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Bloom Energy Corporation

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Additional submitted attachment is included below.

Bloomenergy

June 12, 2020

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

Re: Comments of Bloom Energy Corporation on the Draft Final Project Report for the Distributed Energy Resources Integration Research Roadmap

Dear Chair Hochschild,

Bloom Energy Corporation[1] (Bloom) appreciates the opportunity to provide these comments on the Draft Final Project Report for the Distributed Energy Resources Integration Research Roadmap (DER Research Roadmap), docketed on May 22, 2020. As the California Energy Commission (Commission) prioritizes energy research on distributed energy resources (DER) to accurately reflect the needs of California, Bloom offers these comments in the spirit of collaboratively pursuing these goals.

Summary of Recommendations:

[1] Bloom Energy develops on-site distributed generation using innovative fuel cell energy technology that utilizes natural gas, biogas and can utilize hydrogen. Our unique on-site power generation systems utilize an innovative new fuel cell energy technology with roots in NASA's Mars program. Derived from a common sand-like powder, and leveraging breakthrough advances in materials science, our technology is able to produce clean, reliable, affordable energy, practically anywhere, from a wide range of renewable energy sources or traditional fuels. Our Energy Servers are among the most efficient energy generators on the planet; providing for reduced electricity costs and dramatically reduced greenhouse gas emissions. By generating power on-site, where it is consumed, Bloom Energy offers increased electrical reliability and improved energy security, providing a clear path to energy independence.

1. Bloom supports including green electrolytic hydrogen among research priorities in the DER Roadmap. Research should also consider the use of hydrogen for electricity generation.
2. Bloom supports the Commission giving a high priority to research on risk metrics for extreme events and valuing resilience for microgrids. We encourage metrics to be customer-centric and based on performance attributes.
3. Bloom provides information and asks the Commission to refine the record in Appendix B: *DER for Reliability and Resiliency Barriers*.

Discussion:

Bloom supports including green electrolytic hydrogen among research priorities in the DER Roadmap. Research should also consider the use of hydrogen for electricity generation.

Resource diversity is the cornerstone to achieve zero emissions while meeting other Energy System Goals for reliability and resiliency. The DER Research Roadmap properly outlines the direction to transition to green electrolytic hydrogen and articulates support for research and policies to enable development of hydrogen as a cost-effective solution for commercial fuel cell customers.[2] Given the ability of stationary fuel cells to generate resilient, low emission power the Commission should consider the pairing of hydrogen in electricity generation. Specifically, this research topic should include green electrolytic hydrogen used in fuel cells for electricity generation and not be limited to long-duration storage.[3] Bloom encourages hydrogen-capable fuel cells be incorporated into the Commission's research on DER technologies for use in microgrids. The Commission's inclusion of

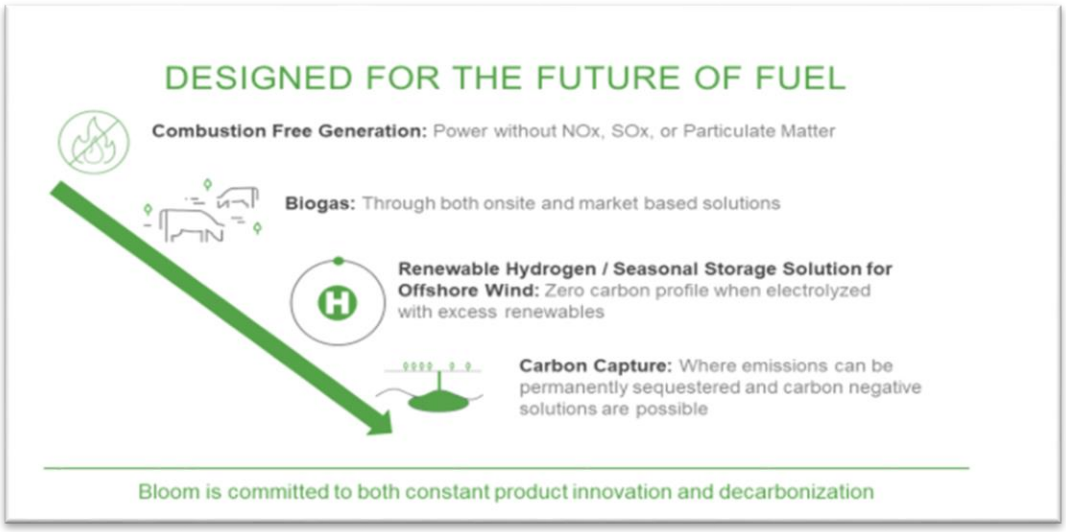
[2] See DER Roadmap Report, p. 42 and A-5
[3] See DER Roadmap Report, p. 42 and A-5

this technology option will inform the market and stakeholders and potentially assist with accelerated widespread adoption of green electrolytic hydrogen.

Bloom's non-combustion fuel cell technology can rely on biofuels, hydrogen and natural gas as inputs to generate resilient and clean energy which emits virtually zero particulate matter [4] and greenhouse gas emissions that are lower than the alternatives. Bloom's fuel cells are uniquely situated to be a cornerstone of California's pathway to a zero-carbon future. With fuel flexibility and without relying on combustion, Bloom's fuel cell technology can maintain resilience, reliability and affordability as the market innovates and transitions to cleaner fuels.

Among these attributes, resiliency is ever more valuable to a broader range of customers and business as the need for reliable power increases during Public Safety Power Shutoffs (PSPS) and unplanned outages, due to disasters and wildfires. Supporting research and development of hydrogen's application in stationary fuel cells will enable reliable, clean additional technology solutions that can achieve even greater reductions in GHGs while maintaining levels of resiliency needed by California's businesses.

[4] https://www.bloomenergy.com/datasheets/energy-server-es5-300kw



Bloom supports the Commission giving a high priority to research on risk metrics for extreme events and valuing resilience for microgrids. We encourage metrics to be customer-centric and based on performance attributes.

Bloom supports research and development focusing on valuing resilience for microgrids and risk metrics for extreme events. The Institute for Policy Integrity at the New York University School of Law provides a detailed examination of how resiliency is defined, measured and monetized at the state and federal levels in its report, *Toward Resilience*.[5] This report is an informative tool that provides multiple references to methodologies for valuation of these attributes used today throughout the United States.

Importantly, the report demonstrates the importance of performance duration of the DER during a resilience event as the most useful type of resilience metric that can measure direct and indirect consequences and

[5] Unel, Burcin, Ph.D., Zevin, Avi, *Toward Resilience, Defining, Measuring, and Monetizing Resilience in the Electricity System.* New York University School of Law, Institute for Policy Integrity, August 2018. Available at: https://policyintegrity.org/publications/detail/toward-resilience

broader social perspectives such as critical service delivery and economic activity.[6] There should be a distinct and higher valued metric for DER that serve loads for more than 48 hours. Evaluated metrics must include the entirety of technology options to ensure that there can be many solutions considered for the multitude of scenarios and customers. Bloom found the longest planned de-energization event in California lasted six days, but it affected relatively few customers (about 87). On the other hand, one outage that occurred over multiple circuits on October 26, 2019, affected 970,000 customers, and lasted for up to five days. The average duration of all outages was about 46 hours, or nearly two full days.[7] Outage durations should be studied and be included in research on resilience metrics.

Resiliency is a valuable DER attribute and must be quantified appropriately, including impacts on customers as a metric. Three prominent energy experts provided a report for the National Resource Defense Council (NRDC) and the Environmental Defense Fund (EDF) that outlined a customer-focused framework to evaluate resilience. These authors found that most outages occur because of problems at the distribution level and concluded that, without analysis significant amounts of money and effort, expenditures on electric system upgrades may not improve resilience in relation to their costs.[8] The Commission's efforts to evaluate metrics and value of resilience are needed to ensure that practical solutions are

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[6] Ibid 5, p. 5

[7] https://www.bloomenergy.com/bloom-energy-outage-map

[8] Silverstein, Gramlich, Goggin, *A Customer-focused Framework for Electric System Resilience*, National Resource Defense Council (NRDC) and Environmental defense Fund (EDF), May 2018. Available at https://gridprogress.files.wordpress.com/2018/05/customer-focused-resilience-final-050118.pdf . *See, e.g.,* Figure ES-3- – *Relative values of measures to improve resilience*

developed and deployed to solve needed resilience and reliability challenges of California's evolving grid.

DER for Reliability and Resiliency Barriers. Bloom provides clarification to refine the Commission's statements. (p. 1-2 of Appendix B)

First Bloom would like to refine the Commission's understanding of microgrids.

> "In many cases, the cost to develop a microgrid can be higher than customer bill savings and other benefits. In addition to the hard costs of the installed generation, storage, and power electronics; there are significant soft costs for permitting, insurance, interconnection, and labor. Historically, microgrids have been designed as unique system configurations that require customization. Delays during different parts of the implementation process can have cascading effects and lead to significant timing risks. The interconnection process remains a major challenge for microgrids as utilities must review each custom system and perform several field tests before approving permission to operate. Finally, cost and performance tradeoffs between fossil-fuel-based or renewable-generation-based microgrids also exist."[9]

The Commission is correct that installation and interconnection of microgrids can be delayed due to utility delays and a regulatory framework that erects barriers instead of facilitating innovations. However, despite a lack of policies to enable microgrids, Bloom fuel cells are being used today in microgrids at data centers, telecommunication facilities, hospitals, waste

[9] DER Research Roadmap, Appendix B, p.1

water treatment facilities, nursing homes and other critical infrastructure facilities for both primary power as well backup power when the grid goes down. Today's grid challenges have spurred customers to invest in DER for wholly different reasons, customers are investing in their own onsite infrastructure because they require service without significant interruption and can no longer rely on the utility.

Second the Commission stated "emissions free back-up generators do not appear to be available in the market."[10] Bloom recently installed a rapid-deploy system at the Sleep Train Arena field hospital which provided electricity to 20 tents and 200 hospital beds and was deployed in less than 2 weeks to support California emergency response activities.[11] Bloom's solution reduced pollution and particulate matter by more than 99% when compared with existing combustion-based power sources.[12] Bloom's solution proved to be an alternative to diesel combustion generation that was rapidly deployed for immediate resiliency needs and if required, can be converted subsequently to a permanent microgrid or deployed as flexible infrastructure for another facility or area. Some of these systems run on biogas and can eventually run on hydrogen. The Commission should consistently apply requirements for clean backup power and give preference in the near-term to low emission DER rather than full combustion generation with extremely negative local air quality and community impacts.

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[10] Ibid 9, p. 2

[11] Wood, Elisa, Bloom's Quick Build Microgrids Installed at COVID-19 Field Hospitals in California,
Microgrid Knowledge, April 22, 2020, https://microgridknowledge.com/rapid-deploment-microgrids-hospitals-bloom/.

[12] Tsvetomira Tsanova, Bloom builds microgrids for California field hospitals, April 22, 2020, Renewables Now, https://renewablesnow.com/news/bloom-builds-microgrids-for-california-field-hospitals-695946/

We agree with the Commission that "[n]ot including a value stream for resilience means that the benefits of DER projects are significantly understated for both customers and utilities and that the playing field between DER and traditional electricity investments remains uneven."[13] Reasons such as these are precisely why additional research would be helpful to overcome these barriers. Our fuel cells currently provide reliable power in the event of a grid outage or de-energization event in communities with constrained transmission, including disadvantaged communities and rural locations. They provide long-duration (always-on, 24/7/365) generation. For these reasons the Commission should recognize the value fuel cell microgrids bring to customers and the state of California and align the findings in Appendix B. We stand ready to collaborate and serve as a resource.

Conclusion:

We thank the Commission for the opportunity to provide comments on the DER Research Roadmap and look forward to continuing efforts to ensure the state is leveraging all available, reliable and clean technologies to achieve the State's ambitious clean energy and environmental goals.

Respectfully,

Abbie Laugtug
Policy Manager
Phone: (612) 239-0021
Email: abbie.laugtug@bloomenergy.com

[13] DER Research Roadmap, Appendix B, p.1