Air Quality Modeling Technical Note
Dolet Hills Power Station
Mansfield, Louisiana

Prepared for
Cleco Power, LLC
and
Southwestern Electric Power Company

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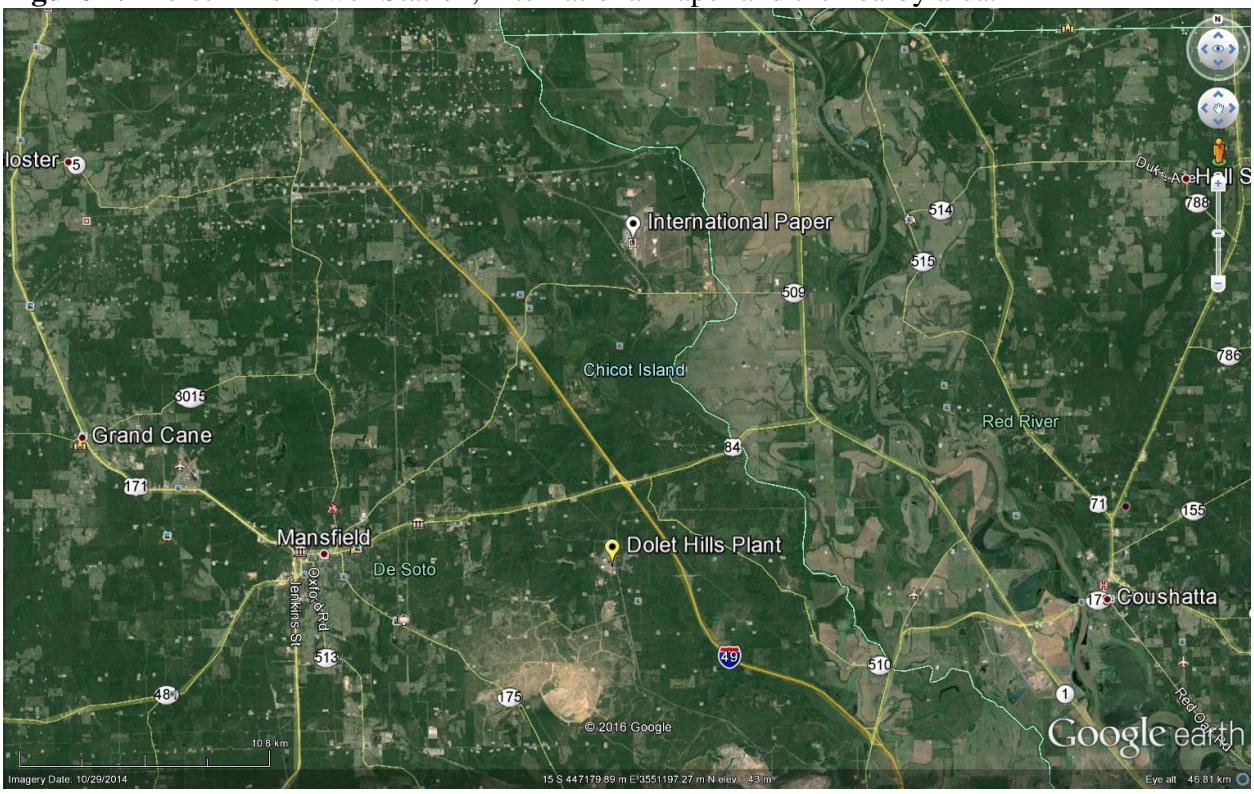
INTRODUCTION

American Electric Power Service Corporation (AEPSC) on behalf of Operating Owner Cleco Power LLC and AEP operating company Southwestern Electric Power Company has examined modeling performed by the Sierra Club and performed derivative modeling of the Dolet Hills Power Station located near Mansfield, Louisiana. This Technical Note briefly describes the Sierra Club modeling and outlines issues raised by that modeling that were addressed by the derivative modeling performed as part of this effort. The additional modeling and analysis performed as part of this effort demonstrated that when the stack parameters for Dolet Hills Plant are properly represented in AERMOD, emissions from Dolet Hills Plant and the nearby International Paper Mansfield Mill do not cause or contribute to nonattainment in the area.

DESCRIPTION OF FACILITY AND AREA

The Dolet Hills Power Station is a single unit 650 MW power generating facility. This unit is equipped with a wet scrubber for sulfur and acid gas control, and an electrostatic precipitator for particulate control. The plant is located in DeSoto Parish, Louisiana approximately 11.5 kilometers east of Mansfield, Louisiana and approximately 13.5 kilometers south of an International Paper facility. The elevation of the Dolet Hills Station is 82 meters and the terrain is gently sloping down to the north, east and south of the facility. Figure 1 shows the nearfield view of the area surrounding the Dolet Hills Power Station and the International Paper Mansfield Mill.

Figure 1. Dolet Hills Power Station, International Paper and the nearby area.



SIERRA CLUB MODELING

As part of a larger program undertaken by the Sierra Club, the Sierra Club sponsored independent modeling of the Dolet Hills Power Station and submitted the results of this modeling to USEPA Region VI. This modeling used surface and upper air meteorology for the period 2012 – 2014 collected at the Shreveport, Louisiana national weather service site. The data was processed using the current version of AERMET as of June 2015 with no Beta Options being used.

The receptor set used in the Sierra Club sponsored modeling was developed using AERMET. The only deviation from what would be considered standard SIP and PSD modeling practice is that the Sierra Club analyst used 1.5 meter tall flagpole receptors. A test simulation performed as part of this study indicated that the use of the 1.5 meter flagpole receptors served to increase the design value by an insignificant 0.003 ug/m^3.

The Sierra Club sponsored modeling also endeavored to generate an hourly input file for Dolet Hills Power Station using emissions data sources from the USEPA Clean Air Markets Division (CAMD). It does not appear that the Sierra Club Modeling made any attempt to use CAMD flow data and used a "flat" full load profile based on design conditions likely sourced from permit data that resulted in a flat flow and temperature profile that was paired with a load varying CEMS based emission rate sourced from CAMD. In doing this, it appears that the Sierra Club analyst did perform some data quality work and reasonably corrected much of the missing, substituted and troubled data received from CAMD. The potential issues with sourcing modeling data from CAMD data was publically reported by Long at the 11th USEPA Triennial Modeling Conference in August 2015[1].

The Sierra Club report also raised the following issues that they claimed caused their modeling to underestimate the actual concentrations present in the area around the Dolet Hills Power Station[2]:

- Allowable emissions are based on a limitation with an averaging period which is greater than the 1-hour average used for the SO2 air quality standard. Emissions and impacts during any 1-hour period may be higher than assumed for the modeling analysis.
- No consideration of facility operation at less than 100% load. Stack parameters such as exit flow rate and temperature are typically lower at less than full load, reducing pollutant dispersion and increasing predicted air quality impacts.
- No consideration of building or structure downwash. These downwash effects typically increase predicted concentrations near the facility.
- No evaluation has been conducted to determine if the stack height exceeds Good Engineering Practice (GEP) height. If the stack height exceeds GEP, the predicted concentrations will increase.
- No consideration of off-site sources. These other sources of SO2 will increase the predicted impacts.

The work performed as part of this review serves to address all of these issues in a fashion that demonstrates that the impacts of these issues either reduces concentrations or has minimal impact on the final conclusion of the modeling exercise.

At this point, we will address one of the Sierra Club claims outlined above, that being the GEP Stack Height issue. Under the provisions of USEPA SO_2 SIP Designations Modeling Technical Assistance Document specific to the 1-Hour SO_2 Standard, it is permissible to use the full stack height for modeling of actual emissions, regardless of the GEP status of the stack for purposes of designation modeling of the 1-Hour SO_2 Standard[3]. Therefore, with regards to the actual emissions case, the GEP height of the stack is irrelevant to the analysis. We would add that since USEPA made major changes to the formulation of AERMOD regarding downwash in version 11059, it is necessary to include a BPIP parameterization in the analysis of all stack emission points. The actual stack height of the Dolet Hills Power Station is 160.02 meters and the BPIP calculated GEP Height 247.85 meters. In order to determine what impact downwash would have on the analysis, a simulation was made that added the BPIP parameterization to the inputs for Dolet Hills Power Station. The results of this simulation were compared to the results of the base simulation performed by the Sierra Club and no change in the modeled design value was noted. Therefore, it can be concluded in the case of Dolet Hills Power Station that the GEP height issue and the lack of BPIP parameterization in the Sierra Club modeling described in the Sierra Club modeling report has no impact on the modeled design value.

MODELING PLATFORM USED FOR THIS EVALUATION

The Sierra Club sponsored modeling used the current versions of AERMOD and AERMET as of June 2015, that being version 14134. AERMOD and AERMET were exercised using none of the Beta Options installed in them. As part of this evaluation, the version of AERMOD used was Version 15181, which was issued in July 2015. Again, no Beta Options were used in AERMOD and an initial simulation was made using AERMOD Version 15181 that exactly matched the results from the Sierra Club modeling. This allows the conclusion that any changes in the results observed in new modeling simulations performed as part of this evaluation were due to other changes we introduced into the modeling system and not attributable to the change in the version of AERMOD.

For purposes of this evaluation, we accepted the 2012 to 2014 meteorologic files developed in the Sierra Club sponsored modeling effort. The review of these files allows us to conclude that the meteorologic files were developed using proper modeling procedures.

While not a standard SIP or PSD configuration, we also are using the Sierra Club developed receptor grid which included 1.5 meter flagpole receptors. We have previously noted that the use of the flagpole receptors resulted in an insignificant difference in modeled design values in this area. This conclusion cannot be applied to other work using flagpole receptors of this type that should be evaluated for their impact on a site by site basis.

SOURCES INCLUDED IN THE MODELING

The sources included in various simulations conducted throughout this work included the Dolet Hills Power Station (all simulations) and the International Paper Mansfield Mill in the final two simulations following the obtaining of appropriate inputs for the International Paper facility.

DOLET HILLS BPIP INFORMATION

BPIP information for use in this evaluation was supplied by CB&I, the A/E firm used by Cleco Power for technical services relating to the generation units they operate. The information supplied appears to have been done using standard practices for developing a detailed BPIP analysis, and was used as received.

This result of inserting this data into the input files originally developed as part of the Sierra Club sponsored modeling resulted in no change in the fourth high values generated by AERMOD at levels that would be of regulatory interest in the sensitivity simulation performed.

BACKGROUND VALUES

With the exception of the final simulation performed under this evaluation that used a seasonal hourly background value developed from the 2013-2015 Shreveport SO_2 Monitor data by AECOM on behalf of International Paper, all simulations used the background value of 31.4 ug/m^3 used by the Sierra Club that are based on air quality data monitored during 2011 to 2013 at an SO_2 monitor located in Bossier Parish, Louisiana.

Based on that additive nature of percentile statistics, the 31.4 ug/m^3 which is noted in the Sierra Club report as representing the 99th percentile value at the selected monitor results in the pooled modeled and monitored value representing the 99.99th percentile value of total impact, a value that is much more restrictive than the actual 1-Hour SO_2 Standard. Please refer to the presentation of Sergio Garcia at the 11th USEPA Modeling Conference[4] for more information on this calculation.

PLANT OPERATING DATA CONSIDERED AND RESULTS

In the Sierra Club supported modeling of the Dolet Hills Power Station, the modeling study used both the permit limits for Dolet Hills and a processed version of the CAMD based emission data to generate an hourly emissions file for the period 2012-2014. The emissions portion of this file appears to have been inspected and corrected to remove missing, substituted, and otherwise invalid data that is reported to CAMD under the requirements of 40 CFR Part 75, but that is not reasonable for use in air quality modeling in a rational manner. However, the inputs for exit velocity (based on flow) and temperature are fixed at values that are represented as being full load values. The study admits that it does not account for reduced load operation, but states that they believe that this serves to reduce the modeled impacts from the study.

As the evaluation progressed, a limited amount of actual operating data became available for comparison to the values used by the Sierra Club and it became apparent that the current full load operating conditions were significantly different than were used by the Sierra Club. This brief evaluation suggested that the temperature used as a full load representation may be on the order of at least 40 F low and the flows and exit velocities would be higher due to the temperature induced differences in volume. In order to not overstate the changes in the initial test of this theory, the second lowest temperature was used and a low end flow value was selected and then corrected for temperature to be used as constant inputs as was done by the Sierra Club. This resulted in a 39 F temperature increase to 200 F from 161 F and an increase in exit velocity from 25.84 m/sec to 27.71 m/sec. This hourly file was then run with the BPIP inputs and the resulting model output found the modeled design value reduced from 218.7 ug/m^3 in the Sierra Club modeling to 188.8 ug/m^3. While, this was not viewed as a definitive result, it did lead to a recommendation that a full actual operating inventory be built and run to see if the actual operating conditions would also give a comparable result. This recommendation was accepted and the full CEMS based operating record for heat input, flow, SO_2 emissions, and temperature was supplied by CLECO Power to allow the development of a CEMS based hourly inventory for use in this exercise.

The hourly CEMS based inventory developed by AEPSC as part of this exercise used the principles we have established during the development of a number of CEMS based hourly emissions inventories for some 11 AEP Operated or affiliated sites, to date. These principles are discussed in a paper to be presented by David Long at the AWMA Specialty Conference on Air Quality Models in April 2016 in Chapel Hill North Carolina[3]. Once the full data set was received from CLECO Power through their consultant CBI, an AERMOD ready CEMS based hourly inventory was prepared.

When this inventory was run in AERMOD, the result was further reduced from the test value of 188.8 ug/m3 to 185.8 ug/m^3, much lower than the Sierra Club generated 218.7 ug/m^3. Since this case used a fully developed actual operating based hourly inventory this result was viewed as a robust and credible demonstration that Dolet Hills Power Station did not violate the 1-Hour SO_2 Standard under its actual operating conditions. This result also serves to rebut the view of the Sierra Club that moving from their flat full load parameterization to an actual hourly parameterization that properly reflected reduced load and startup operations would serve to increase the modeled concentrations. In this case it significantly reduces the modeled concentrations, which in our experience is not an uncommon outcome when compared to a flat operational profile.

With this information in hand, the only question remaining was what interactive impacts would Dolet Hills Power Station have with the one other significant source of SO_2 emissions in DeSoto Parish. That source being the International Paper Mansfield Mill approximately 13.5 kilometers to the north of Dolet Hills. After some discussions with International Paper, we were able to obtain a modeling inventory that they were using in an effort to potentially demonstrate that DeSoto Parish should be split with the portion of the county they are located in deemed as being in attainment with the 1-hour SO_2 Standard. We did not use their Dolet Hills inventory since it was not based on full operating data from CEMS due to the CAMD data source not containing

the concurrent temperature data used to adjust the flow data from actual stack conditions to standard conditions (CAMD does not collect this data). The information supplied by International Paper also contained a more detailed analysis of background data from a monitor in the Shreveport area that allowed the generation of a seasonal hourly background value. In addition to using the 31.4 ug/m^3 background value developed by the Sierra Club, we also ran the more detailed background data to allow a comparison of a more robust background analysis to the more simple single value that had been used.

Adding the emissions from International Paper resulted in a domain wide design value of 186.2 ug/m^3, an increase of 0.4 ug/m^3 when the International Paper facility with what are viewed as reasonable emissions are included in the model. The final simulation in this evaluation replaced the fixed SO_2 background value from the Sierra Club modeling with the AECOM/International Paper developed seasonal hourly background. This change resulted in a further reduction in the peak design value from the 186.2 ug/m^3 to 171.0 ug/m^3. This outcome was expected as the hourly SO_2 concentrations used for background varied from 1.867 ppb in hour 7 in the Fall season (4.88 ug/m^3) to 9.500 ppb during hour 10 in the Summer season (24.85 ug/m^3), all below the constant 31.4 ug/m^3 used in all of the preceding simulations.

The results of these two simulations containing both Dolet Hills and International Paper serve to refute the Sierra Club contention that considering the emissions from other significant sources in the area would further serve to significantly increase modeled SO_2 values in the area, generating a more widespread nonattainment problem in the DeSoto Parish area. These simulations clearly demonstrate modeled attainment with the 1-Hour SO_2 Standard under actual operating conditions at both Dolet Hills Power Station and International Paper. Table 1, below, consolidates all of the simulations discussed into a single table showing how the changes made in the modeling platform changed the results in ways that generally contradict the claims made by the Sierra Club sponsored modeling study and show that when actual conditions are properly represented in the model, the area demonstrates modeled attainment with the 1-Hour SO_2 Standard. The modeling files used for all simulations except the Initial Sierra Club Model are included in electronic form as an appendix to this document.

Table 1. Summary of Modeled Design Values for All Simulations Discussed (Values in ug/m^3 with Background).

Facility	Initial Sierra Club Model	Updated to AERMOD 15181	Added Dolet Hills BPIP Data	Dolet Hills Temp/Flow Sensitivity	Dolet Hills Actual Temp and Flow	Added International Paper	Updated to AECOM/IP Seasonal Background
Dolet Hills	218.7	218.7	218.7	188.8	185.8	185.8	170.5
International Paper	NA	NA	NA	NA	NA	113.0	95.2
Combined	NA	NA	NA	NA	NA	186.2	171.0

CONCLUSIONS

The additional modeling done to support this effort demonstrates that there are significant shortcomings in the Sierra Club's modeling analysis. This work further demonstrates that the claims of conservatism made in the Sierra Club modeling report are not well-founded and are generally inaccurate when the specific issues are addressed. Further, this work demonstrates that EPA should make a final designation of attainment for DeSoto Parish for the1-hour SO_2 standard.

REFERENCES

1. Long, David**,** *The Use of CAMD Data in Air Quality Modeling,* 11th USEPA Triennial Modeling Conference, Research Triangle Park, NC, August 12 – 13, 2015.
2. Klafka, Steven, Dolet Hills Power Station Mansfield, Louisiana – Evaluation of Compliance with the 1-hour NAAQS for SO_2, Revised December 2015, page 4.
3. U.S. EPA, Office of Air Quality Planning and Standards, Air Quality Assessment Division, *SO2 NAAQS Modeling Technical Assistance Document*, page 22.
4. Garcia, Sergio, *Background Concentrations and the Need for a New System to Update AERMOD*, 11th USEPA Triennial Modeling Conference, Research Triangle Park, NC, August 12 – 13, 2015.
5. Long, David, *The Use and Processing of USEPA Clean Air Markets Division CEMS Data for Air Quality Modeling and Other Applications*, To be presented at The Air and Waste Management Association Specialty Conference The Guideline on Air Quality Models: The New Path, Chapel Hill, NC, April 12 – 14, 2016.

APPENDIX

Modeling Inputs for the Reported Simulations in Electronic Form