

My name is Amy Roe and I live in Newark.

It is my privilege to deliver to you a printed copy of the written comments submitted by Lindsay Leveen, who lives in California and is unable to appear at this hearing in person. Mr. Leveen is an award winning chemical engineer and journalist. For the sake of time, I will summarize Mr. Leveen's testimony.

Bloom provides false information on each application, and has repeatedly misrepresented its greenhouse gas emissions to DNREC since 2012.

The way that Bloom has calculated CO2 emissions per mWh is not consistent with how the US EPA calculates emissions for natural gas. Bloom is therefore underestimating its greenhouse gas emissions in a manner that is lower than what the EPA would calculate, and Bloom uses this underestimated figure throughout the application.

Bloom also appears to be underestimating the emissions of Volatile Organic Compounds because it relies upon statistically insignificant data points from three tests with widely varying emissions levels. DNREC should disregard any claims by Bloom that it will lower VOC emissions.

Bloom seemingly ignores SO2 emissions in the applications, even though SO2 is a natural byproduct of its energy production process. This could be interpreted to mean that Bloom is removing all the sulfur from the natural gas via their desulfurization tanks. Yet Bloom is silent in the Application on the handling of this waste, the fate of which should be described.

Bloom uses a capacity factor of 100% for all the megawatts installed to calculate its natural gas consumption. 100% capacity factor is not possible in the real world, which raises questions about the actual consumption that the facility will need.

As reported to Delaware's Public Service Commission, Bloom's capacity factor has been low due to their need to "decoke" the units 3 to 4% of the time. The process of "decoking" creates air emissions, yet these emissions are not quantified in the air permit application.

The amount of waste that Bloom is allowed to generate is limited by its Coastal Zone Act permit. How will the waste products generated by Bloom be categorized by DNREC and how can this be done without violating their Coastal Zone Act permit?

We ask DNREC to do the following:

- Require Bloom to provide accurate and statistically meaningful data on air emissions.
- Require Bloom provide a detailed demolition plan with full disclosure of the mass of solid waste and the method of disposing of the solid waste.
- Require Bloom to provide public assurance that they will not claim investment tax credits for this maintenance.

- Require Bloom to provide details of their agreement with Credit Suisse on how funds will be disbursed.
- Require Bloom to justify why they are installing fewer megawatts of nameplate capacity for this upgrade than were installed in 2012.

Thank you for the opportunity to speak. As noted, I have a written copy of Mr. Leveens full testimony for the hearing record.

January 10, 2019

Comments for the Public Record DNREC Hearing on Bloom Energy On January 10, 2019 by Lindsay Leveen to be read into the record by Amy Roe.

On October 23, 2018, Mr. Mark Mesler a Vice President of Bloom Energy submitted two requests for "maintenance upgrades stationary sources" to Mr. David Fees of DE DNREC. The first was for 2.6 megawatts of fuel cells at Brookside and the second was for 24.9 megawatts of fuel cells at Red Lion. These letters and the accompanying supporting documents are in the public record and have been reviewed by Lindsay Leveen. For reference these will be called the Brookside Permit Application and the Red Lion Permit Application. Collectively called The Applications

Lindsay Leveen is an award winning chemical engineer as well as an award winning journalist. He wrote a university textbook on hydrogen, green energy, and sustainability. He lives in California and is unable to appear in person. Hence Ms. Amy Roe is reading this into the record

On the front page of each application, Bloom makes the false statement that the existing fuel cells emit only 773 pounds of CO<sub>2</sub> per megawatt hour. Facts have proved that Bloom lied in their original permit applications back in 2012 regarding CO<sub>2</sub> emissions being only 773 pounds per megawatt hour. Bloom then provides false data on page 1 of each application that the new fuel cells will only emit 700 pounds of CO<sub>2</sub> per megawatt hour. This again is a lie.

In the same table of the Application Bloom then claims the new units will emit only 0.016 pounds of VOCs per megawatt hour. This claim is based on data in the body of the Application in which Bloom refers to three tests for VOC emissions. These three tests have widely varying amounts of VOC emissions and in fact the standard deviation of the three data points is essentially as large as the mean of the data points. Hence the data provided by Bloom on VOC emissions is statistically insignificant and cannot be relied up. DNREC should disregard any claims by Bloom to lower VOC emissions.

In the Application Bloom shows a Flow Diagram stating the million BTUs of natural gas needed per hour per machine. This heat rate is 6.2 million BTUS per megawatt hour. The US EPA uses an emission rate of 117 pounds of CO<sub>2</sub> per million BTUs of natural gas. Multiplying 6.2 by 117 we have Bloom in the body of the Application now claiming they emit 725.4 pounds of CO<sub>2</sub> per megawatt hour not the 700 pounds in the table on the first page. But later on in the body of the Application Bloom again uses the value of 700 pounds of CO<sub>2</sub> emissions per megawatt hour. The Application is full of such inconsistency.

Within the Application Bloom states the quantity of natural gas in standard cubic feet that will be used at each site in a year. These values are based on the 6.2 million BTU per megawatt hour and capacity factor of 100% for all the megawatts installed. The 100% capacity factor is pure poppy cock and will never happen in the real world.

Within the permit Application bloom uses the 700 pounds of CO<sub>2</sub> per megawatt hour to calculate the tons of CO<sub>2</sub> they will emit in a year. Again, this mass of CO<sub>2</sub> does not equate to how the US EPA calculates emissions for natural gas. The CO<sub>2</sub> emissions Bloom gives are lower than what the EPA would calculate. This proves Bloom is again understating CO<sub>2</sub> emissions.

Bloom does not list SO<sub>2</sub> emissions in the tables in the front page of the Applications. This means that Bloom is removing all the sulfur from the natural gas via their desulfurization tanks. Bloom is silent in

the Application on the handling of the desulfurization waste. The citizens of Delaware must be told what happens with the desulfurization waste.

For several years Bloom told Delaware's Public Service Commission, the PSC, that the reason their capacity factor was low was because they had to "decoke" the units 3 to 4% of the time. When I pointed this out to DNREC, thus introducing air quality and the environment into the discussions, Bloom immediately rebranded. What was labeled "decoking" became "performance improvements" – and who can object to improving performance? You can change the label, but, of course, this is still "decoking". All natural gas reformers experience some coking, which is when carbon instead of carbon monoxide is formed. Bloom has the same problem and must decock every one of their servers to achieve operating efficiencies, which, by the way, degrade over time. Delaware was a test case for Bloom, who had little experience on server performance over time. I have collected and studied 6 years of Bloom's monthly performance reports and can tell you, as an author of a college text book on fuel cell operation, Bloom's concern is more than justified.

So how does "decoking" connect with air quality? The short answer is decoking creates emissions. All natural gas reformers, like Bloom, experience some coking where carbon instead of carbon monoxide is formed. Bloom uses natural gas and, accordingly, has this problem in their fuel cells. Most refineries and companies like Air Products and Bloom will decock via using superheated steam to remove the carbon from the surface of the catalysts. When this is done there are emissions of fine particulate as well as gases formed in the steaming of the catalyst. Loose pieces of catalyst can also become entrained in the effluent. Bloom has been silent over the existence of these emissions. This air quality committee must require Bloom to account for these emissions in a transparent process.

Bloom is limited to remove only 500 pounds a year of metal waste from Red Lion in the existing CZA permit. The demolition of the existing fuel cells will cause much more metal waste than this. Bloom is likewise limited to removing 10,000 pounds a year of E waste from Red Lion. Will DNREC consider the used fuel cells with catalysts such as Scandium to be E waste or catalyst waste? DNREC must provide citizens the answer to this.

Will DNREC mandate, at it should, that Bloom provide accurate and statistically meaningful data on air emissions? DNREC must do this.

Will DNREC mandate that Bloom provide a detail demolition plan with full disclosure of the mass of solid waste and the method of disposing of the solid waste? DNREC must do this.

To protect all US taxpayer, DNREC must have Bloom assure the public that they will not double dip and claim the 30% investment tax credit on the value of the project they claim is a "maintenance upgrade to stationary sources". The reinstated tax credits are not intended for "maintenance upgrades".

To protect Delmarva Ratepayer, DNREC must have Bloom provide details of their agreement with Credit Suisse on how funds will be disbursed from the Delaware power project over the next fifteen year to both Bloom and Credit Suisse and why suddenly this "maintenance upgrade" will be done when for several years Bloom has deferred maintenance even though Bloom extracts approximately \$15 million a year in service fees for the existing project in Delaware.

DNREC must quiz Bloom why they are installing less nameplate capacity now than they did in 2012? 27.5 megawatts are less than the 29.8 megawatts that were installed originally. Is this because the actual efficiency of the new fuel cells is less than the efficiency lied about and claimed back in 2012?

DNREC must quiz Bloom why Bloom states in the Applications they installed only 29.8 megawatts in the original projects at Red Lion and Brookside combined. Bloom and Delmarva Power and Light have told the DE PSC for many years that 30 megawatts were installed. Why does Bloom have a different nameplate capacity in their cover letter for Red Lion permit application? This must be investigated by DE DNREC and DE PSC. DNREC must investigate the historic usage of natural gas month by month and sanction Bloom if they exceeded the maximum quantity of hourly average natural gas permitted.

It makes absolutely no sense if Bloom's claims of improved efficiency are true, that they will install less capacity now than they did in 2012. It makes no sense for them to forgo \$3 million a year in ratepayer subsidies if they have such magnificently efficient fuel cells now. It only makes sense that they install less capacity now versus originally if and only if Bloom lied like crazy about efficiency back in 2012. For over six years I have tenaciously asked DE DOJ to investigate the Bloomdoggie. The Bloomdoggie is the largest eco-fraud of the 21st century. It is Solyndra times Eight and Flint on Steroids.