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Bloom Energy Comments on Draft 2019 IEPR

Additional submitted attachment is included below.

Bloomenergy

December 6, 2019

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

Re: Comments on the Draft 2019 IEPR

Dear Chair Hochschild,

Bloom Energy[1] (Bloom) appreciates the opportunity to provide these comments on the Draft 2019 Integrated Energy Policy Report (IEPR). We value the California Energy Commission's ("Commission") leadership with the IEPR to provide "policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety."[2] The proceeding comments are offered in the spirit of collaboratively pursuing those goals.

Summary of Recommendations
As the recent and historic Public Safety Power Shutoffs and wildfires made all too clear, many of the state's clean energy and clean air goals are currently under threat by the new, climate change normal. And as the seminal document guiding California energy policy and planning, the IEPR should play a role in charting a path to overcome these challenges. Bloom respectfully suggests the following additions to the current IEPR draft to strengthen this guidance:

1. Explicitly state that many of the state's clean energy goals—including building decarbonzation and transportation electrification—are threatened by this new normal, and consequently, the strategies to achieve these critical objectives must but updated.
2. Prioritize cleaner alternatives—such as non-combustion fuel cells—over dirtier, less-efficient technologies—such as combustion diesel generators—during de-energization and other emergency events.
3. Highlight SB 1339 implementation to commercialize microgrids and endorse clean technologies than can reliably ride through long duration (4 hr+) outages.

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[1] Bloom Energy develops on-site distributed generation using innovative fuel cell energy technology that utilizes natural gas or biogas. 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 significantly 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.
[2] Public Resources Code §25301(a)).

Bloom's subsequent comments will focus on specific areas where the current draft can be updated to achieve these outcomes.

The Problems this Rulemaking Can Solve

Increasing loads + more frequent outages

After decades of flat load profiles, this IEPR is forecasting that electricity demand in California will climb rapidly.[3] Driven by an EV charging, building electrification, and increased demand for heating and cooling during more extreme temperatures caused by climate change, this increased electricity consumption must be properly managed to meet—and not jeopardize—the state's goals to ensure reliability, affordability, and GHG reductions in the electricity sector.[4]

This reliance on electricity, however, increases the state's vulnerability to climate caused events. Californians have been warned to prepare for PSPS events that will last for longer than 48 hours[5]; extreme heat causes rolling blackouts[6]; wildfires and severe flooding threaten electricity infrastructure. Indeed, in the immediate wake of the October 9-12 PSPS event—where an estimated 2.25 million customers were de-energized across California[7]—many nightmare scenarios are becoming reality:

- California's medical baseline customers lost power to respirators, dialysis machines, and other life-saving equipment—prompting the County of Santa Clara to declare a state of emergency and deploy emergency personnel to locate and assist these vulnerable Californians;[8]
- Key infrastructure was on the verge of being shuttered: The Caldecott Tunnel on SR 24 and the Tom Lantos Tunnel on SR 1 were hours from being closed—eliminating key transportation and escape routes in the case of wildfires, earthquakes, or other emergencies.[9]
- 461 K-12 schools closed across the state for the nearly 250,000 students they serve.[10] These closures likely depriving many lower-income students of access to nutrition they receive at schools and forcing caretakers to bring their children to work, stay home, or arrange childcare.
- The City of Morganhill declared a curfew in order to reduce crime and/or potential looting as a result of the extended power outage.[11]

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[3] CED 2019 Preliminary Forecast; Summary of Statewide Results accessed from: https://efiling.energy.ca.gov/GetDocument.aspx?tn=229424&DocumentContentId=60830

[4] Ibid, pg 11.

[5] https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/public-safety-power-shutoff-faq.page

[6] https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/07/09/record-heat-put-thousands-of-californians-in-the-dark-friday-scientists-predicted-this-from-climate-change/

[7] http://www.capradio.org/articles/2019/10/10/stanford-professor-california-blackouts-not-a-false-choice/

[8] https://www.kron4.com/news/bay-area/santa-clara-county-declares-state-of-emergency/

[9] https://www.sfgate.com/bayarea/article/Caldecott-Tom-Lantos-tunnel-to-close-PGE-shutoff-14502496.php

[10] https://calmatters.org/education/k-12-education/2019/10/pge-power-outage-blackout-schools-closed-100000-kids-home-from-school/

[11] https://www.kron4.com/powershutoffs/authorities-enforce-curfew-in-morgan-hill-to-mitigate-potential-crimes/

- The Stanford Woods Institute estimates this outage will cost California's residents, workers, and businesses $2.5 billion dollars—due to lost wages, spoiled inventory, cancelled contracts, and other material harms.[12]
- Cell phone services was spotty as telecommunication towers lost power; traffic snarled as signals went dark.[13]

Thankfully, these impacts were not worse. But, as California discovered during the most recent PSPS episode, the prospect of even more pronounced disruptions and loss of life are very real and have largely been unanticipated. The potential future impacts of blunt PSPS events may include:

- Water agencies that lose power may be unable to pump water for drinking, bathing, and/or fighting fires;
- 911 center and emergency response organizations may be grounded;
- EV vehicles, lightrails, buses, forklifts, and other electrified forms of transport may be stranded.

The current draft of the IEPR gives only cursory treatment to these enormous challenges. These risks should be explicitly stated throughout the building decarbonization and transportation electrification chapters, such that policy makers, local governments, and regulators can properly understand and begin to plan to address them. For example, building decarbonization and transportation strategies that rely entirely on electricity supplied via transmission and distribution lines that may be cut off for multiple days to millions of Californians create momentous health, safety, and economic challenges. The current draft does not address these issues. Bloom respectfully requests that—in addition to a summary of the PSPS events—it include a full accounting of the potential risks and ramifications to existing state clean energy and clear air goals to provide decision makers with an understanding of the full suite of risks and solutions.

Current back-up options: dirty diesel generators

Unfortunately, Californians currently have scant options other than relying on dirty diesel generators during the prolonged outages. This reliance makes a bad situation worse: According to the California Air Resources Board, operating an uncontrolled one-megawatt diesel engine for only 250 hours per year results in a 50 percent increase in cancer risk to residents within one city block.[14] Demand for backup generators has spiked 1,400% since the policy to rely on PSPS went into effect.[15] The City of Lathrop (population 22,000) is preparing for 5 day PSPS events and expects to burn 10,000 gallons of diesel/day to power the city's critical facilities during these outages. In the Bay Area Air Quality Management District, there are 7,600 permitted, stationary diesel generators.[16] Based upon the EPA's potential to emit

[12] https://www.sfchronicle.com/business/article/A-cool-billion-Economists-estimate-PG-E-14505047.php

[13] https://www.pressdemocrat.com/news/10153265-181/pge-outage-limits-cell-service?sba=AAS&artslide=7

[14] Santa Barbara County Air Pollution Control District: https://www.ourair.org/do-you-really-need-a-diesel-generator/

[15] https://www.sfchronicle.com/business/article/Demand-for-generators-lights-up-as-PG-E-power-14054242.php

[16] http://dieselfree33.baaqmd.gov/tech-assessment

calculator,[17] if these combustion diesel generators were fired up to ride through a 48 PSPS event, they could release the equivalent amount of CO2 as burning over 2,000 tons of coal and tens-of-thousands of pounds of toxic air pollutants—enough to increase the risk of asthma and cancer.

Residential diesel generator use—which does not require a permit—has exploded during these PSPS events: Home Depot shelves were empty during the most recent episode.[18] Many Californians are dusting off and deploying generators that are multiple-decades old—in one case, leading a homeowner to accidentally light their house on fire.[19] This new reliance on diesel generators is causing concern amongst air quality management districts and other state agencies about "spewing carcinogens right where we breathe."[20] We applaud CEC Vice Chair Scott for raising these issues and highlighting how the wholesale purchase of combustion diesel generators "contradicts the state's goals of reducing GHG emissions and air pollution."[21]

While the current draft of the IEPR does acknowledge the need to "provide an alternative to backup diesel generators," the current suite of options and projects profiled do not give California's universities, hospitals, commercial and industrial, data center, or manufacturing the long-duration (12+ hours) technology options that can keep the lights on for their unique power needs. Yet, there were multiple PSPS events that lasted 48 – 60 hours and kept tens-of-thousands of Californians in the dark during that duration.[22] Californians need additional options to meet these challenges—and the 2019 IEPR should take up this issues in subsequent drafts.

Fuel Cells and Microgrids: A Promising Solution

Fuel cells have an important role to play in filling this gap. This innovative, non-combustion technology—which produces virtually no criteria air pollutants—addresses multiple resiliency needs:

- Reliable power in the event of a grid outage or de-energization event;
- Baseload power in communities with constrained transmission, including disadvantaged communities or rural locations;

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[17] https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwjg-umFvpTlAhWB4J4KHa70BwUQFjAAegQIAhAC&url=https%3A%2F%2Fwww.epa.gov%2Fsites%2Fproduction%2Ffiles%2F2016-09%2Fboilers_and_emergency_engines_pte_calculator_version_1.0.xlsx&usg=AOvVaw2Wm8MSUbnA3mrisCKL_gVs

[18] https://twitter.com/melissaabc7?lang=en

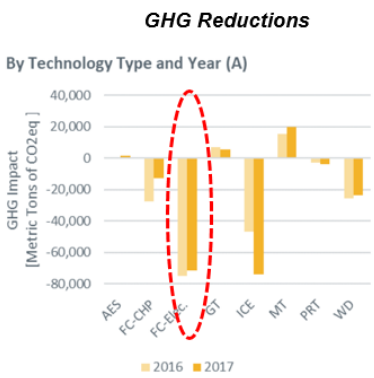
[19] https://www.abc10.com/article/news/local/wildfire/generator-causes-fire-during-pge-power-outage/103-ce5ce56e-e5d1-4032-8f98-1a00515f2049

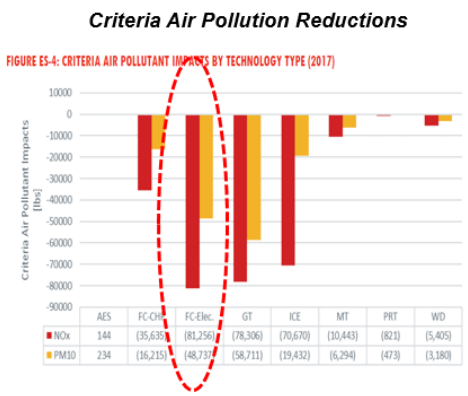
[20] spewing carcinogens right where we breathe

[21] IEPR 2019 Draft, Pg 97

[22] California State Senate, Committee on Energy, Utilities and Communications, Oversight Hearing, "Electrict Utility Power Shutoffs: Identifying Lessons Learned and Actions to Protect Californians," November 18, 2019.

- Long-duration (longer than 24 hours) generation for emergency service centers, telecommunications and critical services such as hospitals, gas stations, and grocery stores. Indeed, the City of Hartford installed a fuel cell-powered microgrid to provide continuous power to these facilities that are co-located on the same block[23];
- By natively producing DC power, fuel cells are able to efficiently charge electric vehicles, buses, and other DC loads during a grid outage and do so while minimizing the efficiency losses that occur when converting to AC power;
- Underground fuel lines eliminate the vulnerability to weather and risk of sparks from traditional poles and wires infrastructure;
- Modular design allows the system to continue operating even while individual components are being repaired or replaced;
- Time to build, uptime, and recovery time are often faster than the electric utility grid network can achieve;
- Leading power density: Fuel cells produce the largest quantity of clean, near-zero criteria air pollutant, electricity in proportion to their equipment footprint compared to any technology currently on the market.
- GHG and criteria air pollutant reductions: The 2016-17 third party impact evaluation of SGIP program found that all-electric fuel cells reduced GHGs more than any other technology – over 100,000 metric tons of CO2e reduced in 2016 and 2017 combined.[24]





Other than a notable, but brief, mention of stationary fuel cells running on hydrogen[25] in the appendix, the current draft is entirely silent on these benefits and the unique role non-combustion fuel cells can play in providing clean electricity, eliminating criteria air pollutants, and powering through both climate and human-caused

[23] https://microgridknowledge.com/microgrid-and-fuel-cell-hartford/
[24]https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/Customer_Gen_and_Storage/2016-2017_Self-Generation_Incentive_Program_Impact_Evaluation.pdf
[25] Bloom Energy announced the ability to run on renewable hydrogen this year: https://www.bloomenergy.com/newsroom/press-releases/bloom-energy-announces-hydrogen-powered-energy-servers-make-always-renewable

disasters.[26] Given the enormity of the challenges, this is missed opportunity. It is also inconsistent with previous IEPR recommendations. Indeed, the 2018 IEPR recommended that: "Backup generation systems intended for use during de-energization and other multiday emergencies should prioritize a mix of clean, efficiency technologies, such as renewable energy, storage, and fuel cells, over dirtier, less efficient technologies."[27] With the events of the last year—and with diesel generators flying off shelves—this guidance has never been more important. The 2019 IEPR should provide the leadership to encourage other technologies that displace dirty, diesel generators.

Additionally, fuel cells can serve as the backbone for microgrids projects. Microgrids—as defined by SB 1339—are a critical solution to these challenges that give Californians a key tool to protect themselves. Microgrids that use fuel cell systems as baseload power are able to immediately disconnect from the grid and island (operate autonomously) from the larger grid when circumstances demand (e.g., grid outage). Furthermore, fuel cell systems—both alone and when paired with other distributed energy technologies such as solar and batteries—support the utility grid network and can also provide ancillary services such as peak demand reduction, power quality, frequency and voltage support, capacity and spinning reserve, and avoidance of expensive transmission and distribution upgrades. The CPUC is beginning the process to implement the provisions of SB 1339 as a solution to PSPS, wildfires, and other outages. The 2019 IEPR should include a summary of this proceeding.

Conclusion

We thank the Commission for the opportunity to provide feedback and reiterate that highly efficient, non-combustion fuel cells should be an integral component of the Commission's continuing efforts to chart a resilient, prosperous, sustainable, and equitable energy future for all Californians.

Respectfully,

Sam Schabacker
Policy Manager

[26] IEPR Draft, A-16.
[27] https://ww2.energy.ca.gov/2018publications/CEC-100-2018-001/CEC-100-2018-001-V2-CMF.pdf, pg 188.

RAMBOLL

GRID + DIESEL BACKUP EMISSIONS COMPARED TO BLOOM ENERGY SERVERS IN CALIFORNIA

Bloom Energy Servers use solid oxide fuel cell technology to convert natural gas into electricity through an electrochemical process without combustion.

Bloom Energy Servers have the ability to tie into the power grid or operate in island mode, which makes them a solution for both primary and back-up power. As shown on this technical handout, the nitrogen oxides (NO_x), sulfur dioxide (SO_2), and greenhouse gas (GHG) emissions are lower compared to traditional diesel backup and existing grid emissions.

Background on the Power Grid

The traditional power grid transmits electricity from power plants to homes and businesses using long-range high-voltage transmission lines and local distribution lines. When there is a power outage, homes and businesses are forced to go without power or use a back-up power source. Consumers have limited options for back-up power. Currently, diesel power generation is the traditional option for back-up power. Solid oxide fuel cells, like the Bloom Energy Servers, can displace both grid power and diesel generators.

A Comparison in Emissions

There are distinct differences in the NO_x, SO_2, and CO_2 emissions profiles of grid-supplied electricity and diesel generators, compared to Bloom Energy Servers. Electricity on the power grid is typically generated from a variety of sources including fossil fuel power plants, renewable energy sources, and in some cases, nuclear power plants. Ultimately, the electricity generation mix and emissions profile are dependent on the region and utility provider.

Table 1 presents a comparison of emission factors on a pound per megawatt hour (lb/MWh) basis for the WECC California[1] power grid, a Tier 4 diesel emergency generator, and a Bloom Energy Server.

Table 1.

	Emission Factor (lb/MWh)		
Power source	**NO_x**	**SO_2**	**CO_2**
WECC California Grid[a]	0.86	0.06	985
Tier 4 Diesel Emergency Generator, 250 kW	0.88[b]	0.016[c]	1,542[d]
Bloom Energy Server, 250 kW	0.0017[e]	negligible[e]	756[e]

Sources: [a] eGRID2016; [b] 40 CFR §1039.101; [c] assumes a maximum fuel sulfur content of 15ppm and that all fuel sulfur is converted to SO_2; [d] AP-42, Table 3.3-1; [e] https://www.bloomenergy.com/sites/default/files/es5-250kw-datasheet-2019.pdf

[1]For purposes of this analysis, non-baseload emission factors have been used as a surrogate for marginal emission factors. The EPA has established this methodology to determine the emissions that would be avoided by displacing the marginal generator. The analysis assumes that there is non-baseload generation over a full year.

Bloom Energy Servers vs. the Marginal Generator on the WECC California Grid with 98 hours per year of Emergency Generator Operation

Figure 1 – NO_x

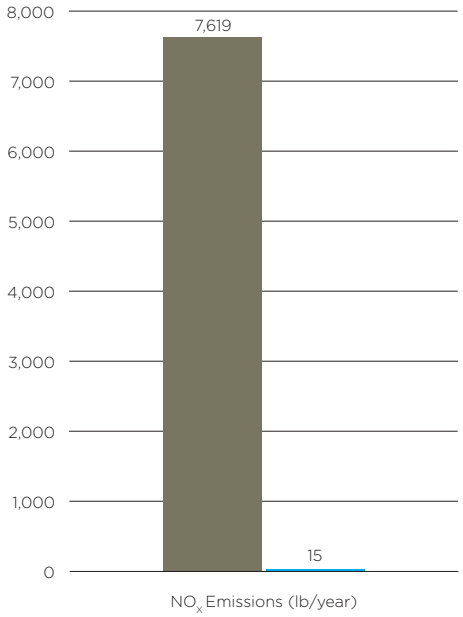
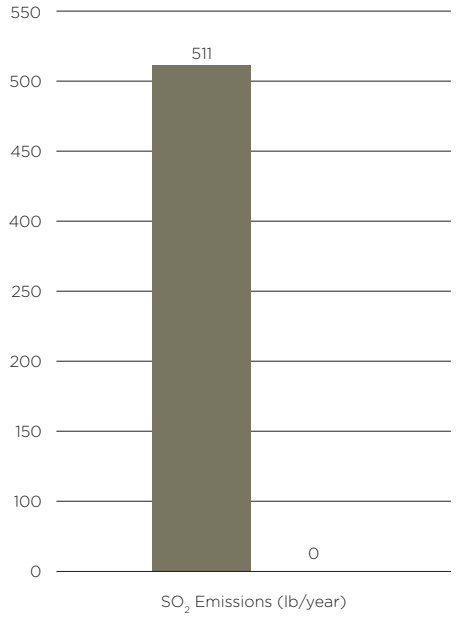
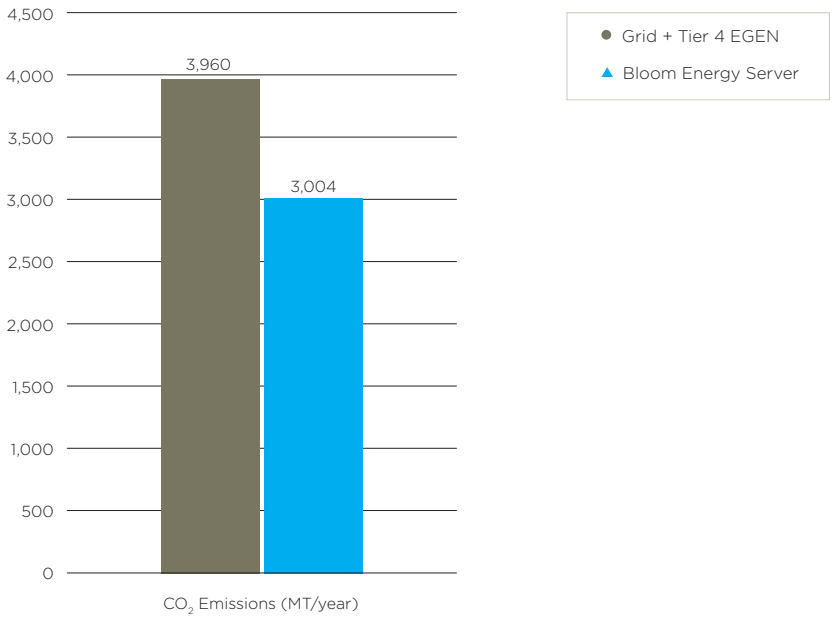


Figure 2 – SO_2



Figures 1-3 show the difference in annual emissions for 1 MW of power generation between electricity pulled from the WECC California power grid with 98 hours of Tier 4 diesel emergency generator operation (assumes 50 hours of routine testing[2] and 48 hours of back-up power during power outages) versus from Bloom Energy Servers. As shown, the Bloom Energy Servers emit significantly less NO_x, SO_2, and CO_2 than the other two sources.

Figure 3 – CO_2



[2]40 CFR §60.4211(f) limits the operation of emergency generators for readiness and maintenance checks to 100 hours/year. Tier 4 diesel engines are used to approximate the actual mix of diesel engines that may exist. Actual engine tiers may be lower than Tier 4.