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Bioenergy Association comments on draft SB 100 Report

Additional submitted attachment is included below.

September 15, 2020

The Honorable David Hochschild, Chair
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Re: Comments on E3's Preliminary SB 100 Modeling and Assumptions

Dear Chair Hochschild:

I am writing on behalf of the Bioenergy Association of California to express concern about a number of the assumptions and conclusions in E3's preliminary assessment and modeling for the SB 100 Report. BAC represents more than 75 local government agencies, private companies, utilities, research institutions, and others working to promote sustainable bioenergy development to help California meet its climate change and clean energy goals. Our main concerns about E3's preliminary modeling and assumptions are:

- E3 assumes that neither biomethane nor hydrogen technologies are commercial in California, despite hundreds of operating biomethane and hydrogen fuel cell facilities around the state.
- E3 does not distinguish between biomass, which can provide baseload power, and biogas, which can provide dispatchable power and long duration storage.
- E3 ignores the potential to use biogas in fuel cells and thereby eliminate combustion.
- E3 models the energy costs of different renewables, but does not include any discussion of their relative carbon intensities or costs per ton of CO_2e reduction.
- E3 does not assess energy storage options of greater than 12 hours duration, which is not sufficient to ensure grid reliability in the face of wildfires, climate change, and other grid disruptions, both planned and unplanned.

Each of these issues is described more fully below.

1. **E3 Mistakenly Asserts that Biomethane and Hydrogen Are Not Commercial Technologies.**

E3 excludes biomethane from its assessment, and understates the role of hydrogen, based on its wholly inaccurate assertion that these technologies are not commercially

available in California.[1] E3's *Modeling Framework and Scenarios Overview* states, without explanation or citation, that biomethane and hydrogen are in a category of "Technology not yet commercially available in California; inadequate cost and supply data for modeling."[2] How are these technologies not "commercially available in California" when there are hundreds of operating biomethane and fuel cell installations in California?

E3 ignores the many commercial biomethane and hydrogen facilities in California and around the globe. It also ignores numerous studies on the availability of biomethane feedstocks, real-world cost data, statutory requirements for increased biomethane and hydrogen, and other important data. Ironically, E3's own report on carbon neutrality includes cost data about both biomethane and hydrogen,[3] as do countless other reports, including recent reports by Lawrence Livermore National Lab and Gladstein Neandross & Associates. To claim that there is insufficient cost data is not accurate.

There are already hundreds of operating biomethane and fuel cell projects in California, including more than one hundred at wastewater treatment facilities, dozens at landfills, and more than 20 stand-alone anaerobic digestion projects using dairy manure and organic waste diverted from landfills. In addition, there are approximately 200 new dairy digesters in development pursuant to the requirements of SB 1383 (Lara, 2016) to reduce methane emissions 40 percent by 2030. All of these facilities are or will be producing biomethane and most of the existing facilities are producing electricity with that biomethane. California also has a large number of fuel cells using hydrogen, so it is completely false to claim that biomethane and hydrogen are not commercially available technologies in California.

The CEC and other state agencies have helped to commercialize these technologies and projects, including several that have recently begun operation. Two projects in Southern California, CR&R's project in Riverside County and Anaergia's project in San Bernardino County, are converting hundreds of thousands of tons of organic waste that would otherwise have been landfilled into carbon negative biomethane. Both projects are injecting the biomethane into SoCalGas pipelines and selling the biomethane commercially.

In addition to current facilities, state law requires a significant increase in both biomethane and hydrogen production and use. In recognizing the critical role that these resources will play in achieving the state's climate goals, California has enacted many laws over the past decade to require an increase in biomethane production and use, including:

- AB 1900 (Gatto, 2012)

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[1] *2021 Senate Bill 100 (SB 100) Joint-Agency Report Modeling Framework and Scenarios Overview,* released by E3 on August 31, 2020, at page 4, Table 3.

[2] Id.

[3] *Achieving Carbon Neutrality in California – Pathway Scenarios Developed for the California Air Resources Board*, Draft released by E3, August 2020.

- AB 2196 (Chesbro, 2012)
- SB 1122 (Rubio, 2012)
- SB 840 (Budget, 2016)
- SB 1383 (Lara, 2016)
- AB 2313 (Williams, 2016)
- SB 1440 (Hueso, 2018)

SB 1383 alone has led to the development of approximately 200 new dairy digesters in California. SB 1383 is also triggering the development of new digesters to convert organic waste diverted from landfills to biomethane. Several have begun operation in the past few years, including two projects that have Power Purchase Agreements under the BioMAT program (SB 1122) and are generating electricity for PG&E customers. One of those projects is operated for the City of San Jose to meet its zero carbon and zero waste goals. The other project is in San Luis Obispo County and is helping the County to meet its requirements for landfill diversion under SB 1383. These projects certainly meet the definition of "commercially available" technologies since they are already in operation and selling power in California. In addition, there are several projects in development in California that will convert woody biomass and agricultural waste to either biomethane or hydrogen using commercially available technologies that are already being deployed in other states and in Europe.

E3's assertion that biomethane and hydrogen technologies are not "commercially available" in California denies the facts on the ground. E3 should remove this statement from the SB 100 Report and should include both biomethane and hydrogen in its analyses going forward. These are proven and highly valuable resources that can provide renewable and carbon negative power, flexible generation, and long duration energy storage. Most importantly, they are commercially available and in operation right now, with many additional projects in development.

2. E3 Fails to Distinguish Between Biomass and Biogas.

E3's mistaken assumption that biomethane is not commercially available resulted in the omission of biomethane throughout its presentation and analysis. Instead, E3 focuses only on biomass combustion, which can provide baseload power, but not flexible generation or energy storage. By excluding biomethane and focusing only on biomass combustion, E3 ignored an important opportunity to produce carbon negative power and energy storage that will greatly increase reliability and resilience since biomethane can provide long duration storage, dispatchable power, and liquid or gaseous fuels for backup generators (and with much lower emissions than diesel).

E3's omission of biomethane is particularly surprising given its recognition that California will continue to need gas for reliability purposes. BAC agrees with this conclusion, as do the state's utilities and most energy experts. Given the ongoing need for some amount of gas, E3 should include an analysis of the potential for biomethane to replace fossil fuel gas. It can provide the same operational benefits and energy storage with zero or even negative carbon emissions.

3. E3 Ignores Biogas Use in Fuel Cells.

In addition to ignoring the potential for biomethane to provide dispatchable power and long duration storage, E3 also ignored the potential for biomethane to be used in fuel cells. This omission is particularly surprising since E3 includes a non-combustion scenario in its modeling, but fails to include biomethane powered fuel cells, which would be the lowest carbon option for non-combustion generation, in many cases carbon negative, which no other resource can achieve. This omission makes no sense when numerous state laws require an increase in renewable and green hydrogen and its use in fuel cells is virtually emission free.[4]

4. E3 Ignores the Cost Per Ton of Carbon Reduction for Different Renewables.

E3 includes the Levelized Cost of Energy for different renewable resources, but does not consider the cost per ton of carbon reduction. Since carbon reductions are a major focus of SB 100, this data is critical to any analysis of how to achieve the over-arching goals of SB 100. This is especially important given recent studies about how to achieve carbon neutrality which find that doing so will require increased focus on generation of negative carbon emissions. This analysis is also important because the carbon intensity of different renewable fuels can vary by orders of magnitude.

For example, solar and wind power are slightly positive emission on a lifecycle basis, including raw materials, manufacturing, transport, and construction. Some forms of bioenergy are also slightly carbon positive on a lifecycle basis, but some types of bioenergy are carbon negative on a lifecycle basis and some are significantly carbon negative. For example, the California Air Resources Board has found that biomethane from dairy waste and diverted organic waste are carbon negative on a lifecycle basis. Biomethane generated from dairy waste, which can have a carbon intensity of negative 377.83 gCO2e/MJ,[5] provides almost four times the carbon reductions that solar and wind power can provide. Bioenergy from organic waste diverted from landfills can also provide greater carbon reductions than solar and wind power provide.

When bioenergy is coupled with carbon capture and storage, it can provide even greater emissions reductions and at a very reasonable cost per ton of carbon reduction. According to a recent report on carbon neutrality by Lawrence Livermore National Lab,[6] bioenergy with carbon capture and storage can provide carbon reductions for an average cost of $64 per ton, less than one-third the cost of carbon reductions under the Low Carbon Fuel Standard.

Renewable resources have a wide range of carbon intensities, meaning they do not all provide equal value in meeting the goals of SB 100 and Governor Brown's Executive

[4] See, e.g., SB 1505 (Lowenthal), Statutes of 2006, Chapter 877.

[5] https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities

[6] [6] Lawrence Livermore National Laboratory, *Getting to Neutral – Options for Negative Carbon Emissions in California*, January 2020,.

Order calling for carbon neutrality by 2045. It is critical, therefore, for E3 to assess not just the levelized cost of energy, but also the cost per ton of carbon reductions.

5. E3 Ignores Storage Options that Can Last More than 12 Hours.

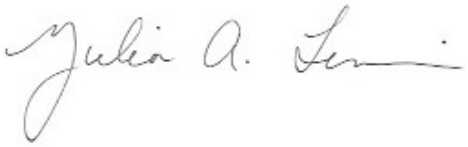
E3's presentation only considered energy storage options that last up to 12 hours. This is nowhere near sufficient to ensure grid reliability. Studies that have considered how to reach 100 percent renewable power generally conclude that long-duration (seasonal) storage will be critical to maintain reliability.[7] In fact, a recent study by former U.S. Secretary of Energy Dr. Ernest J. Moniz and others found that California experiences an average of 90 days per year without adequate solar or wind supplies, and that those days tend to fall in clumps of several days at a time.[8] The report concludes that ensuring reliability with a high penetration of intermittent renewables will require long-duration energy storage, defined as seasonal storage. Even storage that can last multiple days or weeks, however, requires more than 12-hour batteries can provide.

The need for longer duration storage has become even more apparent in recent years as wildfires ravage the state and wildfire smoke reduces solar energy output. El Niño winters, extended heat waves, atmospheric rivers, droughts, and wildfires can all cause grid outages that last days, weeks or even months. Assuming only 12 hours of energy storage is a recipe for disaster in California.

E3 should include long-duration storage in its SB 100 analysis or it will fail to meet one of the basic requirements of SB 100, which is to maintain reliability while moving to 100 percent renewable power. Both biomethane and hydrogen can provide long-duration storage, as can other resources such as pumped hydropower. All of these should be included in the final SB 100 Report.

Thank you for your consideration of these comments.

Sincerely,



Julia A. Levin
Executive Director

[7] See, e.g., Clack, Christopher T.M. et al, *Evaluation Of A Proposal For Reliable Low-Cost Grid Power With 100% Wind, Water, And Solar,* June 26, 2016. Available at: www.pnas.org/cgi/doi/10.1073/pnas.1610381114.
[8] *Optionality, Flexibility & Innovation – Pathways for Deep Decarbonization in California,* released May 2019 by the Energy Futures Initiative.