



Assemblymember Steve Bennett  
Select Committee on Building a Zero-Carbon Hydrogen Economy  
1021 O Street, Suite 4710  
Sacramento, CA 94249

March 27, 2024

***RE: Select Committee hearings regarding “Three Pillars” for hydrogen production***

Dear Assemblymember Bennett,

Environmental Defense Fund (EDF) appreciates the opportunity to submit comments on “the Three Pillars” for electrolytic hydrogen production with regards to the State of California. EDF believes that hydrogen has the potential to solve pressing energy challenges in ‘hard to abate’ sectors of the economy, including steel production, industrial high-heat processes, heavy-duty transport, and shipping. However, hydrogen’s true climate benefit depends on how hydrogen is produced, managed and used.

One of the most important factors determining the climate impacts of electrolytic hydrogen production is the sourcing of electricity. Electrolytic hydrogen production is a very energy-intensive process, and if the renewable electricity used to split water molecules is diverted from the power grid, advanced modeling shows that the grid will respond by ramping up fossil fuel generation – with dramatic climate and air pollution effects. For instance, EDF’s latest peer-reviewed research demonstrates that without ‘additionality’ (or ‘incrementality’) of renewable energy, hydrogen can cause system-wide greenhouse gas emissions to more than triple relative to the fossil fuels being replaced.<sup>1</sup>

*Importance of the Three Pillars*

The Three Pillars framework was designed as a nationally implementable framework to prevent these perverse outcomes and ensure that billions of dollars of taxpayer money are not incentivizing hydrogen production that fails to deliver climate benefits. Without such protections, studies from

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<sup>1</sup> Sun, et al. (2024). “Climate impacts of hydrogen and methane emissions can considerably reduce the climate benefits across key hydrogen use cases and time scales.” *Environ. Sci. Technol.* 12, 5299-5309. <https://pubs.acs.org/doi/10.1021/acs.est.3c09030>

Princeton University, Energy Innovation, and Evolved Energy Research demonstrate that nationwide hydrogen build-out could add hundreds of millions of tons of pollution per year.<sup>2, 3, 4</sup>

Strong climate protections can exist without hampering the potential of hydrogen. The Three Pillars framework has been successfully adopted in the European Union, which has seen an increase in planned hydrogen projects since that announcement. One of the key enablers – hourly matching systems – already exist and are in use across the country, including by voluntary users like Google and major utilities like PJM. Tracking system operators believe these systems can be scaled nationwide within 12-18 months; moreover, there are ways to comply with hourly matching via procurement contracts in the meantime. At the same time, the incrementality provision can be easily met in California. In the adoption of the Preferred System Plan, adopted by the California Public Utilities Commission in February 2024, the state forecasted the need to add more than 56 gigawatts (GW) of new clean generation by 2035 – which is far higher than the 50 megawatts (MW) ARCHES estimates is required per year for hydrogen production. Given that this is all new future capacity, it would be eligible under the current incrementality definitions; and it gives California more than sufficient runway to update load forecasts to account for new electricity production required for hydrogen production.

Finally, advanced modeling by Evolved, Energy Innovation, and EPRI demonstrates that the three pillars will not hinder projects' cost-competitiveness relative to status quo “grey” hydrogen or large-scale deployment.<sup>5,6</sup> On the other hand, weak production rules could significantly increase consumer electricity prices by pushing markets to find less efficient solutions for balancing hydrogen demand and supply, including a net increased call on more expensive generators. This would disproportionately affect lower-income populations and disadvantaged communities.<sup>7</sup>

### *Implementation Details for California*

There are a variety of ways to implement the Three Pillars that ensure maximum climate benefits while growing California's hydrogen economy. One potential policy design that merits exploration is an exemption to incrementality rules for state emissions caps that can demonstrate their effectiveness at preventing emissions increases. California is relatively unique in that the centerpiece of its suite of climate policies is an economy-wide emissions cap, established under AB 32. Tying hydrogen eligibility to a state emissions cap could achieve the same outcome as the incrementality pillar – namely, ensuring systemwide emissions do not increase as a result of hydrogen production. Indeed, the incrementality requirement itself is a proxy for determining that

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<sup>2</sup> Ricks, W., Xu, Q., & Jenkins, J. D. (2023). Minimizing emissions from grid-based hydrogen production in the United States. *Environmental Research Letters*, 18(1), 014025. <https://doi.org/10.1088/1748-9326/acacb5>

<sup>3</sup> Energy Innovation Policy & Technology LLC®. (2023, April). Smart Design of 45V Hydrogen Production Tax Credit Will Reduce Emissions and Grow The Industry. <https://energyinnovation.org/wp-content/uploads/2023/04/Smart-Design-Of-45V-Hydrogen-Production-Tax-Credit-Will-Reduce-Emissions-And-Grow-The-Industry.pdf>

<sup>4</sup> Evolved Energy Research (2023). *45V Hydrogen Production Tax Credits: Three Pillars Accounting Impact Analysis*. <https://www.evolved.energy/post/45v-three-pillars-impact-analysis>

<sup>5</sup> Evolved Energy Research (2023). *45V Hydrogen Production Tax Credits: Three Pillars Accounting Impact Analysis*. <https://www.evolved.energy/post/45v-three-pillars-impact-analysis>

<sup>6</sup> Energy Innovation Policy & Technology LLC®. (2023, April). Smart Design of 45V Hydrogen Production Tax Credit Will Reduce Emissions and Grow The Industry. <https://energyinnovation.org/wp-content/uploads/2023/04/Smart-Design-Of-45V-Hydrogen-Production-Tax-Credit-Will-Reduce-Emissions-And-Grow-The-Industry.pdf>

<sup>7</sup> Environmental Resources Management (2024). *Assessment of Grid-Connected Hydrogen Production Impacts*. <https://www.erm.com/assessment-of-grid-connected-hydrogen-production-impacts/>

generation being used for hydrogen electrolysis is additional (or that it would not have otherwise existed). It is not a perfect proxy, as it cannot ensure that *future* clean generating capacity that would have otherwise served other grid-connected end uses is not diverted to hydrogen electrolysis. An effective state cap could provide an alternative mechanism to protect against this.

However, there are several important qualifications to this approach. First, such a flexibility should apply only to binding emissions caps that cover power-sector or economy-wide emissions – which is distinct from clean energy standards, renewable portfolio standards, or integrated resource plans that do not ensure 100% clean electricity in the near-term. Second, the ‘deliverability’ bounds would need to be adjusted to align with the state cap bounds – that is, both the electrolyzer and the electricity procured must be covered by the state cap. Even so, there is still a risk of emissions leakage, which should be mitigated as much as possible. For example, even if state caps cover imports, policies may do an inadequate job of pricing those imports and accounting for the full marginal emissions impact; there is also a risk that capped states export less clean generation as a result of increased demand for in-state hydrogen production. Given these potential risks, the decision to provide an incrementality exception to capped states should be carefully considered. The California Air Resources Board has contracted for third-party analysis to better understand the efficacy of existing leakage mitigation measures in the power sector under the cap-and-trade program. Depending on the findings, additional policies to address electricity imports and exports should be explored, and additional modeling by NREL or other trusted parties should be conducted to determine that the state cap would indeed be effective at preventing significant emissions increases, compared with the alternative emissions expected under the default incrementality approach.

Other policy flexibilities under the incrementality definition could include allowing “repowered” facilities and curtailed renewable resources. For example, an existing wind farm that “repowers” by replacing some of its older turbines with larger and more efficient designs could be eligible so long as it follows the 80/20 rule established elsewhere in the Inflation Reduction Act – i.e., that at least 80% of the fair market value of the assets are updated. There is also a strong argument to make that resources that would otherwise be curtailed are indeed incremental. For example, the EU rule allows resources that would have been curtailed as demonstrated by downward dispatch or prices reflective of renewables as the marginal generator. In the US, curtailed power still represents a relatively small share of nationwide electricity capacity, but it could provide a material level of power for certain projects in California. In fact, California is currently seeing an increase in curtailment of solar generation<sup>8</sup> – which reaches up to 14% of capacity in the spring months – and this may increase as renewable penetration rates rise.<sup>9</sup>

More details on these and other policy design options are included in a recent report by Environmental Resources Management, commissioned by EDF.<sup>10</sup>

While such flexibilities are all worth further consideration and discussion, it is important that they are applied narrowly in order to uphold the emissions integrity of the system. Removing entire pillars or providing blanket exemptions would not only increase emissions in California, but would

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<sup>8</sup> U.S. EIA (2023). “Solar and wind power curtailments are rising in California.”

<https://www.eia.gov/todayinenergy/detail.php?id=60822#:~:text=Congestion%2Drelated%20curtailments%20have%20increased,outpacing%20upgrades%20in%20transmission%20capacity.&text=In%202022%2C%20CAISO%20curtailed%202.4,of%20electricity%20curtailed%20in%202021.>

<sup>9</sup> Environmental Resources Management (2024). *Assessment of Grid-Connected Hydrogen Production Impacts*.

<https://www.erm.com/assessment-of-grid-connected-hydrogen-production-impacts/>

<sup>10</sup> [https://www.erm.com/globalassets/documents/publications/assessment-of-grid/assessment-of-grid-connected-h2-electrolysis-impact\\_part-ii\\_implementation\\_final.pdf](https://www.erm.com/globalassets/documents/publications/assessment-of-grid/assessment-of-grid-connected-h2-electrolysis-impact_part-ii_implementation_final.pdf)

undermine the protective framework that is even more critical in other parts of the nation. We encourage California to maintain its role as a climate champion by approaching the three pillars debate carefully and thoughtfully.

Sincerely,

Katelyn Roedner Sutter  
California State Director

Beth Trask  
Vice President, Global Energy Transition