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Earthjustice Comments on IEPR Commissioner Workshop on Hydrogen

Additional submitted attachment is included below.

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California Energy Commission
1516 Ninth Street
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Re: Docket No. 21-IEPR-05, Hydrogen to Support California's Clean Energy Transition

Dear California Energy Commission Staff:

Earthjustice respectfully provides these comments on the July 28, 2021, Integrated Energy Policy Report Commissioner Workshop on Hydrogen to Support California's Clean Energy Transition. Green hydrogen, which is produced from 100% renewable electricity,[1] is a promising tool for transitioning to renewable energy in sectors that lack a viable route to direct electrification. The California Energy Commission ("CEC") and its sister agencies should prioritize deploying green hydrogen to displace hydrogen that is currently being produced from fossil fuels through an industrial process that burdens neighboring communities with health-harming air pollution. The CEC should reject calls to support injection of hydrogen into the gas distribution system, which create new risks for public health and the financial interests of captive ratepayers without meaningfully reducing climate pollution.

I. California's First Priority for Deploying Green Hydrogen Should be Displacing Hydrogen that is Currently Produced from Fossil Fuels. The State Should Act Immediately to Advance this Goal by Properly Implementing Senate Bill 1505.

Today, the standard practice for producing hydrogen in California and across the United States is to split hydrogen atoms from fossil gas through a highly polluting technology called steam methane reformation ("SMR"). Fossil fuel companies produce nearly all of the United States' annual supply of hydrogen—about 10 million metric tons—through SMR.[2] Roughly 60% of domestic hydrogen demand comes from crude oil refineries,[3] where it is used to lower the sulfur content of diesel.[4] Producing this hydrogen through SMR emits pollution that harms public health in neighboring communities, including nitrogen oxides, fine particulate matter,

[1] The International Energy Agency's defines "green hydrogen" as hydrogen produced "using electricity generated from renewable energy sources." International Energy Agency, *"Green" hydrogen for use in industrial processes* (Nov. 17, 2020) https://www.iea.org/articles/decarbonising-industry-with-green-hydrogen.
[2] Mark F. Ruth et al., *The Technical and Economic Potential of the H2@Scale Concept within the United States*, National Renewable Energy Laboratory at 7 (2020) ("NREL 2020, Technical and Economic Potential of H2@Scale"), https://www.nrel.gov/docs/fy21osti/77610.pdf.
[3] *Id.* at viii Table ES-1.
[4] U.S. EIA, *U.S. Gulf Coast refinery demand for hydrogen increasingly met by merchant suppliers* (Mar. 15, 2019), https://www.eia.gov/todayinenergy/detail.php?id=38712.

carbon monoxide, and volatile organic compounds.[5] While SMR plants contribute to warming the climate globally, their local impacts are concentrated in the same communities bearing the brunt of health-harming pollution from oil refineries. California's first priority for green hydrogen should be to reduce these harms by deploying green hydrogen to displace hydrogen produced from SMR.

The California Air Resources Board ("CARB") and the hydrogen industry have contributed to a misleading narrative that more than 33 percent of the hydrogen dispensed at California fueling stations is renewable. For example, CARB incorrectly states that "California's [hydrogen fueling] network has recently been dispensing up to 90 percent renewable hydrogen."[6] The California Hydrogen Business Council has repeated that claim and also falsely stated that "[i]n 2018, between 37% and 44% of hydrogen used for transportation in California was renewable."[7] In reality, most of the hydrogen that CARB and industry are labeling as "renewable" is produced from fossil fuels through SMR.[8] Despite producing this hydrogen from fossil gas through a process that releases health-harming emissions into communities that are already overburdened by pollution from oil refineries, the industry calls this hydrogen "renewable" when it is matched with credits for the "environmental attributes" of biomethane from out-of-state sources. For instance, one hydrogen fueling company claims that hydrogen produced through SMR in Wilmington, California, is "renewable" by taking credit for the environmental attributes of biomethane that dairies in Indiana capture from cow manure lagoons.[9] Policymakers will not catalyze the deployment of innovative technologies if their definition of "clean," "renewable," or "green" hydrogen includes the industry's business-as-usual practices paired with biomethane credits.[10]

Mislabeling hydrogen produced from fossil fuels as "renewable" is not just misleading the public and perpetuating an industrial process that harms to public health—it obscures CARB's longstanding failure to require state-funded hydrogen fueling stations to dispense at least 33.3 percent renewable hydrogen, as state law requires. In 2006, California enacted Senate Bill ("SB")1505 (Lowenthal), which ordered CARB to adopt regulations no later than July 1, 2008, that: "Require that, on a statewide basis, no less than 33.3 percent of the hydrogen

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[5] *See* Pinping Sun et al., *Criteria Air Pollutants and Greenhouse Gas Emissions from Hydrogen Production in U.S. Steam Methane Reforming Facilities*, Env't Sci. & Tech., Vol. 53 Issue 12, (Apr. 30, 2019), https://www.osti.gov/pages/servlets/purl/1546962.

[6] CARB, 2020 Annual Evaluation of Fuel Cell Electric Vehicle Deployment& Hydrogen Fuel Station Network Development (Sept. 2020), at xxiv, https://ww2.arb.ca.gov/sites/default/files/2020-09/ab8_report_2020.pdf.

[7] California Hydrogen Business Council, Hydrogen FAQs, https://www.californiahydrogen.org/resources/hydrogen-faq/.

[8] John Eichman & Francisco-Flores Espino, *California Power-to-Gas and Power-to-Hydrogen Near-Term Business Case Evaluation*, NREL (Dec. 2016) ("NREL 2016, Business Case Evaluation"), at 59 ("Senate Bill 1505 in California requires that 33.3% of hydrogen produced for or dispensed by state-funded fueling stations must be made from eligible renewable resources. At present, the majority of the required renewable hydrogen is produced from SMR and coupled with the purchase of biogas credits."), https://www.nrel.gov/docs/fy17osti/67384.pdf.

[9] For instance, a recent California Air Resources Board staff report recommended certifying the carbon intensity of a "renewable hydrogen" production pathway based on the procurement of environmental attributes of gas from cow manure in Indiana. California Air Resources Board, *Low Carbon Fuel Standard Tier 2 Pathway Application Staff Summary* (Dec. 31, 2020), https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/comments/tier2/b0145_summary.pdf.

[10] *See* NREL 2016, Business Case Evaluation, *supra* note 8, at 59 ("The cost to produce renewable hydrogen with an electrolyzer is greater than the cost to install an SMR unit and pay the additional fee for renewable biogas credits.").

produced for, or dispensed by, fueling stations that receive state funds be made from eligible renewable energy resources as defined in subdivision (a) of Section 399.12 of the Public Utilities Code."[11] Today—nearly fifteen years after the enactment of Senate Bill 1505 and more than thirteen years past the deadline for CARB to adopt implementing regulations—the agency has not adopted a rule that requires hydrogen fueling stations to dispense a minimum amount of hydrogen made from renewable energy resources.

As a result of failing to implement SB 1505, CARB is mislabeling hydrogen made from fossil fuels as "renewable" even though it does not meet the statutory standard for renewable hydrogen. CARB's practice of counting hydrogen made from fossil fuels as "renewable" is inconsistent with the statute for at least two reasons. First, SB 1505 demands that at least a third of hydrogen dispensed at state-funded fueling stations be "made from" renewable energy resources. Under the plain meaning of the statute, hydrogen made from fossil fuels does not qualify. The statute does not authorize CARB to accept credits for "renewable attributes" in lieu of requiring hydrogen to actually be made from renewable energy resources.

Second, SB 1505 specified that state-funded hydrogen fueling stations must dispense hydrogen made from renewable *electricity* resources. This requirement necessarily excludes hydrogen produced through SMR—regardless of whether the facility uses a fossil fuel feedstock, a biomethane feedstock, or buys "environmental attributes" to supposedly mitigate the impacts of its fossil fuel use—because SMR facilities do not make hydrogen from renewable electricity resources, as SB 1505 demands. That is, SB 1505 requires that hydrogen be made from "eligible renewable resources as defined in subdivision (a) of Section 399.12 of the Public Utilities Code." In turn, Public Utilities Code Section 399.12 defines "[e]ligible renewable energy resource" as "an electrical generating facility that meets the definition of 'renewable electrical generation facility'" in the Public Resources Code, subject to certain provisos.[12] Thus, SB 1505 orders CARB to require state-funded fueling stations to dispense hydrogen made from renewable *electrical generating facilities.* The statute's legislative history puts this requirement succinctly: "At least 33 percent of the hydrogen produced or dispensed must be made from renewable sources of electricity."[13] Thus, under SB 1505, the only permissible way to use biomethane to produce renewable hydrogen pursuant is to use Renewable Portfolio Standard-eligible biomethane to power an electric generating unit and use the resulting electricity to produce hydrogen.

Currently, the only commercially available process for producing hydrogen from renewable electricity is electrolysis, which uses electricity to split hydrogen atoms from water molecules. As mentioned above, hydrogen produced in this manner is commonly known as green hydrogen.[14]

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[11] Senate Bill No. 1505, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=200520060SB1505.
[12] Today, the Public Utilities Code definition of eligible renewable energy resource is codified at Section 399.12(e). However, subsequent amendments to Public Utilities Code Section 399.12 do not change the analysis because the statute has always defined "Eligible renewable energy resource" to mean "an electric generating facility" that meets certain criteria.
[13] *See, e.g.*, Assembly Committee on Transportation Bill Analysis, SB 1505 (Lowenthal) – as Amended August 7, 2006, at 7 (Aug. 8, 2006).
[14] The International Energy Agency's definition of "green hydrogen" as hydrogen produced "using electricity generated from renewable energy sources" is consistent with the predominant approach among experts in the United

Therefore, consistent with SB 1505, CARB must require state-funded hydrogen fueling stations to dispense at least 33.3 percent *green* hydrogen and not allow hydrogen produced through SMR coupled with credits for "environmental attributes." Compliance with SB 1505 will ensure that the state's hydrogen industry is investing in green hydrogen and will deliver health benefits to California communities because green hydrogen production that relies on wind and solar resources does not emit health-harming air pollution—unlike SMR.

II. California Should Reject Arguments for Injecting Hydrogen in the Gas Distribution System to Deliver Hydrogen-Methane Blends.

The Commission should reject Dr. Brouwer's suggestion to "adopt a renewable hydrogen injection standard immediately" based on his opinion that "even just a 5% hydrogen injection into the natural gas system is desirable today."[15] Injecting hydrogen into the gas distribution system would pose threats to public health and require adding unknown costs to the gas system—all for dubious benefit.

Dr. Brouwer offered two flawed arguments for modifying the gas system to deliver a blend of gas with a small portion of hydrogen. First, Dr. Brouwer suggested that renewable hydrogen injection could be a step to achieving a zero-emissions gas system.[16] With or without green hydrogen, it is not feasible to achieve a zero-emissions gas system. Optimistically, the gas distribution system could deliver a blend that is 20% hydrogen by volume to residential and small business customers, which provide 7% percent of its energy content from hydrogen.[17] There is no viable pathway for procuring zero-carbon gas to meet the remaining 93% of energy needs on the gas system. It would not be reasonable to make system-wide investments in the gas distribution system to achieve incremental greenhouse gas reductions, when the long-term, least-cost path for achieving California's climate goals will require a largescale transition from gas to clean electric technologies. Second, Dr. Brouwer opined that this strategy would provide an additional offtake and additional investment value for wind and solar resources.[18] However, the California gas utilities are still years away from understanding the investments that would be necessary to safely deliver hydrogen blends. If California wants to stimulate the market for green hydrogen immediately to drive investment in renewable electricity generation, it should properly implement SB 1505, as described above.

States and internationally. For instance, the European Bank for Reconstruction and Development defines green hydrogen as hydrogen "made by using clean electricity from renewable energy technologies to electrolyse water" and Wood Mackenzie explains that green hydrogen is "produced from water by renewables-powered electrolysis".

[15] Session 2 – IEPR Commissioner Workshop ("Session 2 workshop video") at 8:48–9:37, https://energy.zoom.us/rec/play/w1fxPLGEzRkZA1ZRjTvTjoPCdar54-xIWyPah-rwoZ-C2zDlaGPP1YuOD1rrsEekzIZk7kGnkm9jjKFa.GqNnEJJAd9WEUa6S?continueMode=true&_x_zm_rtaid=ONei6VEtR-Wc9CA9Oz-8Cw.1628269369855.1b524ba4dbee92be739aa99dfffe8828&_x_zm_rhtaid=195; *see also* Jack Brouwer, Zero Emissions Energy with Hydrogen, 21-IEPR-05 Commissioner Workshop on Hydrogen to Support California's Clean Energy Transition (July 28, 2021) at slide 5.

[16] Session 2 workshop video at 8:59.

[17] Iain Staffel et al., *The Role of Hydrogen and Fuel Cells in the Global Energy System*, 2 Energy & Env't Sci 463, 479 (Jan. 2019) (Staffel 2019), https://pubs.rsc.org/en/content/articlepdf/2019/ee/c8ee01157e.

[18] Session 2 workshop video at 9:37.

Multiple independent studies show that there is a weak economic case for deploying green hydrogen in buildings through the gas distribution grid.[19] The main reason is the superior efficiency of heat pumps, which use small amounts of renewable electricity to move ambient heat to where it is needed. One recent Pacific Gas & Electric Company-funded study found that California could save $20 billion by choosing a high electrification pathway instead of relying on renewable gases like hydrogen and synthetic methane in buildings.[20] Heat pumps for space and water heating are not only the cheapest of all zero-carbon options—in many instances, their superior efficiency means they will yield cost savings relative to conventional gas-based heating systems.[21]

A. Injecting hydrogen into the gas distribution system would create unacceptable risks to public health and to utility ratepayers.

1. Injecting hydrogen into the gas system does not eliminate—and may increase—the indoor air pollution from gas-burning stoves, furnaces, and other appliances.

Unlike electric appliances, all gas-burning appliances emit nitrogen oxides, pollution that contributes to respiratory and heart diseases.[22] Under the status quo, gas combustion for heating and cooking results in significant NO_x pollution and other combustion byproducts that would be considered illegal if measured outdoors.[23] Recent studies show that children growing up in

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[19] The National Renewable Energy Laboratory concluded that gas pipeline injection is the least compelling of four potential applications of hydrogen in California. NREL 2016, Business Case Evaluation, *supra* note 8, at 64. BloombergNEF founder Michael Liebreich has constructed a "ladder" that ranks numerous potential applications for clean hydrogen and rated "domestic heating" an F, noting that the idea of blending clean hydrogen into the natural gas grid to reduce carbon emissions is "stupidly inefficient." Leigh Collins, *Liebreich: 'Oil sector is lobbying for inefficient hydrogen cars because it wants to delay electrification'*, Recharge (June 30, 2011), https://www.rechargenews.com/energy-transition/liebreich-oil-sector-is-lobbying-for-inefficient-hydrogen-cars-because-it-wants-to-delay-electrification-/2-1-1033226. A recent European study ranks heat for buildings last in the "merit order" of potential applications. Norman Gerhardt et al., Fraunhofer Institute for Energy Economics, *Hydrogen in the Energy System of the Future: Focus on Heat in Buildings*, at 5–6 (May 2020) ("Fraunhofer Institute 2020"), https://www.iee.fraunhofer.de/content/dam/iee/energiesystemtechnik/en/documents/Studies-Reports/FraunhoferIEE_Study_H2_Heat_in_Buildings_final_EN_20200619.pdf. The California Energy Commission's 2018 landmark analysis projected that California would only inject renewable hydrogen into the gas pipeline system in the most expensive decarbonization pathway considered, called *No Building Electrification with Power-to-Gas.* California Energy Commission, *Deep Decarbonization in a High Renewables Future*, at Figure 27, Tables A-1, and A-2 (June 2018), https://www.energy.ca.gov/sites/default/files/2021-06/CEC-500-2018-012.pdf. Agora Energiewende and Guidehouse also analyzed several potential use cases for green hydrogen and classified using green hydrogen in individual buildings for space heating as a "bad idea" because of the proven and efficient electric alternatives. Matthias Schimmel et al., *Making renewable hydrogen cost-competitive: Policy instruments for supporting green H_2*, Agora Energiewende and Guidehouse (2021) at 9–10, https://static.agora-energiewende.de/fileadmin/Projekte/2020/2020_11_EU_H2-Instruments/A-EW_223_H2-Instruments_WEB.pdf.

[20] Gridworks, *California's Gas System in Transition, Equitable, Affordable, Decarbonized and Smaller*, at 8 (Sept. 2019) (finding that "[e]ven in an 'optimistic' scenario that assumed aggressively lower-cost hydrogen and [synthetic gas] in the future, the high electrification scenario would still cost $6 billion less per year [than the high electrification scenario]"), https://gridworks.org/wp-content/uploads/2019/09/CA_Gas_System_in_Transition.pdf.

[21] Energy and Environmental Economics, Inc., *E3 Quantifies the Consumer and Emissions Impacts of Electrifying California Homes* (Apr. 15, 2019), https://www.ethree.com/e3-quantifies-the-consumer-and-emissions-impacts-of-electrifying-california-homes/.

[22] Brady Seals & Andee Krasner, *Gas Stoves: Health and Air Quality Impacts and Solutions*, Rocky Mountain Institute et al. (2020), https://rmi.org/insight/gas-stoves-pollution-health.

[23] *Id.*

homes with gas stoves have a 42% increased risk of developing asthma symptoms.[24] In their joint application to the California Public Utilities Commission ("CPUC") to research the compatibility of hydrogen blends with their infrastructure, the California gas utilities acknowledged that blends of hydrogen and methane "may yield higher NO_x emissions than natural gas because hydrogen burns faster than natural gas, which increases combustion temperatures and reduces ignition lag. . . . therefore, additional emissions testing should be completed with natural gas end-use equipment operating with hydrogen blends."[25] Regulators should not allow gas companies to inject hydrogen into their distribution systems unless independent researchers find that doing so will not further degrade indoor air quality.

2. Injecting green hydrogen into a gas system that was not designed for hydrogen could require significant investments, at untold expense to ratepayers.

There are no publicly available estimates for the potential costs of upgrading California's gas distribution systems to safely deliver a gas-methane blend, as far as Earthjustice is aware. In their recent application to the CPUC, the California gas utilities identified numerous safety and reliability risks that they would study before injecting hydrogen into the gas distribution system. For example, the elastomers and rubbers that seal many pipeline components can swell or develop voids after exposure to pure hydrogen; hydrogen can cause embrittlement of steel pipes; and the utilities do not know how much hydrogen they can safely store in the underground formations that they rely on for gas storage.[26] It appears that the utilities cannot yet estimate the infrastructure costs for delivering low-hydrogen blends because additional research is needed to determine what investments will be necessary.

In addition to modifying the gas distribution system to ensure safety and reliability, utilities may need to upgrade infrastructure to prevent hydrogen from leaking into the atmosphere. When a pipeline carries a blend of hydrogen and methane, hydrogen can leak at three times the rate of methane.[27] Leakage could undermine the purported environmental benefits of any green hydrogen project because hydrogen itself is a greenhouse gas with five times the global warming potential of carbon dioxide.[28] Regulators should not let gas utilities force their captive customers to bear the costs of modifying pipeline infrastructure to carry hydrogen safely and with minimal leakage.

3. Increasing investment in the gas distribution system would undermine California's efforts to equitably meet its climate goals.

It would be irrational to add unnecessary costs to the gas distribution system, which is already facing a stranded cost crisis. As a recent report for the CEC explained, any future in which California meets its climate goals will see a reduction in natural gas demand, which will

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[24] *Id.* at 13.

[25] Prepared Direct Test. of Kevin Woo et al. on Behalf of Southern Cal. Gas Co. et al., at 17, A.20-11-004 (Cal. P.U.C. Nov. 2020), https://www.socalgas.com/sites/default/files/2020-11/H2_Application-Chapter_4-Technical.pdf.

[26] *Id.* at section III.

[27] M.W. Melaina et al., *Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues*, NREL, at 20 (Mar. 2013), https://www.nrel.gov/docs/fy13osti/51995.pdf.

[28] Richard Derwent et al., *Global Env't Impacts of the Hydrogen Economy*, 1 In't J. Nuclear Hydrogen Production & Application 57 (2006), https://www.researchgate.net/publication/228402009_Global_environmental_impacts_of_the_hydrogen_economy.

put upward pressure on gas rates that could cause customers to exit the gas system, creating a feedback loop that drives higher rates and ever-greater incentive to disconnect from gas service.[29] The impacts of higher gas rates could be especially acute for low-income customers, who are less able to electrify.[30] To avoid exacerbating these challenges, the CEC's experts found that it is "prudent for the state to begin considering strategies for managing the costs of the natural gas distribution system in California."[31] Consistent with these recommendations, Gridworks also recommended that policymakers "[i]dentify *alternatives to significant new investments in the gas delivery system*, not otherwise needed to maintain system safety and reliability."[32] The CEC should not ignore the sound advice of these independent experts. The costs of unnecessary new investments in the gas distribution system are likely to fall on the households that are least able to bear the expense of a hydrogen boondoggle.

4. Injecting green hydrogen into the gas distribution system would not deliver meaningful climate benefits.

Even if gas utilities upgraded their distribution systems to deliver low-hydrogen blends, these investments would not make a meaningful dent in the climate pollution from the gas-burning appliances in California's buildings. Dr. Brouwer acknowledged that "the immediate decarbonization impact" was not an important motivation for pipeline injection of green hydrogen.[33]

Local gas utilities cannot deliver pure hydrogen to homes and businesses—not just because of the limitations of the gas system itself, but also because appliances that were designed for methane gas cannot safely burn pure hydrogen.[34] The most optimistic scenarios estimate that the gas distribution system could only handle up to 20% hydrogen by volume.[35] This is close to the ceiling for how much hydrogen the gas companies could deliver to homes and businesses before creating an explosion risk in gas-fired residential appliances.[36] A transition to a gas blend that is 80% methane and 20% green hydrogen by volume would only reduce greenhouse gas

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[29] California Energy Commission, *The Challenge of Retail Gas in California's Low-Carbon Future*, at 5 (Apr. 2020), https://www.energy.ca.gov/sites/default/files/2021-06/CEC-500-2019-055-F.pdf.
[30] *Id.*
[31] *Id.*
[32] Gridworks, *California's Gas System in Transition, Equitable, Affordable, Decarbonized and Smaller*, at 3.
[33] Session 2 workshop video at 1:27:50.
[34] Jairo Duran, *Safety Issues to Consider When Blending Hydrogen with Natural Gas* (Feb. 17, 2021), https://processecology.com/articles/safety-issues-to-consider-when-blending-hydrogen-with-natural-gas#:~:text=Blending%20hydrogen%20to%20natural%20gas,slower%20than%202%25%20per%20minute.
[35] Staffel 2019, *supra* note 17, at 479; *see also* Jeff St. John, *Green Hydrogen in Natural Gas Pipelines: Decarbonization Solution or Pipe Dream?*, GreenTech Media (Nov. 30, 2020) (quoting an expert from Wartsila Energy for explaining that hydrogen behaves differently than methane and "burns almost as an explosion. . . . When you go beyond 25 percent hydrogen in the fuel, in most places in the world, you're no longer able to use the same equipment. Electronics, for example, must be explosion-proof."), https://www.greentechmedia.com/articles/read/green-hydrogen-in-natural-gas-pipelines-decarbonization-solution-or-pipe-dream.
[36] Jeff St. John, *Green Hydrogen in Natural Gas Pipelines: Decarbonization Solution or Pipe Dream?*, Greentech Media (Nov. 30, 2020), https://www.greentechmedia.com/articles/read/green-hydrogen-in-natural-gas-pipelines-decarbonization-solution-or-pipe-dream.

emissions in the building sector by 7%. This impact is trivial in comparison to the emissions reductions that California could achieve with aggressive building electrification efforts.[37]

Burning fossil fuels to keep us warm in the winter, heat our water, and power other appliances collectively contributes about 10% of the nation's greenhouse gas emissions.[38] Climate policy that requires greenhouse gas reductions at the pace and scale necessary to avoid climate catastrophe poses an existential threat to America's gas companies because the most cost-effective way to tackle these emissions is by transitioning from appliances that burn fuel to electric appliances that run on a decarbonized power grid.[39] California should not divert resources from cost-effective decarbonization strategies to inject hydrogen into a gas distribution system that will have no role in a zero-emissions future.

B. The gas distribution hits a dead end as a decarbonization tool, regardless of whether utilities inject green hydrogen.

If the gas utilities are able to achieve the most optimistic scenarios for hydrogen injection and deliver a gas blend with 20% hydrogen by volume to homes and businesses, hydrogen would represent just 7% of the energy in the gas pipeline system.[40] In that case, fully decarbonizing the gas system would require the gas utilities to procure enough renewable methane to supply the remaining 93% of energy need on the system. There is no feasible way to displace 93% of the country's fossil gas demand with non-fossil sources of methane. Even under the gas industry's "high resource potential" scenario, methane from landfills, animal manure, food waste, and waste water treatment facilities could displace less than 9% of the fossil gas this country currently uses each year.[41] The same report identifies various methods of creating additional so-called "renewable natural gas" that could displace up to 19.5% of America's gas consumption in

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[37] Replacing 20% of the fossil gas that California utilities provided to residential and commercial customers in 2030 with green hydrogen would have reduced emissions from the state's building sector by about 2.4 $MMTCO_2e$ if California does not aggressively reduce gas throughput (i.e., 7% of the 34.79 $MMTCO_{2e}$ emitted by statewide combustion of gas in residential and commercial buildings that year). *See* CEC, Proposed Final Staff Report: California Building Decarbonization Assessment (July 2021) at A-73 (assuming 34.79 $MMTCO_2e$ emissions from gas combustion from this sector in a 2030 base case). In contrast, CEC found that California could reduce 19.9 $MMTCO_2e$ from this sector in 2030 through efficient aggressive electrification or 18.9 $MMTCO_2e$ through aggressive electrification. *Id.* at 10.

[38] Rocky Mountain Institute, *The Impact of Fossil Fuels in Buildings: A Fact Base*, at 6 (Dec. 2019), https://rmi.org/insight/the-impact-of-fossil-fuels-in-buildings/.

[39] *See, e.g.*, California Energy Commission, *2019 California Energy Efficiency Action Plan*, at 84 (Nov. 2019) ("[T]he most viable and least-cost path to immediate zero-emission residential and commercial buildings" is electrification of gas end uses, "in particular, electrification of space and water heating to high-efficiency, demand-flexible technologies[.]"), https://www.energy.ca.gov/filebrowser/download/1900.

[40] Staffel 2019, *supra* note 17, at 479; *see also* Jeff St. John, *Green Hydrogen in Natural Gas Pipelines: Decarbonization Solution or Pipe Dream?*, GreenTech Media (Nov. 30, 2020) (quoting an expert from Wartsila Energy for explaining that hydrogen behaves differently than methane and "burns almost as an explosion. . . . When you go beyond 25 percent hydrogen in the fuel, in most places in the world, you're no longer able to use the same equipment. Electronics, for example, must be explosion-proof."), https://www.greentechmedia.com/articles/read/green-hydrogen-in-natural-gas-pipelines-decarbonization-solution-or-pipe-dream.

[41] American Gas Foundation, *Renewable Sources of Natural Gas: Supply and Emissions Reduction Assistant*, at 11, 14 (Dec. 2019) (showing a potential of 1,425.3 tBtu/year for landfill gas, animal manure, food waste, and water resource recovery facilities and noting an average U.S. annual consumption of fossil gas of 15,850 tBtu), https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf.

its most aggressive scenario.[42] These industry estimates, however, may be overly optimistic. A report by the Union of Concerned Scientists found that there is only enough potential biomethane supply to displace about 3% of California's fossil gas use.[43] Other alternative sources of methane are being studied, but are decades away from commercialization.[44] If a gas company could ever buy a blend of zero-carbon gas, the cost would likely be exorbitant—potentially 8 to 17 times the cost of natural gas.[45] Thus, rather than chasing the expensive fantasy of an at-scale zero-carbon gas distribution system, California should focus on the imperatives to quickly and dramatically reduce gas throughput and to avoid adding unnecessary costs to the gas system.

It is conceivable that in a few decades gas demand will drop so drastically that gas utilities will have excess transmission pipeline capacity and identify unneeded transmission assets that they could retrofit and use to deliver pure green hydrogen to industrial users. Once operational, the network of dedicated hydrogen pipelines and other hydrogen infrastructure would be distinct from the system that delivers methane gas to California's homes and businesses. The customers who would appropriately bear the costs of the hydrogen delivery infrastructure are the industrial hydrogen customers. In the intervening decades, there is no reason to straddle residential and small business customers with the costs of retrofitting the entire gas distribution system to deliver hydrogen blends.

C. Gas system injection of green hydrogen is an irresponsible strategy for stimulating investment in wind and solar resources.

If California seeks to stimulate demand for green hydrogen to encourage investment in wind and solar resources, the least-regrets strategy for accomplishing this goal is to deploy green hydrogen to displace hydrogen that is currently being produced from fossil fuels. In SB 1505, the Legislature ordered CARB to do exactly that, at least with regard to hydrogen used in the transportation sector. However, as explained above, CARB has failed to follow the Legislature's direction. By properly implementing SB 1505, CARB can stimulate demand for green hydrogen without the risks involved with injecting hydrogen into the gas distribution system. That is, dispensing green hydrogen at hydrogen fueling stations would not threaten indoor air pollution or saddle captive utility ratepayers with the costs of upgrading the gas system.

While CARB could initiate an SB 1505 rulemaking tomorrow, hydrogen injection is a project that would take many years and may never secure regulatory approval. When the California gas utilities proposed a hydrogen injection research program in November 2020, they stated that "[s]uccessful completion of the demonstration projects . . . may accelerate the estimated five-year time for hydrogen injection into a controlled and isolated natural gas

[42] *See id.* (estimating a combined potential for 3,087.4 tBtu/year for producing methane from agricultural residue, forest residue, energy crops, solid waste, and power-to-gas methanation, compared to the U.S. average annual consumption of 15,850 tBtu).

[43] Jimmy O'Dea, *The Promises and Limits of Biomethane as a Transportation Fuel*, Union of Concerned Scientists, at 2, Figure 1 (May 2017), https://www.ucsusa.org/sites/default/files/attach/2017/05/Promises-and-limits-of-Biomethane-factsheet.pdf.

[44] California Energy Commission, *The Challenge of Retail Gas in California's Low-Carbon Future*, at 6 (Apr. 2020), https://www.energy.ca.gov/sites/default/files/2021-06/CEC-500-2019-055-F.pdf.

[45] *Id.* at 4.

system."[46] Given that the CPUC has dismissed that application, the CEC can assume that the utilities are still about five years away from being able to inject hydrogen in a *controlled and isolated system*. The application also acknowledges the additional research that would needed to understand the compatibility of each gas utility's infrastructure with a hydrogen blend.[47] It is unclear how much additional time the CPUC would require to assess a utility's application to inject hydrogen into the distribution system and determine that the utility has taken sufficient precautions to protect safety and reliability. The CPUC would also need to consider whether the utility should be allowed to charge customers for the costs of hydrogen injection.

In contrast, implementation of SB 1505 would not face these hurdles because CARB would compel industry to dispense renewable hydrogen in existing infrastructure that was designed to handle hydrogen and compliance costs would not fall on captive ratepayers.

Perversely, creating demand for green hydrogen in sectors with other decarbonization options could make it more difficult to use green hydrogen in hard-to-abate sectors. Because of its scarcity, competition for green hydrogen among sectors could drive up the cost. For instance, one study compared hydrogen prices in "Green push – high demand" scenario against hydrogen prices in a "Green push – low demand" scenario, where the high-demand scenario relied on hydrogen in residential heating and the low-demand scenario assumed high electrification.[48] In 2040, the estimated price of hydrogen in the scenario that deployed hydrogen for residential heating is about 60% higher than in the low-demand scenario with high electrification.[49] In contrast, the scenario with low hydrogen demand allows a transition to green hydrogen in essential sectors at negligible extra cost.[50]

III. Conclusion

Thank you for considering these comments. Earthjustice looks forward to working with the CEC on policies that will deploy green hydrogen to reduce climate and health-harming pollution without saddling captive gas customers with unnecessary and unreasonable costs.

Sincerely,

Sara Gersen
Earthjustice

[46] CPUC proceeding A.20-11-004, Joint Application of Southern California Gas Company, San Diego Gas & Electric Company, Pacific Gas and Electric Company, and Southwest Gas Corporation Regarding Hydrogen-Related Additions or Revisions to the Standard Renewable Gas Interconnection Tariff, at 12, https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M351/K622/351622423.PDF.

[47] *Id.* ("Additional research is needed to comprehensively evaluate system configurations, components, construction methodologies, and materials of construction to encompass the variety and categories of piping systems for each Utility.").

[48] Aurora Energy Research, *Hydrogen in the Northwest European Energy System*, at 12, https://auroraer.com/resources/Aurora-Hydrogen-in-the-Northwest-European-energy-system.pdf.

[49] *See id.* at 16.

[50] *Id.* at 5.