



April 4, 2022

Rajinder Sahota
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments on the 2022 Scoping Plan Update – Initial Modeling Results Workshop

Dear Ms. Sahota:

Form Energy appreciates the opportunity to comment on the March 15 Public Workshop on the Initial Modeling Results for the 2022 Scoping Plan Update. We appreciate the complexity of the modeling exercise that you have undertaken to explore different scenarios to achieve carbon neutrality in California but were surprised and disappointed by both the modeling scenarios and the modeling results for the electric sector.

We encourage you to reevaluate the electric sector scenarios to ensure that at least one scenario results in zero emissions with no combustion by 2045, in addition to the existing “Alt 1” scenario, which reflects a zero carbon target with no combustion by 2035. The purpose of considering a wider range of electric sector scenarios in the Scoping Plan Update is to provide both the California Public Utilities Commission (“CPUC”) and Legislature with information that can inform revised greenhouse gas emissions (“emissions”) targets for Integrated Resource Planning (“IRP”) in the electric sector.

We are also concerned that the “BAU Reference” scenario and three of the alternative electric sector scenarios all appear to result in electric emissions that are out of compliance with the goals of Senate Bill 100 (“SB100”). Based on modeling in the CPUC IRP Proceeding, electric sector emissions under a business-as-usual SB100 scenario should be approximately 10-11 million metric tons (“MMT”) by 2045. It is both unreasonable and inconsistent with state policy to model electric sector scenarios that result in emissions that remain at or above 30 MMT between 2030 through 2050.

Additionally, we recommend that the Scoping Plan Update assess pathways to cost-effectively achieve deeper emissions reductions, especially by more fully leveraging firm zero carbon

resources, including emerging long duration and multi-day storage technologies. Modeling conducted as part of a California Energy Commission grant has shown that emerging long-duration energy storage resources can achieve zero carbon electrical grid by 2045 under no combustion scenarios at cost parity with existing SB100 goals.

About Form Energy – Enabling a Fully Renewable, Cost-Effective and Reliable Electrical Grid

Form Energy is developing a new class of multi-day energy storage systems. Our goal is to enable a fully renewable electrical grid that’s reliable and cost-effective year-round, even in the face of multi-day weather events. Our first commercial product is a rechargeable iron-air battery capable of continuously discharging electricity for 100 hours at a system cost less than one-tenth of the total installed cost per unit of energy of lithium-ion battery technology. With over 200 employees, Form is headquartered in Somerville, MA, with offices in Berkeley, CA and the Greater Pittsburgh area.

Decarbonizing Electricity is Foundational to Achieving Carbon Neutrality

As California aims to electrify a wide array of end uses – from transportation to buildings – quickly decarbonizing the electric sector will be key to ensuring the State realizes the greatest level of climate benefit from these efforts. Not only do emissions reductions in the electric sector underpin the decarbonization unlocked by electrification of other sectors, the electric sector represents “lower hanging fruit” because many of the technologies necessary to achieve deep decarbonization of the sector are already at or near commercialization. Accordingly, as part of the U.S. Nationally Determined Contribution submitted at the COP26 climate conference in Glasgow, the Biden Administration set a goal of achieving zero carbon in the power sector, nationwide, by 2035.

Scenarios Should Strive to Achieve Zero or Minimum Emissions in the Electric Sector

In order to assess the reasonableness of various pathways to carbon neutrality and the impacts of more and less aggressive approaches to decarbonization of the electric sector, the Scoping Plan should strive to assess the fastest route to achieving zero emissions in the electric sector, an approach that is in line with the directives of the carbon neutrality Executive Order.¹

We were disappointed to see CARB take an apparent step back from California’s existing decarbonization goals and from national goals for the electric sector in the updated scenarios assumptions.² The original set of scenarios included three with total load coverage and zero electric sector emissions, two which would have reached these goals by 2035, in line with our national goal. The updated set of scenarios seems to include only one scenario that achieves

¹ Executive Order B-55-18, signed September 2018.

² https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised_2022SP_ScenarioAssumptions_15Dec.pdf

zero carbon in the electric sector while, in the other three scenarios, electric sector emissions appear to remain flat at or above 30 MMT after 2030, a level that far exceeds the 10-11 MMT emissions by 2045 that the CPUC has found would comply with SB 100.

In addition, the results presented seem to be out of sync with the updated scenario assumptions. The assumptions suggest that Alternative 2 would achieve 10 MMTCO₂e in the electric sector by 2035 and Alternatives 3 and 4 would achieve 24 MMTCO₂e by 2045. None of these scenarios achieve these outcomes, as reflected in Slide 23 of the March 15, 2022, Initial Modeling Results, nor do they appear to make significant effort to reduce emissions in the electric sector after 2030.

Also, given that emissions in the electric sector are entirely flat in three of the alternatives after 2030, it appears that those emissions levels are forced into the model, either as a constraint or an input assumption, rather than a modeled result. Either approach misses an opportunity to more completely explore the potential to achieve greater emissions reductions in the power sector, as well as the implications of doing so, which is presumably the motivation for exploring multiple scenarios as part of this process.

We encourage CARB to revisit its modeling assumptions and approach in the electric sector in order to better understand the true potential to reduce electric sector emissions, including by achieving zero emissions in line with the U.S. climate commitment pursuant to the Paris Climate Accord. We encourage CARB to consider modeling scenarios under which the electric sector achieves zero carbon emissions in a variety of years, including by the years 2035, 2040 and 2045. This approach can better inform policy decisions about future electric sector planning goals. At present, CARB's analysis only provides two options: zero carbon by 2035, or greater than 30 MMT from 2030 on.

California Can Achieve a Zero-Carbon Power Grid Cost-Effectively

Based on stakeholder modeling results, we believe that scenarios that assess the feasibility of full decarbonization of the electric sector would reveal that California can quickly and completely achieve zero carbon in the power sector, and even eliminate combustion, cost-effectively. Multiple studies have highlighted that a truly zero carbon grid can be achieved without increasing customer costs. This includes a study led by the Environmental Defense Fund, which finds that California can achieve a 100% carbon-free grid by 2045 while keeping customer costs similar to levels today.³ It also includes a study by Energy Innovation, which finds that we can achieve a zero carbon electrical grid, *nationwide*, by 2035, without increasing

³<https://www.edf.org/sites/default/files/documents/SB100%20clean%20firm%20power%20report%20plus%20SI.pdf>

customer costs.⁴ Another paper finds that California can achieve 100% renewable energy by 2040, with lower costs and emissions than currently envisioned, if it deploys zero carbon fuels in thermal power plants.⁵ The 2021 SB 100 Joint Agency report itself suggests California can achieve SB 100 goals much sooner than currently envisioned. That report shows that these goals could be met as soon as 2030, without additional capacity additions before 2027, and at an incremental cost of about 5 percent in 2030.

Finally, our own analysis, performed in conjunction with E3 and presented at the California Energy Commission's Workshop on Research to Assess Long-duration Energy Storage Deployment Scenarios last week, shows this to be true. That analysis shows that California can achieve zero emissions from all in-state generation resources by 2045 at portfolio costs commensurate with those of achieving SB 100 goals, when long duration and multi-day energy storage are included in the modeling as candidate resources. The analysis also assessed a no combustion scenario and found similar results. Both the zero carbon and no combustion scenarios result in significantly reduced emissions as compared to the Scoping Plan scenarios.⁶

Summary of Recommendations

In summary, we request CARB further evaluate the electric sector modeling in the Scoping Plan scenarios in order to advance the goals of achieving carbon neutrality statewide as soon as possible, and specifically:

- Update all scenarios to include full load coverage and achieve zero carbon in the power sector in the 2035 (Alternatives 1 and 2) and in additional years including 2040 and 2045 timeframe (Alternatives 3 and 4). Ensure that the BAU Reference Scenario is consistent with SB 100, and results in emissions in 2045 that are approximately 10 MMT,
- Include firm zero carbon resources in all scenarios to minimize emissions and capacity overbuild,
- Specifically include long duration and multi-day storage, especially in Alternative 1, to rapidly decarbonize the electric sector with minimum costs and emissions, and
- In the Scoping Plan itself, highlight the promise of emerging long duration and multi-day energy storage technologies to advance the State's climate change and equity goals, and recommend steps to support deployment of these technologies, including following the successful model for short-duration storage under AB 2514 to support the early market through procurement requirements.

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<https://energyinnovation.org/wp-content/uploads/2020/09/Pathways-to-100-Zero-Carbon-Power-by-2035-Without-Increasing-Customer-Costs.pdf>

⁵ <https://www.wartsila.com/energy/learn-more/downloads/white-papers/path-to-100-renewables-for-california>

⁶ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242516>

Thank you again for the opportunity to comment on these scenarios, and for all your work to deliberately and effectively advance California's climate change goals and replicable climate change solutions. Please do not hesitate to reach out with any questions or follow up items.

Sincerely,

A handwritten signature in black ink, appearing to read 'S Meyer', written in a cursive style.

Sophie Meyer
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