



01/20/2016

Melanie Bachman
Connecticut Siting Council
10 Franklin Square
New Britain CT 06051

Dear Executive Director Bachman

This letter is in response to the request for information sent via electronic mail on January 14, 2016 from your office in regards to **PETITION NO. 1204** for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the construction, operation and maintenance of a customer side 500-kilowatt fuel cell for Legrand Wiremold at 60 Woodlawn St in West Hartford CT.

1. Would the fuel cell shut down in the event of a power outage, and if so, does it have "black start" (automatic restart) capability?

BLOOM RESPONSE

The fuel cell, and more specifically the inverters within, are UL1741/IEEE1547 compliant and thus will not operate without a stable utility voltage available. In the event of an outage the fuel cells will not automatically shut down, they will enter a state of stand-by awaiting the return of a stable utility voltage.

When in a state of complete shut down the Bloom fuel cells require a combination of remote and on-site coordination to start up the systems. This work is performed by Bloom employed, trained and certified personnel only, the customer (Legrand) does not control the operation of the system directly.

2. Will the fuel cells have an uninterruptible power module?

BLOOM RESPONSE

This site will not have an uninterruptible power module (UPM) and thus will not have any means to output power in a grid independent capacity at any time

3. What statutes and/or regulations govern fuel cell emissions for the proposed facility?

BLOOM RESPONSE

The emissions standards for this site are governed by LREC Sec. 16-244t.

4. Provide a table showing state criteria thresholds and projected emissions from the proposed facility for all greenhouse gases defined in Regulations of Connecticut State Agencies Section 22a-174-1(49).

BLOOM RESPONSE

Section 22a-174-1(49) references “greenhouse gases” or “CHGs” which is the aggregate of the following six component gases: carbon dioxide (CO2), methane (CH4), nitrous oxides (NOx), sulfur hexafluoride (SF6), any hydrofluorocarbon (HFC) or any perfluorocarbon (PFC)

By virtue of the non-combustion process the Bloom fuel cells virtually eliminate NOx, SOx, CO, VOCs and particulate matter emissions from the energy production process. Similarly there are NO CH4, SF6, HFC or PFC emissions.

Bloom emissions table is as follows:

Emission Type	Bloom Output	LREC allowance
Nitrous Oxides (NOx)	<0.01 lbs/MWh	0.07 lbs/MWh
Carbon Monoxide (CO)	<0.10 lbs/MWh	0.10 lbs/MWh
Sulfur Oxides (SOx)	Negligible	Not Listed
Volatile Organic Compounds (VOCs)	<0.02 lbs/MWh	0.02 lbs/MWh
Carbon Dioxide (CO2) See note 1	735-832 lbs/MWh	Not Listed

Note 1: Carbon Dioxide is measured at Bloom’s stated lifetime efficiency level of 53-60%

5. Propose information regarding available technologies to reduce greenhouse gas emissions from the proposed facility.

BLOOM RESPONSE

Given the Bloom fuel cell emissions do not exceed the allowable amount for this project research has not been done to reduce the gas emissions.

6. Could offsets be used to mitigate air emissions impacts from the facility?

BLOOM REPONSE

At this time research into offsets has not been completed by Bloom as the fuel cells meet the state criteria for emissions.

7. Discuss other mitigation techniques that could be used to offset air emissions from the proposed facility?

BLOOM RESPONSE

At this time research into mitigation techniques has not been completed by Bloom as the fuel cells meet the state criteria for emissions.

8. Natural gas has sulfur dioxide injected as an odorant. Please submit a desulfurization plan narrative for the proposed fuel cell facility containing the following information:
 - a. Chemical reaction overview concerning what substances are produced from the desulfurization process, as well as plans for their containment and transport;

- b. How much solid sulfur oxide would result from the desulfurization process, and methods and locations for containment, transport, and disposal;
- c. Whether any of these desulfurization substances are considered hazardous, and if so, plans for the containment, transport, and disposal of hazardous substances;
- d. Anticipated method of disposal for any other desulfurization substances; and
- e. Whether any gaseous substances resulting from desulfurization can be expected to vent from the fuel cells, as well as the applicable Connecticut Department of Energy and Environmental Protection limits regarding discharge of these gases.

BLOOM RESPONSE

- a. **Substances produced.** The first step in the production of electricity in the Bloom Energy Server is desulfurization -- the removal of the sulfur compounds, which have been added to natural gas as an odorant by natural gas suppliers. This step occurs in a desulfurization unit -- a canister which contains a filter made for this purpose. Sulfur is not "produced" in this process, but is separated from the natural gas in which it was contained. In that process, trace levels of other compounds which are naturally present in natural gas may also adsorb to the filter. Again, these are not "produced" from the process, but are separated from the natural gas in which they were contained. The filter is made up of inert materials.

Containment. The desulfurization process takes place entirely within desulfurization units. These are made of extruded aluminum or zinc-plated steel that are built to last for the life of the Server and beyond. Because they are built to hold natural gas, their structural integrity is essential. That integrity is assured by around the clock monitoring of the servers to detect any leak. Were there a leak, the Server (including the desulfurization operation) would shut down automatically. There has never been a leak from one of the desulfurization canisters.

The structural integrity and leak prevention continues after the desulfurization units are removed from service. At that point, the entry and exit points for the natural gas automatically seal shut. The desulfurization unit remains sealed and is not opened at the site, or anywhere in the State of Connecticut. In this respect, the Bloom system differs from other systems which may have been reviewed by the Sitting Council. Unlike the Bloom desulfurization units, other desulfurization containers are emptied at the site of the fuel cell. At that point, the integrity of the container is necessarily reduced and the applicable regulations change accordingly.

Transportation Within days that a desulfurization unit is taken out of service, it is picked up by a Bloom contractor and taken to a licensed facility outside the State, where the desulfurization unit is opened and the contents are removed. As described above, the desulfurization unit

has complete structural integrity. Its safety as a container for transporting far more hazardous materials has been certified by the Department of Transportation. Specifically, the desulfurization units are certified to the standards set by DOT, the United Nations, IATA, ICAO and IMO as meeting Hazardous Materials Distribution and Packaging requirements. This certification assures that the canisters are secure and have the structural integrity to transport the desulfurization materials safely and without risk of a release.

- b. To the best of our knowledge, solid sulfur oxide is not produced in this process. At the time of canister replacement, the filter materials have essentially the same make up as when they were new. They also have adsorbed a small amount of sulfur odorants, which are filtered from the natural gas stream and accumulated in the sorbent, representing an estimated 0.3 wt.% of the filter materials. Even if there were an unknown or unanticipated generation of solid sulfur oxide as a breakdown product or otherwise, it would be a minute amount and, for the reasons described in the answer to question 1 above, would be fully contained during operation, removal and transportation.
- c. The filter materials in the desulfurization units are all inert substances. None of them are hazardous materials. Adsorbed sulfur compounds do not pose a hazard either in the natural gas, or when the desulfurization units are removed. In addition to sulfur compounds, the filters adsorb trace amounts of benzene, other hydrocarbons and other naturally occurring components of natural gas. When the filter materials no longer provide fully efficient sulfur removal, Bloom removes the desulfurization unit and replaces it with another unit containing a fresh filter. As described in the response to question 8a above, the units seal automatically upon removal and are shipped within 1 week to a licensed facility in Texas. In removal and transportation of these desulfurization units, Bloom takes a number of additional safety measures. First, as described above, the units themselves are completely sealed, they are certified by the DOT as having sufficient structural integrity to be used for shipment of hazardous materials and hazardous wastes, and they are not opened until they reach Texas. Second, from the time they are removed from service until they are opened in Texas by trained personnel, an electronic record is maintained which documents, among other things, the date of removal from the Server, the anticipated and actual date of pick-up, the identity of the entity of the transporter, the date that shipment is expected and in fact arrives at the transfer facility in Texas, the date the unit is opened, the date the contents are removed and transported for reclamation and for disposition, the identity of the reclaimer or transporter and the date the unit arrived at its destination, and the ultimate disposition. These records are available for inspection by government inspectors. After the contents are removed from the desulfurization units, they are cleaned and re-used. The Texas facility is fully licensed, registered with the Texas Commission on Environmental Quality and serves as the waste generator. Once the units are opened, about 20% of the filter material, which contains copper, is sent for reclamation. The remainder is typically managed as a hazardous waste

and shipped to a licensed hazardous waste disposal facility, in compliance with requirements applicable to such shipments.

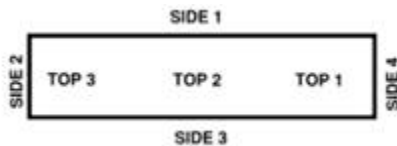
- d. All contents of the desulfurization units remain in the units until they arrive at the licensed facility in Texas and are managed as described above.
 - e. The desulfurization materials are entirely contained in containers which are built not to leak or vent, are monitored to assure they do not, and have not leaked or vented.
9. Please provide a noise analysis for the proposed facility that shows compliance with state noise regulations at the property boundaries.

BLOOM RESPONSE

The Bloom fuel cell sound data at multiple frequencies and faces of the system is as follows:

Surface	ES-5 Sound Power [dB]							LwA
	63	125	250	500	1000	2000	4000	
Side 1	86.0	81.0	83.0	80.8	78.5	75.2	66.8	83.2
Side 2	69.5	70.4	71.3	66.9	64.2	62.7	54.1	69.9
Side 3	75.9	80.4	82.2	77.1	70.8	71.2	62.8	79.1
Side 4	67.1	64.3	63.4	64.3	58.4	61.9	54.0	66.7
Top 1	67.5	71.2	72.7	73.8	68.4	70.2	70.4	76.9
Top 2	74.0	76.6	76.1	73.4	71.5	69.0	61.7	76.4
Top 3	72.4	77.2	76.6	72.9	71.7	69.2	61.5	76.4
TOTAL	87.0	85.6	86.8	83.9	80.8	78.8	73.2	86.4

Table 3: Delaware ES-5 Fuel Cell Sound Power with correction applied to the 2kHz band for surface "Top 1"



Note: Side 1 indicates the front of each fuel cell system

The closest property perimeter will be approximately 125 feet from the edge of the fuel cell and at that distance the estimated sound levels as a direct result of the fuel cells will be <50dBA. Per the local code chapter 123-10-A(1) the lowest allowable sound level permitted is 51dBA at night time. We were directed to this code by the town planner in West Hartford CT.

It should be noted this estimate does not take into account all existing environmental factors at the install site, but a full sound study will be completed to ensure that proper dBA levels are adhered to.

I hope these responses satisfy the CSC requests at this time.

For any additional questions or concerns please feel free to reach out to my directly.

Regards,

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