

November 19, 2021

Liane Randolph, Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Bloom Energy Comments on November 2, 2021 2022 Scoping Plan Update – Electricity Sector Technical Workshop

Dear Chair Randolph,

Bloom Energy Corporation (Bloom Energy) appreciates the opportunity to provide comments on the ***November 2, 2021 2022 Scoping Plan Update – Electricity Sector Technical Workshop (Scoping Plan)***. Advanced clean energy technologies like Bloom Energy's Solid Oxide Fuel Cells have the ability to help the state make meaningful progress towards achieving our climate change and air quality goals while also providing co-benefits such as increasing energy reliability and resiliency and creating jobs. These comments aim to provide guidance on how technologies like Bloom Energy's fuel cells can play a more significant role in the Scoping Plan development, and help to achieve our climate and clean air goals.

Bloom Energy is a provider of a solid oxide fuel cell technology that produces always-on, reliable, resilient, and cost-effective on-site electricity, as well as an electrolyzer for the production of hydrogen. The company has deployed over 300 MW of clean, firm power to Californians to date, and is proud to be a California company that is exporting leading-edge energy technology worldwide, including fuel cells and hydrogen electrolyzers. By virtue of their non-combustion process that converts natural gas, biogas, or renewable hydrogen into clean electricity, Bloom Energy Servers produce on-site or distributed power at world-leading efficiencies, reduce greenhouse gases, and do so with virtually no criteria air pollutants. Bloom Energy provides always-on power directly to hospitals, data centers, universities, advanced manufacturing, and leading commercial and industrial businesses.

Reliable, targeted, clean energy solutions, such as the solutions Bloom Energy delivers, should play an integral role in the state's energy and climate plans to help address the state's ambitious environmental goals. As noted in the California Public Utilities Commission's presentation, in order to further the state's progress towards a decarbonized grid, there will be an increased need for clean, firm power. With both a high availability and capacity factor, Bloom Energy's fuel cells provide a clean firm solution.

Bloom Energy is able and ready to deliver where and when needed to meet local reliability needs to enhance overall grid stability and resiliency in an environmentally sustainable way. Bloom Energy's technology provide permanent and predictable load reduction, and are more reliable than a conventional power plant¹. In addition to the reduced CO₂ emissions, and virtual elimination of harmful pollutants, Bloom Energy's servers do not use any water during normal operation.

Clean, Firm Energy Generation is Necessary

Bloom Energy's systems emit virtually zero smog-forming particulates [nitrogen oxides (NO_x) and sulfur oxides (SO_x), particulate matter (PM)] provide additional air quality benefits by displacing combustion power generators and diesel backup systems. According to many recent studies, local combustion-related pollutants like NO_x, SO₂, and particulate matter (PM) are far more harmful to human health than previously believed, and the greatest impacts occur disproportionately in lower-income communities of color due to the likely proximity to industrial facilities, including power plants and use of large diesel

¹ <https://www.bloomenergy.com/blog/reaching-new-milestones-in-the-field-proven-bloom-energy-server-longevity-and-reliability/>

backup systems. According to a recent Harvard study² air pollution from the combustion of fossil fuels is responsible for as many as one in five deaths worldwide. Through our non-combustion energy generation, Bloom Energy helps improve air quality in these communities.

In increasing numbers, California energy consumers have been responding to what they perceive as the “new normal” of an unreliable energy supply and are resorting to self-help. Unfortunately, as California enters another wildfire season, an overwhelming number of those customers are following existing economic and regulatory signals and deploying and operating diesel generators at unprecedented levels. This worsening dynamic is detrimental to society as a whole, threatening health and the environment while doing more harm than good to other energy consumers - unlike other, cleaner choices that provide net benefits to the grid.

Last year, an estimated 8.3 gigawatts (GWs) of fossil-fueled back-up and emergency generators (BUGs) were in service in California, roughly equal to 15 percent of the state’s total electricity grid capacity³. Diesel generators made up nearly 90 percent of all back-up generation units and nearly 95 percent of all capacity in specific air quality districts – and emitted nearly 450,000 MT of CO₂, the equivalent emissions of more than one million passenger car miles driven⁴.

It is difficult to overstate the harms caused by diesel pollution. California continues to have the worst air quality in the nation⁵, and diesel emissions are among the worst contributors, “responsible for about 70% of California’s estimated known cancer risk attributable to toxic air contaminants,” according to the California Air Resources Board (CARB)⁶. While much of diesel emissions result from mobile sources, CARB estimates that operating a single one-MW diesel generator for 250 hours would cause up to a 50% increase in cancer risks to nearby residents.⁷

CARB has found that the harm caused by diesel emissions go well beyond the 520 additional cancer deaths per million people in California. Diesel emissions cause “premature death, hospitalizations and emergency department visits for exacerbated chronic heart and lung disease, including asthma, increased respiratory symptoms, and decreased lung function in children.”⁸ California had been a widely recognized leader in reducing diesel emissions and their corresponding harm,⁹ the unprecedented up swell in diesel generator deployment and operation now threatens to undermine that progress.

Partnering on Climate Change

As California and the world moves towards decarbonization, Bloom Energy is ready to meet the requirements of our customers in alignment with a transformed energy sector. As a mission-driven company, Bloom Energy continues to develop innovative solutions to respond to challenging problems.

² <https://www.seas.harvard.edu/news/2021/02/deaths-fossil-fuel-emissions-higher-previously-thought>

³ https://www.newsdata.com/california_energy_markets/bottom_lines/the-diesel-fired-california-dream/article_f65b1070-2876-11ec-b3f1-f3ef2c8a4076.html?utm_id=39998&sfmc_id=2452221

⁴ Steven Moss and Andrew Bilich, Hidden Grid: More Than Eight Gigawatts of Fossil Fueled Back-Up Generators Located in Just Five California Districts, p. 5, (May 2020), <http://www.lgsec.org/wpcontent/uploads/2020/05/BUGs-in-5-CA-Air-Districts.pdf>.

⁵ New study: California’s trailblazing diesel rules save lives, Cal Matters (March 25, 2021)

<https://calmatters.org/environment/2021/03/california-diesel-rules/>

⁶ Summary: Diesel Particulate Matter Health Impacts, CARB, <https://ww2.arb.ca.gov/resources/summary-diesel-particulate-matter-health-impacts>.

⁷ Eliminate California’s reliance on diesel backup generators, CalMatters (Apr. 5, 2021), <https://calmatters.org/commentary/my-turn/2021/04/eliminate-californias-reliance-on-diesel-backupgenerators/>

⁸ Overview: Diesel Exhaust & Health, CARB, <https://ww2.arb.ca.gov/resources/overview-dieselexhaust-and-health>.

⁹ New study: California’s trailblazing diesel rules save lives, Cal Matters (March 25, 2021), <https://calmatters.org/environment/2021/03/california-diesel-rules/>.

To this end, Bloom Energy has committed to strategic expansion across our five growth levers of product innovation spanning zero-carbon, renewable and carbon-negative power, and transportation solutions. They include hydrogen solid oxide fuel cells, hydrogen solid oxide electrolyzer cells, carbon capture utilization and storage, biogas, and marine applications.

Hydrogen

Bloom Energy's hydrogen fuel cells provide a combustion-free method of generating clean electricity from hydrogen. Hydrogen fuel cells run on pure hydrogen and provide 24/7 "always-on" power reliability without harmful emissions. Fuel cells are a flexible, scalable, and distributed power technology that can be sited in a compact footprint. Bloom's hydrogen fuel cells offer superior efficiency compared to other fuel cell technologies and they leverage the same core platform technology that has decades of experience and testing behind it. In a future scenario where renewable hydrogen becomes available, most likely in areas of high renewables penetration, Bloom Energy Servers could run on hydrogen directly, thereby creating an always-on renewable power source that acts symbiotically with intermittent wind and solar power to aid California in achieving its carbon neutrality goals.

Solid Oxide Electrolyzer

Solid Oxide Electrolyzers convert electricity and water into hydrogen and oxygen. While the electricity needed for electrolysis can come from any generation source, Bloom is most excited about pairing electrolyzers with intermittent renewable energy generation such as solar and wind. The resulting Green Hydrogen is carbon-free and provides an important storage mechanism that allows solar and wind to continue making up a larger portion of the overall energy-generation mix. Bloom's solid oxide electrolyzer generates hydrogen from electricity with superior efficiency and generates hydrogen that advances decarbonization efforts by providing a clean fuel for carbon-free power generation, injection into the natural gas pipeline, transportation, or for use in industrial processes.

Biogas

Every year in California alone, landfills, wastewater treatment facilities, and dairies generate about 80 million MMBtu of biogas. Bloom's Energy Servers can use biogas to create clean electricity, improving air quality, often in vulnerable communities, by generating electricity from biogas without combustion. Bloom has pioneered the cleanup of biogas on which to run our fuel cells, without the need for processing the fuel into pipeline-quality biomethane. On-site biogas avoids the release of flaring of harmful methane emissions. When used as a fuel, it has a similar direct emission profile as natural gas, but a lower and potentially even negative lifecycle carbon intensity.

Carbon Capture

Bloom Energy's solid oxide fuel cells generate electricity via an electrochemical reaction rather than combustion, to already avoid emitting the harmful air pollutants that come with burning fuel. Bloom's platform captures and recycles hydrogen and water from the fuel cell exhaust and then separates emitted water vapor and CO₂. Once the water vapor is removed via condensation, a pure stream of CO₂ remains. This CO₂ can be easily captured and permanently sequestered in the ground or utilized in new applications. This technology solution paves the way to meet our carbon neutrality targets.

Marine Transit

In an effort to accelerate the marine industry toward a more sustainable future, Bloom Energy has designed and developed the ability to power marine vessels with fuel cells. Internal combustion engines (ICEs) are the most common form of propulsion and power on large sea vessels. ICEs have traditionally run on heavy fuel oil, which is extremely polluting and harmful to our planet. While heavy fuel oil is a plentiful resource, it is also one of the dirtyest fuels in the world. Published studies have recognized the impact that burning heavy fuel oil has on the climate, prompting both governments and maritime organizations to set emissions standards in an effort to curb the negative effects. The International Maritime Organization (IMO) has established guidelines for all cargo ship operators suggesting that by the year 2050, CO₂ emissions from cargo ships should be half what they were in 2008. This has left the marine industry searching for ways to meet this goal. By adopting land-based fuel cells for maritime applications, proposed designs of fuel cell-powered ships would have more than enough power to keep a working vessel powered. Natural gas fuel cells significantly reduce CO₂ emissions and decrease smog-

forming pollutants and particulate matter, like NOx and SOx, by more than 99 percent compared to entrenched power sources. Furthermore, because our fuel cells are fuel-flexible, they can run on readily available natural gas, hydrogen, biogas or blends of any of those, thereby reducing harmful pollutants and CO2 emissions.

Conclusion

Bloom Energy reiterates our appreciation for the opportunity to comment on the **November 2, 2021 2022 Scoping Plan Update – Electricity Sector Technical Workshop (Scoping Plan)**. Bloom Energy encourages CARB to take this opportunity to highlight the innovations in advanced energy technologies that are occurring now and will absolutely continue to advance and improve over the next decades. Technologies like Bloom's Energy Servers can help reduce GHGs today, while also helping bridge the changes and evolution that the energy landscape will undergo. When biogas and hydrogen availability increases in our state, Bloom Energy systems can seamlessly switch from a GHG reducing clean baseload resource to a renewable baseload resource. In addition, as California experiences wide deployment of electric vehicles, technologies like Bloom Energy's fuel cells have the potential to serve as a high capacity local energy generation resource specifically for EVs, avoiding the need to draw from the distribution system. Maintaining a broad scope of potential opportunities for technology neutral solutions and recognizing the value that advanced energy technologies offer is critical in allowing for the best solutions to come to market and be a key part of the future grid.

The distributed generation market is flourishing – with many emerging technologies participating in the State's various programs. The state has made smart investments to help advance the commercialization of these technologies. Now the programs and policies required to achieve California's various energy goals need to continue to provide technology inclusiveness and flexibility for adding new technologies as they come to market, especially recognizing that energy markets and technologies can change significantly in a short time period. To ensure that California maintains reliability while tackling our climate and environmental challenges, Bloom Energy encourages CARB to take this opportunity to provide a push for the most efficient, clean technologies.

We appreciate the CARB's leadership on the climate change Scoping Plan and look forward to working with you to fully realize the potential of fuel cells to help meet our mutual climate and clean air goals.

Thank you for your consideration,

A handwritten signature in black ink, appearing to read 'Brady Van Engelen', with a long horizontal line extending to the right.

Brady Van Engelen
Senior Policy Manager