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CHBC Comments on E3â€™s Final Project Report, â€œNatural Gas Distribution in Californiaâ€™s Low-Carbon Technology Options, Customer Co

Additional submitted attachment is included below.

California Hydrogen Business Council Comments on E3's Final Project Report, "*Natural Gas Distribution in California's Low-Carbon Future: Technology Options, Customer Costs, and Public Health Benefits*"

November 20, 2019

I. INTRODUCTION

The California Hydrogen Business Council (CHBC)[1] welcomes the opportunity to provide comments on the interim report for the future of natural gas project (PIER-16-011), *Natural Gas Distribution in California's Low-Carbon Future.*

Detailed and future-oriented research, like the scenarios explored in this study, are a critical element of California's successful and pioneering climate policy framework. We strongly encourage the continued efforts by the California Energy Commission (CEC) and other state agencies to support robust analytical efforts that can inform the important energy and climate decisions facing the state.

However, we caution against drawing stark conclusions from this study, or others with decades-long time horizons that inevitably are highly speculative, uncertain and frame decisions as "either/or" – that pick one technology or pathway as a winner and prevent others from developing and contributing to the state's climate, clean air, energy and resiliency goals. While we appreciate that the study attempts to take a closer look at some of the concerns we brought up in comments on the June 6 workshop[2], in which slides of the studies draft results were presented, there are still many gaps and questionable assumptions that remain. **We continue to urge the CEC to adopt an approach – at this early stage of technological and market development – that supports a broad array of technologies with potential to accelerate progress to decarbonize buildings and all other sectors, while supporting diverse, resilient and affordable energy systems. Hydrogen derived from renewable and zero carbon sources is one of the solutions that has an important role to play, and the state should take near-term steps to enable it.**

[1] The CHBC is comprised of over 100 companies and agencies involved in the business of hydrogen. Our mission is to advance the commercialization of hydrogen in the energy sector, including transportation, goods movement, and stationary power systems to reduce emissions and dependence on oil. The views expressed in these comments are those of the CHBC, and do not necessarily reflect the views of all of the individual CHBC member companies. Members are listed here: www.californiahydrogen.org/aboutus/chbc-members/.

[2] *CHBC Comments on CEC Staff Workshop on the Natural Gas Distribution Infrastructure and Decarbonization Targets*, June 2019 https://www.californiahydrogen.org/wp-content/uploads/2019/07/CHBC-Comments-on-CEC-Staff-Workshop-FINAL.pdf

Other key points we offer, which are elaborated on in the Comments section below, are:

1. **The study seems to prioritize perceived and speculative ratepayer risks in 2050 over real economic and technological risks today.**

2. **Many of the report's assumptions, upon which it bases its conclusion – e.g. about building electrification technology market development, electricity rates, and gas technology costs – are highly speculative and lacking sound scientific analysis to back them up.**

3. **No matter the extent of assumptions about electrification, in each of the report scenarios there remains significant demand for gaseous fuels and an important role for the pipeline network to provide them through 2050 and beyond. We urge the CEC to look into decarbonizing this gas supply, in parallel to what the state is pursuing for the electricity supply.**

4. **As it considers a broad approach to decarbonize buildings and the rest of the economy, the state of California can take powerful steps to rapidly accelerate innovation, bring down costs of renewable hydrogen, and enable broader, deeper, and more rapid decarbonization than currently envisioned.**

II. COMMENTS

1. The study seems to prioritize perceived and speculative ratepayer risks in 2050 over real economic and technological risks today.

While it is important to understand the range of potential future implications of near-term and medium-term energy policies, we also must account for – and indeed, prioritize – what is known today:

- California's electricity grid and electric utility structure is undergoing massive upheaval – half of the state is uncertain about what entity will be providing their power in the near future, as the state overhauls the electricity system.[3]

[3] https://www.nytimes.com/2019/11/01/business/energy-environment/pge-california-newsom.html

- Utilities and state leaders alike acknowledge that several years, and unknown billions of dollars, will be needed to overhaul the state's grid and address wildfire threats.[4]
- Facing the ongoing threat of public safety power shutoffs, along with a trend of more frequent and/or massive wildfires, electricity supply in California is unreliable for potentially more than a quarter of the state's population, who face heightened wildfire risk[5] – a number that risks expanding significantly as the climate changes.[6]

These are very real, and very significant, risks facing electricity ratepayers today. They dwarf the hypothetical risks that the report speculates gas ratepayers could face decades in the future, if the authors' assumptions were to materialize. They strongly suggest the state's near-term activities should be to not put "all eggs in one basket" of one energy carrier – i.e. the electricity grid – for buildings or other energy sectors, but rather to support diversification in energy carriers and clean energy resources – including renewable and zero carbon hydrogen – in order to help ensure resiliency and reliability of energy services.

2. Many of the report's assumptions upon which it bases its conclusion are highly speculative, lacking sound scientific analysis to back them up.

a. The market for electric heat pumps and other building electrification technologies is in its infancy, and there is little evidence regarding costs, performance, and consumer acceptance of these technologies in the California context.

The study's conclusion that all-electrification is the least cost pathway (compared to combining electrification with decarbonized gas) over the long term to lowering greenhouse gas emissions from buildings hinges on heat pumps providing space and water heating for California's building sector. Specifically, the report states, "*In all the long-term GHG reduction scenarios evaluated here, electrification of buildings, and particularly the use of electric heat pumps for space and water heating, leads to lower energy bills for customers over the long term than the use of renewable natural gas."*[7]

[4] ibid
[5] https://www.gov.ca.gov/2019/04/23/newsom-warns-of-wildfire-risk-to-urban-communities-across-state/
[6] http://www.climateassessment.ca.gov/state/overview/#wildfire
[7] p. 4, *Draft Final Project Report - Natural Gas Distribution in California's Low-Carbon Future*, E3; October 2019 (emphasis added)

However, the assumption that heat pumps, however promising a technology they may be, will be a feasible solution for all or even most California buildings both water and space heating is highly questionable. Even the report concedes that it "*is not a straightforward process for even relatively motivated and well-resourced homeowners to install technologies like electric heat pumps. Those interested run into issues like difficulty receiving permits and contractors without heat pump installation experience. Market transformation initiatives will be needed to lower the costs and barriers to retrofits and make electrification an easy decision for homeowners."*[8] The report does not define or specify the impacts on market acceleration or ratepayers of such initiatives, but rather jumps to the conclusion that a complete technology switch will occur. This should not be taken as a data-driven, science-based policy recommendation.

It can be instructive to examine the real-world heat pump market in Europe,[9] which is far ahead of California's,[10] yet is only expected to penetrate a maximum of about 40% residential buildings by 2050 in the European Commission's high electrification scenario for deep decarbonization (other scenarios show lower penetration).[11] Even in Italy, which with its mild climate like California's, is home to one of the top three national heat pump markets in Europe. Heat pumps are reported to have unexpressed potential, due to issues such as those described above by E3 – and this is *with* incentives already in place.[12]

This is not to suggest that California should not support heat pumps, only that basing policy decisions on a speculative vision that heat pumps will be adopted by all or even nearly all buildings in the state is imprudent, as is assuming that electrifying all buildings will be otherwise feasible. Even the study

[8] p. 6, *Draft Final Project Report - Natural Gas Distribution in California's Low-Carbon Future*, E3; October 2019
[9] *European Heat Pump Statistics and Market Report 2018* finds a growing market four years in succession, with over 10 million units sold. https://www.researchandmarkets.com/research/6sgzkn/european_heat?w=5
[10] *Decarbonization of Heating Energy Use in California Buildings*, Synapse Energy Economics, Inc; October 2018; p. 1 – States that heat pumps "today represent a small share of California's market, due to regulatory barriers and higher upfront costs in older homes."
[11] p. 104, N-DEPTH ANALYSIS IN SUPPORT OF THE COMMISSION COMMUNICATIONCOM(2018) 773, European Commission; November 2018 https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf
[12] *The heat-pump market in Italy: an in-depth economic study about the reasons for a still unexpressed potential*, Maurizio Pieve, Raniero Trinchieri; June 2019 https://academic.oup.com/ce/article/3/2/126/5393281

acknowledges that consumers may continue to prefer gas regardless of cost and "other customers may not be *able* to electrify."[13]

We urge the state to monitor these serious risks when setting policy, rather than rushing to adopt the report's recommendation to electrify all buildings as the least cost pathway.

b. The costs and performance of renewable gas technologies are similarly uncertain, and likely significantly overestimated in the E3 study.

The assumed costs for renewable power for power-to-gas projects in 2050, for example, are higher than costs for renewable power today.[14] The result is assumed renewable hydrogen costs in the scenarios that are higher in 2050 than they are in leading markets, like China, *today*.[15] An analysis by Bloomberg New Energy Finance (BNEF) estimates that costs in the rest of the world could catch up to those in China quickly, and fall to $1.40/kg by 2030 and $0.80/kg by 2050. This is equivalent to about $12/MMBtu and $7/MMBtu, respectively – both far below the optimistic case presented in the E3 report of $20/MMBtu by 2050. The BNEF report notes, "Once the industry scales up, renewable hydrogen could be produced from wind or solar power for the same price as natural gas in most of Europe and Asia. These production costs would make green gas affordable and puts the prospects for a truly clean economy in sight."[16]

Certainly, this is a promising future worth supporting – and at least not disabling – in California.

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[13] p. 50, *Draft Final Project Report - Natural Gas Distribution in California's Low-Carbon Future*, E3; October 2019

[14] In the optimistic case, the authors assume wind costs $40/MWh with a capacity factor of 40% in 2050. The Department of Energy estimates that the unsubsidized, national average levelized cost of electricity for wind projects built in the U.S. in 2018 was $36/MWh, and that the average capacity factor for projects built from 2014-2017 was 41.9%. https://emp.lbl.gov/sites/default/files/wtmr_final_for_posting_8-9-19.pdf
Interestingly, in their conservative case, the authors assume lower energy costs, but this time presenting them in terms of solar power at $26/MWh with a capacity factor of 25% by 2050. Lawrence Berkeley National Laboratory estimates that in 2017, leading solar projects cost as little as $20/MWh, with a median capacity factor of 26%. https://emp.lbl.gov/utility-scale-solar

[15] The report estimates renewable hydrogen costs of about $20-30/MMBtu in 2050. According to an analysis by BNEF, renewable hydrogen costs are as low as $2.50/kg in some markets, like China, today. This equates to about $22/MMBtu. https://www.bloomberg.com/news/articles/2019-08-21/cost-of-hydrogen-from-renewables-to-plummet-next-decade-bnef

[16] Ibid

c. The report's conclusion that after 2030 all-electrification will be the lower cost building decarbonization strategy compared to mixed fuel is based on highly questionable assumptions about electricity rates, given uncertainty about long term wildfire-related impacts – and the study actually finds a mixed fuel approach will be less expensive for ratepayers than all-electrification for at least the next six to ten years.

The report is to be commended for attempting to address wildfire impacts on electricity rates, given California's recent difficult experience. However, the assumptions it makes regarding these rates are based on conjecture, not fact. The report bases its "wildfire sensitivity" higher electricity cost case on the assumption that wildfire safety-related investments will "*attenuate by 2025, at which point they remain steady through 2050*."[17] The report goes on to say this could be biased too high. The fact is, this could also be biased far too low. Just as no one accurately predicted or adequately prepared for the magnitude, frequency, and costs of wildfires in California over the past three years, it is impossible to predict future circumstances. Best laid plans by utilities today – while they will hopefully mitigate wildfires and keep the power grid more resilient in the event of wildfire incidents - may well not prevent further major investments or liability costs from being incurred in the future post-2025. Aboveground power grids will still be vulnerable to wind-driven wildfire events, not to mention earthquakes, which could lead to expensive shutdowns, repairs, and other costs. The gas grid, while not immune to challenges - is less vulnerable to natural disaster by comparison, and so the long-term infrastructure costs, as well as reliability, are not as difficult to predict.

Continued service to buildings by both sets of infrastructure – electricity and gas - ensures that people will not lose all basic energy services during outages. If the power grid is out, residents may be able to cook and have heat, for example, via the gas grid.

Continued gas service additionally optimizes the opportunity for buildings to benefit from stationary fuel cells, which are a unique solution for supplying 24-7-365 zero emissions backup generation or generation for microgrids, a service batteries cannot technically provide because they are not made for long duration, and that traditional generators cannot either because they rely on carbon intensive, air

[17] p. 61, *Draft Final Project Report - Natural Gas Distribution in California's Low-Carbon Future*, E3; October 2019

polluting fossil fuels. Fuel cells that run on decarbonized gas, such as renewable and zero carbon hydrogen, can not only be free of criteria pollutants, but also lower or zero in greenhouse gas emissions over their lifecycle as well.

The bottom line is that it is very difficult, if not impossible, to accurately predict what electricity rates will be post 2025, and California would be wise to diversify its investments in decarbonized building energy pathways to include both electricity and gaseous pathways, in order to ensure resiliency and reliability of essential energy services.

3. **No matter the extent of assumptions about electrification, there remains in each of the report scenarios significant demand for gaseous fuels and an important role for the pipeline network to provide them through 2050 and beyond. We urge the CEC to look into decarbonizing this gas supply, in parallel to what the state is pursuing for the electricity supply.**

In both the high and no building electrification scenarios, the study forecasts similar quantities of natural gas to be in the pipeline in 2050.[18] The only major difference is whether renewable gases are added for buildings in the no building electrification scenario, or whether that demand is covered with electricity in the high building electrification scenario. For reasons explained above, we believe pursuing an all-electrification approach to building decarbonization is imprudent.

But regardless of opinions on the building sector strategy, E3 is still predicting a great deal of gas to be in the pipelines either way, and California ought to consider better strategies than just to assume continued reliance on fossil natural gas for the foreseeable future. Instead, the state ought to make a strong effort to decarbonize the remaining gas and maximize renewable resources, just as it has been doing for the electricity sector for the past two decades.

Near-term steps to decarbonize the pipeline, such as through hydrogen derived from renewable and zero carbon sources, will advance California's carbon neutrality goals and prevent stranded assets. Indeed, utilizing the existing pipeline network to support innovation and cost reductions in renewable

[18] p. 41, *Draft Final Project Report - Natural Gas Distribution in California's Low-Carbon Future*, E3; October 2019

and zero carbon hydrogen supplies may be one of the most significant remaining opportunities and requirements to support cost-effective clean energy economy-wide. Renewable and zero carbon hydrogen solutions can play unique key roles to deeply decarbonize hard-to-abate applications at scale, such as industrial processes, long duration and seasonal storage, heavy duty trucks, light duty vehicles for multi-unit dwellings, shipping, and aviation. This has been pointed out in a report on how to achieve deep decarbonization in California by the Energy Futures Initiative,[19] among others.

4. **As it considers a broad approach to decarbonize buildings and the rest of the economy, the state of California can take powerful steps to rapidly accelerate innovation, bring down costs of renewable hydrogen, and enable broader, deeper, and more rapid decarbonization than currently envisioned.**

Specifically:

- The CEC ought to support a peer-reviewed scientific study that alternatively models an "all of the above" approach, including examining optimal scenarios for *both* electrification *and* hydrogen's potential to balance the grid and utilize curtailed electricity to decarbonize other sectors of the economy – which the E3 scenarios avoid. Such scenarios should not necessarily be limited by the state's climate targets, and should explore the potential for "all of the above" scenarios to accelerate progress and reduce emissions faster than currently required.
- The state ought to avoid adopting all-electrification requirements into the building code, but rather enable flexibility in technology pathways to decarbonizing.
- The CPUC should quickly move to implement several existing statutes supporting renewable gas development, including SB 1440 and SB 1369.
- As part of any of rulemaking processes on renewable gas, the CPUC should support a study to establish evidence-based limits, along with protocols and standards based on the study results for hydrogen to be injected into the gas pipeline system.
- The state ought to invest robustly in renewable hydrogen research and development and pilot projects to accelerate scale.

[19] Optionality, Flexibility and Innovation – Pathways for Deep Decarbonization in California, Energy Futures Initiative; May 2019 https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5ced6fc515fcc0b190b60cd2/1559064542876/EFI_CA_Decarbonization_Full.pdf

- The CPUC should quickly resolve its microgrid rulemaking, so that clear rules and procedures are in place by next spring to allow microgrids to come online before the 2020 wildfire season. As part of that rulemaking, the CPUC should direct utilities to support microgrid pilot projects utilizing renewable hydrogen – to demonstrate zero carbon microgrids capable of continuous operation.
- State agencies should include hydrogen solutions, such as electrolyzers, hydrogen fuel cells, and hydrogen to decarbonize the pipeline as part of its building decarbonization strategy. Specifically, the CPUC should do so in the next phase of its building decarbonization rulemaking.
- The CPUC ought to adopt cross-sectoral modeling and regulatory frameworks to support implementation of hydrogen solutions in its Integrated Resource Planning efforts.
- The CPUC ought to include reasonable electricity rates for the hydrogen supply chain that includes access to wholesale and curtailed electricity rates.
- State agencies should clarify, through the SB 100 report, that renewable and zero carbon hydrogen constitute zero carbon energy resources and can help the state meet its SB 100 goals.
- As part of its rulemaking pursuant to SB 1383, CalRecycle should require procurement of products from diverted organic waste material, while allowing maximum flexibility in terms of eligible products and end uses, which ought to include hydrogen derived from the organic waste.
- As part of the next Scoping Plan or separate process, CARB should develop a renewable and zero carbon hydrogen strategy, including identifying clear opportunities and needs to bring down costs and enable deeper and more rapid decarbonization of buildings, electricity, industry, transportation, and all sectors.

Taking such steps will ensure that California remains a global leader, as governments around the world – including Australia, Canada, China, Europe, Japan and New Zealand – race to capture competitive advantage and economic opportunities from hydrogen. Several countries and regions are already

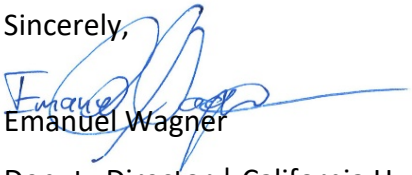
looking closely at potentially transitioning their gas pipeline systems to 100% hydrogen.[20] California risks falling behind the innovation curve on hydrogen, if it does not act swiftly.

III. CONCLUSION

We understand that simplified scenarios, such as E3's, can be helpful to inform policymakers as they seek to balance current and future consumer, economic, technological, and market factors in their decision making. However, given the tremendous uncertainty detailed above and currently associated with electricity supply, rates, and technology into the future, we believe it would be unwise to pursue a single solution approach rather than supporting a broad portfolio of clean technologies to help meet multiple state goals for clean energy, climate, clean air, affordability, reliability, resiliency, and security.

We appreciate your consideration of these comments and would be happy to answer any questions or discuss any of them in detail with you.

Sincerely,



Emanuel Wagner

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[20] See, e.g. H21 project in the UK - https://www.h21.green/ ; New Zealand government vision for hydrogen - https://www.mbie.govt.nz/dmsdocument/6798-a-vision-for-hydrogen-in-new-zealand-green-paper - European Commission/FCH Hydrogen Roadmap Europe at pp. 7, 34