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GEORGIA POWER
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April 30, 2007

Mr. James Capp
Georgia Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, Georgia 30354

RE: Response to comments; Bowen BART Determination Modeling Report

Dear Mr. Capp:

Georgia Power (GPC) and Southern Company (SCS) offer the following response to draft comments provided by EPA Region IV on the Best Available Retrofit Technology (BART) technology evaluation for Plant Bowen that was submitted on February 27, 2007. EPA's comments are quoted in bold below, followed by the GPC/SCS response in italics.

Enclosure 1: Control and Cost Analyses

1. **Capital Recovery Factor (CRF) Calculations: For the capital recovery cost factor calculations, it appears that an equipment life of 15 years and a seven percent interest rate of return is assumed for all the control options evaluated (pp.4-20, 4-32). Where these assumptions differ from those in the *EPA Air Pollution Control Cost Manual* (Cost Manual) for the particular control technology, the document should provide justification. The Cost Manual notes on page 3-50 in Section 3.4.2 of Chapter 3, "Electrostatic Precipitators," (September 1999) of Section 6, "Particulate Matter Controls," that, "For ESPs, the system lifetime varies from 5 to 40 years, with 20 years being typical," and much of the equipment at power plants is designed to last 40 years. The document should include further explanation for the assumed equipment life of 15 years. (To access the most current version of the Cost Manual, go to: http://www.epa.gov/ttncatc1/products.html#cccinfo.)**

GPC/SCS used an equipment life value of 15 years for all control options evaluated for consistency. 15 years is the accepted equipment life assumption for wet scrubbers, as indicated *in EPA's Air Pollution Control Cost Manual. For ESPs, a specific equipment life value is not provided, other than the range and the "typical" value noted in EPA's comments above. GPC/SCS believe that a 15-year equipment life assumption is an acceptable and, in some cases, very conservative estimate for all control options we evaluated for this analysis. For relatively new upgrade options, such as the Juice Can and agglomerator, we believe that a 15-year life is a very generous and conservative estimate given that there is no long-term track record for these technologies. Furthermore, we would like to note that all ESPs currently at Plant Bowen were installed over 25 years ago. Assuming a 15-year equipment life for any retrofit or upgrade of the current ESPs brings the overall lifetime of the system to well over 40 years, the upper value of the range given in the Cost Manual. Again, we believe this is a conservative and acceptable estimate. For a wet ESP installation, very little guidance is currently available, but we also believe a 15-year equipment life estimate is appropriate. Given the much higher maintenance needs of a WESP and associated equipment compared to a traditional ESP, we suspect the equipment life would be less than the typical value of 20 years given in the Cost Manual. A WESP equipment life would more likely be similar to a wet scrubber equipment life of 15 years. Finally, we would note that changing the assumed equipment life for any of the control options modeled would not change the analyses enough to affect our overall conclusions.*

2. **Particulate matter emission limits associated with each control technology option considered are not included in the report. SCS should clarify the WESP capital and O&M costs of $115/kW and $0.47/MWh, respectively. The EPA WESP Air Pollution Control Technology Fact Sheet EPA-452/F-03-029 referenced in footnotes 38 and 43, indicates capital and O&M cost ranges of $40 to $200, and $6 to $10 per scfm, respectively (EPA-452/F-03-029, 08/07/03, www.epa.gov/ttn/catc/dir1/fwespwpi.pdf). It may be useful to indicate any unit conversion calculations.**

Particulate matter emission limits were not included because limits are not necessary unless a control is determined to be required by the BART analysis. Since our conclusion is that no additional controls at any Plant Bowen unit are justified under the analysis of the five factors, no additional emission limits are necessary. It is GPC/SCS's understanding that both EPD and EPA Region IV concur that no new emission limit is necessary unless a retrofit is required.

Regarding the capital and O&M costs for the WESP analysis for Plant Bowen, converting EPA's cost values to the same units used in GPC/SCS's analysis yields equivalent capital costs of $110/kw - $540/kw for Units1 and 2 and $85/kw - $430/kw for Units 3 and 4. EPA's equivalent O&M costs are $1.86/MWh - $3.10/MWh for Units 1 and 2 and $1.48/MWh - $2.46/MWh for Units 3 and 4. These estimates are based on the 2006 stack test data for Units 1 and 3 and assume continuous annual operation. As the dollar figures described above demonstrate, the assumed cost values used by GPC/SCS are very conservative. A more in-depth engineering analysis on WESPs for Plant Bowen would very likely yield a much higher cost value.

Sample calculations:

Unit 1 and 2 capital costs:
Low estimate = ($40/scfm x 1,900,000 scfm)/(700 MW x 1000) = $110/kw
High estimate = ($200/scfm x 1,900,000 scfm)/(700 MW x 1000) = $540/kw

Unit 1 and 2 O&M costs:
Low estimate = ($6/scfm x 1,900,000 scfm)/(700 MW x 8760 hrs) = $1.86/kw
High estimate = ($10/scfm x 1,900,000 scfm)/(700 MW x 8760 hrs) = $3.10/kw

3. **Provide documentation for the additional energy charges. There are assumptions presented involving both purchasing power and constructing additional capacity without clearly documenting the basis for the assumptions and why both charges apply. If the control equipment requires power to operate and reduces the ability of the power plant to generate power, costs associated with the power losses are appropriate. However, given their magnitude, EPA would expect greater documentation of the assumptions and why a combination of capacity increases and purchased power are the lowest cost solution.**

Both charges apply because reduced capacity at a baseload plant like Bowen has two consequences. Firstly, the overall system capacity for the state of Georgia is reduced. Georgia Power must maintain a certain amount of buffer capacity to meet peak demand. Thus, a reduction in overall capacity creates a void that must be filled with the construction or purchase of additional generating capacity. Secondly, Plant Bowen is a baseload generating facility, meaning that it runs almost every day to meet even the minimum amount of demand. If the generating ability at Plant Bowen is reduced, additional generation must be purchased or more expensive plants must be operated to make up for the power lost to the WESP or other controls. New capacity and the ongoing cost of additional energy generation are, in fact, two different costs. Thus, it is appropriate to account for both costs in this analysis. The methods used to account for these two costs in the BART report follow standard practices that have been used in prior BACT analyses.

4. **The EPA Air Pollution Control Cost Manual suggests that an ESP system lifetime varies from 5 to 40 years, with 20 years being typical for capital recovery cost calculation purposes (Section 6 - Particulate Matter Controls, 3.4.2 Indirect Annual Costs, pg. 3-50). It is unclear from the BART Report whether or not the "juice can" cost effectiveness calculations are based on upgrading all or a few ESP transformer-rectifier sets. Footnote 32 mentions that "some" of the existing transformer-rectifier sets are already equipped with "juice can" technology. The technical and economic feasibility of the "juice can" ESP control technology option is well established since it is already utilized successfully at Plant Bowen. Visibility impacts do not override all other considerations in a BART analysis. Based on a review of the BART determination analysis for PM included in the attachment, additional**

consideration should be given to the "juice can" upgrade option for Plant Bowen ESP electrode systems. Cost effectiveness values for the Bowen ESP electrode system upgrade are consistent with those determined to be reasonable for TECO Big Bend Station PM control device upgrades. Modeling results indicate a six to nine percent reduction in both filterable PM_{10} and $PM_{2.5}$ emissions (e.g., 72.0 TPY PM_{10} emissions total on pg. 4-16). It would also appear that some additional gas flow optimization may be feasible based on previous studies, operational data, and information from other similar units.

We believe that neither additional installations of the juice can technology nor additional gas flow optimizations at Plant Bowen are justified under BART and that no further analyses are required to reach this conclusion. While we did not model the visibility impacts of these controls on their own, it is safe to assume that the visibility impacts from either option are much less than the visibility impacts of the juice can/agglomerator combinations that were, in fact, modeled. The modeling showed that the maximum possible visibility improvement from a juice can/agglomerator installation was 0.01 delta-delta deciview for any Bowen unit. The PM reductions from juice cans alone are roughly 1/7 of the reductions from the juice can/agglomerator combinations. The maximum reductions from gas flow optimization are even smaller. Thus, the visibility improvement from either juice cans alone or gas flow optimization would be much smaller than 0.01 delta-deciview. Furthermore, it is likely that values this small are within the noise of uncertainty and error associated with the CALPUFF model and are, essentially, equivalent to zero. Even if the degree of visibility improvement did not override all other BART factors, that factor plainly must be considered in any BART analysis of a possible control option. Furthermore, we believe that visibility impact does *override those other factors when the degree of anticipated visibility improvement is equivalent to zero. To be required under the BART rule, any control must, at a minimum, result in an appreciable improvement in visibility. Thus, the fact that these options are not projected to provide any appreciable or meaningful visibility improvement is significant. We followed the BART Guidelines and, moreover, used a conservative approach.*

5. **When identifying all available retrofit control technologies, the "Guidelines for BART Determinations Under the Regional Haze Rule" (BART Guidelines) clarify that consideration should be given not only to add-on controls but also improvement in the performance of existing controls and P2. The analysis does not discuss the facility's evaluation of any P2 options for the four BART-eligible units.**

Although P2 options are not discussed directly in the report, we believe we did address a comprehensive list of feasible options that are available to retrofit Plant Bowen for PM reduction. The Bowen ESPs are already very well performing and very well maintained. Low NOx burners are already installed at Plant Bowen. GPC/SCS are not aware of any additional P2 options that could be explored for Plant Bowen.

6. **On page 1-2 and at several other points, the report compares potential BART cost per ton controlled values for Plant Bowen to threshold values used in previous BACT determinations. The report indicates that costs above $10,000 per ton controlled are considered to be prohibitive. However, most past BACT determinations are conducted for new units and establish a cost/ton value for each control option that assumes an uncontrolled baseline. This is clearly not the case in this BART analysis since controls currently exist. It would be more appropriate to compare the cost per ton values to incremental costs in past BACT determinations. Incremental costs are quantified as a tool to evaluate the point where diminishing returns might be expected as several increasingly expensive options are compared. This point of diminishing returns is case-specific and can be significantly higher than $10,000/ton.**

GPC/SCS believe that no additional analyses are required to investigate incremental costs or diminishing returns. Additional costs analyses would not change our conclusion that the cost of any additional controls is not justified when placed in the context of little or no visibility improvement and the negative energy and non-air quality environmental impacts of some of these controls.

7. **On page 4-22 it is indicated that biannual PM stack tests from 2003-2005 were used to establish baseline emission rates. The data was then used to estimate tons reduced for each technology being evaluated. Since very limited data was available (two tests for three years), EPA recommends that an analysis be conducted to evaluate whether the stack test-measured emissions are likely to be representative of emissions during the rest of the period. Examples of possible information that should be evaluated are the electrical parameters of the ESP during the stack tests as compared to the rest of the operating year. This data should be readily available at the plant. If, for example, the overall secondary current to a particular ESP was significantly greater during the stack test than the rest of the year, it would be appropriate to adjust baseline emissions higher as well as the tonnages expected to be controlled by each technology option.**

PM stack tests must be performed during normal operation of the plants and are used, without adjustment, for other compliance purposes. The PM stack tests at Plant Bowen during the 2003-2005 time period were conducted as required. GPC/SCS followed guidance from VISTAS using emissions estimates for these three years. The ESPs at Plant Bowen are very well performing, very well maintained, and operated consistently according to plant procedures throughout the year, not just during the stack test.

Enclosure 2: Modeling Analysis

1. **Overall, the modeling procedures followed the VISTAS BART Modeling Protocol and are acceptable.**

2. **Estimated PM emission reductions were modeled for two emission control scenarios. The results of the modeling indicate that the estimated visibility improvement at the Cohutta Class I area was low. On page 5-2 of Section 5.0, the GPC document states several reasons why a 0.2 deciview (dv) improvement in visibility at Cohutta is considered by the facility to be too small to merit the additional costs of using a wet ESP. References are made to "...the level that EPA considers to be detectable (approximately one deciview), and is also below the level (0.5 deciview) that EPA has recommended be used for visibility contribution analyses..." This statement appears to imply the controls are not considered to make enough of an improvement in visibility at the Cohutta Wilderness Area. We note; however, that there is no bright line for evaluating in the BART determination analysis the degree of visibility improvement that is considered significant enough to warrant BART controls. Rather, a State has flexibility in setting absolute thresholds and determining the weight and significance to be assigned to each BART factor. (See 70 FR 39170, 1st col., July 6, 2005.) In addition, EPA suggests that GA EPD carefully evaluate the other four BART statutory factors in assessing the Wet ESP control option. Visibility improvement based on modeling results is only one of the factors that should be assessed in this decision.**

We understand that there is no bright line for evaluating the visibility improvement for the BART determination. However, we do feel that all five factors were adequately addressed in our analysis and were evaluated appropriately in developing our conclusion. The other statutory factors that were considered (the costs of controls, the energy and non-air quality environmental impacts of controls, remaining useful life of the facility, and existing controls in use at the facility) support the conclusion that WESP is not appropriate as a BART option. As shown by the analysis, WESPs at Plant Bowen would yield very little visibility improvement while imposing high costs, additional energy requirements, and negative non-air quality environmental impacts (water usage requirements, wastewater treatment/disposal, and WESP ash disposal).

3. **The modeling results presented in Appendix E of the report indicate that the primary contributor to the visibility impairment at the Cohutta Class I area is sulfate concentrations, which are the result of sulfuric acid emissions. Since SO_2 emissions are not being modeled (because they will be addressed under the Clean Air Interstate Rule rule), potential controls for sulfuric acid emissions should be examined closely. Section 4.2 of the report (Pages 4-9 & 4-10) discusses the potential sulfuric acid controls. One control option that is considered feasible is sorbent (lime) injection. Section 4.4 indicates that lime injection has been shown to be an effective method for reducing flue gas SO_3 and thus controlling sulfuric acid emissions. However, the report indicates that the addition of the lime adds to total PM_{10} emissions and therefore the total PM_{10} emissions reductions are low with this control option. Since the total PM_{10} emission reductions are low, the cost effectiveness for lime injection in $/ton is shown to be very expensive (Tables 4-15 thru 4-18). If this analysis considered the cost effectiveness of reducing sulfuric acid**

emissions (since sulfuric acid is the primary contributor to the visibility impairment), the conclusions may be different. EPA suggests that this option be reconsidered and that modeling of the lime injection control scenario be conducted to evaluate the visibility impacts.

Modeling the visibility impact of the lime injection option is not necessary because GPC/SCS have already identified that even the WESP, which would provide a net reduction in both filterable PM and sulfuric acid emissions, would provide only a very small degree of visibility improvement. Thus, it is reasonable to assume that lime injection, which yields less of a reduction in both sulfuric acid and filterable PM than a WESP, would result in at most only minimal visibility improvement (e.g., less than 0.2 delta deciview) for any Bowen unit. We evaluated the cost-effectiveness of each option based on tons of PM reduced following the BART Guidelines and regulations.

4. **Page 2-5 of the Modeling Protocol contained in Appendix D of the report describes how the PM emissions were speciated into the coarse and fine fractions. The discussion references AP-42 Table 1-1.6. It is unclear how the values of 55.6% coarse and 44.4% fine were calculated from the information in AP-42 Table 1.1-6. It would be helpful if additional information describing the PM speciation procedures was provided.**

If EPD would like to see the underlying calculations of PM coarse and fine fractions, we will be happy to provide further documentation. We used the FLM interpretation of AP-42 1-1.6 based on past comments.

5. **Section 4.4 of the Modeling Protocol contained in Appendix D of the report indicates that visibility impacts presented in the report were developed using the New IMPROVE equation as implemented in an external spreadsheet created by Dr. Ivar Tombach. The report provides very limited discussion of the rationale for using the New IMPROVE algorithm instead of the default IMPROVE algorithm that is contained in CALPOST. The report should provide additional justification for using the new algorithm. Sea salt is not an issue for the Cohutta Class I Area. The additional justification should focus on the why the new IMPROVE algorithm is preferred for this specific application.**

GPC/SCS discussed this issue extensively with EPD's modeling group prior to submitting the Bowen BART determination modeling report. EPD staff indicated that they support our decision to use the new IMPROVE equation. Treatment of sea salt is not the only improvement in the new IMPROVE equation over the original version. The new IMPROVE equation is appropriate for this and any other application because it represents an advancement in modeling science. The IMPROVE Steering Committee officially adopted the revised IMPROVE equation in December 2005. We note that the results from using both the old and new IMPROVE equations are presented in the report, as requested by EPA Region IV.

6. **Page 3-3 of the report indicates that an external hard drive containing all the modeling files and data was provided with the report. EPA did not have access to this information and thus was unable to do a complete review. EPA suggests that GA EPD carefully evaluates the modeling files and data contained on this hard drive to ensure that the modeling was conducted as it was described in the report.**

GPC/SCS provided EPD with all the necessary modeling files and data. EPD is free to distribute that information as needed.

7. **The State has flexibility in determining how the five statutory BART factors should be addressed. EPA recommends that the modeling should be discussed for each control used in the determination.**

It is not necessary to model each and every control because the two options that were modeled can be used to frame the results and the conclusions would be the same. The visibility improvement for the unmodeled options is '< X delta-delta deciview', based on a comparison of the expected PM reductions with the modeled options.

Georgia Power appreciates the opportunity to respond to the draft comments of EPA Region IV. If you have any questions about this response, please contact Rosa Chi at (404)506-3123.

Sincerely,

M.E. Wilder
Manager, Air Programs

TRC