California Hydrogen Business Council

901 H St Ste 120
#74
Sacramento, CA 95814
(310) 455-6095
www.CaliforniaHydrogen.org

July 6, 2026

VIA EMAIL AND U.S. MAIL
New Mexico Environment Department
Air Quality Bureau
525 Camino de los Márquez, Suite 1
Santa Fe, New Mexico 87505
[NMED Air Quality Bureau comment email address]

Re: Comment in Support of Air Quality Permit Application No. 10883 — Yucca Growth Infrastructure, LLC ("YGI Microgrid"); the Clean Profile and Established Global Track Record of Solid-Oxide Fuel Cell Technology

Dear Air Quality Bureau:

The California Hydrogen Business Council submits these comments in support of the above-referenced construction permit application and requests that the Department record our written interest in this matter pursuant to 20.2.72.206 NMAC. We write as a coalition of companies and experts who collectively bring decades of expertise and hands-on experience in stationary fuel cells and distributed generation technology deployment.

Solid-oxide fuel cell ("SOFC") technology is extensively tested, independently certified, and deployed at commercial scale in multiple regions, with emission characteristics substantially lower emissions from combustion-based generation. Based on the public record and widely available technical information for this class of technology, the application appears to provide data relevant to the findings the Department must evaluate under applicable requirements. The project is expected to supply electricity to a critical load with lower associated air-quality impacts than the natural-gas turbines originally proposed for this site.[1]

I. Fuel cell systems are non-combustion, clean energy generation technology.

A solid oxide fuel cell generates electricity through a direct electrochemical reaction rather than combustion. Fuel and oxygen react across a ceramic electrolyte to produce electric current; there is no flame and no high temperature combustion zone of the kind that drives thermal NOx formation in a turbine or reciprocating engine. The developers of this project have described

[1] Oracle, BorderPlex Digital Assets & Bloom Energy, "Oracle, BorderPlex, and Bloom Energy to Power Project Jupiter with Cleaner, Water-Efficient Fuel Cell Technology" (Apr. 27, 2026), https://www.oracle.com/news/announcement/oracle-borderplex-and-bloom-energy-to-power-project-jupiter-with-fuel-cell-technology-2026-04-27/.

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technology in precisely these terms, and this distinction is the physical reason the technology has negligible emissions.[2]

Because there is no combustion, the formation pathways for nitrogen oxides (NOx) and sulfur oxides (SOx) are largely absent. The manufacturer's published data and independent commentary consistently characterize NOx and SOx output from this technology as negligible relative to reciprocating engines and turbines, even when the cells operate on natural gas.[3]

II. Fuel cell systems are tested and independently certified.

The California Air Resources Board ("CARB") has certified Bloom Energy Servers under its Distributed Generation ("DG") certification program[4]. CARB uses this certification for the cleanest electrical generation sources that are located near the source of electricity consumption and requires third party validated source testing. CARB's DG standards cap NOx at 0.07 lb/MWh, CO at 0.10 lb/MWh, and VOC at 0.02 lb/MWh; to obtain certification, the units underwent independent stack testing confirming NOx, CO, and VOC below those limits. Many California air districts have the most stringent air quality standards in the country (including the two largest, the Bay Area Air Quality Management District and the South Coast Air Quality Management District) and have fuel cell exemptions in their own regulations, which the CARB certification uses as a basis.

The NO_x emission factor reflected in the application—approximately 0.003 lb/MWh—is substantially below the 0.07 lb/MWh emission limit established in the California Air Resources Board (CARB) distributed-generation certification standard. The applicant reports that this value incorporates an additional 15 percent safety margin above test-derived results, and that non-detect measurements were treated conservatively in calculating the factor. These elements indicate that the emission rates presented in the application are based on a recognized certification methodology and on third-party source-test data rather than on manufacturer estimates alone.

III. Fuel cells are among the oldest continuously developed electrochemical technologies.

The fundamental operating principle of fuel cells was first shown in 1839 by Sir William Grove, building on earlier observations by Christian Friedrich Schönbein. The material science underlying

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[2]Bloom Energy, "Bloom Energy Announces Hydrogen Solid Oxide Fuel Cell with 60% Electrical Efficiency …" (Aug. 5, 2024) (describing direct electrochemical conversion versus combustion technologies); see also Bloom Energy, "Everything You Need to Know About Solid Oxide Fuel Cells."

[3]Bloom Energy, "How Bloom Reduces Emissions" (Technical Note) (describing negligible NOx and SOx output; CARB Distributed Generation certification; third-party source testing by Montrose Environmental; reliance on the certification by California air districts, including BAAQMD and SCAQMD; cumulative fleet NOx and SOx reductions; and Ramboll verification of the annual GHG inventory), https://www.bloomenergy.com/wp-content/uploads/bloom-energy-how-bloom-reduces-emissions-technical-note.pdf.

[4]Cal. Air Resources Bd., Distributed Generation Certification Program; emission standards codified at 17 Cal. Code Regs. § 94203 (NOx 0.07, CO 0.10, VOC 0.02 lb/MW-hr); see CARB DG Certification Evaluation Tool, https://ww2.arb.ca.gov/resources/documents/dgcert/dgcert-tool.

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solid oxide fuel cells (SOFCs) emerged in 1899, when Walther Nernst identified that stabilized zirconia conducts oxygen ions at elevated temperatures. This discovery enabled the first ceramic (solid-oxide) fuel cell, demonstrated by Emil Baur and H. Preis in 1937.[5]

Development continued through the 1950s at research institutions in Europe and the United States, and fuel cells were reliable enough to power crewed American spaceflights beginning in the 1960s. Fuel cell systems have demonstrated long-duration reliability in these crewed spaceflights, including the Gemini, Apollo, and Space Shuttle missions, having supplied primary onboard electrical power and potable water for crewed spacecraft for more than half a century.[6]

IV. The commercial platform proposed for this site has a seventeen-year operating record.

Bloom's founder, Dr. K.R. Sridhar, developed the core technology for NASA's Mars program. This electrochemical cell was designed to produce oxygen and fuel on Mars and in 2001 it was adopted for power generation. After field trials in Tennessee, California, and Alaska, the first commercial Energy Servers were delivered to Google in 2008.[7]

In the years since, fuel cell systems and this platform have been utilized by a long list of demanding commercial and industrial customers including Walmart, The Coca-Cola Company, FedEx, eBay, The Home Depot, AT&T, and Bank of America. These customers demand rigorously tested and proven technology to ensure the resilience and reliability of their operations, alongside a requirement for environmental performance to meet their decarbonization objectives. Bloom has deployed more than 200 microgrids across its customer base.[8] The product line proposed here is an advancement of equipment that has been refined through many successive generations of real-world operation.[9]

V. Fuel cell technology is deployed at scale across the globe and proven to be resilient.

Bloom Energy reports a global installed base exceeding 1,000 customer installations in 9 countries, powering businesses and critical infrastructure worldwide, and serving Fortune 500

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[5]On the early history of the fuel cell, see, e.g., Aalto University, "Fuel Cells" (Schönbein 1838–39; Sir William Grove 1839); on solid-oxide chemistry, W. Nernst's 1899 work on zirconia oxygen-ion conduction and E. Baur & H. Preis's first ceramic fuel cell operating at ~1000°C in 1937 (Baur & Preis, Z. Elektrochem. 43(9):727 (1937)); see also Stanford Univ., "Solid Oxide Fuel Cells."

[6]Development accelerated in the 1950s at institutions including the Central Technical Institute (The Hague), Consolidation Coal Co. (Pennsylvania), and General Electric (Schenectady, New York). Fuel cells have also powered crewed U.S. spaceflight since the 1960s (Gemini, Apollo, and the Space Shuttle).

[7]NASA, "Energy Servers Deliver Clean, Affordable Power," NASA Spinoff 2010 (Bloom traces its technology to K.R. Sridhar's NASA Mars-program work; founded as Ion America in 2001; first commercial Energy Server installed 2008). See also Bloom Energy, "Company" timeline, https://www.bloomenergy.com/company/.

[8]Bloom Energy, 2025 Impact Report, https://www.bloomenergy.com/wp-content/uploads/2025-bloom-energy-impact-report.pdf (200+ microgrids deployed; fleet resilience and avoided-downtime statistics).

[9]Bloom Energy, "Company" timeline (first field-trial unit shipped to the University of Tennessee, Chattanooga; Energy Server launch with deployments at Google, Walmart, Coca-Cola, FedEx, and Bank of America; first microgrid at Owens Corning), https://www.bloomenergy.com/company/.

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companies across the data center, semiconductor manufacturing, artificial intelligence (AI) infrastructure, utility, and other industrial sectors.[10] Fuel cell systems and Bloom's modular, fault-tolerant architecture have proven resilient through outages caused by hurricanes, winter storms, wildfires, and other extreme weather and natural disasters.

Reliability is central here because a microgrid is designed to serve as both the primary and emergency backup power source for a critical data center load. Unlike intermittent generation, fuel cells produce electricity continuously and can separate from the grid to carry load through an outage. The already deployed fleet has demonstrated this capability repeatedly under real-world conditions. The fuel cell technology therefore satisfies a significant reliability need while doing so with a far smaller air quality footprint than the combustion equipment that would otherwise be required to serve the same continuous load. The same class of solid oxide fuel cells is in successful commercial service across Asia and Europe, frequently powering large, continuous data center and manufacturing loads which is the application central to this permit application. The following are representative deployments:

Location	Customer / Project	Scale	Significance
United States	Google — first commercial Energy Server	100 kW	The platform's first commercial deployment in 2008; the same product line has run continuously since.
United States	eBay, Walmart, The Coca-Cola Co., FedEx, The Home Depot, AT&T, Bank of America, and many others	Part of 1,000+ sites	Broad, long-running commercial and industrial adoption across many states and climates.
Ohio, United States	Owens Corning	Microgrid	Bloom's first microgrid — resilient, always-on power at commercial scale in 2011; the first of its 200+ microgrids deployed worldwide.
United States	Equinix (data centers)	100+ MW	Providing power to 19 data-center sites in 6 states as of 2025.
Hwasung & Paju, South Korea	SK Engineering & Construction	28 MW	Utility-scale clean energy facilities in Gyeonggi Province deployed in 2020.
South Korea	SK ecoplant partnership	400+ MW deployed	One of the largest solid-oxide fuel-cell markets in the world.
Taiwan	Unimicron (semiconductor substrates / PCBs)	10 MW (initial phase)	Powering precision semiconductor manufacturing.
Bengaluru, India	Nxtra by Airtel (data centers)	500 kW	Powering data-center load — the same application class as the YGI Microgrid.
Italy	Ferrari headquarters	Part of 1,000+ sites	Bloom Energy Servers operate across 9 countries.

[10] Bloom Energy, Annual Report (Form 10-K) (Feb. 9, 2026), https://d18rn0p25nwr6d.cloudfront.net/CIK-0001664703/1259d63b-8944-40da-974c-451082d403f8.pdf (global installed base exceeding 1,000 customer installations in 9 countries).

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Location	Customer / Project	Scale	Significance
Japan	Ene-Farm program (other SOFC manufacturers)	~70,000 units	Mass-market residential solid-oxide fuel cells — evidence the technology class is mature at scale.

Sources for the deployments above: Bloom Energy press releases, https://investor.bloomenergy.com/press-releases/default.aspx.

VI. The project's emissions profile differs materially from the natural-gas combustion turbines originally proposed.

The most direct comparison available is the project's own redesign. When the developers replaced the originally planned natural-gas combustion turbines with a Bloom fuel-cell microgrid, they publicly stated that the change would reduce NOx emissions by approximately 92% and lower water use to a negligible amount. This is a project-specific figure reported by the developer for this site.

Additional published data provides context for how this class of technology performs:

- **Carbon intensity.** Bloom Energy's published CO_2 emission rate for a natural-gas SOFC system is 679–833 lb/MWh. For reference, publicly available EPA data indicate that typical natural-gas power-plant emissions are roughly 960 lb/MWh, and coal generation averages about 2,310 lb/MWh. Fuel cells using natural gas emit CO_2, but at a lower rate per unit of electricity due to higher electrical efficiency.[11]

- **Criteria pollutants.** The manufacturer reports that, across its deployed fleet from 2011 through 2025, cumulative avoided emissions relative to displaced generation total approximately 24 million pounds of NOx and 9 million pounds of SOx. Bloom's annual greenhouse-gas inventory is independently verified by Ramboll.

- **Comparison to combustion technologies.** Combustion-based generators—including natural-gas turbines and diesel backup units—produce NOx as a byproduct of combustion and rely on controls such as selective catalytic reduction to limit emissions. Non-combustion fuel-cell systems do not generate NOx through combustion, resulting in lower reported NOx emissions per MWh.[12]

For a facility of this scale, the resulting permitted totals reflect a comparatively low emissions profile: a generation campus with facility-wide NOx on the order of only tens of tons per year

[11] Bloom Energy ES6.5 Datasheet (CO2 679–833 lb/MWh), as cited in Bloom Energy, "How Bloom Reduces Emissions" (Technical Note); comparison rates of approximately 960 lb CO2/MWh (natural gas) and 2,310 lb CO2/MWh (coal) per U.S. Energy Information Administration data cited therein.

[12] See U.S. EPA, New Source Performance Standards for Stationary Combustion Turbines, 40 C.F.R. pt. 60, subpt. KKKK (best system of emission reduction for NOx is combustion controls, with selective catalytic reduction for certain subcategories), https://www.epa.gov/stationary-sources-air-pollution/stationary-gas-and-combustion-turbines-new-source-performance.

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indicates an emissions intensity that differs significantly from combustion-based technologies at similar output levels.

VII. The record supports each of the required findings.

Under 20.2.72.208 NMAC, the Department issues the permit unless the source would violate an applicable regulation, exceed an NSPS or NESHAP limit, cause or contribute to an exceedance of a national or New Mexico ambient air quality standard, consume unavailable PSD increment, or otherwise violate the Air Quality Control Act. The application before the Department concerns a mature, independently certified, non-combustion technology with more than seventeen years of commercial operating experience across three continents and diverse climatic and load conditions, including the same data center environment in which the YGI Microgrid will operate.

The record demonstrates low certified emission factors, conservative safety margins, extensive real-world performance data, and continuous remote monitoring with automatic shutdown on out-of-range conditions. Solid oxide fuel cells are among the most thoroughly field tested and commercially deployed distributed generation technologies available today, and this record supports required findings. We urge the Department to weigh the clear air quality advantages of this technology against the combustion alternatives it displaces.

VIII. Conclusion.

The California Hydrogen Business Council respectfully requests that the Department (1) record our written interest in Air Quality Permit Application No. 10883, and (2) consider this information in the issuance of the requested construction permit.

We appreciate the opportunity to comment and are available to provide additional information at the Department's request.

Respectfully submitted,

Katrina M. Fritz
President & CEO
California Hydrogen Business Council
Email: kmfritz@californiahydrogen.org
Phone: 860-338-1303