What Powers You

June 21, 2024

Mark Sippola, Ph.D.
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments on the May 31, 2024, CARB Public Workshop: Potential Amendments to the Cap-and-Trade Regulation

Dear Dr. Sippola,

Bloom Energy appreciates the opportunity to submit comments in response to the May 31, 2024 Staff Report regarding potential amendments to the Cap-and Trade Regulation. Acknowledging the complexity and far-reaching nature of the program, we thank the California Air Resources Board (CARB) for its leadership over the years, balancing a broad range of interests and stakeholders.

Bloom Energy is a California-based manufacturer of solid oxide fuel cell (SOFC) technology that utilizes an electro-chemical process to generate power without combustion. It also manufactures high efficiency electrolyzer systems designed to convert renewable electricity into renewable "green hydrogen," using the same technology. Bloom Energy's SOFC Energy Servers are designed in a modular, fault-tolerant format that is fuel agnostic and provides mission critical reliability with no downtime for maintenance. In 2023, the average availability of Bloom's fleet was 99.995%. The company has installed over 1000 of its SOFC systems for customers in thirteen U.S. states as well as in Japan, South Korea, India and Italy. Running on any fuel (*e.g.*, natural gas, biogas, hydrogen), Bloom Energy's technology provides substantial criteria pollutant, water and greenhouse gas (GHG) emission benefits via a platform that has proven resilient through outages caused by hurricanes, winter storms, earthquakes, forest fires, and other extreme weather and natural disasters. Bloom's fleet has avoided 3,460 hours of customer downtime during a total of 1,743 grid outages.

In-state Distributed Energy Resources (DERs), including and especially fuel cell Electric Generating Units (EGUs), can reduce load on the electricity system and provide needed grid capacity. In addition to avoiding the line losses and other risks created by transmission, DERs can simultaneously power critical facilities and the communities they support through short duration peak events and public safety power shut-off (PSPS) events and avoid the too-common use of diesel generators during these events. DERs, including fuel cell EGUs, provide these benefits while also reducing GHG and criteria pollutant emissions on an annual basis.

Given the near-term local air quality, water and GHG emission benefits that can be derived from fuel cell technology that is also exceptionally reliable and resilient, Bloom appreciates CARB's recognition of the need to revisit Resolution 18-51 and more specifically the following language:

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> BE IT FURTHER RESOLVED that the Executive Officer will return to the Board with proposed amendments to exempt through 2030 fuel cells connected to existing natural gas infrastructure where there are demonstrated local air quality benefits. The Executive Officer will evaluate and propose any necessary transition assistance for fuel cells that meet these requirements and incur a compliance obligation for emissions years 2018 through 2020.

To that end, and in furtherance improved air quality and a clean, resilient electricity grid – we encourage CARB to implement the exemption for fuel cell installations connected to existing natural gas infrastructure where doing so would achieve meaningful emission reductions. More specifically, we offer the following comments to address related questions raised at the May 31, 2024 Workshop.

How could an exemption be applied? Exempt facilities whose fuel cell emissions cause facility's total emissions to exceed the emissions threshold? Other approach?

Pursuant to 17 CCR § 95103(a)(2):

> . . .In addition, if a facility includes an electricity generating unit, the facility operator must report the electricity generating unit ***separate*** from other stationary fuel combustion sources by following the unit aggregation provisions in sections 95112(b) and 95103(a)(6).

The aforementioned language dictates that fuel cell EGUs are currently reporting separate from other sources at a facility. As such, applying an exemption would not require exempting an entire facility where both an EGU and other sources at that facility trigger Cap-and-Trade compliance. Bloom, as the party operating and maintaining any SOFC Energy Server installation that triggers Cap-and-Trade compliance requirements, is handling all compliance requirements for said EGUs separate and distinct from facility (or customer) sources that might also separately trigger a Cap-and-Trade obligation. CARB need not exempt an entire facility from Cap-and-Trade requirements to apply a targeted exemption for fuel cells providing air quality benefits. To effectuate the intent of Resolution 18-51, CARB can simply exempt fuel cell EGUs that meet specific requirements from Cap-and-Trade compliance.

Should a fuel cell exemption be linked to existing standards, such as the Stationary Fuel Cell Net Energy Metering Standard?

First, Bloom thinks it important to highlight the following language from Resolution 18-51: ". . . ***connected to existing natural gas infrastructure where there are demonstrated local air quality benefits***." Implicit in this statement is the idea that the exemption is being proposed because there are not only GHG benefits to be derived from fuel cell EGUs, but also, local air quality (criteria pollutant) benefits. Accordingly, and despite Cap-and-Trade being a GHG-focused regulation, the Resolution renders it clear that these important co-benefits were also a critical component of the calculus here. Local air quality benefits must be weighed heavily as part of this process and the benefits in this context would support a blanket exemption that is not linked to existing standards.

As efficient "always on" baseload power, fuel cell EGUs running on natural gas displace system generation that would otherwise result in GHG and criteria pollutant emissions. It is generally recognized, and was explicitly recognized by CARB when developing the Stationary Fuel Cell Net Energy Metering

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Standard, that "displaced resources" are those on the "margin."[1] Marginal resources are typically the most flexible but least efficient energy generation sources, which generally operate at the lowest electrical efficiently; they also generally have the highest level of associated emissions, as more fuel is required to generate power per unit of electricity demand. The marginal emission rate in any region reflects the average emission rate associated with marginal resources operating, as needed, throughout the entire year. While average emission rates in California and nationwide are steadily declining due to the penetration of renewable resources, marginal rates are not.[2]

California's marginal emission rates (historic and projected) are well documented. Using any of the prevailing tools in the space, marginal emission rates are significantly higher than those reflected in the Stationary Fuel Cell Net Energy Metering Standard. The attached graphs summarize the benefit of the existing Bloom fuel cell fleet in California versus the marginal resources that the fleet displaces, using the U.S. EPA's eGRID database. Using this tool, Bloom's existing fleet, operating at an average efficiency of 54%, provides a 26.6% percent GHG benefit and a 99% reduction in NOx and SOx when compared to the marginal grid electricity it displaces in California.[3] Operating at the adopted 2020 Fuel Cell Net Energy Metering Standard, Bloom provides a 25% benefit versus the marginal resources it displaces and the same 99% reduction in NOx and SOx.

In contrast, and operating at that same average efficiency, the Bloom fleet does not meet the Stationary Fuel Cell Net Energy Metering Standard set for calendar year 2021 and beyond. Moreover, Bloom is unaware of any fuel cell technology that could meet the adopted 2024 or 2025 standard running on natural gas. All of this is true even though the actual numbers demonstrate that fuel cell EGUs running on natural gas still reduce actual GHG emissions and provide significant local air quality benefits versus the marginal resources they have and will continue to displace. Because of the way the marginal rate is assessed, this is true even where fuel cell technology operates 24/7, 365 days per year while various marginal resources do not. An exemption tied to an impossible standard would not incentivize additional deployment of larger fuel cell EGUs and, thereby, would not translate to any of emission or grid reliability benefits that would come with the further scaling of this technology.

Fuel cell EGUs running on natural gas are providing significant local air quality benefits. Moreover, it is clear that they provide significant GHG emission reductions (the objective of the Cap-and-Trade regulation) when operating at efficiencies far less than that required to meet the Stationary Fuel Cell Net Energy Metering Standard for calendar years 2021 and beyond. For these reasons, Bloom believes linking the exemption to the Stationary Fuel Cell Net Energy Metering Standard is unnecessary and counterproductive.

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[1] *See, e.g.*, CARB, *Public Hearing to Consider The Proposed Fuel Cell Net Energy Metering Greenhouse Gas Emission Standards Regulation, Staff Report: Initial Statement of Reasons* at 1 (Oct. 22, 2019), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/fcnem19/isor.pdf. (stating: "fuel cell resources would displace marginal (as opposed to baseload) generator resources.")

[2] https://www.pnas.org/doi/10.1073/pnas.2116632119

[3] *See* eGRID 2022 non-baseload emission factors for CAMX including 5.1% average line loss. U.S. Envtl. Prot. Agency, eGRID 2022, https://www.epa.gov/egrid/download-data. Notably, the average benefit is up from 2021 and Bloom's weighted average lifetime efficiency across the fleet is approximately 55.86%. Bloom Energy 2023 Sustainability Report (2023) at 33, https://www.bloomenergy.com/sustainability/

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Should CARB not allow exemptions where fossil gas is utilized?

The emission benefits described above fully support the conclusion that fuel cell EGUs are one of the most efficient ways to leverage existing natural gas infrastructure to provide critical and resilient energy with minimum emissions. Enabling this efficient use of existing natural gas infrastructure via a Cap-and-Trade exemption is consistent with California's emission reduction goals.

Moreover, and inasmuch as it explicitly contemplates an exemption for "fuel cells connected to existing natural gas infrastructure," Resolution 18-51 is premised on the idea that an exemption is warranted where fossil gas is utilized by fuel cell EGUs. No doubt, the numbers set forth above also support the conclusion that fuel cell EGUs running on fossil gas can, and will, provide significant local air quality, water and GHG emission benefits for the foreseeable future.

Finally, fuel cell technology should be leveraged as a part of the state's strategy to achieve SB 100 goals and a Cap-and-Trade exemption would further support that outcome. Among the findings from the 2021 SB 100 Joint Agency Report were the following:

1. Construction of clean energy and storage will need to be sustained at record setting rates;
2. Diversity in energy resources lowers overall costs;
3. Retaining some natural gas power capacity may minimize costs while ensuring uninterrupted power supply during the transition to 100 percent clean energy; and
4. Advancements in zero-carbon technologies can reduce natural gas capacity needs.[4]

Fuel cells running on natural gas provide significant flexibility versus other technologies as the state moves to 100% clean energy. Fuel cells are modular, can be skid mounted and can be deployed for short project lives. Investing in fuel cell technology does not represent an investment in a thirty (or longer) year asset that must run on fossil gas for its useful life. Quite the contrary, Bloom and other fuel cell technology uses the same core platform for multiple products and fuels. As such, and when biogas, hydrogen and carbon capture applications become commercially viable, fuel cell EGUs can quickly transition from near-zero to zero emissions. No other technology offers this combination of feedstock flexibility and ease of short-term utilization. No other technology can effectively compete with diesel back-up generation to meet the needs of reliability conscious customers like data centers that are driving a large percentage of the load growth that is challenging the system. This combination of short-term and long-term benefits renders an exemption even more reasonable given the current state of the marginal grid. Implementing the exemption as called for in the resolution, including when using fossil gas (that is, when directly connected to "existing natural gas infrastructure"), will result in important near-term emission reductions and support system reliability on the way to a 100% clean energy grid.

Bloom Energy appreciates the opportunity to comment on this potential amendment. Please do not hesitate to contact me if we can provide additional information. We look forward to further engagement and collaboration that will strengthen the Cap-and-Trade regulation and further California's emission reduction goals.

[4] See *Key Takeaways from Modeling* at https://www.energy.ca.gov/sb100

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Best Regards,

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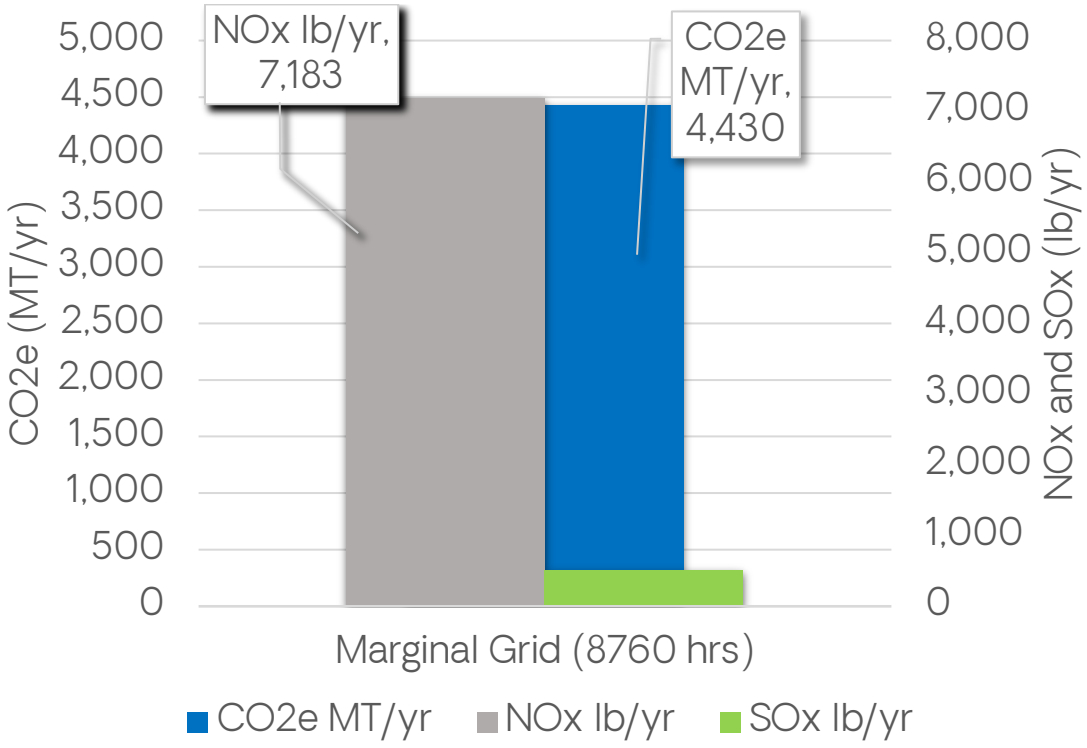
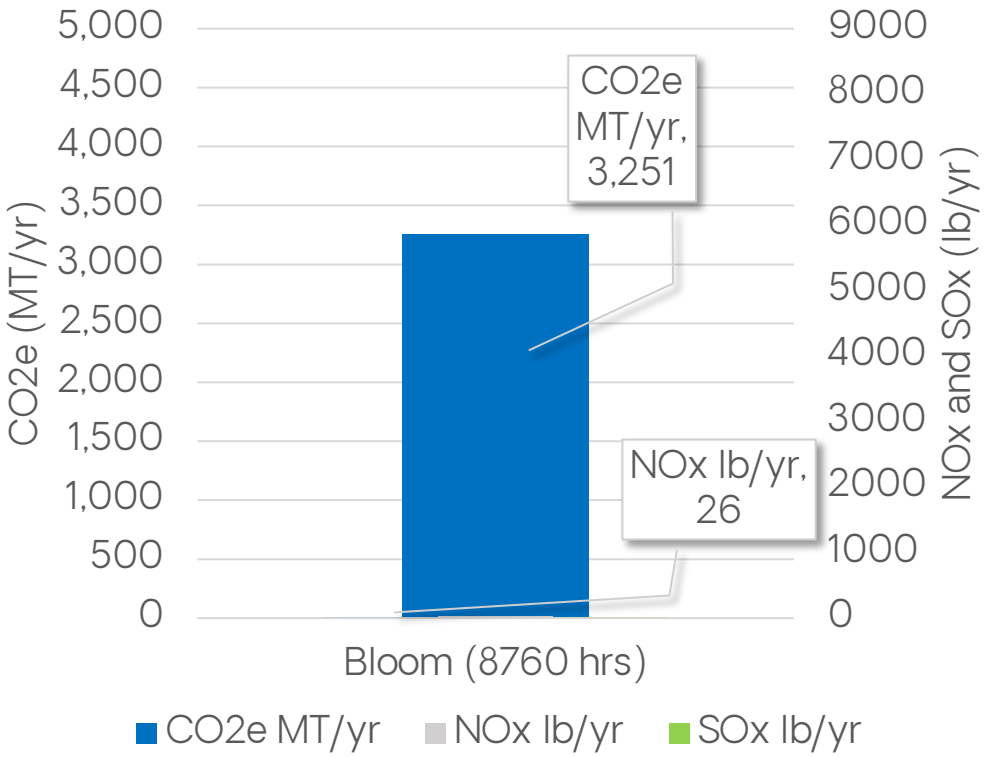
Scenario #1: Marginal Grid, 1 MW, 1 full year



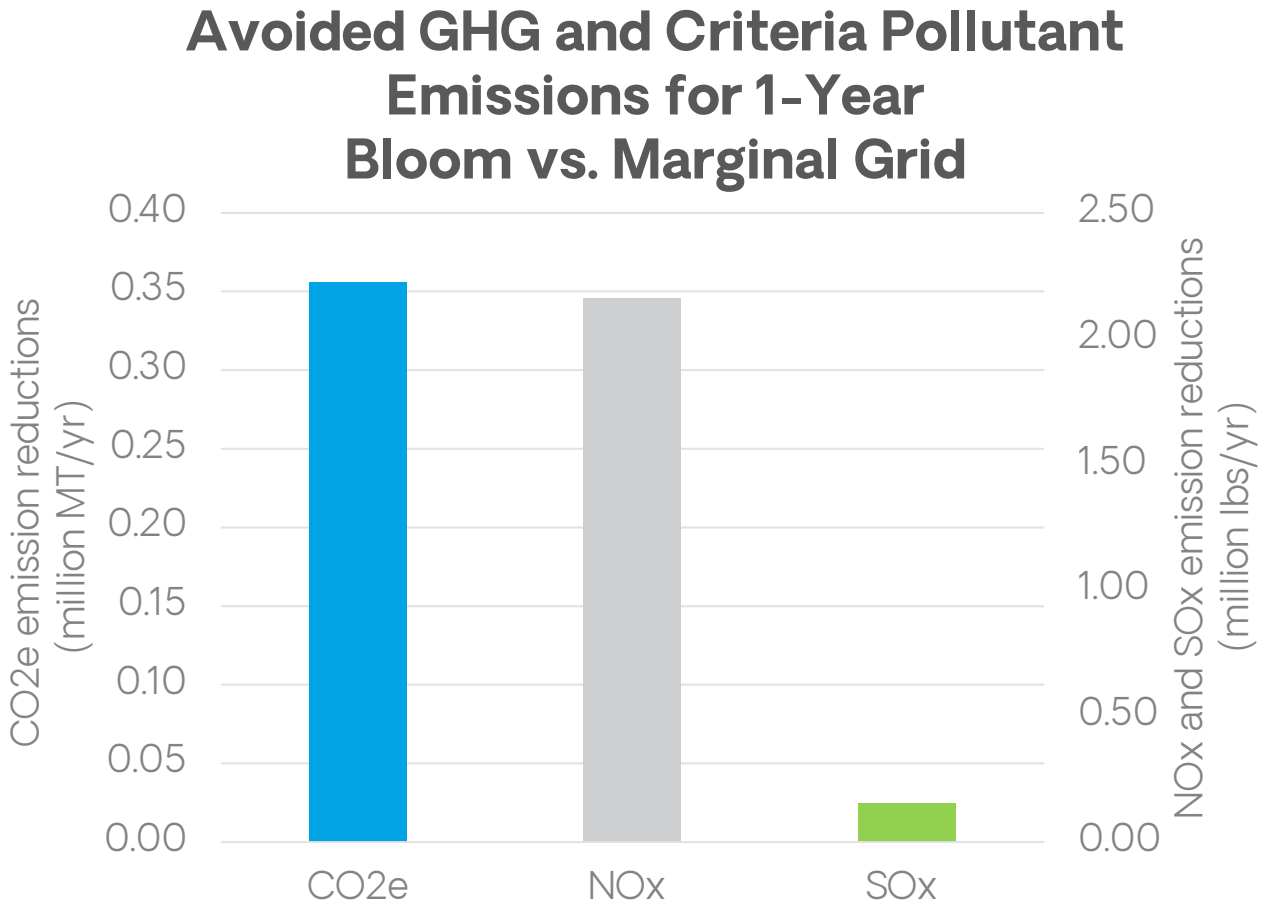
Scenario #2: Bloom, 1 MW, 1 full year



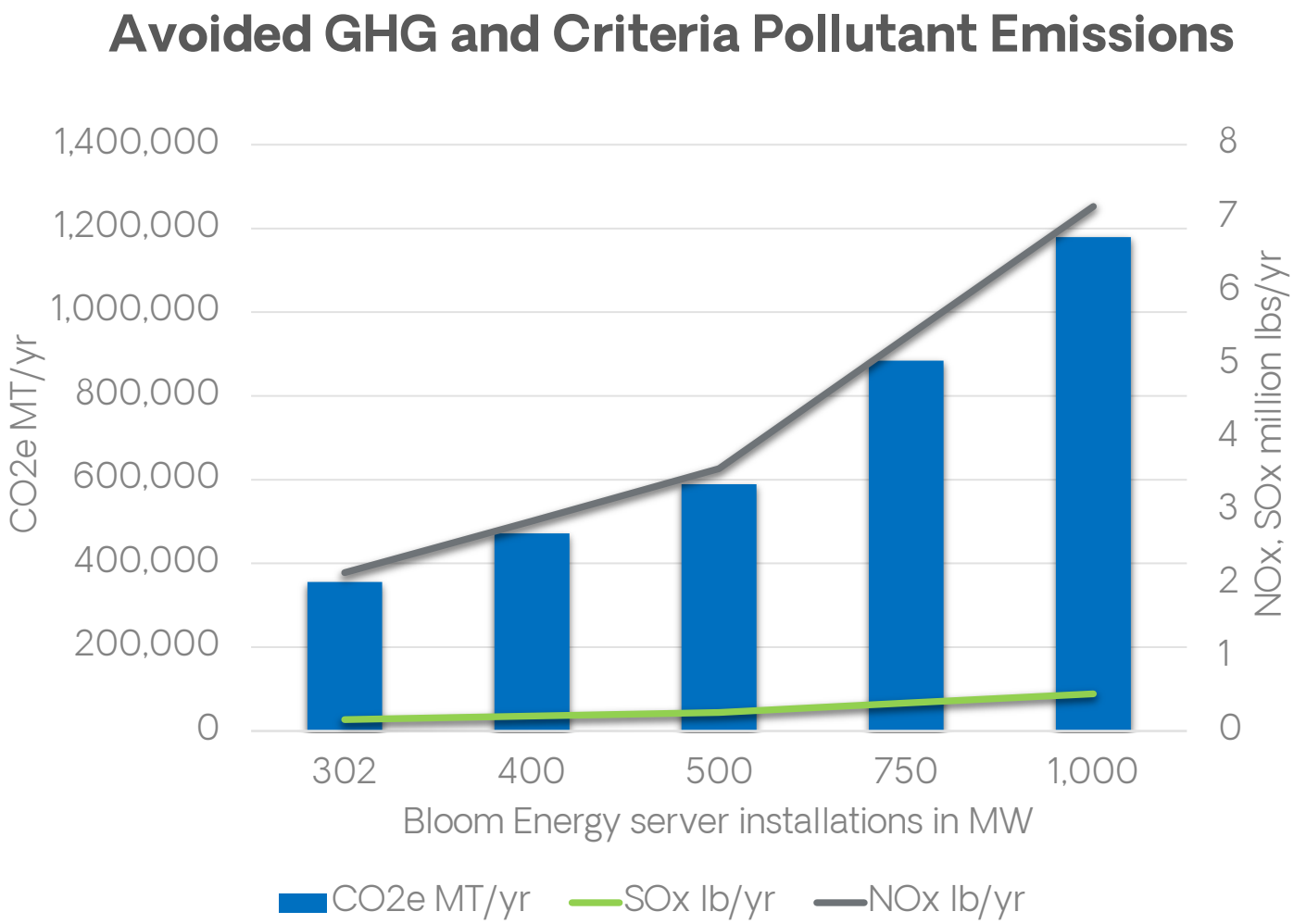
		Emission Factors (lb/MWhr)		
		CO2e	**NOx**	**SOx**
Scenario #1	Marginal Grid (8760 hrs)[1]	1,115	0.82	0.058
Scenario #2	Bloom (8760 hrs)[2]	818	0.003	4.6E-06

1) eGRID 2022 for CO2e, NOx and SOx emission factors for non-baseload including line losses.
2) Bloom Specification sheet.

Currently, Bloom has 302 MW operating in California. Avoided emissions for the near-term vs. the marginal grid are significant.

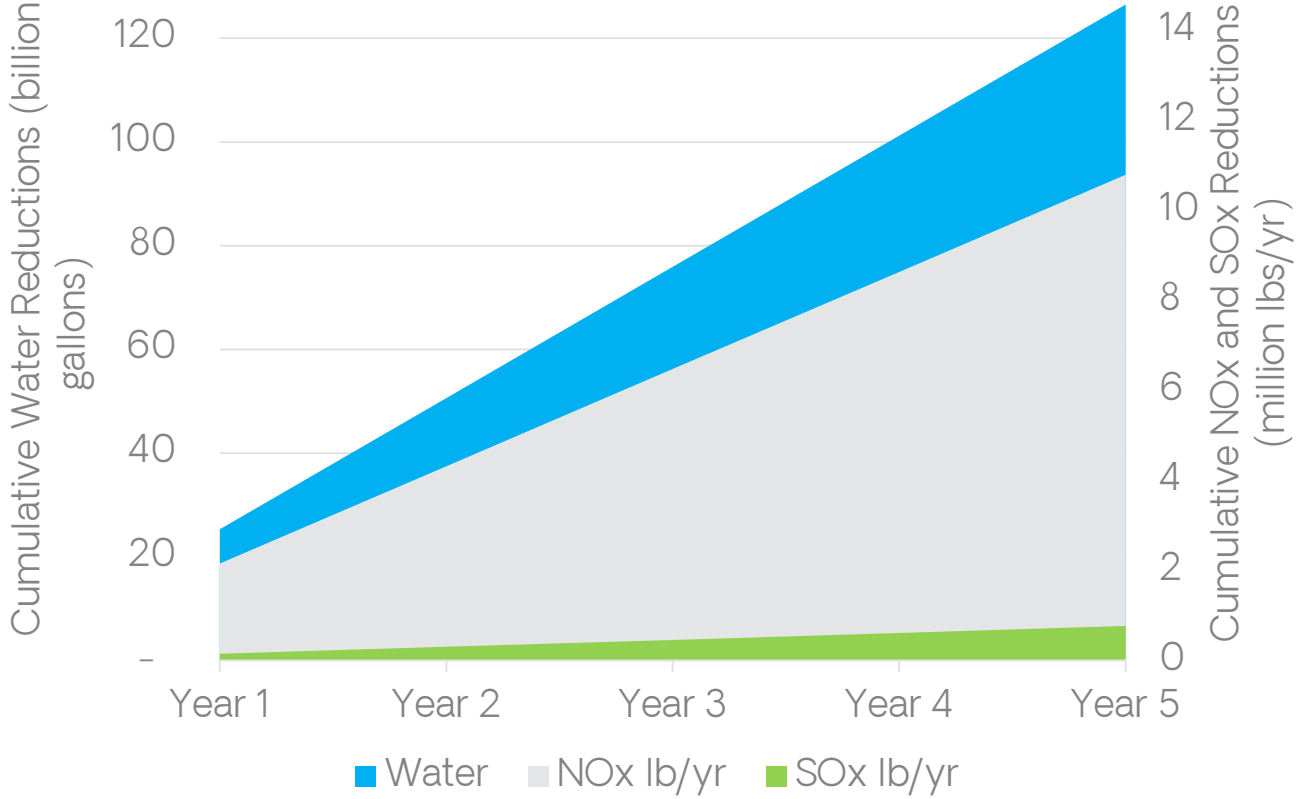


As Bloom scales, the avoided emissions vs. the marginal grid will be even more significant.



As Bloom scales, billions of gallons of water could be saved, and millions of pounds of criteria pollutants can be avoided.

Water and Criteria Pollutant Reductions



	Water (gal/MWh)	NOx (lb/MWhr)	SOx (lb/MWhr)
Bloom	0.69	0.003	4.6E-06
Marginal Grid[1]	9,891	0.82	0.058

1)https://waterdata.usgs.gov/ca/nwis/water_use?format=html_table&rdb_compression=file&wu_area=State+Total&wu_year=2015&wu_category=PT&wu_category_nms=Total%2BThermoelectric%2BPower and eGRID 2022 for NOx and SOx emission factors.