United States Department of the Interior
FISH AND WILDLIFE SERVICE

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RW Air Quality
Mail Stop 60130

29 SEP 1989

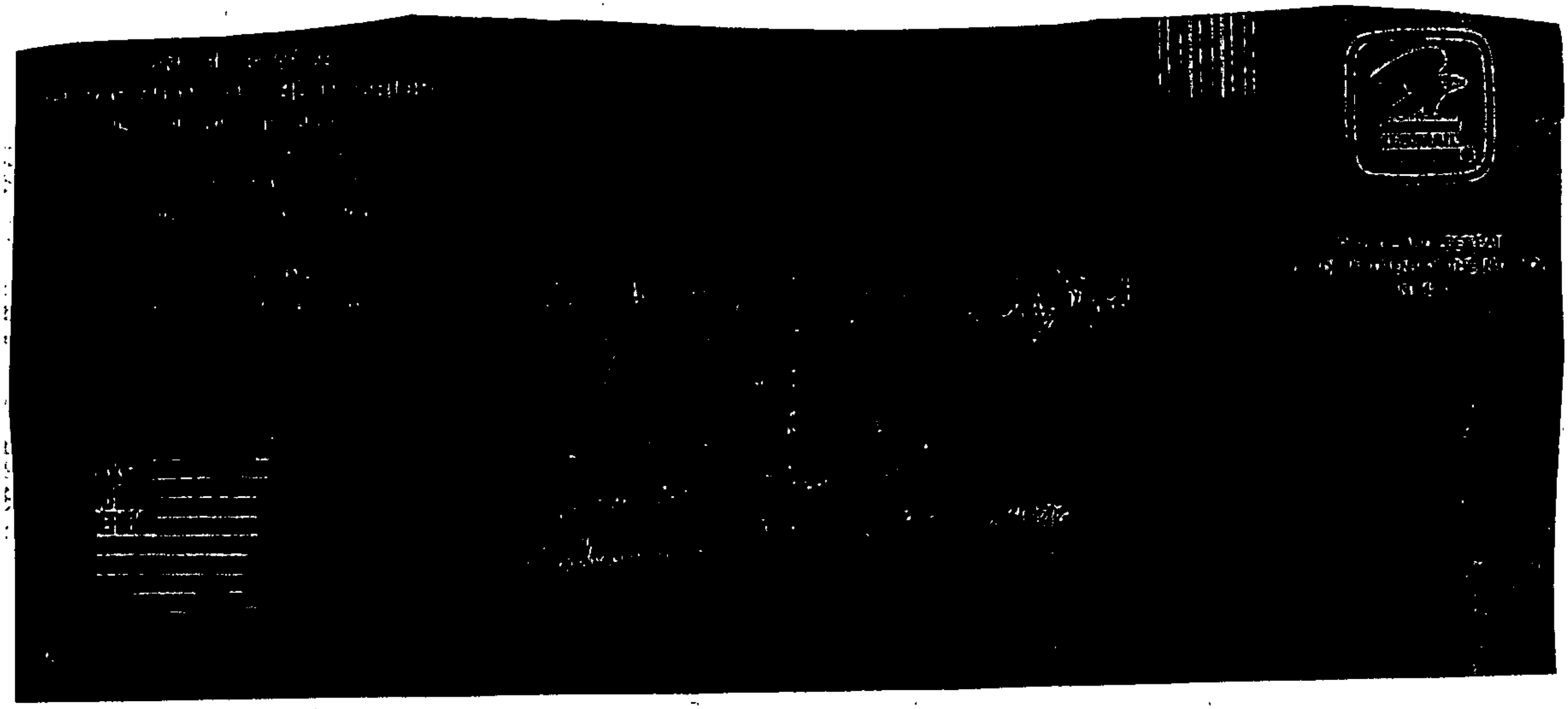
Mr. C.H. Fancy, P.E., Deputy Chief
Bureau of Air Quality Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

We have reviewed the information you forwarded to us regarding Orlando Utilities Commission's request to increase the permitted particulate matter rate for the new gas turbines at their Indian River plant. The Indian River plant is located approximately 175 km east of Chassahowitzka National Wildlife Refuge (NWR), a class I area administered by the U.S. Fish and Wildlife Service. We appreciate your continued cooperation in notifying us of projects that have the potential to impact the air quality or air quality related values of our class I lands.

Results of initial performance tests indicate that particulate matter emissions from turbine CT-A ranged from 12.65 to 19.4 lb/hr (average of 15.3 lb/hr) and particulate matter emissions from turbine CT-B ranged from 17.83 to 24.93 lb/hr (average of 21.9 lb/hr) when burning oil. Based on the performance tests results, Orlando Utilities requests that you increase the permitted limit for the turbines from the current 10 lb/hr rate to 30 lb/hr.

Considering the relatively long distance from the Indian River plant to the Chassahowitzka NWR, we do not expect that the proposed increase in particulate matter emissions would significantly impact resources at the refuge. However, in order to minimize local impacts from the turbine emissions we offer the following comments for your consideration. First, since particulate matter, nitrogen oxides, and sulfur dioxide emissions from the turbines would be much less when burning gas as compared to oil, and the turbines are capable of burning both gas and oil, we recommend that you encourage Orlando Utilities to fire the turbines with gas rather than oil. Also, because turbines CT-A & B are identical, we would expect that the emissions from the turbines would be similar. However, during the performance tests the particulate matter emissions from turbine CT-B averaged over 43% higher than those from turbine CT-A. Unless Orlando Utilities can explain the discrepancy in the test results, and provide



further justification for the proposed 30 lb/hr emission rate, we recommend that the revised particulate matter rate be closer to the test results for turbine CT-A (i.e., 15-16 lb/hr).

If you have any questions regarding this matter, please contact John Bunyak of our Air Quality Office at (303) 969-2071.

Sincerely,

Ralph F. Fries

Ralph F. Fries
Acting Assistant Regional Director
Refuges and Wildlife, Region 6

copied: P. Laval
B. Andrews
D. Rogers
C. Collins, 6 Dist.
CHF|BT

ORLANDO UTILITIES COMMISSION
500 SOUTH ORANGE AVENUE • P. O. BOX 3193 • ORLANDO, FLORIDA 32802 • 407/423-9100

September 18, 1989

RECEIVED
SEP 19 1989
DER - BAQM

Mr. Pradeep Raval
Bureau of Air Quality Management
Florida Department of
Environmental Regulation
2600 Blairstone Road
Tallahassee, FL 32399-2400

Re: **PSD-FL-130 Modification to Permit**

Dear Mr. Raval:

Per your request, I had Black & Veatch develop correction factors to be applied to compensate for the location of the ports. Attached is this estimated as supplied to me by Black & Veatch in their letter of September 14, 1989.

If the Department concurs with this estimate and uses it to establish maximum emissions per unit, I request that the calculation be made a part of the permit.

We appreciate your cooperation and understanding in this matter. If you have any questions, please call me at 407/423-9141, Steve Day (B&V) at 913/339-2880 or Al Ferguson (B&V) at 913/339-2199.

Sincerely,

J. S. Crall
Director
Environmental Division

JSC/cs
Attachment

xc: S. M. Day (B&V)
cc'ed: Barry Andrews
Madelon
Wayne Aronson, EPA
Steve Shaver, DER
Chuck Collins & Bob.
C.F. Lee
Jim Pennington

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Orlando Utilities Commission
Indian River Plant, CT Project
TSP Measurements

B&V Project 14137
B&V File 32.0404
September 14, 1989

Orlando Utilities Commission
500 South Orange Avenue
Orlando, Florida 32802

Attention: Mr. James S. Crall
Director, Environmental Division

Gentlemen:

The measurement of particulate emissions from Combustion Turbine Units A and B were conducted in an expanding section of the duct. This location is immediately adjacent to turns and bends in the flue gas duct and does not meet the requirement for proper stack sampling. GE located the sampling ports there because no duct or stack locations were available which met the criteria for sampling. To achieve a proper sampling port location within the existing duct, the silencer would have had to be removed to perform the sampling.

The test measurements include a measurement of the gas flow rate. However the measured gas flow rate is much higher than the gas flow rate that Black & Veatch has calculated to have occurred during the test using the F-factor method. We believe that the F-factor method for estimating the gas flow rate is more accurate than the value obtained during the measurement due to the location of the sampling ports. In view of this, the application of a correction factor to the measured data is appropriate.

The high measurement of gas flow rate indicates turbulent gas flow in the duct at the point of measurement. The concentration of large particles of particulate matter will vary across a flue gas duct in an environment of turbulent gas flow making estimates of the appropriate correction factor difficult. However very small particles of particulate will retain a uniform concentration in a turbulent flow acting much the same as the gas itself. Since the particulate emissions in a combustion turbine are mostly fine particles, the correction factor can be approximated as the ratio of the actual (calculated) flue gas flow rate to the measured flue gas flow rate.

The enclosed calculations provide the estimated correction factors to be applied to the measured particulate emission rates. With these correction factors applied, the estimated average particulate emission rate from Unit A becomes 9.6 pounds per hour and for Unit B it becomes 15.4 pounds per hour.

If you have any questions regarding these estimates of correction factors, please call me at 913-339-2880 or Al Ferguson at 913-339-2199.

Very truly yours,

BLACK & VEATCH

Steven M. Day

Enclosure

Purpose: The purpose of these calculation is to estimate the particulate emissions from CTA and CTB using the measured data from the emission tests. The test portion is a very turbulent area which resulted in measurment of gas flow which was higher than should exist at that point.

Ref. TSA Test Report CTA and CTB

Measured gas flow during particulate runs

CTA

Run 1 7/26/89 - 854,407 actm - 295,450 dscfm

Run 2 7/27/89 - 853,157 actm - 295,743 dscfm

Run 3 7/27/89 - 857,662 actm - 283,445 dscfm

Calculate gas flow using "F" factors

"F" factor for fuel oil = F_d = 9190 dscf/MBtu

F_w = 10320 scf/MBtu

F_c = 1420 scf/MBtu

Fuel oil flow rate

					Btu/lb
Run 1	7/26/89	17:30 - 18:57 pm	6.05	lb/sec	19,533
Run 2	7/27/89	07:05 - 08:21 am	6.26	lb/sec	19,533
Run 3	7/27/89	08:43 - 10:02 am	6.13	lb/sec	19,533

DO NOT WRITE IN THIS SPACE

RGN-1724

Flue Gas Flow Rate CTA

Adjustment for excess air from "F" factor

Run 1 - $9190 \frac{dscf}{MBTU} \times 0.019533 \frac{MBTU}{lb\,fuel} \times 6.05 \frac{lb\,fuel}{sec} \times 60 \frac{sec}{min} \times \frac{20.9}{(20.9-13.5)}$

$= 184{,}037$ dscfm

Run 2 $9190 \frac{dscf}{MBTU} \times 0.019533 \frac{MBTU}{lb\,fuel} \times 6.26 \frac{lb\,fuel}{sec} \times 60 \frac{sec}{min} \times \frac{20.9}{(20.9-13.45)}$

$= 189{,}147$ dscfm

Run 3 $9190 \frac{dscf}{MBTU} \times 0.019533 \frac{MBTU}{lb\,fuel} \times 6.13 \frac{lb\,fuel}{sec} \times 60 \frac{sec}{min} \times \frac{20.9}{(20.9-13.6)}$

$= 189{,}025$ dscfm

Particulate Emissions

The measured flow rate is higher than the calculated flow rate as would be expected for flow not perpendicular to the pitot tube. This also means that the measured concentration is equal to or higher than actual because of super-isokinetic sampling. This is because the expected particle size distribution is low for this source. That is all the particles are expected to be small. These small particles will follow the gas streamlines and be relatively evenly distributed across the combustion turbine duct. Sampling above isokinetic as was done at this location would result in an abnormally high weight of these particle being trapped on the filter and weighed. This would not be true if all the particles were large. In that instance the particles would cross the streamlines. If we assume that the measured particulate concentration is correct we will either estimate emissions which are too high or correct. This is the approach which will be used.

CTA Estimated Emissions

Run 1 Concentration from TSA report

$$184{,}037 \frac{dscf}{min} \times \frac{60\,min}{hr} \times 2.13 \times 10^{-7} \frac{lb}{dscf} = 2.87\ lb/hr$$

Run 2

$$189{,}147 \frac{dscf}{min} \times \frac{60\,min}{hr} \times 1.09 \times 10^{-6} \frac{lb}{dscf} = 12.4\ lb/hr$$

Run 3

$$189{,}025 \frac{dscf}{min} \times \frac{60\,min}{hr} \times 8.21 \times 10^{-7} \frac{lb}{dscf} = 9.31\ lb/hr$$

Avg. 9.86 lb/hr

CTB Estimated Emissions

Fuel Oil Flow Rate CTB

			O_2	Part lb/dscf	Fuel Oil Flow
Run 4	7/28/89	09:25 - 10:42	13.5	1.25×10^{-6}	6.32 lb/sec
Run 5	7/28/89	11:00 - 12:16	14.5	1.00×10^{-6}	6.22 lb/sec
Run 6	7/28/89	12:30 - 13:44	14.5	1.14×10^{-6}	6.15 lb/sec

Flue Gas Flow Rate CTB

Run 4 $9190 \frac{dscf}{MBtu} \times 0.019537 \frac{MBtu}{lb\,fuel} \times 6.32 \frac{lb\,fuel}{sec} \times \frac{60\,sec}{min} \times \frac{20.9}{(20.9-13.5)} = 192{,}290$ dscfm

Run 5 $9190 \frac{dscf}{MBtu} \times 0.019537 \frac{MBtu}{lb\,fuel} \times 6.22 \frac{lb\,fuel}{sec} \times \frac{60\,sec}{min} \times \frac{20.9}{(20.9-14.5)} = 218{,}817$ dscfm

Run 6 $9190 \frac{dscf}{MBtu} \times 0.019537 \frac{MBtu}{lb\,fuel} \times 6.15 \frac{lb\,fuel}{sec} \times \frac{60\,sec}{min} \times \frac{20.9}{(20.9-14.5)} = 216{,}354$ dscfm

CTB Estimated Emissions

Run 4 $192{,}290 \frac{dscf}{min} \times 60 \frac{min}{hr} \times 1.25 \times 10^{-6} \frac{lb}{dscf} = 14.4 \; lb/hr$

Run 5 $218{,}817 \frac{dscf}{min} \times 60 \frac{min}{hr} \times 1.00 \times 10^{-6} \frac{lb}{dscf} = 13.1 \; lb/hr$

Run 6 $216{,}354 \frac{dscf}{min} \times 60 \frac{min}{hr} \times 1.44 \times 10^{6} \frac{lb}{dscf} = 18.7 \; lb/hr$

Avg 15.4 lb/hr

This correction should be repeated for any future particulate sampling which occurs at this site. The following values should be determined for the new tests.

Fuel Flow Rate - lb/sec
Heat Value of the Fuel - Btu/lb
Particulate concentration - lb/dscf
O_2 at sample site - %

With these new values and the other values, the equations shown above can be used for future particulate emission estimates.