California Hydrogen Production, Delivery, and End Uses

A climate and equity centered summary for policymakers and stakeholders

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Introduction

Interest in hydrogen is on the rise. Demand for hydrogen is increasing with new end uses being announced on a daily basis. National and subnational governments are ramping up investments of public dollars in hydrogen technologies.[1] The labor community sees enormous opportunity in the hydrogen sector. But to what degree is the reemergence of hydrogen benefitting efforts to mitigate the climate crisis or reduce longstanding public health hazards imposed on frontline communities near oil and gas facilities? This summary outlines a cautious climate and equity centered approach to hydrogen with a very limited method of production, minimization of the need to move hydrogen over long distances, and a limited suite of end uses where other methods of decarbonization are not an option. For a more detailed explanation, see The Climate Center's Hydrogen Policy Guidance.[2]

Production

Public investments in California must be limited to green hydrogen. To be able to call hydrogen green and have it be true, at least five requirements are needed:

- Hydrogen must be produced via electrolysis of water using clean renewable energy resources and without diverting water needed to meet basic human needs;
- Hydrogen must be produced with *newly constructed* purpose-built renewable energy resources to avoid "resource shuffling" that can easily occur when inefficient electrolysis can result in gas plants firing up to meet the new demand from the electolyzer/s;
- Production must be co-located with end use or at least in the same distribution circuit on order to ensure that the electrolyzers are indeed run on renewables;
- Electrolysis must be limited to operating only when the renewable resource is generating electricity (time matching); and
- Communities impacted or potentially impacted by any hydrogen proposal must be meaningfully engaged in decision-making.

Storage and Delivery

- Moving hydrogen around is difficult, expensive, and has potential public safety consequences, especially in a scaled up hydrogen sector;
- Leakage of hydrogen in a scaled up sector is not inconsequential. In addition to the safety risk, hydrogen is an indirect greenhouse gas with a global warming potential[3] of about 12 (12 times the global warming potential of carbon dioxide over a 100-year time horizon;[4] and

[1] https://iea.blob.core.windows.net/assets/c5bc75b1-9e4d-460d-9056-6e8e626a11c4/GlobalHydrogenReview2022.pdf
[2] https://theclimatecenter.org/clean-energy/hydrogen-policy-brief/
[3] https://www.epa.gov/ghgemissions/understanding-global-warming-potentials
[4] https://www.nature.com/articles/s43247-023-00857-8

- The “gold standard” deployment is a deployment where green hydrogen production is co-located with the end use. This avoids the need to move hydrogen over long distances, regardless of how it is moved.

End Uses

- End uses of hydrogen should be limited to hard-to-electrify purposes because it is inefficient and costly to use hydrogen in areas better suited for electrification. For example, in the case of light duty vehicles, a hydrogen fuel cell vehicle is about three times less efficient than a comparable battery-electric vehicle with a commensurate cost disadvantage;
- Public dollar investments must be limited to truly hard-to-electrify purposes;
- Gas industry proponents are working to introduce hydrogen into existing fossil gas lines. This is a bad idea, because pipelines designed for fossil gas are not suitable for hydrogen and present potential safety concerns including significant leakage,[5] and because gas of any kind is not needed for homes given a clear path for home electrification; and
- Combustion of hydrogen for any purpose should be avoided, because it produces oxides of nitrogen, a toxic, highly reactive smog precursor, in addition to water vapor.

Existing California Hydrogen Policy

- California policy relative to hydrogen emerged in the 1990s with the state’s zero emission vehicle (ZEV) mandate in 1990[6] that included fuel cell electric vehicles as ZEVs, despite the fact that they emit copious amounts of water vapor;
- Much of the current California hydrogen deployment activity are taking place in the implementation activities pursuant to SB 1075 (Skinner, 2022);[7] and
- SB 414 (Allen),[8] that calls for an agency evaluation of appropriate end uses of hydrogen, may be voted on during the 2024 legislative session.

Conclusions

- Truly green hydrogen can play an important role in decarbonizing difficult-to-electrify end uses;
- Co-location of green hydrogen production and end use is the highest priority deployment scenario;
- Evaluation of appropriate end uses is needed; and
- Green hydrogen presents opportunities for a high road labor transition, but this should be limited to climate-smart hydrogen scenarios that don’t otherwise harm communities or the environment or extend the life of the oil and gas industry.

[5] https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-issues-independent-study-on-injecting-hydrogen-into-natural-gas-systems
[6] https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program
[7] https://ww2.arb.ca.gov/our-work/programs/sb-1075-hydrogen
[8] https://theclimatecenter.org/our-work/bill-tracker/sb-414-allen-assessment-of-hydrogen-applications/