August 17, 2023

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

Re: Comments on SB 350 Electricity Sector Greenhouse Gas Planning Targets and the July 27, 2023 Cap-and-Trade Program Workshop

Dear Ms. Sahota:

Form Energy appreciates the opportunity to comment on California's planning for greenhouse gas reductions in the electricity sector, and submits these comments jointly into the dockets related to both the SB 350 Electricity Sector Greenhouse Gas Planning Targets and the July 27, 2023, Cap-and-Trade Program Workshop. We urge CARB, in collaboration with other energy agencies, to begin planning for and implementing steps to achieve a truly clean and reliable electricity grid.

In order to achieve this, CARB should establish a vision for achieving two benchmarks. First, the state must plan to decarbonize the electricity sector, through 2030, at least to the same degree as other sectors identified in the 2022 Scoping Plan. Second, the state must plan to entirely decarbonize the electricity sector in line with California's carbon neutrality goal and the U.S. Nationally Determined Contribution, pursuant to the Paris Climate Accord, to achieve a zero-carbon electricity grid by 2035. Specifically, we encourage CARB to revise the SB 350 planning targets to 20-30 million metric tons of carbon dioxide ($MMTCO_2$), design cap-and-trade scenarios aiming to achieve 0 $MMTCO_2$ in the electricity sector in the 2035-2045 timeframe, and work with other energy agencies, especially the California Energy Commission (CEC) to enable rapid and deep decarbonization of the electricity sector and development of a truly zero carbon, reliable electricity grid.

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 500 employees, Form is headquartered in Somerville, MA, with offices in Berkeley, CA; Weirton, WV; and the Greater Pittsburgh area.

Emissions reductions in the electricity sector are as or more accessible than those in other sectors

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.

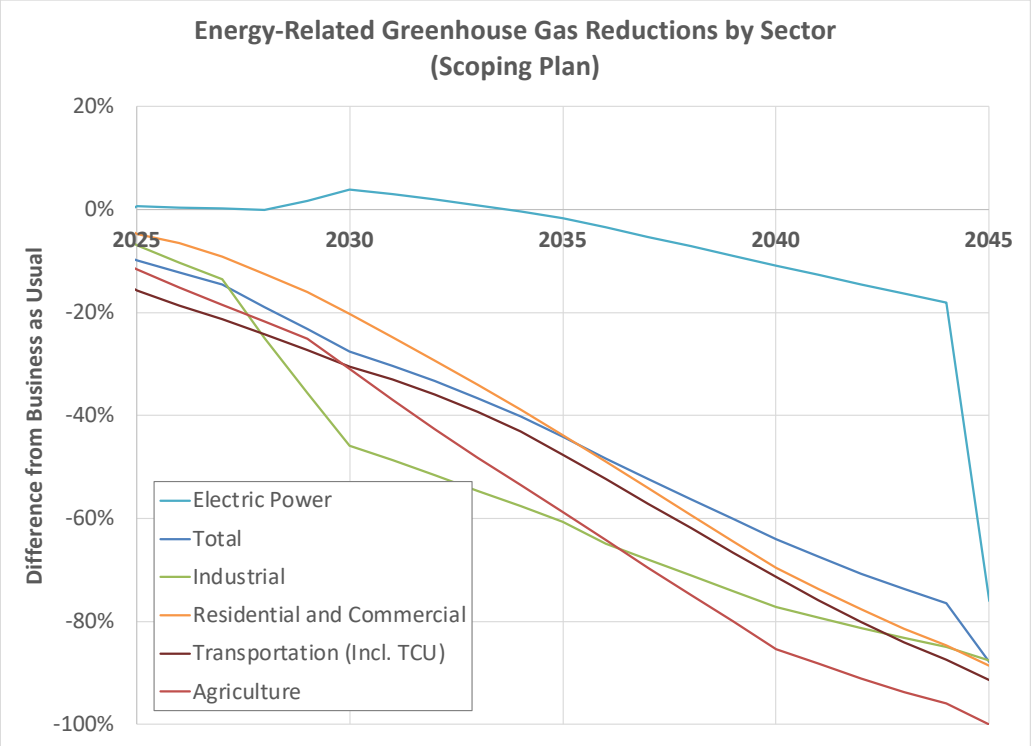
Traditionally, decarbonizing the electricity sector has been a top priority for early climate action, and the sector has been assumed to be one of the easiest to decarbonize. Accordingly, as part of the U.S. Nationally Determined Contribution submitted at the COP26 climate conference in Glasgow, the Biden Administration set a goal of achieving zero carbon in the power sector, nationwide, by 2035.[1] CARB, in originally scoping scenarios for Scoping Plan modeling, envisioned ongoing, rapid and deep greenhouse gas reductions in the electricity sector, including 23-30 $MMTCO_2$ by 2030 and 0 $MMTCO_2$ by 2035-2045.[2] Several studies,[3] including the State's 2021 SB 100 Joint Agency Report,[4] have shown that these levels of greenhouse gas reductions at the state and national level are feasible and can be achieved at costs commensurate with less ambitious decarbonization scenarios.

Yet, in the final Scoping Plan modeling, the electricity sector appears to be treated as the hardest sector to decarbonize, and no efforts appear to be made to reduce electricity sector emissions below business-as-usual levels before around 2035 (see Figure below). In the final Scoping Plan scenario, electricity sector emissions actually *increase* in 2030 compared to business as usual, whereas all other sectors see a reduction of 20-45 percent in energy-related greenhouse gas emissions.[5] If similar levels of greenhouse gas reductions were applied to the electricity sector

[1] https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%202021%20Final.pdf
[2] https://ww2.arb.ca.gov/sites/default/files/2021-09/Draft_2022SP_ScenarioAssumptions_30Sept.pdf
[3] For example, see the following:
- https://www.nrel.gov/analysis/100-percent-clean-electricity-by-2035-study.html
- https://www.edf.org/sites/default/files/documents/SB100%20clean%20firm%20power%20report%20plus%20SI.pdf
- https://energyinnovation.org/wp-content/uploads/2020/09/Pathways-to-100-Zero-Carbon-Power-by-2035-Without-Increasing-Customer-Costs.pdf
- https://www.wartsila.com/energy/learn-more/downloads/white-papers/path-to-100-renewables-for-california

[4] Various scenarios demonstrated that SB 100 goals could be achieved as soon as 2030 at costs that are likely less than the benefits associated with doing so, based on prevailing social cost of carbon estimates and avoided cap-and-trade compliance costs, and that deploying firm zero carbon resources reduced both costs and emissions associated with meeting the goals of SB 100. https://www.energy.ca.gov/sb100
[5] See 'AB 32 GHG Inventory Sectors Modeling Data Spreadsheet' at https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents

(that is, 20-45% below business as usual levels), electricity sector emissions would be 20-29 $MMTCO_2$ in 2030.



California has access to the clean energy technologies needed to unlock significant emissions reductions by 2030 and 2035. In order to achieve these reductions, however, the state must plan appropriately – fairly to do so will stifle the ability of the clean energy industry to scale up manufacturing appropriately and will hamper the state's long-term ability to meet net zero goals.

CARB should revise its SB 350 planning targets to 20-30 $MMTCO_2$ in 2030

We encourage CARB to adopt 20-30 MMT in 2030 as the revised SB 350 planning target to ensure that the electricity sector is decarbonizing at least at similar rates as other sectors and as rapidly as is needed to support achieving 2045 goals. Many of the same strategies that can be deployed to decarbonize the industrial sector, which sees its emissions nearly halved by 2030 compared to business as usual, can be deployed to decarbonize the power sector. Indeed, the Scoping Plan applies many of the tools utilized to decarbonize industry (e.g., renewable fuels, carbon capture and sequestration, etc.) to decarbonize the electricity sector -- it merely waits until 2045 to deploy these strategies in the electricity sector rather than assuming they will come online at scale in 2028, as is assumed for the industrial sector. In fact, the electricity sector should be even easier to decarbonize than industry, because in addition to being able to leverage many of the of strategies and technologies applicable in the industrial sector, a broader array of technologies –

like mature renewable energy technologies and long duration and multiday storage – are available in the electricity sector.

Accordingly, we encourage CARB to set electricity sector planning targets at least in line with the next slowest to decarbonize sector, which would result in 29 $MMTCO_2$ in the electricity sector in 2030, and aim to achieve reductions on pace with the industrial sector, which would result in less than 20 $MMTCO_2$ in 2030. As noted above, several research items suggest these levels of emissions reductions can be achieved cost effectively. Indeed, the 2021 SB 100 Joint Agency report laid out a scenario that would reduce electricity sector greenhouse gas emissions by 15 $MMTCO_2$ in 2030 at an added total resource cost of about $3 billion in 2030.[6] This accelerated greenhouse gas reduction scenario did not include firm zero carbon resources, which other scenarios in the report showed could reduce costs associated with meeting SB 100 goals by billions of dollars per year. Nor does it include incentives from the Inflation Reduction Act, which will significantly reduce costs associated with technologies needed to decarbonize the electricity sector, including multiday storage, hydrogen, or carbon capture and sequestration. Still, even as modeled, total incremental costs in 2030 are less than the avoided costs based on the most recent estimates of the social cost of carbon from U.S. EPA and avoided cap-and-trade compliance costs.[7,8]

Finally, we note that many of the State's largest electric utilities, including the Los Angeles Department of Water and Power[9] and Sacramento Municipal Utilities District,[10] most of the state's other largest cities and counties, including San Diego,[11] San Jose,[12] San Francisco,[13] and others, many community choice aggregators and others – have already committed to achieving zero or near-zero greenhouse gas emissions by 2030. We encourage CARB to incorporate the wide array of existing goals and commitments at a local, regional, and utility level into its SB 350 targets and Cap-and-Trade scenario modeling.

CARB should evaluate scenarios that achieve 0 $MMTCO_2$ in the electricity sector in the 2035-2045 timeframe.

In its evaluation of Cap-and-Trade allocation and emissions reduction scenarios, CARB should include a thorough evaluation of that range of 2030 planning targets and also evaluate scenarios that achieve zero carbon (i.e., 0 $MMTCO_2$) in the electricity sector in the 2035-2045 timeframe. As

[6] Comparison of the SB 100 Core scenario to the SB 100 in 2030 scenario. https://www.energy.ca.gov/sb100
[7] Assuming a social cost of carbon of $190/MT and cap-and-trade allowance prices of $35/MT, greenhouse avoided costs from accelerated electricity decarbonization in the SB 100 scenarios would exceed $3 billion and the incremental costs modeled in the SB 100 by 2030 scenario.
[8] https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf
[9] https://www.ladwpnews.com/100-percent-carbon-neutral-power-by-035-los-angeles-city-council-approves-landmark-initiative/
[10] https://www.smud.org/en/Corporate/Environmental-Leadership/2030-Clean-Energy-Vision
[11] https://www.sandiegocounty.gov/content/dam/sdc/dgs/Doc/Energy_ZeroCarbonPP.pdf
[12] https://www.sanjoseca.gov/Home/Components/News/News/3546/4699
[13] https://sfmayor.org/article/san-francisco-adopts-new-climate-action-goals

mentioned above, as part of its Nationally Determined Contribution pursuant to the Paris Climate Accord, the U.S. has set a goal to achieve zero carbon in the electricity sector by 2035,[14] and several studies have shown that the country can reach this goal without increasing ratepayer costs, if seasonal storage and other firm zero carbon resources are deployed at sufficient levels.[15] CARB should work with other agencies to evaluate implications of achieving this objective in California, and should further evaluate scenarios to achieve zero carbon by 2045, in line with other sectors and the State's carbon neutrality objectives, in order to understand comparative costs and benefits compared to current planning efforts and scenarios for achieving accelerated climate outcomes.

CARB should work with the CEC and California Public Utilities Commission (CPUC) to incorporate these targets into upcoming energy planning efforts, and enable complete decarbonization of the electricity sector.

We encourage CARB to work with the other energy agencies to incorporate these goals into broader energy planning and take the steps to ensure the state is able to deliver on them. In particular, we encourage the joint agencies to:

- **Develop a timely and thorough evaluation of firm zero carbon resources, including multiday storage, pursuant to SB 423 (Stern).** CEC owes a thorough evaluation of resources capable of delivering zero carbon electricity reliably during multiday weather events by the end of this year. These are exactly the resources needed to replace fossil fueled power plants and deliver a truly zero carbon, reliable electricity grid. We encourage CEC to fully evaluate the role these resources can play to accelerate electricity sector decarbonization and achieve the targets identified above.

- **Evaluate zero carbon scenarios in the forthcoming SB 100 report.** We further encourage the joint energy agencies to evaluate scenarios that achieve the targets identified in these comments, including 20-30 $MMTCO_2$ by 2030 and 0 $MMTCO_2$ by 2035-20345 in the upcoming SB 100 report. The previous joint agency report already showed widespread benefits associated with deploying firm zero carbon resources (or zero carbon baseload and dispatchable resources), including significantly lower costs, emissions, and resource build requirements. We hope the agencies will expand that analysis to evaluate the role those resources can play in achieving zero emissions in the electricity sector in the next SB 100 report.

- **Coordinate with energy agencies to incorporate climate change and multiday weather events into energy planning.** In order to achieve a reliable, zero carbon electricity grid, we have to plan for it. Current planning based on example 24-hour periods is insufficient for

[14] https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%202021%20Final.pdf
[15] See footnote 3.

fully modeling reliability requirements in a decarbonized future, including needs to seasonally shift renewable energy, maintain reliability during multi-day periods of low renewable generation, or to fully account for climate impacts and multiday extreme weather events. We encourage the state to update planning efforts, including the Integrated Energy Policy Report, Integrated Resource Plans, and Resource Adequacy planning, to design for reliability in an entirely renewably-powered grid. This requires coordinating demand and renewable generation profiles, hourly modeling over 8,760 hours in a year, and planning for climate-induced extreme weather that may have historically occurred only once every 10, 20 or 40 years.

- **Advance firm-zero carbon resources capable of decarbonizing the electricity grid.** The 2022 Scoping Plan states, "The scale of solar and battery build rates needed could be reduced through the commercialization of new zero-carbon technologies."[16] 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. We encourage CARB to work with CEC and other agencies through the processes identified above, as well as upcoming incentive programs, to rapidly deploy firm zero carbon resources necessary to decarbonize the electricity grid at low cost and to ensure their inclusion in state planning efforts.

Thank you again for the opportunity to comment on these proceedings, 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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[16] See pg. 202. https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf