A "Combustion-Free" Power Plant That Reports Combustion Pollutants

What a New Mexico fuel cell permit reveals about the gap between clean-energy marketing and the emissions inventory

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ABSTRACT

An April 2026 air-quality permit application in Doña Ana County, New Mexico, asks regulators to authorize a Bloom Energy fuel cell microgrid that the filing repeatedly describes as generating electricity "without combustion." The same document then reports a maximum-emissions table with tonnages of the very pollutants normally produced by burning fuel: nitrogen oxides, carbon monoxide, and volatile organic compounds. The technology at its core is a solid-oxide fuel cell, which converts natural gas to electricity through an electrochemical reaction rather than a flame. Yet the emissions are large enough that the site qualifies as a major source under federal air-permitting rules, and the filing never explains how a non-combustion process yields combustion-style pollutants. The result is a useful case study in how clean-energy marketing language and the granular reality of an emissions inventory can sit, unreconciled, inside the same legal document.

Keywords: solid-oxide fuel cell; Bloom Energy; New Source Review; Title V; criteria pollutants; desulfurization; startup/shutdown/maintenance; MERPs ozone

1. Introduction

In April 2026, a company called Yucca Growth Infrastructure, LLC, filed an initial air-quality permit application in Doña Ana County, New Mexico, to build a fuel cell microgrid operated by Bloom Energy Corp. Technically it is an initial New Source Review application under 20.2.72.200.A(1) NMAC, the subsection that establishes it as a first-time filing rather than a modification. Fuel cells have become a fashionable answer to a hard problem: how to add reliable electricity for data centers and industrial sites without lighting a furnace. The selling point is right there in the marketing language, electricity generated "without combustion."

But this document is interesting precisely because it undercuts its own framing. The filing classifies the site as a major source under Title V (20.2.70 NMAC), the federal permitting tier reserved for facilities that emit pollutants in significant quantities. The right way to think about this is as a stress test of the "clean" label: a single document where the brochure version and the regulatory version of the same machine sit side by side.

Over the next few years, distributed power and microgrids will keep moving from pilot to procurement, especially for the surging electricity demand from data centers and the desire to avoid waiting years for grid connections. When vendors describe fuel cell electricity as "electrochemical" rather than combustion, buyers may assume negligible air-permit exposure. This filing shows the opposite can be true.

That shift relocates the leverage point. The interesting question is no longer the chemistry of an individual cell, but how regulators treat an aggregated site, what counts as exempt, and whether a "non-combustion" descriptor earns any regulatory relief at all. This filing suggests it does not: the site is a major source regardless of how the electricity is made. It also creates a template. The application relies on continuous full-load operation and uses voluntary ozone modeling to demonstrate a tiny impact. If regulators accept that posture, other fuel cell projects may follow the same path, including similar accounting that treats large natural-gas purge events as exempt. The moats and risks will increasingly live in details that used to feel secondary: sulfur-polishing systems, purge volumes, and how applicants justify their modeling inputs.

2. The Big Idea and How It Works

A solid-oxide fuel cell is less like an engine and more like a battery that you feed. Instead of igniting natural gas to spin a turbine, it pulls the energy out chemically, the way a battery discharges, except the fuel flows in continuously. No flame, no pistons.

Old world. You burn fuel, capture the heat, and accept the smokestack pollutants that combustion creates.

New world. You run an electrochemical reaction at high heat and skip the flame. That is the promise. The twist in this document is that the promise and the pollution coexist: the filing keeps the "no combustion" language while reporting the kinds of emissions that combustion usually explains, and never connects the two.

- **Fuel cleaning.** Pipeline natural gas first passes through a Centralized Desulfurization System of roughly 95 skids, each with two vessels arranged lead/lag (one active, one in reserve) holding 1,370 standard cubic feet each, which strips sulfur out before the gas reaches the cells. Large gas purges during startup, shutdown, or maintenance dominate those event emissions: a single startup event purges about 780,900 standard cubic feet of gas.
- **Electrochemical generation.** The heart of the system is the Bloom Energy Server System, a solid-oxide fuel cell, or SOFC. The filing describes a three-layer ceramic cell, an electrolyte sandwiched between a cathode (air side) and an anode (fuel side), operating at 700 to 900 degrees Celsius, with no precious metals, corrosive acids, or molten materials. At temperature, oxygen ions migrate through the electrolyte from cathode to anode, where they react with hydrogen and carbon monoxide drawn from the natural gas; that reaction releases the electrons that flow out as electricity. Each unit is rated at 325 kilowatts net of alternating-current power, with a minority running at 260 kilowatts, and the application models every unit at maximum rated load for all 8,760 hours in a year, the most conservative assumption possible. The vendor characterizes the depleted anode exhaust, once dried, as roughly 95 percent carbon dioxide, vented to atmosphere.
- **A missing number.** Notably, the filing never states how many units there are or the microgrid's total megawatt capacity, so the project's full scale cannot be determined from the document itself.

3. Implications and Tensions

The emissions table is the story. Despite the repeated "no combustion" framing, the application's maximum-emissions table reports substantial criteria pollutants, the standard regulated air contaminants: nitrogen oxides at 37.20 tons per year, carbon monoxide at 161.21 tons per year, volatile organic compounds at 124.01 tons per year, and sulfur oxides at just 0.08 tons per year. That last figure is reassuringly tiny, exactly what a working sulfur-removal system should produce. The first three are not. These are the kind of numbers that trigger public comment periods, community health reviews, and ongoing monitoring obligations. A technology marketed as an alternative to polluting infrastructure is, in regulatory terms, a major source of the same pollutants.

On secondary pollution, where regulators look at contaminants that form downstream in the atmosphere, the facility is treated as non-major under the Prevention of Significant Deterioration (PSD) program, the federal track that subjects large new sources to stricter review. It voluntarily submitted ozone modeling under New Mexico's Modeling Emissions Review Protocol (MERPs), producing a modeled ozone impact of 0.0915 parts per billion, far below the Environmental Protection Agency's 1.0 parts per billion de minimis level. Secondary fine-particle formation was not modeled because nitrogen oxides and sulfur dioxide each fall below 40 tons per year. The precise posture matters: the site is non-PSD-major for this secondary-formation review while remaining a Title V major source overall.

A near-term consequence is concrete: a facility marketed as combustion-free is, on its own paperwork, a Title V major source. The medium-term, directional consequence is that as these microgrids proliferate near data

centers, expect agencies and the public to demand that emissions inventories, not vendor descriptors, define what "clean firm power" means.

Combustion-free vs. emissions. The deepest tension is internal. The filing asserts non-combustion operation yet reports nitrogen oxides, carbon monoxide, and volatile organic compounds, pollutants normally tied to burning fuel, without ever describing a formation pathway or the equipment that would produce them.

Sulfur story vs. H2S math. The desulfurization system and the near-zero sulfur-oxides figure are consistent with effective sulfur removal. Yet the same table lists hydrogen sulfide at 75.40 tons per year, with no supporting calculation, sitting uneasily beside a system designed to strip sulfur out of the gas. The document does not reconcile these signals.

Identical PM10, PM2.5, and H2S values. Three chemically unrelated pollutants share the exact same value, 75.40 tons per year (17.21 pounds per hour). The text mentions a conservative estimate from reference-method testing but neither explains the identical numbers nor squares them with the vendor's "zero PM" claim. One reading is independent conservative estimates; another is a placeholder or spreadsheet artifact.

Exempted methane. Startup, shutdown, and maintenance emissions are claimed exempt under 20.2.72.202.B(5) NMAC and reported as 0.34 tons per year of VOC and 16.45 tons per year of methane, a potent greenhouse gas sitting outside the routine totals. The figures take the larger of the startup or maintenance event rather than summing them.

Modeling inputs and scale. The MERPs analysis uses a 10-meter stack without justifying that height or disclosing the actual stack design, which bears on dispersion credibility. An attached pipeline tariff sets gas-quality specs, but the filing does not say whether it governs the facility's actual supply. And the SSM premise, that startup and maintenance cannot occur within the same 12-month rolling period, is stated as the applicant's accounting basis rather than an independently verified constraint.

4. Hooks, Takeaways, and For the Nerds

A handful of lines that travel well in conversation:

- "There's a fuel cell permit out of New Mexico that calls itself combustion-free and then lists hundreds of tons of the exact pollutants combustion produces, and never explains the contradiction."
- "The clever part isn't the chemistry, it's that 'no combustion' buys you nothing at the permit counter. It's still a Title V major source."
- "One startup purge is about 780,900 cubic feet of gas, which is why those startup-and-maintenance emissions loom so large, and roughly 16 tons of methane a year gets claimed exempt from the routine totals."
- "Three chemically unrelated pollutants are listed at exactly the same value to four significant figures. That's either a bold coincidence or a placeholder that needs explaining."

If you remember three things. A solid-oxide fuel cell makes electricity from natural gas electrochemically rather than by burning it, which is genuinely different from a turbine; Yet this filing's own emissions table makes the site a Title V major source, so "combustion-free" marketing did not translate into low criteria-pollutant numbers, and the document never reconciles the two; Watch how regulators handle the unexplained hydrogen sulfide figure, the identical pollutant values, and the methane exemption, and whether buyers start judging these microgrids by their inventories rather than their labels.

For the nerds. The SOFC description is classic: a three-layer ceramic cell at 700 to 900 degrees Celsius, per-unit 325 kilowatts net AC (with some 260 kilowatt units), modeled at maximum load all year. The vendor characterizes the dried anode exhaust as roughly 95 percent carbon dioxide, but the permit's binding numbers are the criteria-pollutant tonnages and the startup/shutdown/maintenance accounting, not that exhaust

composition.

Two methodological pivots shape the outcome. First, the secondary-formation posture: non-PSD-major treatment plus voluntary MERPs ozone screening yields a 0.0915 parts per billion increment and avoids secondary fine-particle modeling because nitrogen oxides and sulfur dioxide each sit below 40 tons per year. Second, the exemption under 20.2.72.202.B(5) NMAC, which reports 16.45 tons of methane and 0.34 tons of VOC using the larger of startup or maintenance rather than both.

The open technical frontier here is not the modeling math but source characterization. The document asserts non-combustion operation and reports combustion-associated pollutants without ever describing the mechanism connecting the two. The honest reading is that this gap, along with the sulfur and particulate entries that conflict with the plant's own gas-cleaning design, is simply unexplained in the filing, not something the document lets us resolve.

WHERE SOURCES DISAGREE

How a "non-combustion" process produces NOx, CO, and VOC

The application repeatedly states the SOFC generates electricity "without combustion," yet its emissions table reports tonnages of pollutants normally associated with burning fuel. The application provides no formation pathway or description of ancillary equipment that would account for them

Unresolved: the document asserts non-combustion operation and reports combustion-associated pollutants without ever describing the mechanism connecting the two

The reported H2S emissions of 75.40 tpy

The emissions table lists hydrogen sulfide at 75.40 tpy (17.21 lb/hr), a figure that sits uneasily beside an on-site desulfurization system of ~95 skids designed to remove sulfur and a pipeline tariff capping H2S at ¼ grain per 100 scf — and beside the table's own near-zero SOx figure (0.08 tpy), which is what a working desulfurization system would predict. The application offers no basis for the H2S number

Unresolved: the document provides a value but no supporting calculation or explanation, and it conflicts with the facility's stated sulfur-removal function

The identical PM10, PM2.5, and H2S values (each exactly 75.40 tpy / 17.21 lb/hr)

One reading is that these are independent conservative estimates derived from reference-method testing because the vendor supplies no particulate emission factors. Another reading is that three chemically unrelated pollutants sharing an identical value to four significant figures indicates a placeholder or spreadsheet artifact rather than three separate calculations

Unresolved: the document states the PM figure is a conservative estimate but neither explains the identical values nor reconciles them with the vendor's stated "zero PM emissions."

The total scale of the project

The application gives per-unit ratings (325 kW, with some 260 kW units) but never states the total number of Energy Servers or the microgrid's aggregate megawatt capacity

Unresolved: the document omits the unit count and total output entirely, making the project's full scale indeterminate from the filing

Whether the attached Transwestern tariff describes the actual fuel supply or is illustrative

One reading treats the tariff's gas-quality specifications as the assured supply parameters for the facility. Another treats it as an attached reference spec whose relationship to the project's fuel is never asserted

Unresolved: the application text does not explicitly connect the tariff to the project's fuel-supply or quality assumptions

The basis for the 10 m stack height used in modeling

The MERPs analysis uses a 10 m stack, but the document neither justifies this choice nor discloses the facility's actual stack configuration

Unresolved: the modeling input is stated without any explanation of how it relates to the intended physical design, which bears on the credibility of the dispersion results