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Defenders of Wildlife and Sierra Club CA Comments on SB 100 Analytical Framework Workshop

Additional submitted attachment is included below.

November 14, 2023

California Energy Commission
715 P Street
Sacramento, CA 95814

RE: Comments on Senate Bill 100 Analytical Workshop (Docket 23-SB-100)

Dear Commissioners,

These comments are submitted on behalf of Defenders of Wildlife and Sierra Club California and our more than 800,000 members and supporters. Our organizations are dedicated to protecting and conserving wild animals, plants, and habitats throughout California. We appreciate the opportunity to comment on the California Energy Commission, California Public Utilities Commission, and California Air Resource Board (Joint Agencies) SB 100 Analytical 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 the protection of natural, cultural, and tribal resources. 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 Joint Agencies recognize and have demonstrated through the development of differentiated energy generation scenarios, 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, cultural, and tribal resources. In evaluating the successful

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

implementation of these core values, we support the consideration of reliability, affordability, non-energy benefits/impacts, social costs, and land use impacts in every scenario.

Importantly, it is incumbent upon the Joint Agencies to ensure that implementation of SB 100 is not considered in isolation from other critical state policies such as SB 350 and SB 337. These policies mandate increased additional achievable energy efficiency (AAEE) and protection of 30% of California's lands and waters, respectively. Planning that focuses almost exclusively on generation and transmission creates a conflict with these policies and unnecessary financial, land use, and environmental burden to generate renewable energy. In particular, the state has fallen behind on tracking progress on SB 350, much less implementing it; all scenarios should assume full implementation of AAEE under SB 350.

These core values 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 scenarios. At the same time, land use conflicts will also impact the stability and resilience of California's water, food, and clean air. Wherever possible, these costs must be factored into scenario feasibility evaluations. They should not, as proposed, simply be used to evaluate tradeoffs after the fact of developing resource portfolios. If we achieve 100% clean energy at the expense of our most vulnerable communities and ecosystems, we will have failed to achieve the purpose of SB 100 and will have created a less healthy, less sustainable, and less resilient California in the process.

To ensure that the core values above are evaluated correctly and that the statutory requirements are met effectively, the Joint Agencies must prioritize and integrate both the core values and the final model parameters into their future decision making.

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

Comments

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

1. Broaden the Distributed Energy Resources (DER) Focus Scenario and increase DER deployment in all scenarios 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 of and behind the meter, and full realization of the benefits through increased bidirectional charging requirements, maintaining virtual net energy metering 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 while reducing the need to develop lands that impact natural, cultural, and tribal resources. Developing and evaluating a DER Focus Scenario Concept is a good step toward realizing these benefits. However, significant gaps need to be addressed for an accurate evaluation of all four scenarios.

A DER Focus Scenario 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 significantly benefit from direct engagement opportunities that 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 local long-duration storage, decentralized through the development of microgrids in local communities that can be supported by bidirectional energy flow.

In addition to modifications to the DER Focus Scenario Concept, all five scenarios should specify Increased DER, not just the DER Focus and Combustion Retirement scenarios. 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,[5] and minimize the need for further development and degradation of California's natural resources. As such, none of these scenarios can be accurately evaluated without assuming full utilization of potential DER opportunities.

By nature of its name, the Resource Diversification Scenario should include all available resource opportunities. As the resource opportunity with the lowest requirements for

[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.
[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.

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 evaluated by the Geographic Diversification Scenario will be driven largely by the need for additional transmission development. Only by minimizing that need can an accurate evaluation be made of whether or the extent to which additional geographic diversification is needed.

Recommendations:

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

2. Prioritize Conservation and use the Terrestrial Climate Resilience Land Use Scenario in evaluating all four scenarios

Conserving biodiversity can no longer be seen as a benefit of mitigating climate change. California's biodiversity thrived across the incredible breadth of ecosystems found in our state for millennia and has continued to persist despite nearing dangerous tipping points due to climate change.[6,7] These ecosystems were the first nature based solution that allowed the unique diversity of species to adapt and thrive across such a varied landscape. California will struggle to meet our co-equal goals for climate resiliency and protection of refugia[8] if terrestrial climate resilience is not considered within SB 100.

Critical habitats that will persist in the face of climate change must be protected across all scenarios. As such, the Terrestrial Climate Resilience Land Use Scenario should be included as the reference level for all scenarios 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 California 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 and sequester carbon as climate change advances across our state. Additionally, they remain California's most resilient and

[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.

[8] Executive Order N-82-20 https://www.gov.ca.gov/wp-content/uploads/2020/10/10.07.2020-EO-N-82-20-.pdf

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

While some of these impacts may be considered in subsequent Land Use Impact modeling, accurate identification of available land area will also influence the precision of model predictions for implementation costs of utility scale development and transmission and resource reliability. If the Terrestrial Climate Resilience Layer cannot be applied consistently across all scenarios, then an effective analysis of the layer's impacts would result from application to a scenario with higher land use expectations or as a comparative analysis on the reference layer. Comparing the impacts of the Terrestrial Climate Resilience Layer on the Reference Scenario versus the Core Land Use Screen would provide a more comprehensive evaluation and enable more accurate incorporation of these critical habitat areas into the final scenario development.

In addition to the adoption or comparative application of the Terrestrial Climate Resilience Layer, every effort should be made to minimize the development and degradation of natural, cultural, and tribal resources. 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[9] or 50,000+ acres of warehouse rooftops[10] in California. 11,500 MW potential of large commercial or industrial rooftops were also determined to be within 3 miles of distribution substations in 2009.[11] Further development and deployment of agrivoltaics on identified least conflict agricultural lands in and out of critically overdrafted basins would promote multi-benefit land use beyond single-purpose utility scale solar.

Additionally, transmission investments should direct renewable energy development to least conflict lands, support the use of distributed energy resources, and facilitate the retirement of fossil fueled plants. We encourage new transmission lines to follow and make use of current transportation right-of-way wherever possible, including interstate corridors and rail lines.

[9] Geological Survey data release. 2019. https://doi.org/10.5066/P9UTMB64

[10] Kurdgelashvili, L., Li, J., Shih, C. H., & Attia, B. (2016). Estimating technical potential for rooftop photovoltaics in California, Arizona and New Jersey. Renewable Energy, 95, 286-302.

[11] 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.

Recommendations:

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

3. Include Combustion Retirement in all scenarios

The purpose of SB 100 is 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] Pursuant to state law, the Joint Agencies should build off these scenarios to develop a faster timeline to retire gas plants. 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 Joint Agencies 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 cannot, 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

[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] Cal. Pub. Util. Code §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 Capture Combustion 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.

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] Finally, storage of the CO_2 produced from CCS presents significant technological and environmental issues and will continue to substantially harm 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 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 scenario concepts and redirect efforts from CCS to technologies that offer substantiated solutions for producing zero-carbon renewable energy.
- Include the full retirement of combustion resources in DACs by 2030 in all scenarios and analyze the retirement of all combustion scenarios by 2035 and 2045, respectively.

4. Eliminate reliance on Hydrogen combustion in energy generation

The Joint Agencies have 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 scenarios.

The currently feasible use of hydrogen in large-scale energy production includes hydrogen as a combustion additive blended with methane gas. This is not the cost-effective decarbonization

[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

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] Hydrogen energy storage with a 1-day and 2-week discharge duration is estimated to be cost-effective between 2025 and 2045 for the Western energy grid.[26] This stored energy can 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

[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

[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

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 a vehicle for excess renewable energy storage used only in hard-to-decarbonize sectors.

Conclusion

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 Joint Agencies 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,

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