



June 23, 2022

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

**Re: Comments on the draft 2022 Scoping Plan Update**

Dear Ms. Sahota:

Form Energy appreciates the opportunity to comment on the draft 2022 Scoping Plan Update. We appreciate the complicated modeling exercise that you have undertaken to explore different scenarios to achieve carbon neutrality in California, but we encourage you to reevaluate the approach to the electricity sector. As the draft Scoping Plan recognizes, a decarbonized electricity sector provides the foundation for a carbon neutral economy. The Scoping Plan should lead with a zero-carbon electricity sector, which the State can readily achieve with the use of firm, zero-carbon resources, including long duration and multi-day storage.

**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 system. Our goal is to enable a fully renewable electrical grid that is 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 250 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 electricity sector will be key to ensuring that the State realizes the greatest level of climate benefit from these efforts. While CARB must tackle emissions from hard-to-abate sectors and persistent sources, the decarbonization of the electricity sector represents lower hanging fruit, given that many of the technologies necessary to reach zero greenhouse gas emissions in that 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 MMTCO<sub>2</sub> or Minimum Emissions in the Electricity Sector**

We were disappointed to see CARB apparently reduce ambition in the electricity sector in the updated scenarios assumptions,<sup>1</sup> which originally would have included three scenarios with total load coverage and achieving 0 MMTCO<sub>2</sub>e/year in the electricity sector, including two which would have done so by 2035, in line with our national goal. 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 electricity sector, the Scoping Plan should strive to assess the fastest route to achieving zero emissions in the electricity sector, an approach that is in line with the directives of the carbon neutrality Executive Order.<sup>2</sup>

We note, however, that modeling of more ambitious electricity sector decarbonization goals is likely to yield inflated portfolio costs if emerging clean generation technologies are excluded from consideration. The results presented seem to acknowledge this implicitly, stating that, that “The scale of solar and battery build rates needed could be reduced through the commercialization of new zero-carbon technologies.”<sup>3</sup> It follows that, if commercialization of new, zero-carbon technologies can reduce build rates, it is likely that such commercialization would also improve the feasibility and reduce the portfolio costs of more aggressive decarbonization goals in the electricity sector. In order to accurately assess the reasonableness of aggressive approaches to decarbonization of the electricity sector, is it essential to include emerging zero-carbon technologies in the modeling.

Also, given that emissions in the electricity 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 way seems to miss 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.

We encourage CARB to revisit its modeling assumptions and approach in the electricity sector, in order to better understand the true potential to reduce electricity sector emissions as quickly as possible, including achieving zero emissions in line with the U.S. climate commitment pursuant to the Paris Climate Accord.

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<sup>1</sup> [https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised\\_2022SP\\_ScenarioAssumptions\\_15Dec.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised_2022SP_ScenarioAssumptions_15Dec.pdf)

<sup>2</sup> Executive Order B-55-18, signed September 2018.

<sup>3</sup> Draft 2022 Scoping Plan Update at page 161.

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

We have no doubt that such an exploration 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 EDF, which finds that California can achieve a 100% carbon-free grid by 2045 while keeping customer costs similar to levels today.<sup>4</sup> It also includes a study by Energy Innovation, which finds that we can achieve a zero-carbon electrical grid, nationwide, by 2035, without increasing customer costs.<sup>5</sup> Another paper finds that California can achieve 100% renewable energy by 2040, with lower costs and greenhouse gas emissions than currently envisioned, if it deploys zero-carbon fuels in thermal power plants.<sup>6</sup> The 2021 SB 100 Joint Agency report, itself, suggests California can achieve SB 100 goals much sooner than currently envisioned, and that including firm, zero-carbon resources in grid mix can significantly reduce costs, resource build rates, and emissions.

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 in March, 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.<sup>7</sup>

## Long Duration and Multi-day Energy Storage is Key to Achieving a Low-Cost, Reliable and Combustion-Free Electrical Grid

The key to achieving a truly zero-carbon, low cost and reliable electrical grid is to develop firm, zero-carbon resources that can completely replace dispatchable natural gas power plants. The studies identified above take different approaches here, including the use of carbon capture and sequestration, renewable fuels such as green hydrogen or synthetic methane, or long duration and multi-day energy storage. The latter can deliver a truly renewable, carbon- and combustion-free electrical grid. We encourage CARB to more fully evaluate the role that long duration and multi-day storage can play in cost-effectively decarbonizing the electrical grid and moving away from combustion power plants, including in Alternative 1.

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<sup>4</sup><https://www.edf.org/sites/default/files/documents/SB100%20clean%20firm%20power%20report%20plus%20SI.pdf>

<sup>5</sup><https://energyinnovation.org/wp-content/uploads/2020/09/Pathways-to-100-Zero-Carbon-Power-by-2035-Without-Increasing-Customer-Costs.pdf>

<sup>6</sup><https://www.wartsila.com/energy/learn-more/downloads/white-papers/path-to-100-renewables-for-california>

<sup>7</sup><https://efiling.energy.ca.gov/GetDocument.aspx?tn=242516>

In summary, we request CARB further evaluate the electricity 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) or 2045 timeframe (Alternatives 3 and 4),
- 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 electricity 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.

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,

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