



**Commonwealth Edison**

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Address Reply to: Post Office Box 767  
Chicago, Illinois 60690 - 0767

February 1, 1988

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

Subject: Byron Station Units 1 and 2  
Essential Service Water  
System Cooling Towers  
NRC Docket Nos. 50-454 & 50-455

References: (a) January 14, 1987 letter from K. A. Ainger to  
H. R. Denton

(b) May 28, 1987 NRC Meeting Summary

Gentlemen:

This letter is to inform you of the results of our performance test program that was conducted on an essential service water system cooling tower at Byron Station. The test program was described in reference (a) and discussed in detail at a meeting with the NRC staff and their consultant on May 13, 1987. A summary of the meeting was documented in reference (b).

A draft report of the cooling tower test program results was provided to the NRC's contractor in September, 1987. Written questions were received from the contractor on December 16, 1987. These questions are addressed in the attached letter from Environmental Systems Corporation.

Enclosed is Revision 1 of "Byron Nuclear Generating Station Essential Service Water Cooling Tower Thermal Performance Test Report". As stated in the conclusion of the report, the results indicate the tower capacity is more than sufficient to reject the design basis heat load resulting from a LOCA in one unit and safe shutdown of the other unit. The results of this report will be used by Commonwealth Edison to generate a proposed change to the Byron ultimate heat sink technical specification.

Please direct any questions regarding this matter to this office.

Very truly yours,

8802090059 880201  
PDR ADOCK 05000454  
P PDR

K. A. Ainger  
Nuclear Licensing Administrator

Attachment  
Enclosure

cc: Byron Resident Inspector  
NRC Region III Office



ENVIRONMENTAL SYSTEMS CORPORATION □ 200 TECH CENTER DRIVE □ KNOXVILLE, TENNESSEE 37912

January 21, 1988

Mr. Kenneth D. Brienzo  
Commonwealth Edison Company  
Room 1532  
72 West Adams  
Chicago, IL 60603

Dear Ken:

Subject: Byron Essential Service Water Cooling Tower Test Report

Enclosed are four (5) copies of Revision 1 of the subject report. The revisions to the report are in response to the review comments by Norman Pace. In accordance with our telephone conversation of January 11, I have also included five copies of the three volume appendices. Volume 3 is a revised version which includes the uncertainty analysis requested by Norm. Volumes 1 and 2 have not been revised.

I discussed by telephone with Norm his review comments on December 17. What follows is a summary of our conversation and the resulting actions.

(Numbers refer to the question numbers in the attached letter from Norm Pace. The questions from Norm are repeated, and my answer follows.)

1. QUESTION - Some inlet WBT's were identified as being in error and thrown out; other inlet WBT's appear to be in error also but were retained and are near or over higher than the DBT's. Including these WBT's in the data is, I believe, nonconservative and maybe they should be thrown out also? What are ESC's comments on this? Typical data points are:
  - a. BYTEST 06 #63 somewhat high; #65 high almost equal to the DBT
  - b. BYTEST 08 #65 greater than the DBT
  - c. BYTEST 10 #65 and 66 almost equal to the DBT
  - d. BYTEST 16 #62 almost equal to the DBT
  - e. BYTEST 22 #62 almost equal to the DBT
  - f. BYTEST 32 #67 almost equal to the DBT

RESPONSE - During the tests, inlet wet bulb temperature (WBT) psychrometers were monitored to ensure they were operating properly. Table 4.6 in the report provides a listing of WBT measurements which were not used for a particular test and the reason for rejection of the data. The questions raised by Norm concern WBT's which were higher than nearby temperatures. This was due to the blow-out from the adjacent operating cells, which would be pulled into the downwind side of the test cell. This was a non-steady,

and often localized, phenomena which resulted in significant differences among the WBT's on the downwind side of the tower. This problem was lessened, but not eliminated, beginning with BYTEST 10 by operating the fans on all the tower cells which had water running over them. The uncertainty analysis in Appendix J.5 assigns a high bias uncertainty to the measurement of both the inlet wet bulb and dry bulb temperature ( $\pm 1^\circ\text{F}$ , as compared to  $\pm 0.3^\circ\text{F}$  for most cooling tower test) in recognition of the blow-out temperature effects. Further discussion of this problem is included on pages 31-32 of the report.

2. QUESTION - Some CWT's were thrown out due to low water level, but those indicated as thrown out were not necessarily thrown out according to data sheets. For examples:
  - a. BYTEST 11 Table 4.5 indicated CWT's #40, 55, and 59 thrown out while test data sheets show #44, 55, and 59 thrown out
  - b. BYTEST 16 and 17 Table 4.5 shows five marked to be thrown out but data sheets show only two thrown out
  - c. BYTEST 19 Table 4.5 indicates #40, 44 and 55 to be thrown out but data sheets show #40, 42, and 59 thrown out
  - e. BYTEST 21 Table 4.5 has #44 in it and it should be #40
  - f. BYTEST 22 Table 4.5 states none eliminated but data sheets show two eliminated
  - g. BYTEST 24 and 25 Table 4.5 does not include #40 as it should

RESPONSE - The discrepancies between the cold water temperature (CWT) measurements rejected for a particular test have been corrected in Table 4.5 of the revised report.

3. QUESTION - BYTESTS 27, 28 and 29 have exit WBT's much lower than the HWT; why? I realize these tests had no fans on and this data have no effect on the results: I just wondered why.

RESPONSE - These tests were conducted with the fans off in an attempt to determine the amount of natural draft cooling available. This proved to be of limited value because of problems with acquiring valid inlet and exit WBT's. The reasons that exit WBT's were considerable lower than the hot water temperature were twofold; first, the amount of heat transferred was minimal, so the terminal temperature difference between the hot water and exit WBT was higher than for the other tests; second, with the low exit air velocities, some outside air was probably entering the fan stack and influencing the exit WBT measurements.

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4. QUESTION - Please discuss the correction of L/G to match the heat balance to me over the phone.

RESPONSE - The report discusses this in Section 5.2. Norm and I went into considerably more detail on the telephone. If requested, I can provide a more detailed written account of our conversation.

5. QUESTION - Section 5.2 states fan test within 5% when data shows within 6.4%.

RESPONSE - The correction has been made in the revised report.

6. QUESTION - Pitot tube used to measure water flow rate was calibrated in wind tunnel. What inaccuracies are incurred by this. I realize that in theory this is quite valid.

RESPONSE - The transfer of Pitot tube calibration results from one fluid medium to another requires the matching of Reynolds number, which was done in this case. In addition, Mach number effects must also be matched if either the calibration or test flows are compressible (i.e. Mach number  $> .4$ ). In this case both the calibration and test flows were well into the incompressible regions, and so Mach number similarity was not a requirement.

7. QUESTION - How do you know the water flow rate in each cell is about the same for each of the eight cells for the fan air flow rate tests? It would be good to put this information into the report.

RESPONSE - The last paragraph of Section 5.2, on page 42 has been revised and describes the water flow rate conditions in more detail.

8. QUESTION - There are a number of typing errors or mistakes in the report that should be cleaned up. If you want my input on this I will be willing to page through the main report with someone on the phone.

RESPONSE - These typing errors were discussed, and the corrections made to the revised report.

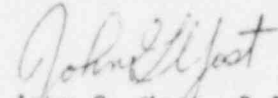
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Another issue raised during my telephone conversation with Norm, concerned an uncertainty analysis. As he requested, the revised report contains an uncertainty analysis in Appendix J.5 and is referenced in the report text. This analysis indicated the predicted cold water temperature at the design operating conditions of 97.3° F, had an uncertainty of 0.6° F attributable to possible test measurement error.

If Norm Pace or you have any further questions, please call me.

Sincerely,

ENVIRONMENTAL SYSTEMS CORPORATION



John G. Yost, P.E.  
Manager, Component Testing & Analysis

cc. Karl R. Wilber, ESC

Attachment: Letter from Norman Pace dated December 16, 1987

December 16, 198

## QUESTIONS ON THE BYRON COOLING TOWER REPORT

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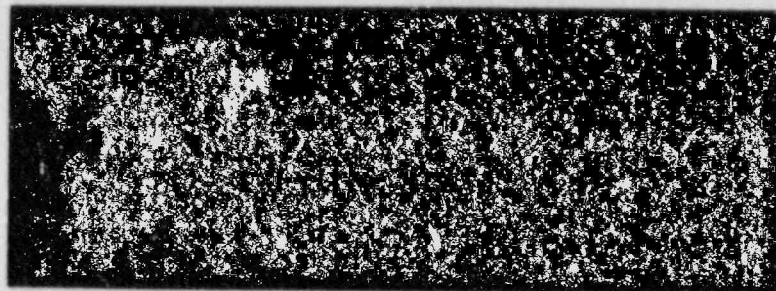
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4. Please discuss the correction of L/G to match the heat balance to me over the phone.
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8. There are a number of typing errors or mistakes in the report that should be cleaned up. If you want my input on this I will be willing to page through the main report with someone on the phone.

Norman E. Pace  
208-526-0398  
EG&G Idaho Inc.





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