VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

August 20, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Serial No. 725
NO/JOE
Docket No. 50-338
License No. NPF-4

Attention: Mr. Robert A. Clarke, Chief
Operating Reactors Branch No. 3

Gentlemen:

REQUEST FOR ADDITIONAL INFORMATION
ELECTRICAL DISTRIBUTION SYSTEM VOLTAGES
NORTH ANNA POWER STATION - UNIT 1

In accordance with your letter dated June 25, 1980 requesting additional information, we are providing the following responses. Complete responses are not provided for all questions, but schedules for completion of the outstanding responses are included.

NRC Request

1. Pages 1 and 2 of references b and d list pre-conditions that need to be met to assure that the worst-case loading assumed for the study is not exceeded. These limiting conditions of operation (LCO) should be included in the North Anna Technical Specifications.

Response

Control of the referenced pre-conditions is adequate and is presently administered by station operating procedures. We do not feel that a change to the Technical Specifications is required at this time since the failure to implement these conditions would not result in the inability of any safety equipment to perform its function.

NRC Request

2. Page 1 of both reference b and d and item (1) of the attachment of reference a indicate that the voltage at the emergency buses must be maintained above 90% of motor rated voltage. Enclosure A[b,d] shows a plot of "minimum acceptable" voltage, which allows the 480 V emergency buses to be lower than 90% voltage. Resolve this discrepancy.

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Response

The criteria for degraded voltage setpoint, as well as the design of our load shed scheme (and therefore the "minimum acceptable" value), was for the steady state voltage on the safety related 4 KV buses to be no less than 90% of the bus rating of 4160 volts. When cable voltage drops are accounted for, this setting insures that the motor terminal voltage is above the value that the motors can continuously operate. The "minimum acceptable" voltage plot on the referenced enclosures allowed for the difference in bus ratings and motor terminal ratings, as well as cable voltage drops. This plot was not extended to 480 volt emergency buses. The values of the 480 V emergency bus voltages for these conditions will be supplied in reply to your question #3 below.

NRC Request

3. Enclosure $B^{b,d}$ shows voltage levels below 90%. Justify continued operation of the emergency loads under these conditions. Enclosure $A^{b,d}$ does not show the voltage levels for the 480 V class IE buses.

Response

The voltage levels given in the referenced enclosure were for the transient condition of class 1E motors starting on the emergency buses as required for a CDA. These motors will be accelerated to operating speed in four seconds or less. After these motors have accelerated, and the load tap changers have reset as required, the voltage will improve to a point better than the voltages given for conditions AP through AU (enclosure A of our referenced letters). Therefore, there will be no "continued operation of the emergency loads under these conditions".

The voltages for the 480 V class 1E buses for the cases studied in the referenced enclosure A will be provided by September 16, 1980.

NRC Request

4. The assumed minimum grid voltage per assumption A, page $2^{b,d}$, is 508 kV. The attachment of reference a indicates that 482 kV is possible on the 500 kV grid. Per NRC guideline 6^{c}, the minimum expected grid voltage should be used in the analysis.

Response

Grid studies have shown that the minimum expected voltage for worst case conditions is approximately 508 KV at North Anna. This value has been used in all our calculations of which we

sent the results to you via our letters of August 7, 1979 and August 16, 1979. The value of 482 KV was used in our calculations of which we sent the results to you via our letters of September 12, 1978 and December 10, 1976, and as we pointed out in both of these submittals, the value of 482 KV represented a substantial conservative factor below our postulated worst case grid voltage.

NRC Request

5. Does the 90% of 4160 V setpoint of Grid Degraded Protection[g] adequately protect 480 V and 120 V class IE equiment? The enclosure in section 1.a[g] indicates that VEPCo plans to operate motors down to "85% potential value." This cannot be allowed unless VEPCo can verify by manufacturer or test data that this will not be adverse t motor life.

Response

The setpoint of 90% of 4160 volts for degraded grid protection adequately protects the 480 V and 120 V class 1E equipment. We have no intention of continuously operating equipment down to 85% voltage.

NRC Request

6. What are the voltages and duration of depressed voltage on all class IE buses when starting and running a 7000-HP reactor coolant pump? Justify continued operation of class IE loads for this duration and describe how spurious trips of the class IE buses and loads are prevented during this time period. The intent of the NRC guideline 3[c] was that, during the worst case (reactor trip) loading conditions, consideration should be made for any possible start of a large non-safety load. The analysis would then show the resultant voltages on all safety-related loads (buses) during the transient (start) and the steady state (running) conditions.

Response

Studies will be run to provide the values requested. This information will be forwarded by September 16, 1980.

NRC Request

7. Paragraph 2[f] indicates that some modifications are required in the North Anna switchyard to meet the intent of reference c requirements regarding GDC 17. When will these modifications be complete and documented?

Response

The modifications discussed in our letter of November 28, 1979 will be completed and documented at an early date. We will supply the completion schedule by September 16, 1980.

NRC Request

8. Unit one-line diagrams, enclosure $C^{b,d}$ indicate that it is possible for all class IE buses to be supplied power from reserve transformer C. It is not evident that references b and d have analyzed for this possible loading. Per guideline 1, perform analysis "assuming the power source to the safety buses is ... other available connections to the offsite network one by one ...".

Response

Our present bus arrangement, as per the referenced enclosure, has no available connection of all class 1E buses to reserve transformer C. If this question is in regards to the administrative tie breaker in cubicle 15H1, it should be noted that this breaker is only used for maintenance (as per the FSAR) and would therefore present no concerns for heavy loading.

NRC Request

9. Guideline 11^{c}, which asks for a determination of the maximum voltage expected at each safety load (and starting circuit), has not been supplied by any of the VEPCo references. VEPCo should supply this analysis; they should identify and correct any overvoltage conditions.

Response

Recent grid studies for postulated worst case conditions of overvoltage have indicated a maximum of 530 KV at North Anna. Without any load on the reserve system, an extremely conservative assumption, the voltage on the 4160 V buses for this maximum voltage would be approximately 4317 volts or 108% of the motor nameplate rating. The voltage on the 480 V buses for this condition would be approximately 511 volts or 111% of the 460 volt motor nameplate rating. The voltage on the 120 V motor starting circuits for this condition would be approximately 128 volts or 107% of the starter's nameplate rating.

The voltage on the 480 V bus of 111% is not considered a problem because voltage drops in cables and transformers throughout the feed from the 500 KV bus to the 480 V load will reduce this value to below the maximum continuous operable value of 110%.

NRC Request

10. As required by NRC guideline 9, VEPCo should provide analysis and comparison of terminal voltages on all class IE loads (4160 V, 480 V, and lower voltage buses and loads) for the worst case starting voltage and steady state running voltages. Enclosures A and B[b,d] do not include these values.

Response

This question will be addressed in conjunction with item #6 above, by September 16, 1980.

NRC Request

11. Will the controls and instruments (low voltage circuits) perform their functions as required under the voltages calculated in Question 10 without overheating, blowing fuses, etc?

Response

This question will be addressed in conjunction with item #6 above, by September 16, 1980.

Very truly yours,

B. R. Sylvia
Manager - Nuclear
Operations and Maintenance

svm:SK5

cc: Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement, Region II
Atlanta, Georgia 30303