NORTHEAST UTILITIES
THE CONNECTICUT LIGHT AND POWER COMPANY
THE HARTFORD ELECTRIC LIGHT COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

P.O. BOX 270
HARTFORD, CONNECTICUT 06101
(203) 666-6911

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Docket No. 50-213
A01499

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

References: (1) D. M. Crutchfield letter to W. G. Counsil, dated January 13, 1981.
(2) W. G. Counsil letter to D. M. Crutchfield, dated November 4, 1980.
(3) Telcon: NRC/LLNL/CYAPCO, dated October 7, 1980.
(4) W. Gammill letter to all licensees, dated August 8, 1979.
(5) W. G. Counsil letter to D. M. Crutchfield, dated August 21, 1980.
(6) A. Schwencer letter to D. C. Switzer, dated June 3, 1977.
(7) D. C. Switzer letter to A. Schwencer, dated July 21, 1977.
(8) W. G. Counsil letter to D. L. Ziemann, dated September 24, 1979.
(9) D. C. Switzer letter to A. Schwencer, dated September 30, 1976.

Gentlemen:

Haddam Neck Plant
SEP Topic VIII-1; Degraded Grid Voltage

In Reference (1), the NRC Staff requested additional information of Connecticut Yankee Atomic Power Company (CYAPCO) on the above SEP Topic VIII-1. This information was determined to be necessary as a result of the Staff's review of References (3) and (5). Accordingly, the following material is provided to enable the Staff to complete their review of the subject SEP topic.

Based upon the Staff concerns articulated in Reference (1), CYAPCO has modified its proposal to more directly comply with the Staff position. Each of five items included in Reference (1), as well as a sixth item identified verbally by the Staff, are addressed as follows:

The licensee has proposed two second-levels of undervoltage protection with the following setpoints:

a) First second-level protection at 3940 volts (94.4% of 4160 volts) for nine seconds.

b) Second second-level protection at 4028 volts (96.8% of 4160 volts) for nine seconds.

In a telephone conference on October 7, 1980, the two second-levels of undervoltage protection were discussed. The following are points of concern.

Item 1

For an SI signal, both of these second-level protection schemes would be blocked and will only be reinstated when SI signal is reset. This blocking removes the protection of the Class 1E equipment should a degraded grid condition exist during an accident condition until the loss-of-voltage protection scheme setpoints are reached (2870 volts - 69% of 4160 volts). The Class 1E equipment must be protected against sustained degraded voltages per staff Position 1 of Reference (6). The bypassing of the degraded grid protection scheme during the time period that an SI signal is present is a direct contradiction of the lessons learned from the original Millstone event and is therefore unacceptable.

Response

Because of the concerns expressed in item 1, CYAPCO intends to implement modifications to the degraded voltage protection which will include the following:

a. CYAPCO will install a set of level two (degraded) voltage relays on each 4.16 KV emergency bus, calibrated for 3620 volts (the minimum acceptable 4.16 KV bus voltage). These relays will alarm and, if concurrent with a safety injection signal, trip the offsite supply to initiate sequencing of SI loads onto the emergency diesels. These relays will be in service at all times, but their output will not cause interruption of the sequencing or operation of emergency loads on the emergency onsite power supplies. This set of relays will be referred to as the level two relays.

b. CYAPCO will install a set of undervoltage relays on each 4.16 KV emergency bus, calibrated for 3940 volts. This is the voltage level required prior to starting SI loads to assure a level of 3620 volts or greater once the SI loads are running on the offsite supply (assuming both the 389 and 399 transformers are in service). These relays will alarm whenever the 4.16 KV bus voltage falls below the setpoint. Also, if the voltage is below this setpoint when a SI signal occurs, these relays will trip the offsite supply and initiate sequencing of the SI loads onto the emergency diesels. Even though the trip function of these relays is blocked once the SI loads begin to sequence, the alarm function will be in service at all times. This set of relays will be referred to as level three relays.

c. If either the 389 or 399 transformer is out of service, the voltage required prior to starting SI loads, to assure a level of 3620 volts or greater once the SI loads are running on the offsite supply, increases from 3940 volts to 4028 volts. CYAPCO intends to propose LCO's for operation with one SST inoperable in a license modification request which will be submitted to the Staff in subsequent correspondence. Degraded voltage protection is not compromised while the plant is operating under an ACTION Statement because the relays set at 3620 volts are in service at all times and the relays set at 3940 volts will alarm (if the voltage falls to this level) identify to the operator that system voltage improvements are necessary.

The changes discussed above provide a level two scheme which will be in service at all times and should eliminate any NRC concerns expressed in item 1. Assuming Staff concurrence with the above concept, CYAPCO intends to submit a request for license amendment reflecting the revised proposal on or about May 15, 1981.

Item 2

The two second level setpoints (now level three) are considered to be too high to preclude spurious trips during the starting of a large non-Class 1E load required by Guideline 3 and 9 of Reference (4). Please provide justification for these setpoints and explain how spurious trips are prevented from occurring.

Response

The 3940-volt (2 transformers) and 4028-volt (1 transformer) setpoints would indeed be high enough to cause drop-out of the relays during starting of a large non-Class 1E load. However, spurious trips are prevented by three means:

a. Trip output for the level three relays is time delayed for nine seconds to prevent actuation during the starting of large loads.

b. Trip output for the level three relays is interlocked with a safety injection signal.

c. The level three relays are blocked from tripping once SI loads begin to sequence. Any non-Class 1E load starting at this point in time would not trip the offsite supply even if the voltage remained below the 3940-volt setpoint continuously.

The 3620 volt setpoint, in conjunction with the level two nine-second time delay, is low enough to prevent spurious tripping during the starting of a non-Class 1E load.

Item 3

The 4160 volt non-Class 1E tie breaker, 2T3, between redundant load groups will automatically close when one of the two 115 KV/4160 volt transformers is out of service. The selecting of either the first second-level protection scheme or the second second-level protection scheme and enabling the selected scheme is a manual operation. Manual actions associated with enabling/disabling the second level protection scheme associated with the unlikely and infrequent configuration of having only one 115/4.16 KV transformer may be acceptable. However, the normal two transformer configurations should meet the requirements of Staff Position 1 of Reference (6), (i.e. the protection scheme shall be initiated automatically). Provide further details on this aspect of your proposed design as well as supporting bases and justification.

Response

The concern expressed in item 3 is essentially eliminated by the modifications proposed in item 1.

Item 4

In Reference (3), it was stated that approximately 113 KV would have to be maintained on the grid to keep the Class 1E 4160 volt bus above the second second-level setpoint (97%) in the case where only one station service transformer is available. Explain what administrative procedures or limiting conditions of operations would be used to maintain this grid voltage.

Response

The 113 KV figure cited in Reference (3) was introduced into the conversation as an approximate figure. The actual requirement identified by the voltage studies is 110.8 KV. As noted in Response 1.c., above, the LCO's to be proposed will address ACTION Statements for operation with one SST inoperable. During the ACTION Statement interval, the level three alarm, calibrated for 3940 V, will be used to initiate operator action to correct a degrading voltage. The response to this alarm would be to notify the Connecticut Valley Electric Exchange (CONVEX) and ask them to increase the 115 KV system voltage. Voltage correction can be accomplished by either starting generation or increasing the Var output at the nearby Middletown Station. The alarm response procedure calls for the operator to bring the plant to hot standby if the voltage cannot be improved within a 24 hour period. The 24 hour period and operation under the ACTION Statement with the 3940 volt setpoint is justified by two considerations:

a. The level two relays provide protection against degraded voltages while trying to improve system voltage.

b. Operation in the voltage range between 3620 and 3940 volts is above the minimum acceptable voltage, therefore, no degradation of electrical equipment will occur. The function of the level three relays will be to anticipate a possible degraded voltage and does not require action beyond that identified above.

Item 5

The previously proposed degraded grid protection scheme included an alarm annunciator system. Clarify in detail the integration of the proposed two second-levels of undervoltage protection (now level two and level three) with the alarm protection system with its associated administrative procedures and limiting conditions of operation.

Response

The attached proposed annunciator response procedures, provided as Attachments 1 and 2, identify operator actions to be taken when either the level two or level three trip annunciators operate. The procedures provided refer to bus 3; similar procedures are proposed for bus 9.

If the station service voltage drops to a level between the level-two and level-three setpoints, a level-three trip alarm will occur (assuming no SI signal, only the alarm will occur). The operator is then instructed to notify CONVEX to try to improve the station service voltage. If the voltage cannot be restored to a level above the level-three setpoint within 24 hours, the operator is instructed to bring the unit to hot standby (justification for the 24-hour limit is discussed in item 4 above). If, at any time, the station service bus voltage drops below 3620-volts, a level-two trip alarm will occur (assuming no SI signal, only the alarm will occur). The operator is then instructed to bring the unit to hot standby immediately.

Item 6

Provide maximum drop-out voltages and minimum pick-up voltages on Class 1E motor starters. Explain how these prevent Class 1E motors from dropping out when starting non-Class 1E loads.

Response

The motor starters have been tested to determine the voltage required for pickup and the voltage at which the starters will drop out. The starters were tested with resistances in the control circuit to simulate control lead resistance. The resistance used was based on the length of the longest leads for Class 1E starters plus a 20 percent margin. The highest test values recorded were:

Voltage Required for Pickup	=	386 volts
Voltage to Cause Dropout	=	214 volts

A review of the voltage data submitted in our Reference (2) submittal indicates that at no time does the 480-volt bus voltage drop to a level where dropout of the Class 1E motor starters would be possible. This includes the case of starting of a steam generator feed pump while all accident and normal plant loads are running.

Assuming Staff concurrence with the above response and the request for license amendment when submitted, CYAPCO intends to implement the required modifications prior to startup from the next refueling outage currently scheduled to begin in October, 1981. CYAPCO perceives that the proposed modifications are

sufficiently independent from other SEP topics such that they can be implemented prior to completion of the integrated assessment for the Haddam Neck Plant. Your timely and favorable response to the proposed actions will facilitate adherence to the above schedule.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

W. G. Counsil

W. G. Counsil
Senior Vice President