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CONNECTICUT YANKEE ATOMIC POWER COMPANY

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August 21, 1980

Docket No. 50-213
A01116

Director of Nuclear Reactor Regulation
Attn: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Reference: (1) D. M. Crutchfield to W. G. Counsil dated July 1, 1980.
(2) W. G. Counsil to D. L. Ziemann dated November 15, 1979.
(3) W. Gammill to All Power Reactor Licensees dated August 8, 1979.
(4) D. C. Switzer to A. Schwencer dated July 21, 1977.

Gentlemen:

Haddam Neck Plant
Adequacy of Station Electric Distribution System Voltages

In Enclosure 1 to Reference (1), Connecticut Yankee Atomic Power Company (CYAPCO) was requested to supply additional information on the subject topic by responding to a list of questions.

In response to that request Attachment 1 to this letter provides answers to your questions 2, 3 and 4. Question 1 requires additional efforts which, due to the demands of other NRC requirements on existing manpower, we have been unable to complete at this time. We anticipate submitting a response to your question 1 by November 26, 1980.

CYAPCO trusts this meets with the Staff's approval.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

W. G. Counsil
W. G. Counsil
Senior Vice President

Attachment

By: W. F. Fee
W. F. Fee
Executive Vice President

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ATTACHMENT 1

HADDAM NECK PLANT

ADDITIONAL INFORMATION ON ADEQUACY OF STATION DISTRIBUTION SYSTEM VOLTAGES

AUGUST 1980

References

1. NRC letter (D. M. Crutchfield) to Connecticut Yankee (W. G. Counsil) dated July 1, 1980.

2. Attachment 1 of Northeast Utilities letter (W. G. Counsil) to NRC (D. L. Ziemann) dated November 15, 1979.

3. NRC letter (W. Gammill) to all Power Reactor Licensees, dated August 8, 1979.

4. CYAPCo letter (D. C. Switzer) to NRC (A. Schwencer), dated July 21, 1977.

Question 2

Ref. 2, Page 5, Paragraph 2 refers to a proposal for installing a second second-level of undervoltage protection for the Class 1E equipment when only one of the two station service transformers is available (389 or 399). The operation of this second second-level protection scheme is stated to be the same as that of the first second-level scheme detailed in Ref. 4. The design of the second-level of undervoltage protection (NRC Staff Position 1, June 2, 1977 letter) is to protect all Class 1E equipment from grid voltage degradation under all modes of operation. Explain in detail why this second second-level protection is necessary.

Response 2

If two station service transformers are in service, each transformer is carrying the plant-load of the associated redundant division. Prior to starting LOCA loads, a voltage of 3940 volts is required on each 4160-volt safety bus to assure that sufficient voltage is available to start and operate all LOCA loads in each division. Once the LOCA loads are running, the 4160-volt bus voltage drops to 3620 volts and the 480 volt bus voltage to 406 volts. (The 3620-volt and 406-volt levels are the minimum voltages for continuous operation of loads on the associated buses). Bear in mind that in dropping from 3940 volts to 3620 volts, each station service transformer experiences the voltage drop associated with running one division of accident loads.

If only one station service transformer is in service, it must carry the plant load of both divisions. It must also be capable of starting and operating the LOCA loads associated with both divisions. The starting of two divisions of LOCA loads produces a larger voltage drop through the station service transformer than starting one division of LOCA loads. Therefore, in order to maintain the same minimum voltages (3620 volts and 406 volts) for operation of all loads, it is necessary to maintain a higher 4160 volt bus, voltage prior to the start of the LOCA loads. This higher voltage is 4028 volts and represents the setpoint of the second level two scheme.

Since one set of relays cannot identify the two different voltage levels (3940 volts and 4028 volts) discussed above, it is necessary to install redundant monitoring devices. One of the level-two schemes will be set at 3940 volts and will be in service when both station service transformers are being used. The other level-two scheme will be set at 4028 volts and will be in service when only one station service transformer is available.

Question 3

Ref. 2, Page3 identifies that overvoltages can occur on the Class 1E buses under minimum load and high offsite grid voltage conditions. Installation of overvoltage alarms will be added to initiate operator corrective action. Credit will be given for this corrective action only if the undervoltage monitors and alarms are Class 1E and in the interim period of correction, the overvoltage condition does not shorten equipment life or affect the Class 1E equipments ability to perform the required function. Provide documentation which demonstrates the equipment can meet these overvoltage conditions. Also, provide the calculated overvoltages on all Class 1E equipment for each case analyzed.

Response 3

The overvoltages identified can occur in the minimum load case when the system voltage approaches its normal maximum.

Case a. The unit is shutdown and the station service is carrying minimum auxiliary load (3.98 MVA).

Minimum Load on the Plant Auxiliary System is:

4.16 KV Bus 8	-	1.99 MVA @ .70 pf
4.16 KV Bus 9	-	1.99 MVA @ .70 pf
480 V Buses	-	4 X 0.5 @ .70 pf

Bus Voltage Limits (Overvoltage)

4160 V Buses	-	4420 V
480 V Buses	-	494 V

Voltage Reached for Normal System Maximum (117 KV)

4160 V Bus 8	-	4423 V
4160 V Bus 9	-	4423 V
480 V Bus 1-4	-	503 V
480 V Bus 1-5	-	503 V
480 V Bus 1-6	-	503 V
480 V Bus 1-7	-	503 V

The 4423-volt figure is less than 0.1% above the maximum 4160-volt bus voltage. The voltage value on the 480-volt buses is 2.0% above the maximum.

As the load on the auxiliary buses increases or as system voltage decreases, the magnitude of the overvoltage will decrease. Case a, above, represents the worst case overvoltage condition since other loading conditions result in decreasing the voltage. Since this case requires the coincidence of high system voltage with minimum plant auxiliary load, the occurrence of these overvoltages is infrequent. Because the overvoltage magnitudes are small and the overvoltages occur infrequently, we conclude that the effect of these small overvoltages on the life of the motors is negligible.

The overvoltage monitors on 4160-volt buses 8 and 9 are Class 1E relays. The monitors on the 480-volt buses and the overvoltage annunciators are not Class 1E equipment.

Question 4

Per guidelines 10 and 12 (Ref. 3), submit the undervoltage protection scheme setpoints (voltage and time delay) in terms of Class 1E nominal bus voltage, not in terms of switchyard voltage as stated in Ref. 2.

Response 4

The voltage setpoints for the level-two undervoltage schemes are:

Two Station Service Transformers - 3940 V

One Station Service Transformer - 4028 V

For the transformer configuration selected, these values represent the voltage required on the safety buses prior to starting of LOCA loads, such that the starting of all LOCA loads can be assured.

The time delay associated with the level two relays is 9 seconds in either the one transformer or two transformer configuration. This allows for transmission system fault clearing, auxiliary bus voltage transients, and motor starting without reducing the availability of the offsite power source.

The level-one loss-of-voltage setpoint is 2870 volts (approx. 69%) with a time delay of 1.0 second at 50% of the relay setpoint (approx. 35% of bus voltage). These levels are sufficient to override transmission system fault clearing and other transient bus voltage conditions for which the loss-of-voltage scheme should not operate.