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Sierra Club California Comments on the SB 100 Kickoff Workshop

Additional submitted attachment is included below.

September 8, 2023

California Energy Commission
715 P Street
Sacramento, CA 95814

RE: Comments on CEC Senate Bill 100 Kickoff Workshop

Dear Commissioners,

On behalf of Sierra Club California and our more than half a million members and supporters statewide, thank you for the opportunity to comment on the California Energy Commission's (CEC) SB 100 Kickoff Workshop. We strongly support California's goal to achieve a 100% renewable and zero-carbon electricity sector by 2045, and applaud the ongoing commitment to achieving this goal by supporting sustainable, resilient, and equitable communities and natural spaces. We support the transparency and engagement opportunities provided through the workshop process, and we look forward to engaging in additional workshops on social costs and land use as mentioned in the Kickoff Workshop.[1]

As the CEC recognizes and demonstrated through the development of differentiated energy generation models, success in achieving the SB 100 goal will be defined by how we achieve it. The purpose of SB 100 was not just to achieve 100% clean energy in California; it was to achieve clean energy for the health and resilience of all California's communities and natural spaces. In evaluating successful implementation of these core values, we support the consideration of reliability, affordability, non-energy benefits/impacts, social costs, and land use impacts in the evaluation of every model.

For the evaluation of these variables to be accurate, however, all agencies involved must be accountable for prioritizing and incorporating both the variables and the final model parameters into decision making going forward. Furthermore, these variables cannot be seen solely as downstream effects. Non-energy impacts and social costs to communities and public health will have a significant impact on the costs and feasibility of these models, while land use impacts will also impact the stability and resilience of California's water, food and clean air. Wherever possible, these costs must be factored into model feasibility evaluations. If we achieve 100%

[1] See 2025 SB 100 Report Vision, Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=251718&DocumentContentId=86699.

clean energy at the expense of our most vulnerable communities and ecosystems, we will have failed to achieve the purpose of this goal and will have created a less healthy, less sustainable, and less resilient California in the process.

Additionally, while we understand the need for discrete models to evaluate the effectiveness of individual pathways, the current model differentiation will obstruct progress in developing a diversified and reliable clean energy system. As set up, the models are incomplete and create false competition between complementary resources. To create a more accurate picture of the pathways that lead to compliance by 2045, sensitivities should be applied consistently across all pathways, including increased distributed energy resources (DER), climate resilience consideration in land use models, and avoiding reliance on costly technologies that will delay California's transition away from fossil fuels. Where models need to remain differentiated, it is essential that a clear roadmap for integration of separate sensitivities is defined for greater transparency and understanding of the process as it moves forward.

We offer the following comments and suggestions in the spirit of partnership, to strengthen the development of the 2025 SB 100 report and the engagement process moving forward.

I. Broaden the DER Focus Pathway and increase DER deployment in all pathways for more accurate evaluation

DER utilization is a critical step towards democratizing energy generation and use while also prioritizing demand response and distributed generation as called for by California's loading order.[2] Increased opportunities for implementation, both in front and behind the meter, and full realization of the benefits through increased bidirectional charging requirements, maintaining virtual net energy metering (VNEM) tariffs, microgrid development, and other distributed avenues,[3,4] will help make California's energy sector more equitable as well as cleaner and more resilient. The development and evaluation of a DER Focus Pathway Concept is a good step towards realizing these benefits, however there are significant gaps that need to be addressed for accurate evaluation of all four pathways.

A DER Focus pathway cannot be accurately examined without considering the technological innovations that might decrease the resource generation footprint and costs while also increasing accessibility for all communities. Disadvantaged communities in particular, would experience significant benefits through direct engagement opportunities that would provide ownership of how and where their energy resources are developed. In addition to technological innovations in distributed energy generation, DER would greatly benefit from increased investment in long duration storage, decentralized through the development of microgrids in local communities that can be supported by bidirectional energy flow. Developments like these would provide the reliable firm power currently provided by fossil fuel combustion. This would

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[2] See CPUC California Public Utilities Commission Decision 14-03-004, n.3, pp. 6-7 (Cal. P.U.C. Mar. 13, 2013).

[3] Blackhall, L., Kuiper, G., Nicholls, L., & Scott, P. (2020). Optimising the value of distributed energy resources. The Electricity Journal, 33(9), 106838.

[4] Akorede, M. F., Hizam, H., & Pouresmaeil, E. (2010). Distributed energy resources and benefits to the environment. Renewable and sustainable energy reviews, 14(2), 724-734.

release our dependence on polluting generating energy facilities that disproportionately impact communities of color and low-income communities.[5]

In addition to modifications to the DER Focus Pathway Concept, all four pathways should specify Increased DER, not just DER Focus and Combustion Retirement. DER is a critical tool in equitably expanding California's electricity generation portfolio. It can provide clear, firm power, release environmental justice communities from the pollution created by utility scale combustion energy generation, and minimize the need for further development and degradation of California's natural resources. As such, none of these pathways can be accurately evaluated without assuming full utilization of potential DER opportunities. Resource Diversification, by nature of its name, should include all available resource opportunities. As the resource opportunity with the lowest requirements for development, land use, and technological innovations, as well as the lowest risk of environmental degradation or pollution compared to offshore wind or hydrogen, DER must be increased for an accurate evaluation of resource diversification. Similarly, the impacts that are being evaluated with regards to Geographic Diversification will be driven largely by the need for additional transmission development. Only through minimizing that need, can an accurate evaluation be made of if, or the extent to which, additional geographic diversification is needed.

Recommendations:

- The DER Focus Pathway should be expanded to include Increased Technology Innovations and Increased Long Duration Storage for a more accurate evaluation of the pathway's potential costs and benefits
- Increased DER should be included in the Resource Diversification and Geographic Diversification Pathways to accurately assess the impacts of these resource options

II. Prioritize Conservation and use the Climate Resilience Land Use Scenario in evaluating all four pathways

Conserving biodiversity can no longer be seen as a benefit that comes from mitigating climate change. California's biodiversity thrived across the incredible breadth of habitats found in our state for millennia, and have continued to persist despite nearing dangerous tipping points as a result of climate change.[6,7] These ecosystems were the state's first nature based solution that allowed the unique diversity of species to adapt and thrive across such a varied landscape. And they remain California's most resilient and adaptable solution for protecting our communities, safeguarding our water supply, and supporting life statewide. The loss of these habitats would result in increased stress on our communities' health and infrastructure as climate change

[5] Krieger, E. M., Casey, J. A., & Shonkoff, S. B. (2016). A framework for siting and dispatch of emerging energy resources to realize environmental and health benefits: Case study on peaker power plant displacement. Energy Policy, 96, 302-313.
[6] Barnard, P. L., Dugan, J. E., Page, H. M., Wood, N. J., Hart, J. A. F., Cayan, D. R., ... & Iacobellis, S. F. (2021). Multiple climate change-driven tipping points for coastal systems. Scientific Reports, 11(1), 15560.
[7] Au, J., Bloom, A. A., Parazoo, N. C., Deans, R. M., Wong, C. Y. S., Houlton, B. Z., & Magney, T. S. (2023). Forest productivity recovery or collapse? Model-data integration insights on drought-induced tipping points. Global Change Biology.

advances and would require an ever-increasing supply of energy to offset the benefits and stability that California's biodiversity currently supports.

Critical habitats that will persist in the face of climate change must be protected across all Pathways. As such, the Climate Resilience Land Use Scenario should be included as the reference level for all pathways being evaluated. California's Department of Fish and Wildlife's Areas of Conservation Emphasis has designated Climate Resilience Ranks to indicate the probability that a specific area will persist in the face of climate change. Climate Resilience Ranks 4 and 5 include the areas in CA that are most likely to include climate refugia under all future climate projections. These are the areas that are most likely to remain intact and continue to support California's incredible biodiversity as climate change advances across our state. Neglecting to protect these habitats will accelerate the loss of species that make California one of the world's 36 biodiversity hotspots, and result in incalculable damage to California's communities and natural spaces.

In addition to the adoption of the Climate Resilience Layer, every effort should be made to minimize the development and degradation of lands. This includes maximizing the use of DER to support energy generation and reliability locally, such as through maximizing deployment on the 200,000+ acres of parking lots in California[8] or the 11,500 MW potential of large commercial or industrial rooftops within 3 miles of distribution substations.[9] Further development and deployment of agrivoltaics on agricultural lands both in and out of critically overdrafted basins would also promote multibenefit land use beyond single-purpose utility scale solar. With agriculture constituting the greatest proportion of land use in the contiguous United States,[10] development of agrivoltaics presents California with an opportunity to both increase clean energy generation statewide and create a model for further application across the country.[11]

Additionally, expanding the capacity of current transmission lines should be prioritized over the installation of additional transmission lines and the concomitant habitat degradation those would entail. Where new power lines are needed, these should follow and make use of current transportation right of ways wherever possible, including interstate corridors and rail lines.

Recommendations:

- Make the Climate Resilience Land Use Scenario the reference sensitivity across all Pathway Concepts
- Prioritize energy generation and transmission opportunities that will minimize or eliminate the need for habitat degradation, including DER and agrivoltaics

III. Include Combustion Retirement in all pathways

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[8] Geological Survey data release. 2019. https://doi.org/10.5066/P9UTMB64
[9] E3 and Black & Veatch. 2009. Summary of PV Potential Assessment in RETI and the 33% Implementation Analysis, CPUC Re-DEC Working Group Meeting, December 9, 2009, p. 24.
[10] U.S. Department of Agriculture. *Agrivoltaics: Coming Soon to a Farm Near You?* USDA Climate Hubs. https://www.climatehubs.usda.gov/hubs/northeast/topic/agrivoltaics-coming-soon-farm-near-you
[11] DOE Solar Futures Study: Solar Futures Study (energy.gov) https://www.energy.gov/sites/default/files/2021-09/Solar%20Futures%20Study.pdf

The purpose of SB 100 to transition all energy in California to zero-carbon and renewable energy cannot be achieved through reliance on combustion- driven energy generation.

The 2021 Joint Agency Report included two additional scenarios: a No Combustion Scenario, retiring all combustion resources by 2045, and an Accelerated Timeline Scenario, meeting SB 100 goals by 2030, 2035 and 2040.[12] The CEC should build off of these scenarios to develop a faster timeline to retire gas plants, pursuant to state law. State law also requires prioritization of retirements of gas plants in disadvantaged communities (DACs).[13] SB 887 requires the CEC and CPUC in collaboration with CAISO to "[p]rovid[e] resource projections that . . . substantially reduce, no later than 2035, the need to rely on [gas plants] in local capacity areas."[14]

In modeling gas plant retirements, the CEC should not consider Carbon Capture and Storage (CCS). CCS has repeatedly failed to live up to capture rate expectations,[15,16] and will likely result in the facilities with proposed CCS modifications continuing to produce greenhouse gas (GHG) emissions. These facilities are disproportionately located in disadvantaged communities, which will continue to suffer the adverse health effects from health-damaging pollutants not captured by CCS technology. Additionally, the continued extraction, refinement, and transportation of fossil fuels will result in significant GHG emissions that CCS will not, and can not, compensate for. Powering CCS equipment will also require an additional 10-40% more energy,[17,18] which is equal to or more than the proportion of carbon currently being captured in some study systems.[19] Even if CCS could capture 100% of CO_2 being emitted, the cost of powering CCS equipment would result in a net increase in fuel combustion and other associated pollutants such as NO_x and NH_3.[20] And finally, storage of the CO_2 produced from CCS presents significant technological and environmental issues, and will continue to result in substantial harm to communities and the natural environment when they fail.[21,22]

Our reliance on the potential of CCS, or hope for its success, will simply extend the use of fossil fuels that are accelerating climate change, harming our communities, and devastating our natural environment. At the same time, we will be trading the minimal benefits we might gain

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[12] CEC, 2021 SB 100 Joint Agency Report, page 14, available at https://www.energy.ca.gov/publications/2021/2021-sb-100-joint-agency-report-achieving-100-percent-clean-electricity

[13] Cal. Pub. Util. Code § 454.52(a)(1)(H) and Cal. Health and Safety Code § 38562.5.

[14] Public Utilities Code Section 454.57(e)(4).

[15] See Box 5; https://www.gao.gov/assets/gao-22-105111.pdf

[16] Jacobson, M. Z. (2019). The health and climate impacts of carbon capture and direct air capture. Energy & Environmental Science, 12(12), 3567-3574.

[17] Vasudevan, S. et al. (2016). Energy Penalty Estimates for CO2 Capture: Comparison Between Fuel Types and CaptureCombustion Modes. Energy, 103, pp. 709-714.

[18] Sgouridis, S. et al. (2019). Comparative Net Energy Analysis of Renewable Electricity and Carbon Capture and Storage. Nature Energy, 4(6), pp. 456-465.

[19] Jacobson, M. Z. (2019). The health and climate impacts of carbon capture and direct air capture. Energy & Environmental Science, 12(12), 3567-3574.

[20] van Harmelen, T., van Horssen, A., Jozwicka, M., Pulles, T., Odeh, N., & Adams, M. (2011). Air pollution impacts from carbon capture and storage (CCS).

[21] https://pstrust.org/wp-content/uploads/2022/03/CO2-Pipeline-Backgrounder-Final.pdf

[22] Zegart, D. (2021, August 26). *The Gassing of Satartia.* HuffPost. https://www.huffpost.com/entry/gassing-satartia-mississippi-co2-pipeline_n_60ddea9fe4b0ddef8b0ddc8f

from CCS, for a wide range of new environmental and community harms. Our hope that this silver bullet will save us, instead will delay the investment in technologies that could permanently free us from our reliance on these fuels and allow us to establish a truly renewable and clean energy sector in California.

Recommendation:

- Include the Combustion Retirement sensitivity in all pathway concepts, and redirect efforts from CCS to technologies that offer substantiated solutions for producing zero-carbon renewable energy
- Include in all models the full retirement of combustion resources in DACs by 2030 and analyze retirement of of all combustion scenarios by 2035 and 2045, respectively

IV. Eliminate reliance on Hydrogen combustion in energy generation

The CEC has highlighted hydrogen for use in the power sector, including as a fuel source for backup power, reciprocating engines, and distributed generation. Using hydrogen energy for large-scale energy production is at best, an inefficient emissions reduction strategy, and when fully considered, could extend the use of pollution-producing fossil fuels and infrastructure, expand environmental harms resulting from the production, storage, and combustion of hydrogen, and redirect investments that could otherwise be used for true zero-carbon energy generation and storage pathways.

The currently feasible use of hydrogen in large-scale energy production includes the use of hydrogen as a combustion additive, blended with methane gas. This is not the cost-effective decarbonization strategy it is promoted as. While able to utilize existing methane gas infrastructure, hydrogen blending faces financial and logistical challenges in creating fuel pipelines able to transport hydrogen. Existing methane gas pipelines are damaged by the addition of hydrogen atoms, whose small atomic size embrittles pipeline materials.[23] Beyond these infrastructure hurdles, hydrogen blending is an inefficient emissions reduction strategy, offering only a 6 percent reduction in methane gas emissions with a 20 percent hydrogen blend.[24] Hydrogen blending will lock in a dependence on methane.

Hydrogen is more efficiently utilized as a storage vehicle for renewable energy. Green hydrogen can be generated from electrolysis using excess renewable electricity during peak production hours, then stored in fuel cells as gas or liquid for use during off-peak renewable energy periods.[25] It is estimated that hydrogen energy storage with a 1-day, and 2-week discharge

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[23] Nykyforchyn, H. et al. (2021). Pipeline durability and integrity issues at hydrogen transport via natural gas distribution network. 26th International Conference on Fracture and Structural Integrity, 33, 646–651. https://doi.org/10.1016/j.prostr.2021.10.071

[24] Goldmeer, J. (2019). *Power to Gas: Hydrogen for Power Generation*. General Electric Power. https://www.ge.com/content/dam/gepower/global/en_US/documents/fuel-flexibility/GEA33861%20Power%20to%20Gas%20-%20Hydrogen%20for%20Power%20Generation.pdf

[25] Hirscher, M. et al. (2020). Materials for hydrogen-based energy storage – past, recent progress, and future outlook. Journal of Alloys and Compounds, 827, 153548. https://doi.org/10.1016/j.jallcom.2019.153548

duration will be cost-effective between 2025 and 2045 for the Western energy grid.[26] This stored energy can be utilized to fuel non-combustion fuel cells and technologies for hard-to-decarbonize end uses, such as high-heat industrial processes, aviation, shipping and long-haul heavy duty trucking.

Hydrogen is a limited resource with only 10 million metric tons per year being produced in the United States as of 2021[27] and less than 1 percent of global hydrogen produced in 2021 being green.[28] Given its scarcity, using hydrogen as a combustion additive will slow down the decarbonization of truly hard-to-decarbonize industrial sectors that present a significantly more efficient opportunity for hydrogen application.[29] Rather than blending green hydrogen with methane to burn in gas power plants, it should be used in the power sector to help stabilize the electric grid exclusively through non-combustion fuel cells and reserved for hard-to-electrify end uses in the industrial and transportation sectors. The production of hydrogen should be limited to electrolytic green hydrogen produced from excess renewable energy.

Recommendations

- Remove hydrogen combustion from consideration as a primary energy generation option
- Prioritize hydrogen production as vehicle for excess renewable energy storage that can be used only in hard-to-decarbonize sectors

The SB 100 goal and planning process has the potential to accelerate the development and implementation of clean renewable energy in California, while setting an example for the rest of the country to follow. To successfully accomplish this, the CEC must prioritize the development of energy resources that will reliably and sustainably move us beyond combustion energy generation and the GHG emissions and air pollution it produces. California cannot advance its climate goals without putting the health, resilience, and sustainability of our communities and natural spaces at the core of these efforts. We look forward to working with you throughout the SB 100 process to support the development and implementation of California's clean energy roadmap.

Sincerely,

Jason John
Associate Director

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[26] Omar, G. et al. (2020). The Value of Seasonal Energy Storage Technologies for the Integration of Wind and Solar Power. Energy & Environmental Science. https://pubs.rsc.org/uk-ua/content/getauthorversionpdf/D0EE00771D
[27] Beagle, E. et al. (2021). Policy Memo: Clean Hydrogen Abatement. Rocky Mountain Institute. https://rmi.org/insight/policy-memo-clean-hydrogen-abatement/
[28] Hydrogen Overview. (n.d.). International Renewable Energy Agency. Retrieved August 29, 2023, from https://www.irena.org/Energy-Transition/Technology/Hydrogen
[29] Turner, A., & Delasalle, F. (2021). Making the Hydrogen Economy Possible. Energy Transitions Commission. https://energy-transitions.org/wp-content/uploads/2021/04/ETC-Global-Hydrogen-Report.pdf