

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**



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Application of Southern California Gas  
Company (U 904 G), San Diego Gas & Electric  
Company (U 902 G), and Southwest Gas  
Corporation (U 905 G) to Establish Hydrogen  
Blending Demonstration Projects.

A. 22-09-006  
(Filed September 8, 2022)

**SIERRA CLUB PROTEST TO APPLICATION OF SOUTHERN CALIFORNIA GAS  
COMPANY (U 904 G), SAN DIEGO GAS & ELECTRIC COMPANY (U 902 G), AND  
SOUTHWEST GAS CORPORATION (U 905 G) TO ESTABLISH HYDROGEN  
BLENDING DEMONSTRATION PROJECTS**

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Dated: October 12, 2022

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**

Application of Southern California Gas Company (U 904 G), San Diego Gas & Electric Company (U 902 G), and Southwest Gas Corporation (U 905 G) to Establish Hydrogen Blending Demonstration Projects.

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Pursuant to Rule 2.6 of the California Public Utilities Commission’s (“Commission”) Rules of Practice and Procedure, Sierra Club submits the following protest to the application of Southern California Gas Company (“SoCalGas”), San Diego Gas & Electric Company (“SDG&E”), and Southwest Gas Corporation (“SW Gas”) (collectively, “the Joint Utilities”) for approval of their hydrogen blending demonstration projects. The application first appeared in the Commission’s Daily Calendar on September 12, 2022. Therefore, this protest is timely filed.

**I. INTRODUCTION**

California policymakers have identified electrification as a cost-effective, complete, and safe approach to building decarbonization and taken significant steps toward a widespread electrification of residential and commercial appliances. In the most recent Integrated Energy Policy Report, the California Energy Commission (“CEC”) recommended electrification of end use equipment as the “perfect pathway to decarbonize buildings” because appliances like heat pumps are “substantially more energy-efficient than the combustion alternative,” and their adoption “reduces local emissions of the criteria pollutants associated with combustion.”<sup>1</sup>

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<sup>1</sup> CEC, *Final 2021 Integrated Energy Policy Report, Volume 1: Building Decarbonization*, at 15 (Feb. 2022), <https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report>.

Accordingly, the Commission decided to end subsidies for gas line extensions in 2023,<sup>2</sup> the California Air Resources Board has proposed ending the sale of gas furnaces and water heaters by 2030,<sup>3</sup> and Governor Newsom set a goal of deploying 6 million heat pumps by 2030.<sup>4</sup> These policies also align with the growing consensus among independent analysts that hydrogen is not a competitive decarbonization solution for heating needs in buildings because heat pumps have several inherent advantages.<sup>5</sup>

Unlike California’s strategies to deploy heat pumps at scale, burning hydrogen blends in residential and commercial buildings is likely incompatible with California meeting its climate goals while minimizing household energy burdens and achieving federal air quality standards. Hydrogen blending carries significant risks related to safety, air quality impacts, and feasibility with existing gas infrastructure and end-use equipment.<sup>6</sup> A recent Commission-funded study by the University of California, Riverside (“UC Riverside”) identified numerous and wide-ranging safety-related concerns that would need to be addressed before the approval of systemwide hydrogen blending. Given the scale of the research needed to address these concerns, the availability of lower-cost electric alternatives that enable deep decarbonization, and the trajectory of California’s building decarbonization policy toward electric solutions that eliminate on-site climate and criteria pollution, the Commission should not force ratepayers to fund this \$35.26 million set of experiments.<sup>7</sup>

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<sup>2</sup> D.22-09-026, *Phase III Decision Eliminating Gas Line Extension Allowances, Ten-Year Refundable Payment Option, and Fifty Percent Discount Payment Option Under Gas Line Extension Rules*, at 2 (Sept. 15, 2022) (“D.22-09-026”), <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M496/K987/496987290.PDF>.

<sup>3</sup> CARB, *2022 State Strategy for the State Implementation Plan; Resolution 22-14*, at 10 (Sept. 22, 2022), <https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/092222/prores22-14.pdf>.

<sup>4</sup> Letter from Governor Gavin Newsom to Liane Randolph, CARB Chair, at 2 (July 22, 2022), <https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf?emrc=1054d6>.

<sup>5</sup> Jan Rosenow, *Is heating homes with hydrogen all but a pipe dream? An evidence review*, at 1, *Joule* (Sept. 27, 2022) (surveying 32 independent studies that find hydrogen will not play a widespread role in meeting heating needs in buildings) (“Rosenow Article”), <https://doi.org/10.1016/j.joule.2022.08.015>.

<sup>6</sup> Earthjustice, *Reclaiming Hydrogen for a Renewable Future*, at 27–30 (Aug. 2021), [https://earthjustice.org/sites/default/files/files/hydrogen\\_earthjustice\\_2021.pdf](https://earthjustice.org/sites/default/files/files/hydrogen_earthjustice_2021.pdf).

<sup>7</sup> A.22-09-006, *Joint Application of SoCalGas (U 904 G), SDG&E (U 902 G), and SW Gas (U 905 G) to Establish Hydrogen Blending Demonstration Projects*, at 9–10 (Sept. 8, 2022) (“Application”) (listing estimated direct costs of \$12.86 million for SoCalGas’ project, \$12.2 million for SDG&E’s project, and \$10.2 million for SW Gas’s project.), <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M496/K875/496875149.PDF>.

## II. BACKGROUND

The Joint Utilities’ application is their second request for over \$30 million of ratepayer funds to study distribution system blending, and their first such application since the UC Riverside study identified the knowledge gaps that prevent immediate hydrogen blending at scale. While issues related to hydrogen blending have arisen in multiple proceedings,<sup>8</sup> the Commission has never come to the conclusion that hydrogen blending in residential and commercial buildings is an appropriate or cost-effective strategy for meeting California’s climate goals.

In A.20-11-004, the utilities proposed a five-year research program on hydrogen blending that would cost \$31.8 million, 77% of which would be treated as a capital expense.<sup>9</sup> In D.21-07-005, the Commission dismissed this application as incomplete for failing to explain how it would fill knowledge gaps that would not be filled by other research, among other reasons.<sup>10</sup> The decision also provided the gas utilities direction on what they must include in any future application for hydrogen blending research and demonstration projects.<sup>11</sup> For instance, the Commission required a new application to leverage research by UC Riverside and the CEC “to obtain the most cost-effective use of the state’s research money,” to provide detailed timelines, budgets, and descriptions of “each component of the proposed research program,” and to make “every reasonable attempt to use existing and other funds before requesting new funds.”<sup>12</sup>

In July 2022, the Commission released the UC Riverside Hydrogen Blending Impacts Study, which “assesse[d] the operational and safety concerns associated with injecting hydrogen into the existing natural gas pipeline system.”<sup>13</sup> Although one of the tasks the Commission hired UC Riverside to perform was to “evaluate the maximum hydrogen percentage at which no or minor modifications are needed for natural gas infrastructure and end-use systems,”<sup>14</sup> the UC

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<sup>8</sup> The Commission has invited comment on the UC Riverside Hydrogen Blending Impacts Study in R.13-02-008 and considered a joint utility proposal for hydrogen blending research in A.20-11-004.

<sup>9</sup> D.21-07-005, *Decision Dismissing Application*, at 4 (July 26, 2021) (“D.21-07-005”), <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M393/K334/393334756.PDF>.

<sup>10</sup> *Id.* at 16–19.

<sup>11</sup> *Id.* at 22–26.

<sup>12</sup> *Id.* at 23–25.

<sup>13</sup> UC Riverside, *Final Report: Hydrogen Blending Impacts Study*, at 1 (July 18, 2022) (“UC Riverside Study”), <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF>.

<sup>14</sup> State of California Agreement Summary, Agreement No. 19NS1662, at PDF p. 10–11 (Apr. 1, 2020) (Task 3).

Riverside team did not identify a level of hydrogen blending that would be safe in the existing gas system. Instead, the UC Riverside Study found that a “systemwide blending injection scenario becomes concerning as hydrogen blending approaches 5% by volume” and recommends a multi-year research and planning process that would precede adoption of a hydrogen blending standard.<sup>15</sup> The UC Riverside Study does not assess whether a transition to a 5% hydrogen blend—which would reduce the carbon-intensity of pipeline gas by less than 2%<sup>16</sup>—would be part of a cost-effective climate strategy or consistent with just and reasonable rates.

The UC Riverside Study identified multiple issues that are likely to pose challenges to safe hydrogen blending in California. For instance, the study notes that “[h]ydrogen is known to have serious detrimental effects on underground porous reservoirs.”<sup>17</sup> Of the twenty known ways that hydrogen can negatively impact these reservoirs, the most serious is bacterial growth that causes a loss of gas volume, the production of toxic hydrogen sulfide gas, and damage to the reservoir itself.<sup>18</sup> Each of SoCalGas’ major storage facilities are underground porous reservoirs.<sup>19</sup>

Based on a literature review, modeling studies, and experiments, the UC Riverside Study recommends research on 16 separate issues to close knowledge gaps on the potential effects of injecting hydrogen into the existing gas pipeline systems, including:<sup>20</sup>

- Conduct research to address knowledge gaps in specific leak mechanisms through joints, threads, cracks, and pinhole defects to accurately predict the leak flow rates with gas blends with varying concentrations of hydrogen.
- Conduct research to address knowledge gaps in hydrogen diffusion and embrittlement processes in metals, alloys, and other materials used in the natural gas infrastructure.
- Research the impact on metallic pipes and components under pressure, stress, and hydrogen concentrations that are of interest but are lacking experimental results that can be used in established Fit For Service assessment calculations to

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<sup>15</sup> UC Riverside Study at 4.

<sup>16</sup> The equation for determining the share of hydrogen by energy content (using hydrogen and methane’s mole fraction) is available in: Iain Staffell et al., *The role of hydrogen and fuel cells in the global energy system*, at 479, Energy & Env’t Sci. (2019), <https://pubs.rsc.org/en/content/articlepdf/2019/ee/c8ee01157e>.

<sup>17</sup> UC Riverside Study at 15.

<sup>18</sup> *Id.*

<sup>19</sup> SoCalGas, *Underground Storage of Natural Gas* (2016), <https://www.santa-clarita.com/home/showpublisheddocument/10960/635907826867630000>.

<sup>20</sup> UC Riverside Study at 113–14.

determine appropriate operating pressure and factors of safety.

- Conduct case-by-case studies of key components, equipment and facilities to determine the appropriate blend percentage suitable to mitigate operational risks, public safety, durability and integrity of the network and prevent negative impacts to appliances.
- Perform an in-depth study of leak detection, odorization, gas build-up, dispersion dynamics, and safety zones to account for changes in flammability, ignition, and explosivity to identify potential impacts on the integrity, durability, and safety at various hydrogen blending percentages.
- Update existing inspection, leak detection, maintenance and repair procedures to mitigate the potential risk factors due to hydrogen’s broader flammability range, low ignition energy, and high flame velocity.

The application and supporting testimonies do not allege that the proposed pilots would close all identified knowledge gaps and the UC Riverside Study does not estimate the cost of the research that would be necessary to determine a safe blending standard.

### **III. GROUNDS FOR THE PROTEST**

The proposed projects are an inappropriate use of ratepayer funds because they fail to provide a significant benefit, while posing health, climate, and safety risks. Hydrogen blending is an expensive, dead-end strategy for decarbonizing buildings. Exploratory projects related to hydrogen blending in residential and commercial buildings are a poor use of limited Commission and ratepayer resources when zero-emissions electric equipment already provides a pathway to decarbonize the same end-uses. In addition, the projects could increase emissions of nitrogen oxides (“NO<sub>x</sub>”) and greenhouse gasses (“GHGs”) and unnecessarily create risks to customers’ personal safety and property.

#### **A. The Commission Should Not Waste Ratepayer and Commission Resources on a Strategy that Will Not Play a Meaningful Role in Decarbonizing Residential and Commercial Buildings.**

Burning a blend of hydrogen and methane in residential and commercial buildings would be incompatible with California’s policy of “[a]chiev[ing] net zero greenhouse gas emissions as soon as possible, but no later than 2045,”<sup>21</sup> as zero-emission electric appliances are available to meet these customers’ needs today. Even in a best-case scenario, hydrogen blending offers

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<sup>21</sup> Assem. Bill 1279, § 2(c)(1) (2022) (adding the California Climate Crisis Act to the California Health and Safety Code), [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=202120220AB1279](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB1279)

minimal GHG reductions. The Joint Utilities admit that a 20% hydrogen blend—the upper limit of blending potential addressed by these projects—has a CO<sub>2</sub> reduction potential of only 6.3%.<sup>22</sup> That means over 93% of the CO<sub>2</sub> emissions from the gas system would still be left unaddressed by the utilities’ most ambitious hydrogen blending scenario. There is no feasible path to decarbonizing the remaining 93% of the climate pollution from pipeline gas.<sup>23</sup> Consequently, reliance on a hydrogen blend would extend California’s reliance on fossil fuels and make it far more difficult to reach the State’s deep decarbonization goals.

A better use of scarce ratepayer and Commission resources would be helping gas customers transition to electric appliances that have a clear path to full decarbonization. Electric appliances eliminate emissions at the point of consumption and their life cycle emissions will continually decline as California’s electric utilities comply with Senate Bill (“SB”) 100. Independent analysis for the CEC explains the risk of delaying investments in electrification in the hope that affordable deep-decarbonization solutions for pipeline gas might materialize.<sup>24</sup> As the CEC report notes, “if building electrification is delayed, missing the lower-cost opportunities for all-electric new construction and replacement of equipment upon failure, there is a greater risk that expensive early retirement of equipment may be needed, or that the climate goals could be missed.”<sup>25</sup> There is a risk that these hydrogen blending projects could disrupt full decarbonization of the residential and commercial sectors, both by diverting resources and by feeding a false narrative that these sectors can continue to rely on pipeline gas without threatening California’s climate goals.

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<sup>22</sup> Testimony Chapter 1, *Prepared Direct Testimony of Hugo Mejia, Victor Cervantes, and Laura Nelson on Behalf of SoCalGas, SDG&E, and SW Gas (Policy)*, at 3 (Sept. 8, 2022) (“Test. Ch. 1”), [https://www.socalgas.com/sites/default/files/Chapter1-Policy-Joint\\_IOUs.pdf](https://www.socalgas.com/sites/default/files/Chapter1-Policy-Joint_IOUs.pdf).

<sup>23</sup> See, e.g., Jimmy O’Dea, *The Promises and Limits of Biomethane as a Transportation Fuel*, at 2, Fig. 1, Union of Concerned Scientists (May 2017) (finding that there is only enough potential biomethane supply to displace about 3% of California’s fossil gas use), <https://www.ucsusa.org/sites/default/files/attach/2017/05/Promises-and-limits-of-Biomethane-factsheet.pdf>.

<sup>24</sup> CEC, *The Challenge of Retail Gas in California’s Low-Carbon Future*, at 70 (Apr. 2020) (“should building electrification be delayed in the hope that RNG technology will progress more rapidly than considered in the optimistic P2G cost scenario here, and these RNG cost reductions do not materialize, then it will be difficult to recover from delays in building electrification and it may prove difficult to reduce emissions at reasonable cost. Further, customers who do not electrify face the risks associated with high cost of gas, while customers who electrify, do not face the same level of rate impact risk.”) (“Challenge of Retail Gas Report”), <https://www.energy.ca.gov/sites/default/files/2021-06/CEC-500-2019-055-F.pdf>.

<sup>25</sup> *Id.* at 37.



To avoid wasteful spending, the Commission should only approve research and other investments in hydrogen blending for residential and commercial customers if the record shows that this strategy can have a meaningful role in a least-cost, least-risk pathway for achieving California’s carbon neutrality goal. It is very unlikely that the utilities could make this showing, as dozens of independent studies agree that hydrogen is not suitable for a widespread role as a fuel for heat in buildings.<sup>26</sup> “A total of 32 studies” by “universities, research institutes, intergovernmental organizations.... and consulting firms” advise against hydrogen for domestic heating—finding it to be “less economic, less efficient, more resource intensive, and associated with larger environmental impacts” than “alternatives such as heat pumps.”<sup>27</sup> The Commission should align its policies with the growing consensus that scarce, costly green hydrogen should not be squandered on combustion for low-grade heat, and that electric technologies are the least cost and most environmentally responsible option for decarbonizing heating equipment in domestic and commercial buildings.

If the Commission allows the utilities to pursue hydrogen blending, the costs of this strategy—in this application and beyond—will likely fall entirely on ratepayers. In D.21-07-005, the Commission required the gas utilities to take some common-sense steps to minimize the burden of hydrogen blending projects on ratepayers, like making “every reasonable attempt to use existing and other funds before requesting new funds,” noting that the federal government might research hydrogen blending in partnership with entities like Joint Utilities.<sup>28</sup> However, since the Commission issued that decision, the U.S. Department of Energy (“DOE”) has released a draft National Clean Hydrogen Strategy and Roadmap that does not include distribution system blending as a priority use for hydrogen.<sup>29</sup> Instead, the first of three key strategies that DOE identifies for ensuring that clean hydrogen is an effective decarbonization tool is to “[t]arget strategic, high-impact uses for clean hydrogen... where limited deep decarbonization alternatives exist.”<sup>30</sup> The federal strategy seeks to “ensure that clean hydrogen will be utilized in the highest value applications,” such as “the industrial sector” and “heavy-duty transportation.”<sup>31</sup> This

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<sup>26</sup> Rosenow Article at 1.

<sup>27</sup> *Id.*

<sup>28</sup> D.21-07-005 at 25.

<sup>29</sup> See generally U.S. Dept. of Energy, *DOE National Clean Hydrogen Strategy and Roadmap* (Sept. 2022), <https://www.hydrogen.energy.gov/pdfs/clean-hydrogen-strategy-roadmap.pdf>.

<sup>30</sup> *Id.* at 3.

<sup>31</sup> *Id.*



planning document only considers hydrogen blending in the industrial sector, where users require heat over 300°C.<sup>32</sup> Even in the industrial context, the Department of Energy does not anticipate blending to be a viable strategy until the last phase of clean hydrogen development because of its high costs.<sup>33</sup> Given the federal focus on using hydrogen in hard-to-electrify sectors, the Commission should not expect federal funds to offset the costs of the utilities’ efforts to blend hydrogen into their low-pressure distribution systems. Similarly, the Commission should not expect the CEC to devote funds from the Hydrogen Program it administers to help harden the gas distribution system for hydrogen blending, as the Legislature required the CEC to prioritize projects that maximize air quality benefits.<sup>34</sup>

In addition to research costs, hydrogen blending at scale could require extensive and costly retrofits of the gas distribution system.<sup>35</sup> For instance, SDG&E plans to demonstrate hydrogen blending by replacing the pipe serving the buildings in its project with “new, State of the Art PE Pipe.”<sup>36</sup> The UC Riverside Study reported that only half of the distribution mains in California’s pipeline system are comprised of plastic pipe, with 48.32% of distribution mains made of steel or iron.<sup>37</sup> Thus, the Commission would not be able to rely on these pilots to approve widespread distribution blending. The Commission would still need to investigate the compatibility of hydrogen with more materials that are common in the gas utilities’ systems and oversee retrofits on an untold scale—all to pursue a dead-end strategy.

The Commission’s equity goals also require avoiding unnecessary spending on the gas distribution system because those costs are likely to be borne by the customers who can least afford it.<sup>38</sup> As the Commission recently recognized, as California moves toward electrification

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<sup>32</sup> *Id.* at 33. *See also id.* at 44 (noting that “[t]he use of hydrogen in this sector will require the advancement of low-NOx hydrogen combustion technologies, as well as an improved understanding of the impacts of hydrogen on infrastructure and turbine materials”).

<sup>33</sup> *Id.* at 90, 93.

<sup>34</sup> Assem. Bill 209, § 12 (art. 4)(g) (2022) (budget trailer bill creating a Hydrogen Program in Article 4), [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=202120220AB209](https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB209).

<sup>35</sup> UC Riverside Study at 3 (finding that metals and alloys used in natural gas transmission systems experienced “hydrogen induced embrittlement” when exposed to hydrogen gas, and that “polymeric material results identify limitations in material integrity for mixtures of 20% hydrogen.”).

<sup>36</sup> Testimony Chapter 3, *Prepared Direct Testimony of Melanie Davidson and Pooyan Kabir on Behalf of SDG&E (SDG&E’s Hydrogen Blending Demonstration Project)*, at 6 (Sept. 8, 2022) (“Test. Ch. 3”), [https://www.socalgas.com/sites/default/files/Chapter3-Technical\\_Presentation-SDGE\\_Project.pdf](https://www.socalgas.com/sites/default/files/Chapter3-Technical_Presentation-SDGE_Project.pdf).

<sup>37</sup> UC Riverside Study at 10.

<sup>38</sup> CPUC, *Environmental & Social Justice Action Plan: Version 2.0*, at 22 (Apr. 7, 2022) (“as California

as a cost-effective way to fully decarbonize its buildings, “[t]he maintenance and operational costs associated with gas infrastructure will need to be paid for by a shrinking number of future gas customers, which will be reflected in higher rates.”<sup>39</sup> There is a risk that “low-income customers who are less able to electrify may face a disproportionate share of gas system costs.”<sup>40</sup> To reduce these risks, independent analysts urge policymakers to “[i]dentify alternatives to significant new investments in the gas delivery system, not otherwise needed to maintain system safety and reliability.”<sup>41</sup> The costs of researching hydrogen blending and retrofitting distribution systems to accommodate hydrogen are precisely the types of unnecessary costs the Commission should avoid to reduce the utilities’ stranded asset risk and limit the energy burdens of California’s most vulnerable households.

## **B. The Application Lacks Basic Safeguards for Health and Climate Risks.**

The Joint Utilities’ perfunctory approach to health and climate risks inherent to the projects should concern the Commission. To the extent that the demonstration projects go forward, the Commission must require comprehensive monitoring, reporting, mitigation, and consumer protection parameters for the projects regarding air quality, safety, and potential property damage. Additionally, to ensure that the demonstration projects do not result in increased GHG emissions, the electrolyzers used to produce hydrogen at each project site must be required to be powered by new or excess renewable energy sources, with the renewable attributes of the energy they consume retired upon use.

### **1. The Projects Pose Significant Health Risks Due to the Risk of Increased NO<sub>x</sub> Emissions.**

The risk of increased emissions of NO<sub>x</sub> from transitioning to a hydrogen blend is sufficient reason to deny this application. A transition to burning a methane-hydrogen blend is

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transitions to a cleaner grid, the risk of a smaller number of households, likely lower income households who cannot afford to upgrade their existing household appliances to energy efficient and/or all electric, becoming increasingly financially responsible for maintaining legacy infrastructure.... Continuing to assess the cumulative impact of rates on households and working to mitigate these impacts on the most burdened households will remain a priority in all actions the CPUC takes.”), <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/news-and-outreach/documents/news-office/key-issues/esj/esj-action-plan-v2jw.pdf>.

<sup>39</sup> D.22-09-026 at 16 (describing the findings of Energy Division Staff).

<sup>40</sup> Challenge of Retail Gas Report at 5.

<sup>41</sup> Gridworks, *California’s Gas System in Transition*, at 3 (2019), [https://gridworks.org/wp-content/uploads/2019/09/GW\\_Calif-Gas-System-report-1.pdf](https://gridworks.org/wp-content/uploads/2019/09/GW_Calif-Gas-System-report-1.pdf).

likely to increase NO<sub>x</sub> emissions because hydrogen burns hotter than methane, and NO<sub>x</sub> is formed under high temperature conditions during combustion. A 2022 meta-analysis of NO<sub>x</sub> emissions from equipment analogous to domestic burners operating on hydrogen/natural gas blends found “a huge range of possible changes in NO<sub>x</sub> emissions from H<sub>2</sub>-[natural gas] fuel blends.”<sup>42</sup> In a mean case that reflects the results across the relevant literature, hydrogen blends of over 5%–20% led to NO<sub>x</sub> emission increases of 7%–30%.<sup>43</sup> The UC Riverside Study also cautioned that combustion of a hydrogen blend can result in heightened emissions of NO<sub>x</sub>.<sup>44</sup>

Despite the known NO<sub>x</sub> risks of hydrogen combustion, the Joint Utilities’ direct testimony barely discusses this issue. Neither the Joint Utilities’ policy testimony nor SW Gas’ technical testimony mentions NO<sub>x</sub>.<sup>45</sup> SDG&E and SoCalGas fail to offer a concrete plan for monitoring, reporting, and mitigating NO<sub>x</sub> emissions. Instead, SDG&E and SoCalGas state a vague intention to “[p]erform measurement on emissions from hot water and space heaters,” at intervals “[t]o be determined,” to check customer equipment for “emissions, including NO<sub>x</sub>.”<sup>46</sup> SoCalGas and SDG&E have a track record of dismissing concerns about NO<sub>x</sub> emissions that the Commission and the California Air Resources Board (“CARB”) have repeatedly concluded need to be addressed.<sup>47</sup> It would be inappropriate for the Commission to authorize research projects that deliver hydrogen blends to gas customers without requiring comprehensive and concrete monitoring, reporting, and mitigation strategies to identify and address increases in NO<sub>x</sub> emissions.

NO<sub>x</sub> emissions from existing gas appliances are already a threat to California

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<sup>42</sup> Madeleine L. Wright & Alastair C. Lewis, *Emissions of NO<sub>x</sub> from blending of hydrogen and natural gas in space heating boilers*, at 7, 11, *Elementa: Science of the Anthropocene* (May 31, 2022), <https://doi.org/10.1525/elementa.2021.00114>.

<sup>43</sup> *Id.*

<sup>44</sup> UC Riverside Study at 8.

<sup>45</sup> See generally Test. Ch. 1. See also Testimony Chapter 4, *Prepared Direct Testimony of Kevin M. Lang on Behalf of SW Gas (SW Gas’ Hydrogen Blending Demonstration Project)*, (Sept. 8, 2022) (“Test. Ch. 4”), [https://www.socalgas.com/sites/default/files/Chapter4-SWG\\_Technical\\_Presentation.pdf](https://www.socalgas.com/sites/default/files/Chapter4-SWG_Technical_Presentation.pdf).

<sup>46</sup> Testimony Chapter 2, *Prepared Direct Testimony of Kevin Woo on Behalf of SoCalGas (SoCalGas’ Hydrogen Blending Demonstration Project)*, at 14 (Sept. 8, 2022) (“Test. Ch. 2”), [https://www.socalgas.com/sites/default/files/Chapter2-Technical\\_Presentation-SoCalGas\\_Project.pdf](https://www.socalgas.com/sites/default/files/Chapter2-Technical_Presentation-SoCalGas_Project.pdf); see also Test. Ch. 3 at 15.

<sup>47</sup> See, e.g., R.19-01-011, *Comments of SoCalGas (U 904 G) on Proposed Decision Re Phase III Decision Eliminating Gas Line Extension Allowances, Ten-Year Refundable Payment Option, and Fifty Percent Discount Payment Option under Gas Line Extension Rules*, at 7–11 (Aug. 29, 2022) (arguing against Commission and CARB findings that NO<sub>x</sub> emissions from gas appliances present health risks due to air quality degradation), <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M496/K630/496630982.PDF>.

communities without introducing hydrogen to the mix. Nitrogen dioxide (“NO<sub>2</sub>”) is known to have detrimental impacts on human health as a criteria pollutant regulated by the U.S. Environmental Protection Agency (“EPA”), and a 2020 CARB resolution acknowledged that “studies have linked exposure to high levels of NO<sub>2</sub> and other nitrogen species (NO<sub>x</sub>) emitted from gas appliances with asthma and exacerbation of other respiratory symptoms.”<sup>48</sup> Indeed, in its 2022 Air Quality Management Plan, the South Coast Air Quality Management District determined that “there is no viable pathway to achieve the needed reductions [in NO<sub>x</sub> emissions to achieve federal health-based air quality standards] without widespread adoption of zero emissions (ZE) technologies across all mobile sectors and stationary sources, large and small.”<sup>49</sup> NO<sub>x</sub> is also a precursor to ground-level ozone, also known as smog, and “Particulate Matter less than 2.5 microns in aerodynamic diameter (PM-2.5).”<sup>50</sup> As CARB noted in its 2022 State Implementation Plan (“SIP”) Strategy, “[e]very year, over 5,000 premature deaths and hundreds of illnesses and emergency room visits for respiratory and cardiovascular disease in California are linked to PM2.5 pollution,” and “[t]he health impacts of exposure to elevated levels of ozone in California are also considerable, including higher levels of emergency room visits and hospitalization, lost school days, and most critically, premature mortality.”<sup>51</sup> Emissions from gas appliances in residential and commercial buildings emit “about four times the emissions from electric utilities” in California.<sup>52</sup> The Commission should not authorize any project that risks increasing emissions from these sources. The Commission should take any risk of increasing NO<sub>x</sub> emissions from gas-fueled end-use equipment in buildings very seriously, particularly given that the Joint Utilities have proposed projects in counties that fail to achieve the health-based

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<sup>48</sup> CARB, *California Indoor Air Quality Program Update*, Res. 20-32, at 1 (Nov. 19, 2020), <https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2020/res20-32.pdf>.

<sup>49</sup> South Coast Air Quality Management District, *Revised Draft 2022 Air Quality Management Plan*, at ES-6 (2022), <http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/revised-draft-2022-aqmp/revised-draft-2022-aqmp.pdf?sfvrsn=4>.

<sup>50</sup> EPA, *Basic Information about NO<sub>2</sub>*, (last updated Aug. 2, 2022), <https://www.epa.gov/no2-pollution/basic-information-about-no2>; EPA, *Ground-level Ozone Basics*, (last updated June 14, 2022), <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics>; EPA, *Technical Bulletin: Nitrogen Oxides (NO<sub>x</sub>), Why and How They are Controlled*, at 7 (Nov. 1999), <https://www3.epa.gov/ttn/catc1/dir1/fnoxdoc.pdf>.

<sup>51</sup> CARB, *Proposed 2022 State Strategy for the State Implementation Plan*, at 15 (Aug. 12, 2022), [https://ww2.arb.ca.gov/sites/default/files/2022-08/2022\\_State\\_SIP\\_Strategy.pdf](https://ww2.arb.ca.gov/sites/default/files/2022-08/2022_State_SIP_Strategy.pdf).

<sup>52</sup> *Id.* at 30, 101.

California Ambient Air Quality Standards for ozone.<sup>53</sup> Instead of devoting ratepayer funds to a dead-end climate strategy that can increase health-harming emissions, the Commission should focus on electrifying residential and commercial end-uses, which can eliminate both climate and NO<sub>x</sub> emissions and relies on technology that is ready to scale today.

## **2. The Projects' Designs Do Not Ensure Climate Benefits, and Pose Risks of Increasing Greenhouse Gas Emissions.**

The Joint Utilities' primary justification for the projects—that hydrogen blending will decarbonize the gas system and advance the state's climate goals—fails to address the substantial risk that these projects could increase total greenhouse gas emissions.<sup>54</sup> Without well-crafted production standards for hydrogen in the pilot, the utilities may use hydrogen that is so carbon intensive that the climate pollution associated with producing the hydrogen will overwhelm any benefits from reducing carbon emissions at the burner tip. Further, additional climate risks from hydrogen leakage appear to lack sufficient safeguards.

While the Joint Utilities note that “hydrogen is carbon-free at the point of consumption,” they fail to address the energy- and GHG-intensity of hydrogen production.<sup>55</sup> The only carbon-free way to produce hydrogen is through electrolysis, a process in which hydrogen atoms are split off of water molecules, powered exclusively by additional or excess zero-emissions energy sources, retiring the renewable attributes of that energy afterward. While the projects all propose to use electrolyzers to produce hydrogen using water and electricity, it is unclear from the application how they intend to procure electricity to power the electrolyzers. If the electrolyzers rely on grid electricity instead of new on-site renewables, the new energy load could increase total GHG and criteria pollution emissions from the power sector to such a degree that it would outweigh any emissions reductions achieved by the hydrogen blend. Electrolysis is such an energy-intensive process that hydrogen produced from grid-average electricity in California is far more carbon-intensive than the fossil gas that the Joint Utilities currently deliver to their core customers.<sup>56</sup> Consequently, the pilots could increase climate pollution by delivering a gas blend

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<sup>53</sup> CARB, *Area Designations for State Ambient Air Quality Standards: Ozone*, (Oct. 2020), [https://www.arb.ca.gov/desig/adm/2020/state\\_o3.pdf?\\_ga=2.194051307.797655394.1665408640-1846882355.1611247428](https://www.arb.ca.gov/desig/adm/2020/state_o3.pdf?_ga=2.194051307.797655394.1665408640-1846882355.1611247428).

<sup>54</sup> *See* Test. Ch. 1 at 2.

<sup>55</sup> *Id.* at 3.

<sup>56</sup> Electrolytic hydrogen produced from California grid-average electricity is more than twice as carbon-

that is even more carbon intensive than fossil gas.

Additionally, hydrogen itself is an indirect greenhouse gas with a 20-year global warming potential of roughly 30 times greater than carbon dioxide.<sup>57</sup> As the UC Riverside Study noted, “blends with higher hydrogen percentages leak faster compared to methane,” and “[h]ydrogen gas is known to permeate through polymer pipes.”<sup>58</sup> SoCalGas and SDG&E’s plans for addressing leakage involve only monthly leak surveys, unless the utilities receive a customer service call, and SW Gas intends to hire a third party to make a plan.<sup>59</sup> To ensure that the project does not contribute to the climate crisis that it ostensibly seeks to address, the Commission should consider hydrogen’s indirect contribution to global warming and impose robust monitoring and reporting requirements.

### **3. The Projects Do Not Appear to Account for Other Risks to Participants.**

It is unclear from the application and supporting testimony whether the gas utilities will be responsible for any damages that the pilot projects cause to people or property. For instance, one study by researchers at the University of California, Irvine (“UC Irvine”) identified safe limits of operation for two different kinds of gas water heater at <10% hydrogen.<sup>60</sup> The study provides one example of how hydrogen blends can damage appliances that were designed to burn methane, observing that the different flame characteristics of a hydrogen blend could “overheat the burner and lead to failure.”<sup>61</sup> Additionally, because “[h]ydrogen ignites more easily and is more explosive than methane,” risks from gas leaks and explosions are higher with a hydrogen blend.<sup>62</sup> It would be unreasonable for the Commission to approve a hydrogen

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intensive as compressed natural gas, which itself is more carbon-intensive than gas in the low-pressure distribution system due to the emissions from compression at the fueling station site. 17 C.C.R. § 95488.5(e) (comparing a 164.46 carbon intensity value for hydrogen “produced in California from electrolysis using California average grid electricity” to a 79.21 carbon intensity value for “[c]ompressed [n]atural [g]as from [p]ipeline [a]verage North American [f]ossil [n]atural [g]as”).

<sup>57</sup> Ilissa B. Ocko & Steven P. Hamburg, *Climate consequences of hydrogen emissions*, at 9359, *Atmospheric Chemistry and Physics* (July 20, 2022), <https://acp.copernicus.org/articles/22/9349/2022/> (Figure 3).

<sup>58</sup> UC Riverside Study at 3, 12.

<sup>59</sup> Test. Ch. 2 at 13; Test. Ch. 3 at 14; Test. Ch. 4 at 9.

<sup>60</sup> Shiny Choudhury, et al., *Combustion performance of low-NOx and conventional storage water heaters operated on hydrogen enriched natural gas*, at 2412, table 8, *Int’l Journal of Hydrogen Energy* (Dec. 5, 2019).

<sup>61</sup> *Id.* at 2412.

<sup>62</sup> Physicians for Soc. Resp., *Hydrogen Pipe Dreams: Why Burning Hydrogen in Buildings is Bad for*



blending project that poses risks to customers, particularly when hydrogen blending is unlikely to play a meaningful role in decarbonizing California’s residential or commercial buildings.

#### **IV. ISSUES TO BE CONSIDERED**

The issues considered in this case should include, but are not limited to, the following:

- Whether charging customers for the proposed pilots is consistent with just and reasonable rates, including consideration of (a) whether hydrogen blending is an appropriate use of resources for sectors that are not hard to electrify, such as residential and commercial buildings, and (b) whether the pilots will demonstrate technologies that are likely to play a meaningful role in the deep decarbonization of California’s buildings;
- Air quality impacts of hydrogen combustion in residential and commercial end-use equipment, including whether air quality risks warrant denial of the application. If the Commission does not deny the application, it will need to consider monitoring and mitigation strategies to address potential air quality impacts;
- The extent to which the demonstration projects will result in greenhouse gas reductions and whether the proposed pilots are a cost-effective means of achieving any anticipated greenhouse gas reductions;
- Greenhouse gas and air quality impacts of producing hydrogen for the pilot, including requirements to ensure (a) any hydrogen production is zero-emissions and (b) the environmental attributes of the electricity used for hydrogen production are not double counted;
- Health and safety issues related to distribution and combustion of hydrogen gas blends;
- Monitoring requirements related to leakage from the hydrogen gas blend;
- Reporting requirements for any authorized pilot(s);
- Redressability of and compensation for potential harms to project participants (e.g., personal injuries or damage to appliances and buildings), including whether customers with damaged gas appliances should receive assistance transitioning to electric appliances

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*Climate and Health*, at 13 (June 2022), <https://psr.org/wp-content/uploads/2022/07/hydrogen-pipe-dreams.pdf>. See also *id.* (“In the United Kingdom, a comprehensive risk assessment conducted by Hy4Heat evaluating a theoretical methane-hydrogen blend predicted that the number of explosions per year and the risk of injuries from in-home explosions would be four times higher with a 20 percent blend of hydrogen compared to methane alone.”).



and whether ratepayers should bear the costs of risks that the Joint Utilities fail to address in their application;

- Whether the proposed projects are the most cost-effective use of research funds, as directed by D.21-07-005;
- Whether the application meets all other requirements set forth by D.21-07-005.

Sierra Club attempted to probe several of these issues in discovery prior to filing this protest to better understand the Joint Utilities' plans and potentially narrow the issues for Commission consideration. However, the Joint Utilities refused to respond to data requests in this proceeding until Sierra Club became a party. This is the first Commission proceeding Sierra Club is aware of in which Joint Utilities refused to respond to discovery that would inform protests and assist the Commission in crafting the proceeding's scope. In this informational vacuum, the Commission should set out a broad and inclusive scope in the scoping memo.

#### **V. EFFECT OF THE APPLICATION ON THE PROTESTANT**

Sierra Club is a non-profit public benefit corporation with over 744,000 members nationwide, and more than 150,000 members living in California, including ratepayers of the Joint Utilities. Sierra Club's mission is to "promote the responsible use of the earth's ecosystems and resources" and "to protect and restore the quality of the natural and human environment."<sup>63</sup> In California, Sierra Club supports policies that will help cost-effectively and swiftly meet the State's clean energy, air quality, and climate protection goals, and reduce our dependence on dirty forms of energy.

This application could harm the interests of Sierra Club and its members by permitting the Joint Utilities to invest in projects that increase greenhouse gas emissions and lung-damaging indoor and ambient air pollution. Sierra Club is concerned that these projects would be an inappropriate use of ratepayer dollars because they would not meaningfully contribute to California's deep decarbonization goals. Further, the application could divert resources from alternative strategies that could more equitably, affordably, and feasibly eliminate emissions from the residential and commercial buildings targeted in these pilots. The application seeks to recover project costs from ratepayers, including Sierra Club members who are residential

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<sup>63</sup> Sierra Club, *About the Sierra Club*, <https://www.sierraclub.org/about-sierra-club> (last visited Oct. 11, 2022).

customers. These customers would be harmed by any decision that forces them to bear the costs of hydrogen projects that do not benefit them, and that could increase greenhouse gas emissions and air pollution in their communities.

## **VI. CATEGORIZATION AND SCHEDULING**

Sierra Club concurs with the Joint Utilities' proposed categorization of the proceeding as "Ratesetting" pursuant to Rule 1.3(e) and 7.1(e)(2).<sup>64</sup>

The Joint Utilities do not request an evidentiary hearing in their application.<sup>65</sup> However, based on review of the application and supporting materials, Sierra Club anticipates that evidentiary hearings may be necessary.

With regard to scheduling, Sierra Club requests that the Commission adopt a schedule that provides all parties adequate time to evaluate the Joint Utilities' application, conduct discovery, develop their recommendations on the issues, and submit testimony as needed. Sierra Club will participate in any party or Commission efforts to develop a mutually agreeable procedural schedule.

## **VII. COMMUNICATION OF SERVICE**

For the purpose of receipt of all correspondence, pleadings, orders, and notices in this proceeding, the following representative for Sierra Club should be placed on the service list as a "party":

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<sup>64</sup> Application at 14.

<sup>65</sup> *Id.*

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## VIII. CONCLUSION

For the reasons set forth above, Sierra Club respectfully requests that the Commission: (1) include the issues identified in this Protest within the scope of the proceeding; (2) adopt a procedural schedule, including time for evidentiary hearings, with sufficient time for parties to evaluate the Joint Utilities' application and develop their recommendations; and (3) categorize the proceeding as Ratesetting.

Dated: October 12, 2022

Respectfully submitted,

/s/

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