideal
2 partner for a demonstration project supporting decarbonization.¹⁴⁸

3 Intervenor do not challenge how the UC Irvine project site was selected. The proposal
4 to blend to the ARC was closely coordinated with UCI facilities personnel and was selected
5 based on the facility's consistent gas load, location, ability to isolate from other campus
6 buildings and residences, pipeline components, and end use equipment.¹⁴⁹ Various sites for the
7 hydrogen production, compression, storage, and blending equipment were considered. As
8 indicated in subsequent testimony, the equipment site has moved from the police campus parking
9 lot to a site just south of the ARC.¹⁵⁰

10 **B. Scoping Issue 5.b What Measures Ensure Equitable Distribution of Risks**
11 **and Benefits of Each Project?**

12 LCJA further identify risks for the proposed demonstration project based on the potential
13 for increased NOx emissions, and its potential to impact public health.¹⁵¹ Detailed responses on
14 NOx emissions in the community are detailed in section II.A.7. LCJA and EDF further
15 highlight a financial burden on a disadvantaged community containing older appliances, on the
16 off chance that appliances need to be replaced or repaired due to the demonstration project.¹⁵²
17 Based on currently available research, appliance certification standards, and SoCalGas's internal
18 assessments, SoCalGas is not aware of any appliances that cannot function with a 5% hydrogen
19 blend.¹⁵³ Issues with gas appliances that arise during the demonstration will be addressed and
20 documented on a case-by-case basis, in accordance with SoCalGas's existing processes and

¹⁴⁸ See Joint Opposition of Southern California Gas Company, San Diego Gas & Electric Company, Pacific Gas and Electric Company, and Southwest Gas Corporation to Joint Motion to Dismiss (July 30, 2024) at Attachment A: Orange Cove City Council Resolution No. 2024-04, *available at*: <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M537/K060/537060074.PDF>.

¹⁴⁹ Data Request CAL ADVOCATES-SCG-A2209006-001, Question 1.e, *available at*: https://www.socalgas.com/sites/default/files/2025-08/Cal_Advocates-SCG-A2209006-001_UCI-7-21-25_FINAL.pdf.

¹⁵⁰ Joint Utilities Ch. 1R (SoCalGas, Waymire) at 5-7.

¹⁵¹ Ex. OCU/LCJA 3 (Sinclair) at 5-6; Ex. EDF-01 (Colvin) at 10.

¹⁵² Ex. OCU/LCJA 3 (Sinclair) at 7.

¹⁵³ This statement is based on currently available research, appliance certification standards, and SoCalGas's internal assessments. It does not constitute a warranty or guarantee of appliance performance. Actual appliance compatibility may vary depending on age, condition, and manufacturer specifications. SoCalGas will continue to monitor and evaluate appliance performance throughout the demonstration period.

1 procedures. Today, customers who experience appliance issues with traditional natural gas can
2 call SoCalGas's dedicated customer service representatives to have a customer service technician
3 troubleshoot their equipment.¹⁵⁴ A SoCalGas technician would be dispatched to the home or
4 business and attempt to troubleshoot the issue. If equipment malfunction occurs during the
5 demonstration, SoCalGas may opt to send the equipment to a lab for root cause analysis, though
6 research, previous demonstration projects, and real circumstances in other jurisdictions currently
7 implementing hydrogen blends indicate this scenario is unlikely. *See* Chapter 11, Rebuttal
8 Testimony of Chris Gilbride for additional details regarding SoCalGas's customer outreach.

9
10 **C. Scoping Issue 5.c: How were community stakeholders in each pilot project**
11 **included in the planning process?**

12 *Stakeholder Engagement activities are addressed in the Chapter 11*
13 *Testimony of Chris Gilbride.*

14 **D. Scoping Issue 5.d What ongoing community engagement is planned during**
15 **implementation of each pilot project?**

16 *Stakeholder Engagement activities are addressed in the Chapter 11*
17 *Testimony of Chris Gilbride*

18
19 **E. Scoping Issue 5.e What, if any are the impacts on environmental and social**
20 **justice communities, including the extent to which these pilots impact**
21 **achievement of any of the nine goals of the Commission's Environmental and**
22 **Social Justice Action Plan.**

23 Several Intervenors claim that the proposed demonstration project in Orange Cove has
24 the potential to pose harm or risk to a disadvantaged community.¹⁵⁵ Posed risks and benefits to
25 the Orange Cove community (a disadvantaged community) are detailed in section II.A.7.

26
27 **VII. CONCLUSION**

28 For the reasons stated herein, the Commission should approve SoCalGas's proposed
29 hydrogen blending demonstration projects. The projects conform to the regulatory requirements
30 set out in this proceeding, and will produce data to advise proposal of a statewide hydrogen

¹⁵⁴ As described in the prepared Direct Testimony of Blaine Waymire (Joint Utilities Ch. 2), SoCalGas will establish a dedicated means for customer contract specific to the proposed demonstration project. *See* Joint Utilities Ch. 2 (SoCalGas, Waymire) at 11.

¹⁵⁵ Ex. SC-01 (Gersen) at 68-72, Ex. OCU/LCJA 3 (Sinclair) at 5-8; Ex. EDF-01 (Colvin) 9-10.

1 injection standard.

2 This concludes my prepared rebuttal testimony.

1 **VIII. QUALIFICATIONS**

2 My name is Blaine Waymire. I am employed at SoCalGas as a Project Manager in the
3 Gas Engineering and System Integrity organization. Currently, I lead the Hydrogen Engineering
4 and Strategy Team's planning for live hydrogen blending demonstrations and regulatory
5 applications. Prior to this, I have held positions within SoCalGas including Hydrogen Blending
6 RD&D Project Manager, Sr. Distributed Energy Resources Advisor and Sr. Account Executive,
7 with various research, engineering analysis, and regulatory responsibilities. I have been
8 employed at SoCalGas since May 2012. I hold a Bachelor of Science degree in Mechanical
9 Engineering from California State University, Long Beach. I am a licensed Professional
10 Engineer in the State of California.

11 I have not previously testified before the Commission