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## **Report: Balico Proposal Impact Analysis**

### **Executive Summary**

- This report analyzes the health impacts and related costs associated with increased exposure to fine particulate matter (PM<sub>2.5</sub>) that would result from the 3,500-megawatt natural gas-fired power plant proposed by Balico, LLC. PM<sub>2.5</sub> is a particularly serious form of air pollution. Public health experts agree that no level of PM<sub>2.5</sub> exposure is safe. The most serious health impacts occur when PM<sub>2.5</sub> levels in an area exceed 0.1 micrograms per cubic meter (µg/m<sup>3</sup>) for prolonged periods of time. Exposure at this level can be expected to cause severe impacts, including increased hospitalizations due to heart attack, pneumonia, cardiovascular issues or, in some cases, stroke or cancer.
- Based on conservative assumptions, Balico's proposed power plant would emit at least 326.53 tons of PM<sub>2.5</sub> per year.
- Over one quarter of the plant's PM<sub>2.5</sub> emissions (27%) will affect Pittsylvania County, which will also experience the highest concentrations of PM<sub>2.5</sub>, and 52% of all emissions will affect Virginia. The remaining 48% of emissions will affect North Carolina (47%) and South Carolina (1%), although at lower concentrations of PM<sub>2.5</sub>.
- Dispersion modeling of these emissions reveals that more than 1,282,000 people would experience additional PM<sub>2.5</sub> exposure in Virginia and North Carolina. Of those, more than 17,500 people would be exposed to increased PM<sub>2.5</sub> concentration greater than 0.1 µg/m<sup>3</sup>, all in Pittsylvania County, Virginia.
- The Pittsylvania County population that would be most affected is older and less wealthy than the Virginia average, making them more vulnerable to the most severe health impacts of PM<sub>2.5</sub> exposure.
- According to the EPA COBRA tool, conservative estimates reveal that the Balico gas plant proposal, if built, could result in upwards of \$31M in healthcare related costs annually due to increased disease burden on impacted communities, increasing to \$48M annually by 2040. These annual figures result in more than \$625M in cumulative healthcare related costs by 2040.

### **Introduction**

Researchers from the lab of Dr. Francesca Dominici, Chair of the Harvard Data Science Initiative and Professor in the School of Public Health at Harvard University, have prepared this





report analyzing the impact of the 3,500-megawatt natural gas power plant that Balico has proposed to the Pittsylvania County Board of Supervisors (the “Balico proposal”). As explained below, Balico’s proposed gas plant would increase the concentration of air pollution in communities in Pittsylvania County and beyond. These changes to air quality, and the economic cost of the resulting health impacts, have not been quantified to date in any of Balico’s application materials and presentations. This report seeks to quantify some of those impacts.

### *Built on peer-reviewed research*

The Dominici Lab’s work builds on decades of robust research on the public health impacts of air pollution.<sup>1</sup> The research team applies causal inference AI to data on emissions to model the movement through the air (dispersion) of particulate matter emitted by power generation to quantify changes in air quality, and to identify the communities that would be most impacted by those changes. For the purposes of this report, the analysis focuses on a specific type of pollution called PM<sub>2.5</sub>, a fine particulate matter. The team can then estimate the economic impact of increased health burdens due to power plant air pollution based on data reported by the EPA.<sup>2</sup> Please see Appendix 1 for additional details on the underlying datasets that the Dominici lab uses to perform its analyses.

### *What is PM<sub>2.5</sub>, and why does it matter?*

PM<sub>2.5</sub> is a harmful air pollutant that contributes to poor air quality. Exposure to PM<sub>2.5</sub> is linked to adverse health outcomes such as respiratory and cardiovascular illnesses, asthma, and, in more severe cases, heart attack, stroke, and cancer.<sup>3</sup>

PM<sub>2.5</sub> is made up of solid particles and liquid droplets in suspension created by the chemical reactions of a collection of gases: nitrous oxides (particulate nitrate’s precursor) and sulfur oxides (particulate sulfate’s precursor). These chemical reactions occur due to industrial processes, like the combustion of fossil fuels, and through natural events, like wildfires or dust storms. The “2.5” refers to the size of the particles, which have a diameter of smaller than 2.5 micrometers. For comparison, “the average human hair is about 70 micrometers in diameter – making it 30 times larger than the largest fine particle.”<sup>4</sup> Its tiny size allows it to penetrate deep into the lungs and even enter the bloodstream.

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<sup>1</sup> See “Measuring The Impact of Air Pollution on Health Care Costs,” [Health Affairs](#), Dec. 2020; See also “Short term exposure to fine particulate matter and hospital admission risks and costs in the Medicare population: time stratified, case crossover study,” [The BMJ](#), Nov. 2019; See additional references on EPA portal, “Research on Health Effects from Air Pollution,” [EPA](#). Accessed March 25, 2025.

<sup>2</sup> For more information, please review publications from the Dominici Lab: [one on cryptocurrency](#) data centers and their health impacts on communities published in *Nature Communications* March 2025, and another [on emissions overall](#) and the Dominici Lab’s methodology for determining data center impact under peer review.

<sup>3</sup> See “Measuring The Impact of Air Pollution on Health Care Costs,” [Health Affairs](#), Dec. 2020; See also “Short term exposure to fine particulate matter and hospital admission risks and costs in the Medicare population: time stratified, case crossover study,” [The BMJ](#), Nov. 2019; See additional references on EPA portal, “Research on Health Effects from Air Pollution,” [EPA](#). Accessed March 25, 2025.

<sup>4</sup> [EPA](#), “Particulate Matter (PM) Basics,” Accessed March 26, 2025.





There is no safe level of human exposure to PM<sub>2.5</sub>.<sup>5</sup> The most serious health impacts occur when PM<sub>2.5</sub> levels in an area exceed 0.1 micrograms per cubic meter (µg/m<sup>3</sup>) for prolonged periods of time. Exposure at this level correlates with severe impacts, including increased hospitalizations due to heart attack, pneumonia, cardiovascular issues or, in some cases, stroke or cancer. 95% of all deaths linked to air pollution can be attributed to PM<sub>2.5</sub>.<sup>6</sup>

The combustion of fossil fuels always releases fine particulate matter. Advanced technologies like scrubbers or filters reduce, but cannot eliminate, the release of particulate matter.

## Part 1. Estimating Total Volume of PM<sub>2.5</sub> Pollution

### *Project scope*

For this report, the researchers focused on analyzing the permanent power source described in the Balico proposal:

- A 3,500-megawatt natural gas plant using stationary Mitsubishi 501JAC turbines in a simple cycle configuration utilizing SCR and oxidation catalyst control technologies.

The research team reviewed the Conceptual Plan that Balico submitted to the Pittsylvania County Board of Supervisors, as well as slides that Balico's representatives displayed in their March 6, 2025 meeting at the Gretna Theater, both attached as Appendix 2.

It is important to point out that this analysis of the Balico proposal is focused on the air quality and resulting health impacts of PM<sub>2.5</sub> emitted by the proposed natural gas plant. It does not evaluate or consider any additional impact metrics related to the operations of the future plant (i.e., water consumption, noise, biodiversity loss due to land use change, etc.). In addition, the report does not consider any emissions from diesel generators that may be required as a backup source of energy generation. It is limited to permanent turbine performance.

### *Establishing a baseline*

To estimate emissions from the proposed gas plant, the research team analyzed reported emissions data from two currently operating gas plants using turbines from the same Mitsubishi J Series that Balico proposes to use. The J Series includes both M501J and M501JAC turbines. Though Balico has proposed to use M501JAC turbines, there are currently no M501JAC turbines operating in simple cycle in the United States. The first project to be approved, at the Grand River Energy Center ("GREC") in Oklahoma, is projected to come online in 2026,

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<sup>5</sup> [American Lung Association](#), "Particulate Pollution," Updated Feb. 4, 2025. Accessed April 9, 2025.

<sup>6</sup> [Christopher W. Tessum et al.](#), "InMAP A model for air pollution interventions," *PLoSOne*, April 2017.





replacing a coal-fired power unit.<sup>7</sup> Therefore, for the purposes of establishing a baseline comparison for this study, the research team analyzed reported emissions data from two plants in the mid-Atlantic region where M501J turbines are in operation: the Greensville (Virginia) County Power Station (three M501J turbines), and the Tenaska (Pennsylvania) Westmoreland Generating Station (two M501J turbines).

The M501J and M501JAC turbines are identical in design with the exception of their internal cooling mechanism, which, according to Mitsubishi specifications, would not be anticipated to make any appreciable difference in their emissions numbers.<sup>8</sup> Further, in both facilities used to establish a baseline, M501J combined cycle combustion engines are used with natural gas-fired duct burners, controlled by selective catalytic reduction (“SCR”) systems and oxidation catalysts—features Balico has noted it expects to use with its proposal. The similarities between the M501J turbines in the two benchmark examples and the M501JAC turbines Balico has proposed make them the most appropriate available baseline for assessing the pollution emissions from Balico’s proposal.

However, it is important to note that both benchmark gas plants operate in combined cycle formation, rather than the simple cycle configuration put forward by Balico. This is significant because the combined cycle formation being used in the two benchmark examples is a more efficient and less polluting method of turbine operation than the simple cycle formation Balico is proposing, and this is true for both the M501J turbines and the M501JAC turbines.<sup>9</sup> By basing analysis on emissions estimates drawn from combined cycle plants, this report undercounts the total PM<sub>2.5</sub> pollution Balico’s proposal would generate, because it does not capture the additional emissions that would come from Balico’s plans to operate its plant at the lower efficiency levels of a simple cycle configuration. This makes the results presented below conservative estimates of the emissions and resulting economic damage expected from Balico’s proposal.

Additional details about the performance of the M501J and M501JAC series in simple cycle versus combined cycle configuration may be found in Appendix 3.

## Part 2. Methodology

1. Collected data on Greensville and Tenaska power plants to develop a baseline:
  - Retrieved their emissions based on EPA reported emissions of PM<sub>2.5</sub>. Appendix 4 shows the emissions of each plant from 2019 - 2021.<sup>10</sup>

<sup>7</sup> “Mitsubishi Power Selected to Supply Second Advanced Class Gas Turbine to Oklahoma’s Grand River Energy Center,” [Mitsubishi Power Americas](#), 10/4/23. Accessed March 25, 2025.

<sup>8</sup> Mitsubishi reports that the NO<sub>x</sub> and CO emissions of the 501J and JAC turbines in simple cycle are the same (25 ppm at 15% O<sub>2</sub> NO<sub>x</sub> and 9 ppm at 15% O<sub>2</sub> CO). Our assumption is that PM<sub>2.5</sub> emissions would behave similarly and therefore no appreciable difference is considered.

<sup>9</sup> Mitsubishi reports efficiency of the 501J and JAC turbines in simple cycle are 42.1% LHV for the 501J and 44.0% LHV for the 501JAC. In combined cycle, Mitsubishi reports that the efficiency jumps for the 501J and 501JAC from 42.1% and 44% to 62.2% and >64.2%, respectively.

<sup>10</sup> Source data: [EPA e-grid](#) and EPA PM<sub>2.5</sub>, accessed March 13, 2025. Note: EPA PM<sub>2.5</sub> data is revised every five years; data is available through 2021.



- Reviewed final permits approved by Virginia Department of Environmental Quality to understand emissions controls in place for Greenville<sup>11</sup>
- Reviewed interim permits for Tenaska Westmoreland Generation Station in Pennsylvania<sup>12</sup>
- 2. The team divided tons of PM<sub>2.5</sub> emitted by net generation<sup>13</sup> (in MWh) for each plant in 2019, 2020, and 2021 (most recent year with actual PM<sub>2.5</sub> data provided by EPA). This is the coefficient of emissions. The average value, 0.0284 µg PM<sub>2.5</sub> / MWh, is used as the input for the dispersion model. See Appendix 4 for details.
- 3. Simulated the 3,500-megawatt power plant emissions using the InMap dispersion model, a scientifically validated algorithm. Details provided below in the Emissions Findings section.
  - Key inputs for the model:
    - Location: geographic coordinates
    - Emissions factor: computed as described above, resulting in conservative estimate due to baseline plants' combined cycle configuration versus proposed simple cycle configuration
    - Uptime: assumed 0.75 uptime aligned with representative plant uptime data and pressure tested with sensitivity analysis
    - Height of emissions stack: considered 180 ft. tall stacks as described by the applicant
    - Start-up/Shut-down: assumed highest operational efficiency with limited start-up and shut-down
- 4. Overlaid dispersion model with U.S. Census tract data to determine local impact
- 5. Utilized tons PM<sub>2.5</sub> (calculated for power plant emissions simulation) to run a scenario in the EPA COBRA web tool to estimate economic value of health care costs associated with additional burden due to PM<sub>2.5</sub> exposure

### Part 3. Emissions Findings

#### *Modeling the resulting concentration of PM<sub>2.5</sub> in communities*

The research team focused on determining additional PM<sub>2.5</sub> exposure from the proposed Balico power plant. Once emissions factors were identified using the baseline data explained above, the research team ran a simulation of the proposed 3,500-megawatt Balico gas-fired power

<sup>11</sup> [Virginia Electric and Power Company - Greenville Co. Power Station Permit](#) dated July 2, 2021. Date of access: March 19, 2025.

<sup>12</sup> Located in South Huntingdon Township, PA. [Temporary permit](#) approved by the PA Department of Environmental Protection. Accessed March 19, 2025. Tenaska has not received a final Title V air quality permit since beginning operations in 2018; applied officially in 2024. Tenaska is [ranked one of the top 12 polluters](#) in the state and is well-known to exceed EPA limits on emissions in its operations.

<sup>13</sup> Net generation is defined as the amount of electricity produced by a power plant minus the amount of electricity consumed by the plant for its own operations.



plant using the InMAP dispersion model methodology. InMAP is considered the best-in-class model for determining particulate matter dispersion.<sup>14</sup>

|                           | PM <sub>2.5</sub> |
|---------------------------|-------------------|
| Emissions (tons per year) | 326.53            |

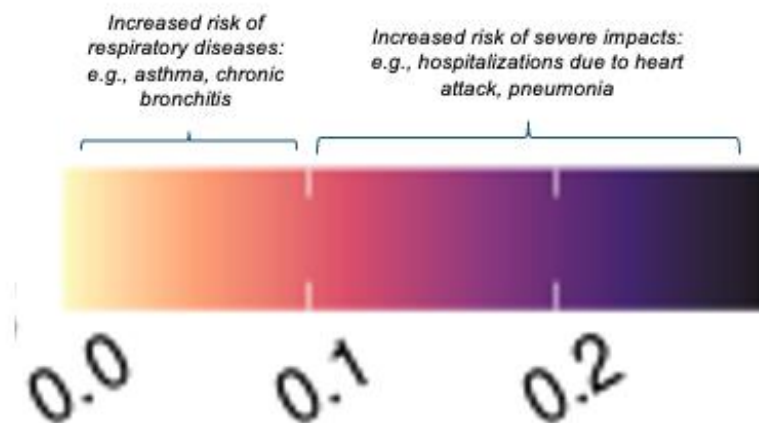
Figure 1. Total emissions from proposed 3,500-megawatt Balico plant proposal.

The resulting simulation shows that Balico's proposed power plant would have far-reaching health impacts on Pittsylvania County communities and beyond County limits. The highest concentrations would be felt by Pittsylvania County (26.88%), followed by Halifax County (9.20%), and Mecklenburg County (2.94%).

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**Spotlight: How can we interpret PM<sub>2.5</sub> concentrations and impact on population health?**

**PM<sub>2.5</sub> Concentration – Health impact over time**



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<sup>14</sup> [Christopher W. Tessum et al.](#) "InMAP A model for air pollution interventions," *PLoSOne*, April 2017. As described: "InMAP is designed to provide estimates of air pollution health impacts resulting from marginal changes in pollutant emissions... InMAP combines spatially-resolved annual-average physical and chemical information derived from a state-of-the-science CTM [Chemical Transportation Models]... with simplifying assumptions regarding atmospheric chemistry for cases of marginal changes in emissions. InMAP is developed here to predict changes in annual average exposure to PM<sub>2.5</sub>; ... that outcome is estimated to cause 95% of air quality-related mortalities. The model is also able to predict changes in concentrations of several other pollutants. Features of InMAP include reductions in computational cost relative to CTMs, yet with more spatially detailed results than are available with existing reduced-complexity models, a variable-resolution grid that focuses on human exposures by employing higher spatial resolution in urban areas and lower spatial resolution in rural and remote locations and at high altitude; and the ability to account for spatially variable aspects of secondary PM<sub>2.5</sub> formation while also being amenable to running many scenarios and theoretically simple enough for use by non-experts" (p. 2).

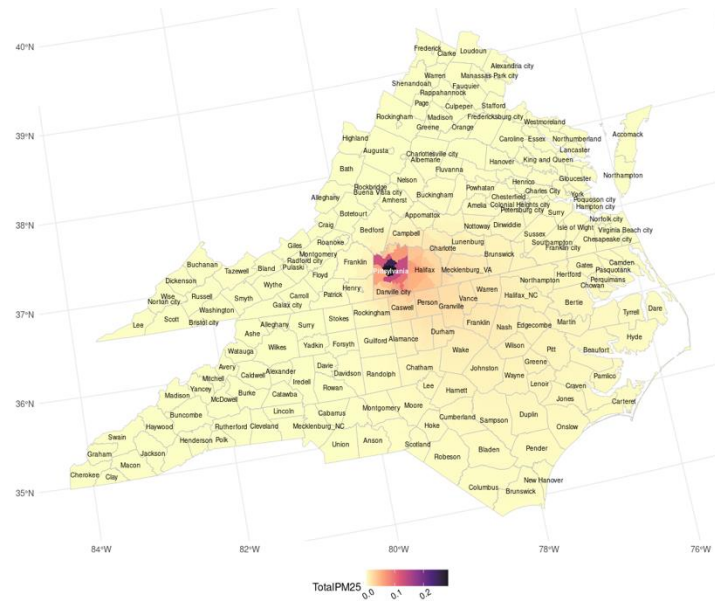


Figure 2. Results of dispersion model: Annual additional  $PM_{2.5}$  emissions from proposed 3,500-megawatt Balico plant using InMAP model. All numbers in  $\mu g/m^3$  for Figures 2 and 3.

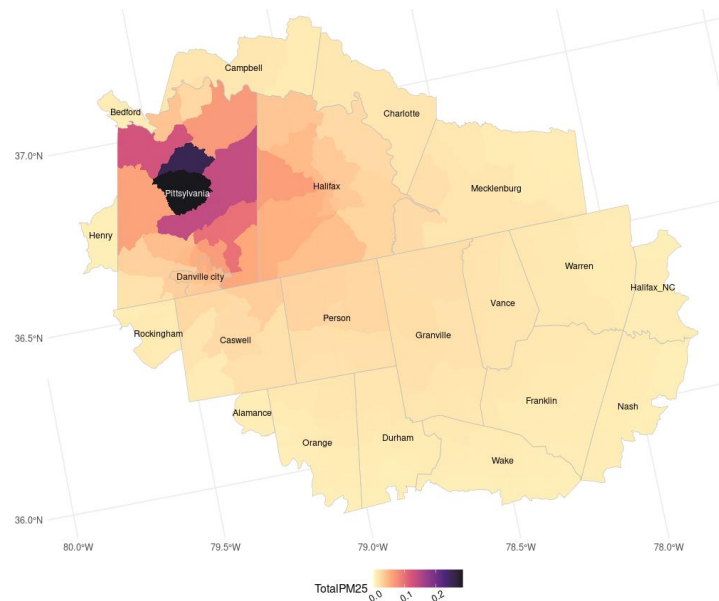


Figure 3. Results of dispersion model: Annual additional  $PM_{2.5}$  emissions from proposed 3,500-megawatt Balico plant using InMAP model. County mapping to U.S. Census Tract data.





As demonstrated by these plots, the most significant PM<sub>2.5</sub> impacts will be felt by Pittsylvania County – 26.88% of emissions are concentrated in Pittsylvania. Other localities in Virginia will also experience increased PM<sub>2.5</sub> exposure (most affected being Halifax receiving 9.20% of attributable emissions and Mecklenburg 2.94%), with Virginia bearing the burden of 51.84% of the total PM<sub>2.5</sub> exposure. The impact will be felt into North Carolina, where 46.97% of the PM<sub>2.5</sub> will disperse, and into South Carolina (0.89%), although this exposure is expected to have limited health impacts given the lower concentration experienced by these counties.

## Part 4. Health Impact Findings

### *Socio-economic impact analysis*

The socio-economic analysis reveals that, on average, the Census Tracts that would experience an increase in PM<sub>2.5</sub> concentrations above 0.10 µg/m<sup>3</sup> are characterized by an older population, lower median household income, and a poverty rate almost double that of Virginia's state average. Additionally, the racial composition of these tracts shows an overrepresentation of Black individuals as compared to Virginia's statewide average, while both Hispanic and Asian populations are underrepresented. Furthermore, the median property value in these tracts is less than half of the state's population-weighted average.

Based on the research team's analysis, as a direct result of Balico's proposed gas plant:

- **1,282,066** people would be affected by at least a 0.01 µg/m<sup>3</sup> increase in PM<sub>2.5</sub> concentrations
- Of those, **17,653** people would be affected by at least a **0.1 µg/m<sup>3</sup>** increase in PM<sub>2.5</sub> concentrations. These people are concentrated in six specific Census Tracts, all of them located within Pittsylvania County: Census Tract 105, 106, 109, 107, 103.02, 108.01
- The composition of these Census Tracts is as follows:
  - Ethnicity and age**
    - White: 69.1% (vs. 63.46% Virginia average)
    - Black: 25.49% (vs. 18.90% Virginia average)
    - Hispanic: 3.33% (vs. 10.03% Virginia average)
    - Asian: 0.36 % (vs. 6.85% Virginia average)
    - People over 65 years of age: 23.51% (vs. 16.01% Virginia average)
  - Economic status (population-weighted)**
    - Poverty rate: 18.51% (vs. 10.16% Virginia average)
    - Median Household Income: \$49,647 (vs. \$100,268 Virginia average)
    - Median Property Value: \$140,567 (vs. \$381,843.2 Virginia average)





### *Health costs from increased exposure to PM<sub>2.5</sub> pollution*

Based on EPA analysis, every ton of PM<sub>2.5</sub> *avoided* from electricity-generating units has, on average, a benefit of \$110,000 in terms of reduced mortality and morbidity. Mortality refers to reduced life expectancy due to prolonged exposure to a pollutant, and morbidity refers to diseases or ailments that arise due to prolonged exposure, such as respiratory and cardiovascular illnesses, asthma, and, in more severe cases, stroke and cancer.<sup>15</sup> Based on the baseline amount of PM<sub>2.5</sub> exposure and other health factors present in a particular population, this \$110,000 number may adjust. For example, in a population that is relatively older and has other co-morbidities present, this value may increase; in a population in an area with otherwise low exposure to PM<sub>2.5</sub> (i.e., no fossil fuel-power plants nearby), this number may increase as well due to the impacts of a change in exposure to otherwise healthy individuals.

### *Health related economic impacts from proposed gas plant*

The Dominici Lab compared its scientifically-backed research to publicly-available data through the EPA COBRA database and the *Technical Support* document referenced throughout this report to derive an economic impact quantifying the expected cost of the Balico gas plant to the healthcare system.<sup>16</sup> The EPA COBRA tool allows users to build scenarios to estimate the health outcomes and associated costs of PM<sub>2.5</sub> exposure using its own database.

By adding 326.53 tons of PM<sub>2.5</sub> per year, this project could result in upwards of \$31M in healthcare related costs annually due to increased disease burden on impacted communities, increasing to \$48M annually by 2040. That is a staggering \$625M in cumulative healthcare related costs by 2040.<sup>17</sup>

It is important to remember that this estimate is conservative. If the M501JACs operate in simple cycle configuration, emissions will be significantly higher, as more pollutants will be emitted per megawatt of generated power than in the baseline combined cycle formation this analysis assumed.

## **Conclusion**

This analysis focuses on the healthcare related costs that would be associated with increased exposure to PM<sub>2.5</sub> resulting from Balico's proposed 3,500-megawatt gas-fired power plant.

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<sup>15</sup> [US EPA](#) *Technical Support Document: Estimating the Benefit per Ton of Reducing Directly-Emitted PM<sub>2.5</sub>, PM<sub>2.5</sub> Precursors and Ozone Precursors from 21 Sectors*. Sept. 2023. Accessed March 14, 2025. Table 8. Electricity-generating units.

<sup>16</sup> [EPA COBRA](#) Web Edition. Accessed March 25, 2025, April 11, 2025.

<sup>17</sup> Scenario: 326.53 tons PM<sub>2.5</sub>, 395.66 tons NO<sub>x</sub>, 46.81 tons SO<sub>2</sub> generated in Pittsylvania County, VA. Sector data included: Fuel Combustion: Electric Utility, Gas, Natural. EPA results are annual. Value reported is low monetary value for all contiguous US states. Harvard team used a 3% annual growth rate to forecast 2040 values. EPA dispersion methodology and subsequent county and state-level economic value calculations have not been verified by the Harvard team; however, this tool is widely used and accepted.



Exposure to PM<sub>2.5</sub> is linked to adverse health outcomes with quantifiable costs. To date, these costs have not been accounted for in Balico's discussions of the impacts of its proposed project.<sup>18</sup>

The conclusions in this report demonstrate that Balico's proposal would significantly increase the concentration of PM<sub>2.5</sub> in Pittsylvania County communities and cause adverse health impacts with real economic costs to County residents and the broader region. This report is a conservative estimation of that impact. Further, this report does not assess economic and environmental effects from changes in land use, water consumption, or biodiversity loss. It also does not take into account the impacts of backup diesel generators or the Phase 1 FT8 Mobile PAC Aero-Derivative Gas turbines (15 x 30 MW).

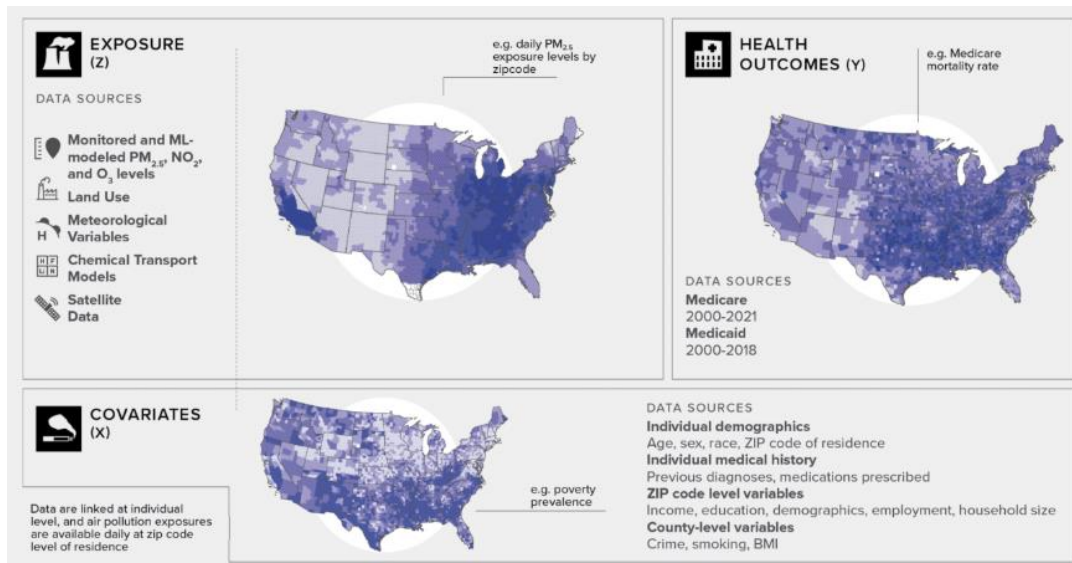
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<sup>18</sup> See Measuring The Impact of Air Pollution on Health Care Costs, [Health Affairs](#), Dec. 2020; See also "Short term exposure to fine particulate matter and hospital admission risks and costs in the Medicare population: time stratified, case crossover study," [The BMJ](#), Nov. 2019; See additional references on EPA portal, "Research on Health Effects from Air Pollution," [EPA](#). Accessed March 25, 2025.

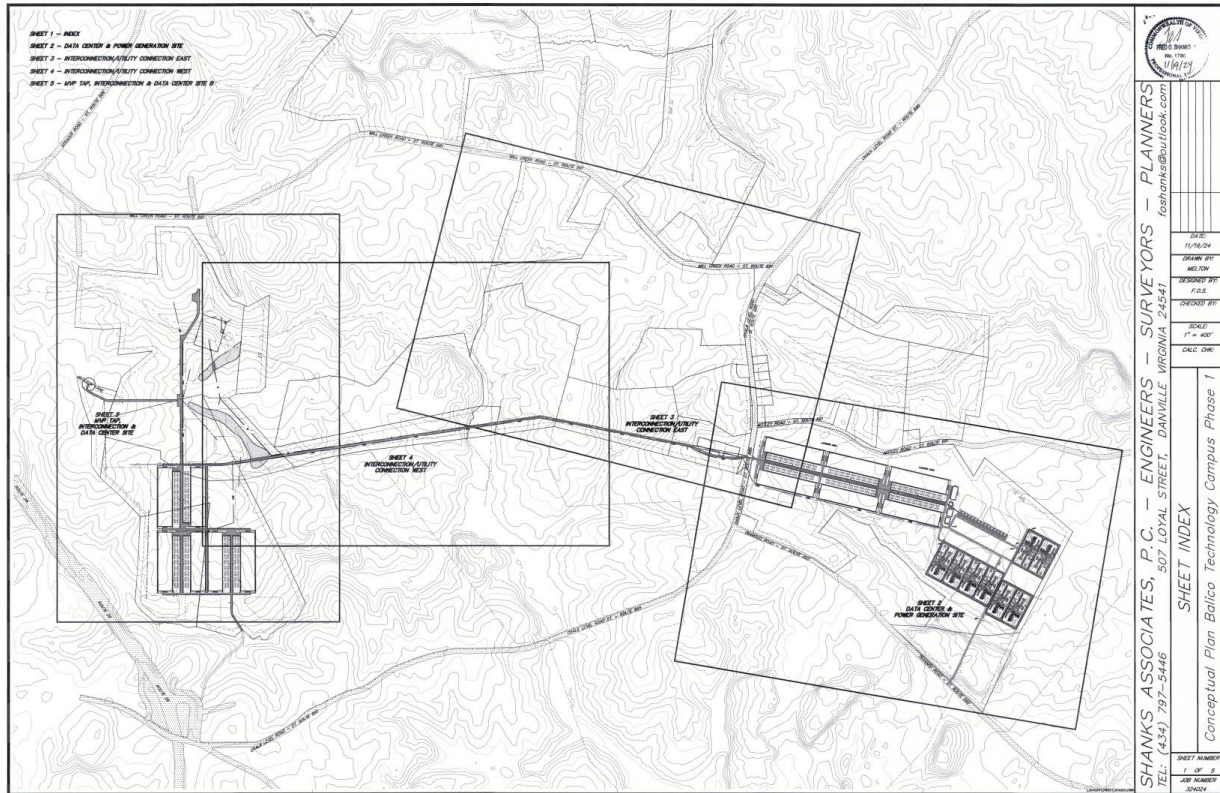




## Appendix 1. Dominici Lab Data Science Pipeline

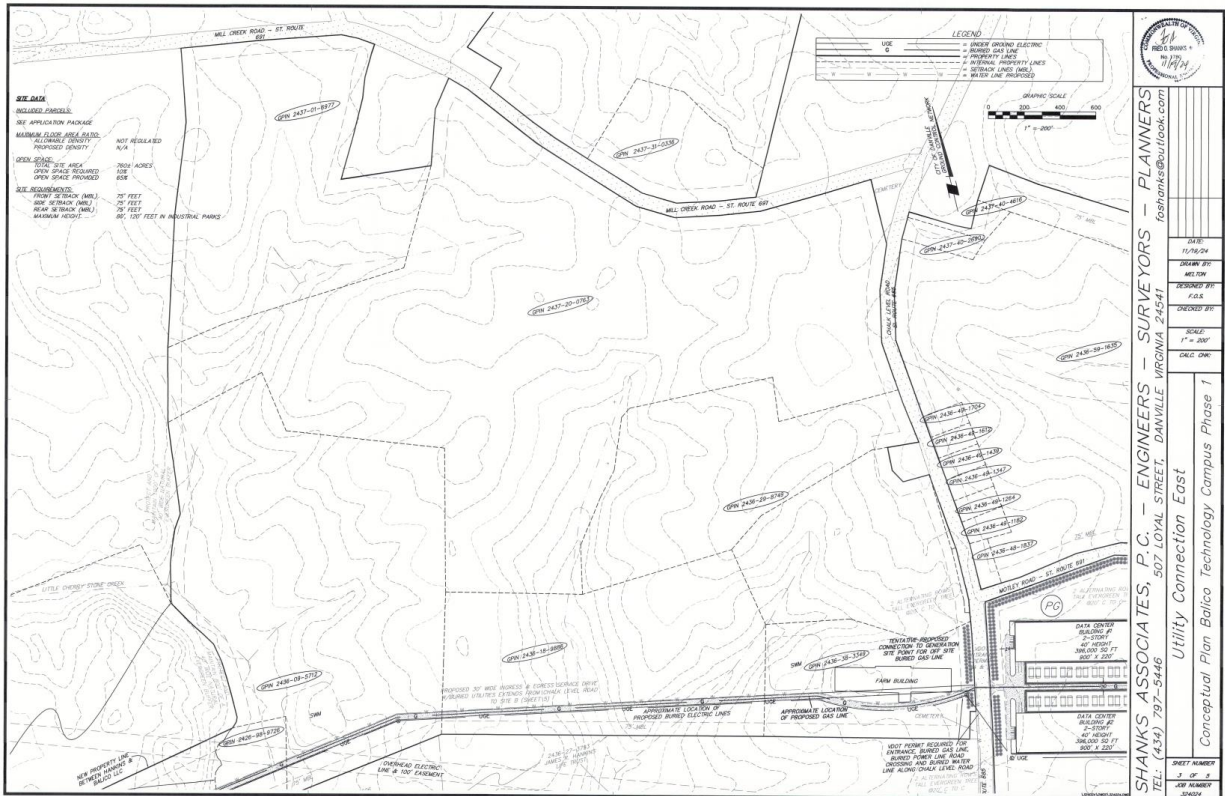
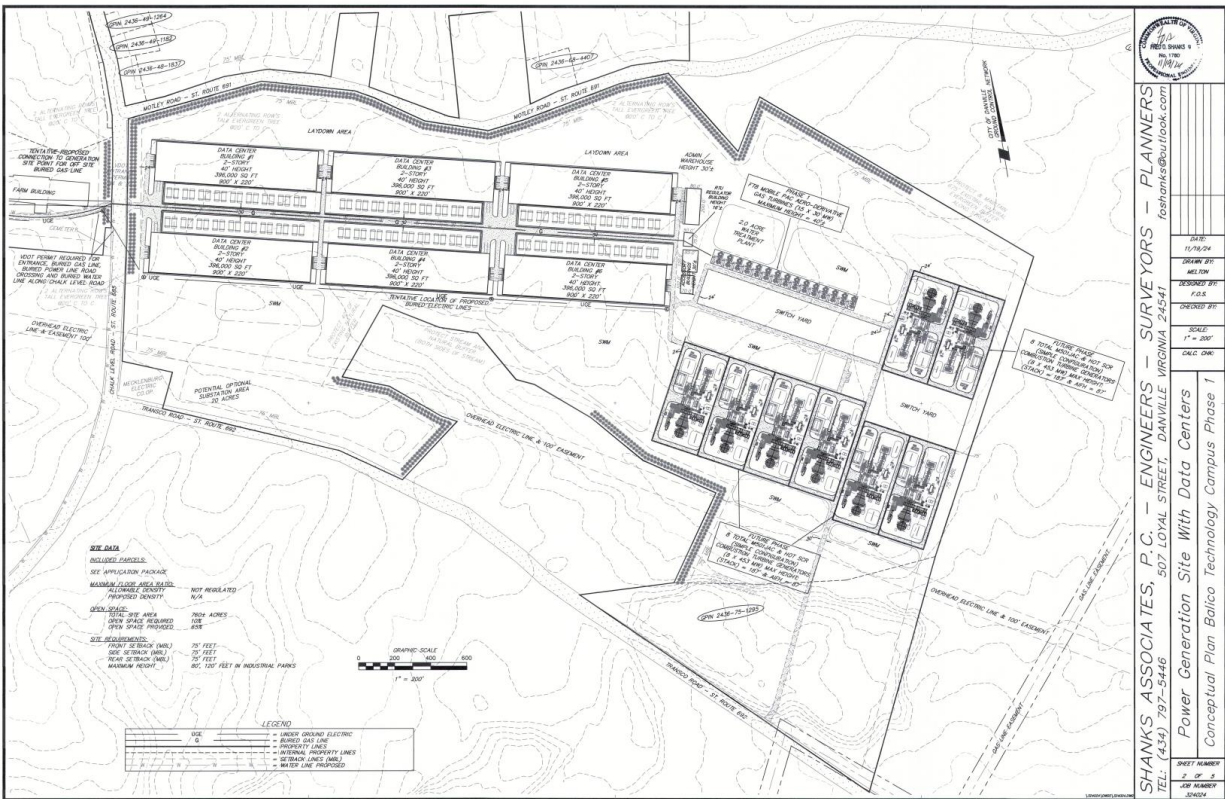


**Appendix 2. Balico's proposed conceptual plan.**

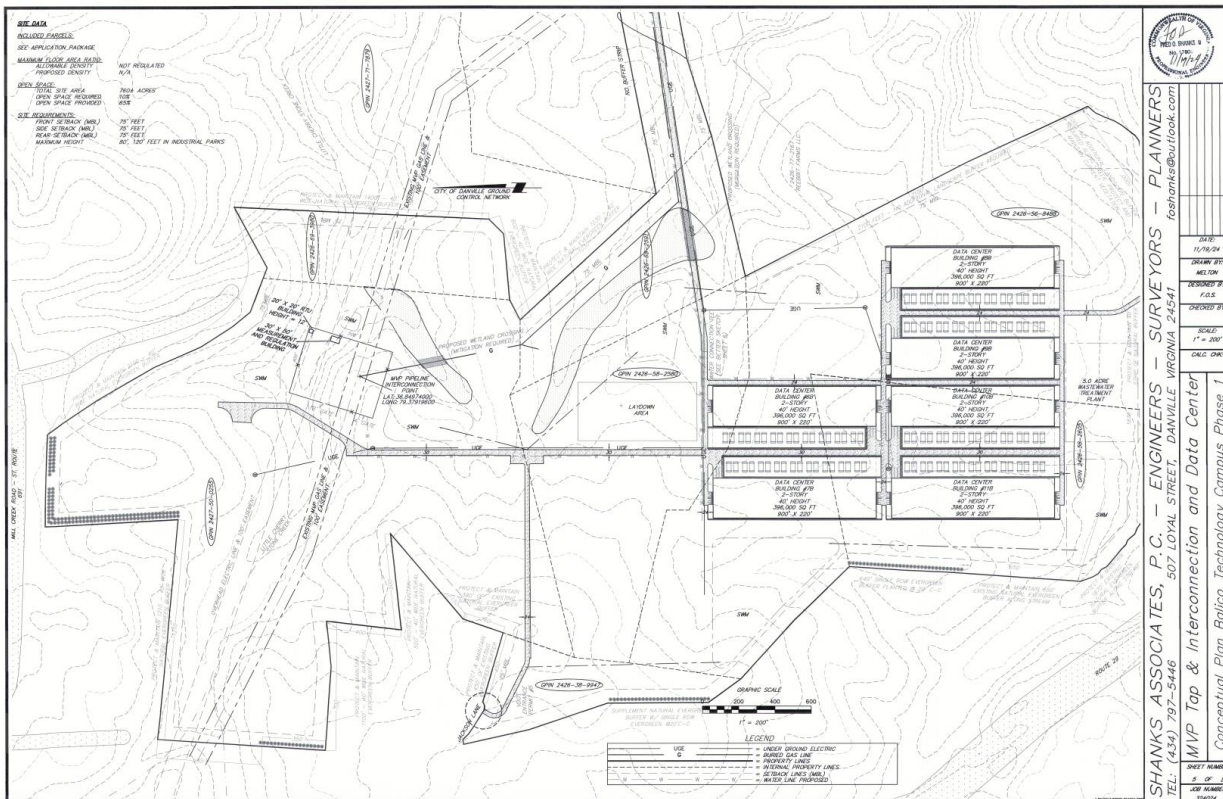
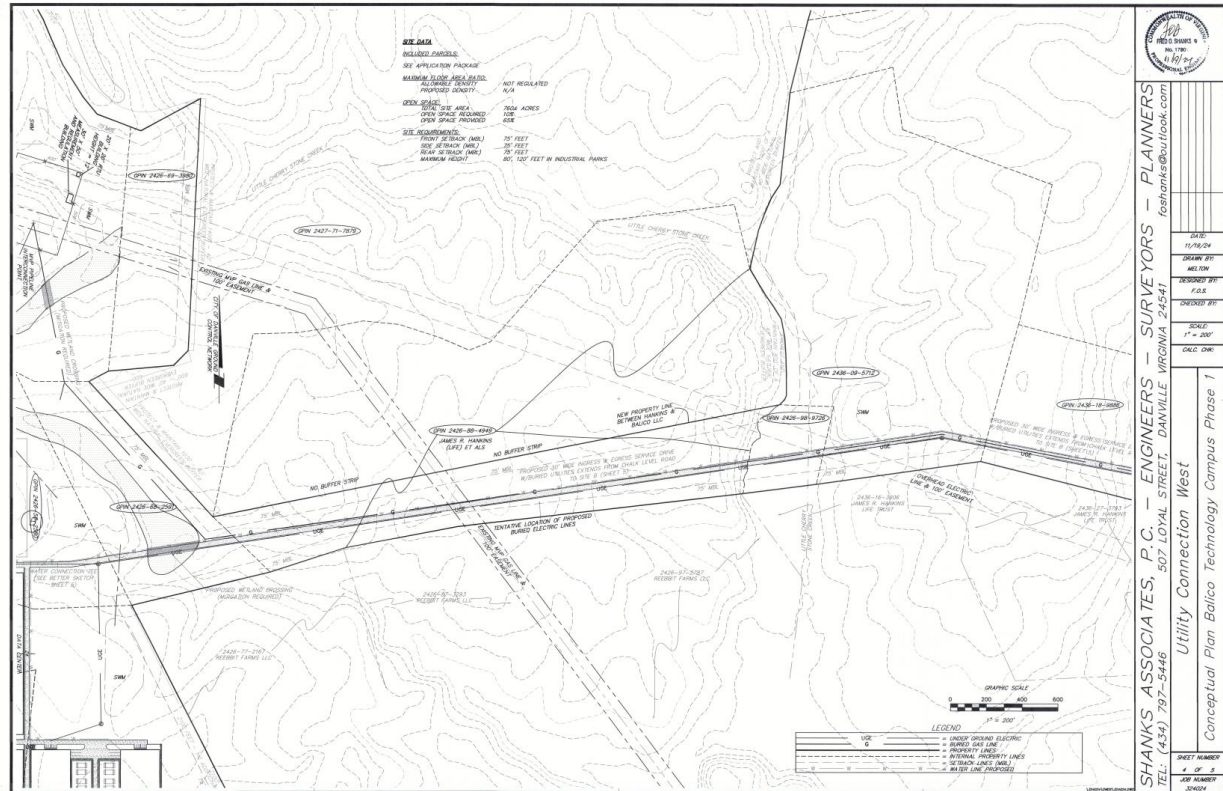




Appendix 2 (cont'd). Balico's proposed conceptual plan.



*Appendix 2 (cont'd). Balico's proposed conceptual plan.*





Appendix 2 (cont'd). Town Hall Presentation Materials.

## WHAT ABOUT THE POLLUTION?

**Overview of Facility Design and Emission Control**

**Facility Components:**

- Turbines:** Three Mitsubishi J-Class turbines.
- Stacks:** Three 180-foot emission stacks.

**Emission Controls:**

- Selective Catalytic Reduction (SCR)** for Nox.
- Oxidation Catalysts** for CO and VOCs.

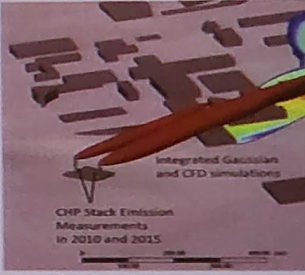
**Emission Standards:**

The plant's emissions meet or exceed EPA's BACT criteria, resulting in significantly lower pollutant levels compared to other industrial or urban sources.

**Pollutant Sources**

| Pollutant  | BACT Emission Rate (lb/MWh) | Comparison to Everyday Sources            |
|------------|-----------------------------|-------------------------------------------|
| Nox        | 2.0                         | Less than 1 mile of highway traffic       |
| CO         | 2.0                         | Equivalent to 1% of gas station emissions |
| PM10/PM2.4 | 0.01                        | Less than a backyard fire pit             |
| CO2        | 900                         | 30-50% lower than coal-fired plants       |

**Balico Technology Campus**





Appendix 2 (cont'd). Town Hall Presentation Materials.

**OLUTION?**

**Key Findings:**

- 1. Fence Line Concentrations:**
  - At the plant's fence line, pollutant levels remain well below National Ambient Air Quality Standards (NAAQS) for NO<sub>x</sub>, CO, and PM<sub>10</sub>/PM<sub>2.5</sub>.
  - NO<sub>x</sub> levels at the fence line are significantly lower than those near a busy gas station or a heavily trafficked urban area.
- 2. Rapid Dispersion:**
  - The plant's 150-foot stack height ensures emissions are dispersed at high altitudes, allowing pollutants to dilute rapidly.
  - The rural setting, with sparse population density and favorable wind conditions, further aids in minimizing ground-level impacts.
- 3. Comparison of Gas Station Emissions:**
  - Air quality standing at the power plant's fence line is modeled to be superior to that near a busy gas station, where COV's and CO concentrations are higher due to vehicle traffic and fuel vapors.
- 4. Comparison to Common Daily Exposure Scenarios:**
  - **School Bus Emissions:** Standing near a school during morning or afternoon pick-up and drop-off exposes individuals to significantly higher NO<sub>x</sub> and particulate matter emissions compared to living within a mile of the power plant.
  - **Highway Intersections:** Traffic congestion at busy urban intersections produces concentrated CO and VOC emissions that are multiple times higher than those measured at the power plant's fence line.
  - **Backyard Barbeques:** Prolonged exposure to smoke from backyard grills emits higher levels of particulate matter (PM<sub>2.5</sub>) than the power plant at its closest proximity.

**Page 18**



**Appendix 3. Mitsubishi 501J vs. 501JAC comparison.<sup>19</sup>****Simple Cycle Performance**

|                     |                 | M501J                    | M501JAC                  |
|---------------------|-----------------|--------------------------|--------------------------|
| Frequency           |                 | 60 Hz                    | 60 Hz                    |
| ISO Base Rating     |                 | 330 MW                   | 453 MW                   |
| Efficiency          |                 | 42.1 %LHV                | 44.0 %LHV                |
| LHV Heat Rate       |                 | 8,552 kJ/kWh             | 8,182 kJ/kWh             |
|                     |                 | 8,105 Btu/kWh            | 7,755 Btu/kWh            |
| Exhaust Flow        |                 | 620 kg/s                 | 815 kg/s                 |
|                     |                 | 1,367 lb/s               | 1,685 lb/s               |
| Exhaust Temperature |                 | 635 °C                   | 649 °C                   |
|                     |                 | 1,176 °F                 | 1,193 °F                 |
| Exhaust Emission    | NO <sub>x</sub> | 25 ppm@15%O <sub>2</sub> | 25 ppm@15%O <sub>2</sub> |
|                     | CO              | 9 ppm@15%O <sub>2</sub>  | 9 ppm@15%O <sub>2</sub>  |
| Turn Down Load      |                 | 50 %                     | 50 %                     |
| Ramp Rate           |                 | 40 MW/min                | 42 MW/min                |
| Starting Time       |                 | 30 minutes               | 30 minutes               |

<sup>19</sup> "M501J Series," [Mitsubishi Power](#). Accessed March 25, 2025.



Appendix 3 (cont'd). Mitsubishi 501J vs. 501JAC comparison.<sup>20</sup>

## Combined Cycle Performance

|        |                  | M501J     | M501JAC     |
|--------|------------------|-----------|-------------|
| 1 on 1 | Plant Output     | 484 MW    | 664 MW      |
|        | Plant Efficiency | 62.0 %LHV | > 64.0 %LHV |
| 2 on 1 | Plant Output     | 971 MW    | 1,332 MW    |
|        | Plant Efficiency | 62.2 %LHV | > 64.2 %LHV |

<sup>20</sup> "M501J Series," [Mitsubishi Power](#). Accessed March 25, 2025.





**Appendix 4.** Emissions Profiles of two representative plants using Mitsubishi 501J turbines in combined cycle mode: Greenville County Power Station (VA), Tenaska Westmoreland Generating Station (PA). PM<sub>2.5</sub> output emission rate (lb/MWh) used as input for dispersion model.

Lower bound: 0.0118 lb/ MWh

Upper bound: 0.0408 lb / MWh

Average (used for this report): 0.0284 lb / MWh

|                                         | EPA Actuals          |                          | Calculations                                  |                                             |                                                 |
|-----------------------------------------|----------------------|--------------------------|-----------------------------------------------|---------------------------------------------|-------------------------------------------------|
| 2019                                    | net generation (MWh) | PM <sub>2.5</sub> (tons) | PM <sub>2.5</sub> / net generation (tons/MWh) | PM <sub>2.5</sub> / net generation (kg/MWh) | PM <sub>2.5</sub> output emission rate (lb/MWh) |
| Greenville County Power Station         | 9,859,878            | 186                      | 1.89E-05                                      | 0.0171                                      | 0.0377                                          |
| Tenaska Westmoreland Generating Station | 5,161,329            | 105                      | 2.04E-05                                      | 0.0185                                      | 0.0408                                          |
|                                         | EPA Actuals          |                          | Calculations                                  |                                             |                                                 |
| 2020                                    | net generation (MWh) | PM <sub>2.5</sub> (tons) | PM <sub>2.5</sub> / net generation (tons/MWh) | PM <sub>2.5</sub> / net generation (kg/MWh) | PM <sub>2.5</sub> output emission rate (lb/MWh) |
| Greenville County Power Station         | 10,675,865           | 218                      | 2.04E-05                                      | 0.0185                                      | 0.0408                                          |
| Tenaska Westmoreland Generating Station | 6,270,337            | 37                       | 5.90E-06                                      | 0.0054                                      | 0.0118                                          |
|                                         | EPA Actuals          |                          | Calculations                                  |                                             |                                                 |
| 2021                                    | net generation (MWh) | PM <sub>2.5</sub> (tons) | PM <sub>2.5</sub> / net generation (tons/MWh) | PM <sub>2.5</sub> / net generation (kg/MWh) | PM <sub>2.5</sub> output emission rate (lb/MWh) |
| Greenville County Power Station         | 11,513,187           | 119                      | 1.03E-05                                      | 0.0094                                      | 0.0207                                          |
| Tenaska Westmoreland Generating Station | 7,115,762            | 67                       | 9.43E-06                                      | 0.0086                                      | 0.0189                                          |

