California Council for Environmental and Economic Balance
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November 19, 2021

Rajinder Sahota
Deputy Executive Officer
Climate Change and Research
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Comments on Scoping Plan Scenarios

Dear Ms. Sahota:

On behalf of the members of the California Council for Environmental and Economic Balance ("CCEEB"), we appreciate the opportunity to comment on recent California Air Resources Board ("CARB") Scoping Plan Modeling Scenarios. CCEEB is a non-profit and non-partisan coalition of business, labor, and public leaders that advances balanced policies for a strong economy and a healthy environment. CCEEB spent several years developing carbon neutrality principles and has for the last decade been an integral stakeholder when major climate change and air quality legislation and regulations are being considered. Our membership is committed to building the energy systems and delivering low, zero, and negative carbon solutions to Californians.

Cost Effective, Technologically Feasible *and Reliable Energy Systems*
CCEEB notes that a large part of the workshops to date have focused on a heavy emphasis on technology. This approach diverges from the past where policy design and market forces were the focus. To that end it is incumbent that CARB consider the technological feasibility and cost-effectiveness emphasized in AB 32, the California Global Warming Solutions Act of 2006, SB 32 (Chapter 249, Statutes of 2016), and Executive Order B-30-15. These two concepts are found throughout California's climate policy for good reasons and are an indication of the legislature's will to ensure a fair and balanced approach to reducing greenhouse gas emissions. However, as we progress further on our compliance pathways to decarbonization of California's economy, maintaining these key principles will become increasingly difficult. Added to the challenge is the need to maintain reliability of the electrical system, a key principle set forth by SB 350, the Clean Energy and Pollution Reduction Act, and SB 100, the 100 Percent Clean Energy Act of 2018. Reliability cannot be ignored in the scenarios for the Scoping Plan.

These three key principles must be modelled in all scenarios studied during the Scoping Plan. For example, Scoping Plan scenarios must reflect CPUC and CAISO resource adequacy requirements, which are based on a "one day in ten" loss of load expectation. This means that SB 100 targets alone are not enough for electrical system modeling assumptions; resource adequacy and CPUC reliability standards must also be factored in. Similarly, cost effectiveness and affordability assessments should be incorporated into every scenario selection. To do this, each scenario should model all costs including incremental transmission and distribution costs, up-front

customer costs, fuel switching costs, and so on, and then compare the total costs of each scenario to evaluate cost effectiveness.

Scenarios should also reflect carbon-free energy systems, both grid and pipeline, that are technology inclusive and fuel neutral. The list of technologies should go beyond the SB 100 candidate resource list allowing all existing and emerging resources that can prove to be commercially viable within the time leading to 2045. This list could include combustion of renewable natural gas ("RNG") and/or renewable and/or clean hydrogen ("RCH_2"), carbon capture, and other clean technologies not currently included in SB 100. For the Scoping Plan scenarios, the SB 100 definition of 100% retail sales needs to be preserved. Expanding the 100% retail sales to "total load coverage" should only be considered if all technologies are eligible.

The benefit of focusing on a broader array of policy and market designs is that it allows CARB and its partners to explore more creative and multi-faceted technology pathways. Too narrow a view in the scenarios suggests that CARB envisions substantial government intervention dictating a limited band of technology choices, or that it intends to pick "winners and losers" rather than rely on private sector innovations and market competition. Emphasis on strong carbon markets like California's Cap-and-Trade Program and the Low-Carbon Fuel Standard with meaningful targets and compliance obligations will ensure the best and most innovative results, along with the most cost-effective strategies to develop carbon neutral technologies. We urge CARB to be technology neutral and let the markets decide which technologies are most competitive to achieve carbon neutrality by 2045.

Scoping Plan Modeling

CCEEB believes that modeling scenarios are best viewed through a lens of intellectual curiosity, allowing CARB and its partners to explore a wide range of possible carbon mitigation and sequestration strategies. That is, scenarios should not seek to predetermine policy outcomes or to try to justify preferred technology pathways ahead of time. At their best, the scenarios help us consider a complex system of interrelated goals and objectives for carbon neutrality, including a look at possible compromises among benefits, costs, leakage, technological feasibility, and equity. We must balance the negative impacts of climate change on communities and residents, with the goal of avoiding disproportionate impacts, as well as what is needed for a "just transition" to a carbon neutral economy that fully protects Californian workers and quality of life. CCEEB believes a well-grounded model can help the State improve environmental and economic outcomes overall, not just avoid harm. We continue to caution, however, that long-range modeling should not be mistaken as a forecast of the future.

We suggest CARB model a range of options to fully understand the impacts and implications of a variety of scenarios. Many of the options presented are a result of various EOs and directives from the governor. While we recognize the need to model under that guidance, we also believe that that limiting the scenarios to only those assumptions constrain the options possible for achieving carbon neutrality. Overall, we respectfully believe CARB simply does not have a sufficient breadth of alternatives to represent the full range of potential options are available to California achieve carbon neutrality.

To that end we would suggest that CARB work with their contractor to provide the public with an open-source or semi open-source model that would allow stakeholders to trial as many scenarios and assumptions as possible. Standards vs. outcomes – do we design an outcome

with specified technologies, or do we set sector/economy-wide targets? We only know so much about the future. Limitations of the four scenarios will not allow substantial intellectual curiosity and exploration of the best ideas.

Scenarios - General

CCEEB believes that these four scenarios are generally limiting and reasserts the need for an open source or semi open-source model such as the RESOLVE model that allows stakeholders to dive more deeply into the assumptions and options being modeled. Without that CARB should fund additional scenarios as the date limitations alone present a limited set of results. CCEEB would like to see scenarios or outputs of scenarios for 2035, 2040, and 2045.

We presume the economic and health sensitivity analyses performed by Rhodium and UC Irvine will include health and social costs of carbon ("SCC"). Other metrics beyond SCC, like energy costs per individual or household, should also be presented in the findings as well, otherwise we will fail to grasp the day-to-day financial impacts of these policy decisions for Californians, which we believe could be dramatic under an accelerated 2035 scenario.

Cost effectiveness should not be left to "the eye of the beholder" – CCEEB proposes workshopping a cost-effectiveness metric so that stakeholders and the Board can agree on how we quantifiably measure a principal tenet of the authorizing legislation. The Cap-and-Trade Program is a good indicator of the cost of carbon in California. This value could help determine, line by line within the scenarios, which technologies could be prioritized by each sector and whether there are better and more applicable technologies available not envisioned in this modeling exercise.

The Scoping Plan update workshops to date have been overwhelmingly technology specific. CCEEB's Carbon Neutrality Principles are technology and fuel neutral, which has made it hard to engage on the sector-based proposals. We preferred the policy-focused modeling of the last Scoping Plan. Our concern with a technology-focused approach for the Scoping Plan relies on accurately predicting market and consumer adoption of these technologies. To make such a prediction CARB will need an expansive, in-depth, and inclusive exploration of the assumptions from a much broader range of individual technologies beyond the narrow subset of CARB has included in the modeling alternatives to date. This analysis would need to include explorations of cost effectiveness, cost/learning, abatement cost, and mean-average precision curves for each technology. The model is only as good as the technologies being modeled, which could lead to bias and omission errors. This pathway forces us to make assumptions based on the provided technology as opposed to examining costs and GHG reductions from policy decisions. The assumption of technology adoption without justification of cost effectiveness and potential GHG reductions leads to less optimal decision making.

CARB has presented 29 categories with one to four options. CCEEB's membership does not believe that the 2035 scenarios are feasible due to the state of technological development, status of the state's energy infrastructure, the ability of the public to bear the increased costs of energy, and the barriers to permitting and building the necessary energy resources and distribution systems in time. Nonetheless we believe these should be modeled to explore the potential near term costs. We do believe that each of these models should reflect technological feasibility, which should include the ability to permit and build within this timeframe all the necessary energy production and distribution. Assuming that the grid in place today is capable

of all the selected technologies would be largely inaccurate. Grid upgrades must be accounted for in the modeling, or we run the risk of providing a false sense that these timelines are achievable with the status quo for project development and the scale of the transition necessary to achieve the goals.

While alternative one appears to be a good outlier to help explore the bounds and limitations of some of the aggressive policy suggestions leading up to the Scoping Plan update modeling, we must ensure that the economic sensitivity analysis is completed. To further explore the other bound with an "all tools" alternative four and everything in between. To this end we believe it may be prudent to only model a single 2035 scenario in alternative one and use alternative two for a 2040 scenario.

Alternative Four – CCEEB Suggestions

The following comments are intended to explore broader bounds in some sectors than currently envisioned in CARB's proposal. We are curious if anything short of 100% uptake of the proposed technologies can achieve the goal of carbon neutrality. We note that in several of the sector proposals the difference between alternatives three and four were minor or non-existent. Anywhere our suggestions fall short of the desired emissions we suggest that cap-and-trade will back up the technology gaps while also directing us to the sector and options that are most cost effective. We also assume cap and trade will be an available tool through 2045 and beyond.

CCEEB offers the following recommendations for Alternative Four:

1.) Smart Growth/Vehicle Miles Travelled ("VMT") - VMT per capita reduced 7.5% below 2019 levels by 2030 and 10% below 2019 levels by 2045. A reduction in VMTs is a huge change to people's lives and CARB needs to make clear what this will mean to travel/commutes. While primarily developed to increase transportation-oriented housing with access to public transit and walkable/rollable communities, there is strong evidence that efforts to reduce VMT have created negative externalities that affect new developments and the overall housing supply. With many passenger vehicles converting to zero emission over this time, VMT becomes a congestion issue instead of a one of emissions. It is unclear at this time whether VMT policy can effectively and equitably solve for legacy land use decisions. CCEEB suggests modeling less ambitious VMT reductions reflective of what is expected from new development and housing market trends. We would also suggest looking into the role that incentives might play in achieving VMT reduction through ridesharing and public transit.

2.) Light Duty Vehicle ("LDV") Fuel Economy Standards – CCEEB generally agrees with the assumption for alternative 4 and supports modeling the Advanced Clean Cars GHG standards for 2017 - 2025 model years and 2% annual fuel economy improvements in 2026-2035. CCEEB suggests extending the 2% annual reduction through 2045. Also, we believe there is a need to model the lifecycle impacts of the differing vehicle drivetrains and the leakage from the fuel resources and production shifts.

3.) LDV Zero Emission Vehicles ("ZEVs") – we support use of the AB 74 University of California, Davis Institute of Transportation Studies Report: 100% of LDV sales are ZEV by 2040, which is further supported by the vehicle manufacturer commitments at COP 26. However, we would like to ask for a full accounting of the infrastructure costs for battery charging and hydrogen refueling in the economic modeling to ensure that the upstream and downstream investments are fully captured. This includes the energy production, transmission, and distribution costs throughout the system and down to the

community level. Some of this data can be extracted from the CARB AB 8 reports, NREL data on the Clean Transportation Plan ("CTP"), and CEC CTP reports. We also suggest updating the biofuels supply module ("BFSM") from 2017 to reflect the significant changes taking place. The BFSM was designed to integrate with the PATHWAYS model developed by E3 for the 2030 Scoping Plan process and is likely needed to help incorporate the use of alternative fuels in the years leading up to 2040 and for the remaining ICE fleet after 2040.

4.) Truck Fuel Economy Standards – We support modeling of California Phase II GHG Standards but would like to examine an R100 standard as we think this could achieve up to a 75% reduction in emissions from on-road and off-road fleets as well as stationary backup generators. We believe liquid renewable fuels will play a major role in decarbonizing the remaining combustion sources and again suggest updating the biofuels module from 2017.
5.) Truck ZEVs - AB 74 ITS Report: 100% of MD/HDV sales are ZEV by 2040 and 75% of all heavy-duty trucks are low-NOx natural gas engines by 2030. We also suggest modeling the role that biofuels in ultra-low NOx engines can fill in driving near-term reductions while infrastructure is built to support a widespread adoption of ZEV drivetrains. As mentioned for LDVs, we suggest a full accounting of the infrastructure costs for charging and hydrogen refueling in the economic modeling to ensure that the upstream and downstream investments are fully captured. This includes the energy production, transmissions, and distribution costs throughout the system and down to the community level. We also suggest updating the biofuels module from 2017 and incorporating the use of alternative fuels in the years leading up to 2040 and for the remaining ICE fleet after 2040.
6.) Aviation – We suggest modeling 0% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045 but model 100% Sustainable Aviation Fuel by 2035.[1]
7.) Ocean-going Vessels ("OGV") - 2020 OGV At-Berth regulation fully implemented with most OGVs utilizing shore power by 2027 and 25% of OGVs utilizing hydrogen fuel cell electric technology by 2045
8.) Port Operations – 100% of cargo handling equipment ("CHE") is zero-emission by 2037 and 100% of drayage trucks are zero emission by 2035. Due to the captive nature of this fleet, we will want to watch this space closely for more detailed information in the next Scoping Plan. We are keenly interested in whether this assumption will be cost effective and technologically feasible.
9.) Freight and Passenger Rail – 75% of heavy long-haul passenger and other locomotive sales are ZEV by 2040. 75% of line haul locomotive sales are ZEV by 2045. Line haul and passenger rail will rely primarily on battery, catenary, or hydrogen fuel cell technology. For light rail and short distance trains, we suggest modeling 100% zero-emission sales by 2040. We believe this is another sector where emphasis on renewable fuels in the near term could produce substantial benefits. CARB should fully support, through grant funding, continued industry efforts to develop zero-emission locomotive technology.
10.) Oil & Gas Extraction – Reduce operations in line with refinery demand meaning Reduce refining capacity in line with reductions in demand. If CA instead simply shifts to imports, emissions will increase due to leakage. Focus on innovative crude, cap and

[11] https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/09/fact-sheet-biden-administration-advances-the-future-of-sustainable-fuels-in-american-aviation

trade, and the LCFS to drive incentives that reduce emissions in the sector. Federal and state rules will drive reductions lower over time. Short-lived climate pollutant ("SLCP") strategy and California oil and gas methane emission reductions should be considered. Carbon capture utilization and storage ("CCUS") should also be factored into the model for this sector. CARB can assume continued improvement in methane reductions strategies beyond the SB 1383 reductions, through 2045.

11.) Petroleum Refining – CCUS on large facilities by 2030, with production reduced in line with petroleum demand decreases. We note that while supportive of modeling 2030, that date is unrealistic based on permitting in California. We note that output should be based on refinery demand (described in 10) not in-state demand. Additionally, there should be considerations of other efficiencies with the use of biofuel, with the benefits of processing biomaterial for fuel gas increasing over time. Increases in 45Q tax credits should also be considered and there is potential for changes to this credit in the near term that could generate significant CCUS activity in the 2020s.
12.) Electricity Generation – Sector GHG target of 38 MMTCO2e in 2030 and 0 MMTCO2e in 2045. Total load coverage with the same generation resources as Alternative two. Model widespread use of renewable gases and CCUS. Also, suggest considering "CCUS hubs" which would defray the costs of over several nearby facilities. CCUS capture rates should be 90-95%.
13.) Building Energy Efficiency – Align with the 2021 IEPR Mid-High (electric) / Mid-High (gas) scenario (the new forecast from the 2021 IEPR which should be released by the end of this year). All technologies should be included and RNG should be incorporated.
14.) New Residential and Commercial Buildings - All electric appliances beginning 2029.
15.) Existing Residential Buildings – 50% of appliance sales are electric by 2030. Appliances are replaced at end of life. The costs of neighborhood and individual home infrastructure costs must be counted. Does this include fireplaces, dryers, and cooking? Decarbonization of the pipeline could be a more cost-effective pathway without the consumer adoption barriers.
16.) Existing Commercial Buildings – 50% of appliance sales are electric by 2030. Appliances are replaced at end of life.
17.) Industrial Energy Efficiency – Energy demand reduced 6% relative to 2019 IEPR Mid-Mid.
18.) Food Products - 0% energy demand electrified by 2030. 25% by 2045, and increased use of renewable natural gas in the 2020s. Potential for reductions with pipeline decarbonization activities.
19.) Construction – 0% energy demand electrified by 2030 and 10% by 2045, with increased use of renewable diesel and RNG to achieve emission reductions. Most jobsites do not have usable power until the later stages of the project.
20.) Chemicals and Allied Products; Pulp and Paper – Electrify 0% of boilers by 2030 and 100% of boilers by 2045. Hydrogen for 25% of process heat by 2035 trending to 100% by 2045 Electrify. 100% of other energy demand by 2045 plus RNG and RCH_2. Consider CCUS hubs in areas where there are concentrated industrial activities to defray the costs across multiple entities.
21.) Stone, Clay, Glass & Cement – CCUS on large facilities by 2030 and on all facilities by 2045, plus use of renewable fuels like RNG or RCH_2.
22.) Other Industrial Manufacturing – 0% energy demand electrified by 2030 and 10% by 2045, plus RNG, RCH_2, and CCUS.
23.) Combined Heat and Power – Facilities retire by 2040

24.) Agriculture Energy Use – 0% energy demand electrified by 2030 and 50% by 2045 plus renewable fuels like RNG, RD, and RCH_2.
25.) Low Carbon Fuels for Transportation – Biomass supply used to produce conventional and advanced biofuels as well as RCH_2 (align with Federal effort), renewable diesel, renewable propane, and renewable gasoline. Update BFSM to reflect advances and investments made since the last Scoping Plan.
26.) Low Carbon Fuels for Buildings and Industry – By 2030 RNG blended in natural gas pipeline at 12% energy by volume for core customers (1440 OIR Staff Proposal), ramping up between 2030 and 2040. In the late 2020s and early 2030s, dedicated hydrogen pipelines constructed to serve certain industrial clusters. Consider higher blends up to 20% by volume for hydrogen.
27.) Non-combustion Methane Emissions – Increase landfill and dairy digester methane capture. Widespread alternative manure management deployed for smaller dairies. Enteric strategy deployed in 2030 Divert 55% of organic waste from landfills by 2025 and 75% by 2030. Oil and gas fugitive methane emissions reduced 50% by 2030 and further reductions as infrastructure components retire in line with reduced natural gas demand.
28.) High Global Warming Potential Emissions – Low-GWP refrigerants introduced in 2025 as building electrification increases, mitigating HFC emissions. Increase refrigerant reclamation starting in 2023 paired with contractor incentives and enforcement of state and federal laws to achieve over 85% reduction in emissions from the installed stock.
29.) Carbon Dioxide Removal ("CDR") from the atmosphere – Maximize CDR projects deployment by 2030 to drive innovation and cost-declines (align with Federal effort). CDR scaled to remove as many GHG emissions as is cost-effectively possible by 2045.

Any shortfall in this scenario should be backstopped with California's Cap-and-Trade program, which ensures California achieves the necessary emission reductions in an economically efficient manner for each obligated party within each compliance period while driving market decisions on technology selections and/or process efficiencies for individuals and businesses.

AB 32 Advisory Groups

"It is the intent of the Legislature that the State Air Resources Board coordinate with state agencies, as well as consult with the environmental justice community, industry sectors, business groups, academic institutions, environmental organizations, and other stakeholders in implementing this division." - California Health and safety Code 38501(f)

In addition to the Environmental Justice Advisory Committee ("EJAC"), section 38591(d) of the California Health and Safety Code establishes the Economic and Technology Advancement Advisory Committee ("ETAAC"). We believe given the steep emission reductions and heavy reliance on emerging technologies needed to achieve California's climate goals, reestablishment of the ETAAC would provide sound technical guidance and better inform CARB, EJAC, contracted modeling consultants, compliance entities and the public. CCEEB would suggest an emphasis on the underlying infrastructure necessary to deploy future zero and near-zero energy solutions at scale as well as potential barriers that would inhibit, delay, or unnecessarily restrict technology with great promise to help decarbonize California. CCEEB would like to be part of ETAAC, if reconstituted, to help inform how energy systems are interconnected throughout the economy and options for mitigation paired opportunities, such as those created by the SLCP strategy, to help ease the costs burdens to the public through cross-sector coupling. As today is likely too

late to interject another advisory into the mix for this Scoping Plan, CCEEB would offer to informally convene this group with advice and support from CARB to develop a similar working document that can build off the last report.

CCEEB would also like to extend an open invitation to EJAC members to discuss the intricacies of the technology and policy questions they are wrestling with during their regular meetings. We have witnessed each of these meetings and struggle with some of the same questions. However, due to the lack of direct dialog we will never be able to find common understanding between compliance entities and communities. We understand a general mistrust exists and firmly believe listening and speaking to each other through direct dialog and discourse are the only path to establishing bilateral agreement on any of these subjects. We will send out individual emails and invites to each EJAC member respectfully requesting meetings and would truly appreciate the opportunity to have meaningful conversations to help each other through this process.

Conclusion

CCEEB requests that CARB continue to provide an open, public process, whereby stakeholders can fully understand the nuances and assumptions of the model operability. It is our hope that stakeholders will be able to ground-truth and validate inputs and assumptions based on their sector-specific knowledge and expertise, including input from the perspectives of labor and communities. To the extent possible, CARB should allow users to suggest their own scenarios for comparison and testing of different mixes of technologies and policy options.

We look forward to additional workshops that will seek to clarify the highly technical and nuanced modeling that is being scoped. We hope to closely work with CARB board members, staff, the EJAC, and other stakeholders to find as many credible pathways as possible for achieving California's climate goals.

Thank you for your consideration of our comments. We look forward to discussing them or answering any questions you may have at your convenience. Please contact me or Jackson R. Gualco, Kendra Daijogo or Mikhael Skvarla, CCEEB's governmental relations representatives at The Gualco Group, Inc. at (916) 441-1392 should you have any questions or comments.

Sincerely,

WILLIAM J. QUINN
CCEEB President & CEO

cc: Honorable Members of the California Air Resources Board
The Environmental Justice Advisory Committee
Mr. Richard Corey
Ms. Chanell Fletcher
Mr. Matthew Botill
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