UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

TERA

July 3, 1980

Docket No. 50-219

Mr. I. R. Finfrock, Jr.
Vice President - Generation
Jersey Central Power & Light Company
Madison Avenue at Punch Bowl Road
Morristown, New Jersey 07960

Dear Mr. Finfrock:

RE: SEP TOPICS III-10.A, V-11.A, VI-7.C.1, VIII-3.B, VIII-4
(Oyster Creek Nuclear Generating Station)

Enclosed is a copy of our current evaluation of Systematic Evaluation Program Topics III-10.A, Thermal-Overload Protection for Motors of Motor-Operated Valves; V-11.A, Electrical, Instrumentation, and Control Features for Isolation of High and Low Pressure Systems; VI-7.C.1, Independence of Redundant Onsite Power Systems; VIII-3.B, D C Power System Bus Voltage Monitoring and Annunciation; VIII-4, Electrical Penetration of Reactor Containment. This assessment compares your facility, as described in Docket No. 50-219 with the criteria currently used by the regulatory staff for licensing new facilities. Please inform us if your as-built facility differs from the licensing basis assumed in our assessment within 60 days of receipt of this letter.

This evaluation will be a basic input to the integrated safety assessment for your facility unless you identify changes needed to reflect the as-built conditions at your facility. This topic assessment may be revised in the future if your facility design is changed or if NRC criteria relating to this topic are modified before the integrated assessment is completed.

Sincerely,

Dennis M. Crutchfield

Dennis M. Crutchfield, Chief
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Division of Licensing

Enclosure:
SEP Topics III-10.A, V-11.A,
VI-7.C.1, VIII-3.B, VIII-4

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SEP TECHNICAL EVALUATION
TOPIC III-10.A

THERMAL-OVERLOAD PROTECTION FOR MOTORS
OF MOTOR-OPERATED VALVES

OYSTER CREEK

TOPIC III-10.A Thermal-Overload Protection for Motors of Motor-Operated Valves

The objective of this review is to provide assurance that the application of thermal-overload protection devices to motors associated with safety-related motor-operated valves do not result in needless hindrance of the valves to perform their safety functions.

In accordance with this objective, the application of either one of the two recommendations contained in Regulatory Guide 1.106, "Thermal-Overload Protection for Electric Motors on Motor-Operated Valves," is adequate. These recommendations are as follows:

(1) Provided that the completion of the safety function is not jeopardized or that other safety systems are not degraded, (a) the thermal-overload protection devices should be continuously bypassed and temporarily placed in force only when the valve motors are undergoing periodic or maintenance testing, or (b) those thermal-overload protection devices that are normally in force during plant operation should be bypassed under accident conditions.

(2) The trip setpoint of the thermal-overload protection devices should be established with all uncertainties resolved in favor of completing the safety-related action. With respect to those uncertainties, consideration should be given to (a) variations in the ambient temperature at the installed location of the overload

protection devices and the valve motors, (b) inaccuracies in motor heating data and the overload protection device trip characteristics and the matching of these two items, and (c) setpoint drift. In order to ensure continued functional reliability and the accuracy of the trip point, the thermal-overload protection device should be periodically tested.

In addition, the current licensing criteria require that:

(3) In MOV designs that use a torque switch to limit the opening or closing of the valve, the automatic opening or closing signal should be used in conjunction with a corresponding limit switch.

DISCUSSION

Review of Oyster Creek drawings show more than 130 motor-operated valves which are supplied power from ESF motor control centers.[4-12] All of these valves have thermal-overload protection devices. The devices are bypassed, except during test, on 12 of the valves; the remainder are not bypassed. There is no docketed information to indicate that TOL trip setpoints have been set to comply with Criterion 2, above. Additionally, where limit switches are used in conjunction with torque switches, the torque switch is the component which halts valve travel.

EVALUATION

Thermal-overload protection for motor-operated valves at Oyster Creek does not comply with current licensing criteria. Only 12 thermal-overload devices are bypassed, no information is available to support adequacy of trip setpoints, and torque switches rather than limit switches are used to terminate valve travel.

REFERENCES

1. IEEE Standard 179-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations."

2. Branch Technical Position EICSB-27, "Design Criteria for Thermal Overload Protection for Motors of Motor-Operated Valves."

3. Regulatory Guide 1.106, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves."

4. Oyster Creek Drawing 3003, Revision 9, dated 6-30-78.

5. Oyster Creek Drawing 3004, Revision 14, dated 7-3-78.

6. Oyster Creek Drawing 3005, Revision 7, dated 7-3-78.

7. Oyster Creek Drawing 3013, Revision 14, dated 6-30-78.

8. Oyster Creek Drawing 3014, Revision 6, dated 6-16-70.

9. Oyster Creek Drawing 3015, Revision 10, dated 6-16-70.

10. Oyster Creek Drawing 3016, Revision 6, dated 6-16-70.

11. Oyster Creek Drawing 3019, Revision 5, dated 6-16-70.

12. Oyster Creek Drawing 3020, Revision 8, dated 11-16-72.

SEP TECHNICAL EVALUATION REPORT

ELECTRICAL, INSTRUMENTATION, AND CONTROL FEATURES FOR ISOLATION OF HIGH AND LOW PRESSURE SYSTEMS

OYSTER CREEK NUCLEAR STATION

1.0 INTRODUCTION

The purpose of this review is to determine if the electrical, instrumentation, and control (EI&C) features used to isolate systems with a lower pressure rating than the reactor coolant primary system are in compliance with current licensing requirements as outlined in SEP Topic V-11A. Current guidance for isolation of high and low pressure systems is contained in Branch Technical Position (BTP) EICSB-3, BTP RSB-5-1, and the Standard Review Plant (SRP), Section 6.3.

2.0 CRITERIA

2.1 Residual Heat Removal (RHR) Systems. Isolation requirements for RHR systems contained in BTP RSB-5-1 are:

(1) The suction side must be provided with the following isolation features:

(a) Two power-operated valves in series with position indicated in the control room.

(b) The valves must have independent and diverse interlocks to prevent opening if the reactor coola[illegible] system (RCS) pressure is above the design pressure of the RHR system.

(c) The valves must have independent and diverse interlocks to ensure at least one valve closes upon an increase in RCS pressure above the design pressure of the RHR system.

(2) The discharge side must be provided with one of the following features:

(a) The valves, position indicators, and interlocks described in (1)(a) through (1)(c) above.

(b) One or more check valves in series with a normally-closed power-operated valve which has its position indicated in the control room. If this valve is used for an Emergency Core Cooling System (ECCS) function, the valve must open upon receipt of a safety injection signal (SIS) when RCS pressure has decreased below RHR system design pressure.

(c) Three check valves in series.

(d) Two check valves in series, provided that both may be periodically checked for leak tightness and are checked at least annually.

2.2 Emergency Core Cooling System. Isolation requirements for ECCS are contained in SRP 6.3. Isolation of ECCS to prevent overpressurization must meet one of the following features:

(1) One or more check valves in series with a normally-closed motor-operated valve (MOV) which is to be opened upon receipt of a SIS when RCS pressure is less than the ECCS design pressure

(2) Three check valves in series

(3) Two check valves in series, provided that both may be periodically checked for leak tightness and are checked at least annually.

2.3 Other Systems. All other low pressure systems interfacing with the RCS must meet the following isolation requirements from BTP EICSB-3:

(1) At least two valves in series must be provided to isolate the system when RCS pressure is above the system design pressure and valve position should be provided in the control room

(2) For systems with two MOVs, each MOV should have independent and diverse interlocks to prevent opening until RCS pressure is below the system design pressure and should automatically close when RCS pressure increases above system design pressure

(3) For systems with one check valve and a MOV, the MOV should be interlocked to prevent opening if RCS pressure is above system design pressure and should automatically close whenever RCS pressure exceeds system design pressure.

3.0 DISCUSSION AND EVALUATION

There are two systems at the Oyster Creek Nuclear Station which have a direct interface with the RCS pressure boundary and have a design pressure rating for all or part of the system that is lower than the RCS design pressure. These systems are the Core Spray (CS) system and the Reactor Water Clean-Up (RWCU) system.

3.1 Core Spray System. The CS system consists of two loops which take a suction on the suppression pool and discharge into the reactor vessel through a set of parallel MOVs in each loop. Isolation is provided by a set of parallel testable check valves in series with the set of parallel MOVs. Each of these valves has position indication in the control room. The MOVs open upon receipt of a safety injection signal after RCS pressure has decreased below CS system design pressure. Therefore, the CS system is in compliance with the requirements for isolation of high and low pressure systems contained in SRP 6.3.

3.2 Reactor Water Clean-Up System. The RWCU system takes suction on the RCS, cools the water by circulation through a regenerative and non-regenerative heat exhanger, and lowers the water pressure by the use of a pressure control valve. After passing through the low pressure filtering and cleaning portions of the system, the water is pumped at high pressure through the regenerative heat exchanger and back to the reactor via the feed line.

Isolation on the suction side of the system is provided by three MOVs, an inboard valve (closest to RCS), a pump suction valve, and a pump bypass valve. Isolation on the discharge side is provided by a MOV and two check valves. None of the MOVs will open if pressure in the low pressure portions of the system is higher than its design pressure. All the MOVs will close on high RWCU system temperature, low flow, or high RWCU system pressure. However, the interlocks for these valves use the same sensors and relays. All the MOVs have position indication in the control room.

The RWCU system is not in compliance with requirements for isolation of high and low pressure systems contained in BTP EICSB-3 since the interlocks for the isolation valves are not independent.

4.0 SUMMARY

The Oyster Creek Nuclear Station has two systems directly connected to the RCS which have lower design pressure ratings than the RCS. The CS system meets the current licensing requirements for isolation of high and low pressure systems contained in SRP 6.3. The RWCU system is not in compliance with BTP EICSB-3 since the isolation valve interlocks are not independent.

5.0 REFERENCES

1. NUREG-075/087, Branch Technical Positions EICSB-3, RSB-5-1; Standard Review Plan 6.3.
2. Final Facility Description and Safety Analysis Report, Oyster Creek Nuclear Station.
3. GE Drawings 148F444, 237E566, and 858D781.
4. Oyster Creek Drawings BR 3020 and BR 3019.
5. JCP&L letter (Finfrock) to NRC (Ziemann) dated February 5, 1979.

TECHNICAL EVALUATION
INDEPENDENCE OF REDUNDANT ONSITE POWER SYSTEMS
OYSTER CREEK NUCLEAR STATION

1.0 INTRODUCTION

The objective of this review is to determine if the onsite electrical power systems (AC and DC) are in compliance with current licensing criteria for electrical independence between redundant standby (onsite) power sources and their distribution systems.

General Design Criterion 17 requires that the onsite electrical power supplies and their onsite distribution systems shall have sufficient independence to perform their safety function assuming a single failure. Regulatory Guide 1.6, "Independence Betwen Redundant Standby (Onsite) Power Sources and Between Their Distribution System," and IEEE Standard 308-1974, "IEEE Standard Criteria for Nuclear Power Generating Stations" provide a basis acceptable to the NRC staff for meeting GDC 17 in regards to electrical independence of onsite power systems.

2.0 CRITERIA

2.1 AC Supplies. When operating from standby sources, redundant load groups and redundant standby sources should be independent of each other at least to the following extent.

(1) The standby source of one load group should not be automatically paralleled with the standby source of another load group under accident conditions

(2) No provisions should exist for automatically transferring one load group to another load group or loads between redundant power sources

(3) If means exist for manually connecting redundant load groups together, at least one interlock should be provided to prevent an operator error that would parallel their standby power sources.

2.2 DC Supplies. Each DC load group should be energized by a battery and battery charger. The battery-charger combination should have no automatic connection to any other redundant DC load group.

3.0 DISCUSSION AND EVALUATION

3.1 AC Supplies

Discussion Oyster Creek Unit 1 onsite emergency AC power system consists of two redundant diesel-generator power trains. Emergency generator 1 (EG1) provides 4160 V AC power to emergency bus 1C which supplies 460 V AC power to substations 1A1, 1A2, and 1A3 from three separate transformers. Emergency generator 2 (EG2) provides similar services to emergency bus 1D and 460 V substations 1B1, 1B2, and 1B3.

Means exist to connect the redundant trains at four locations. Buses 1C and 1D may be connected through a normally-closed tie breaker, EC and a normally-open tie breaker, ED. Normally open tie breakers US1T, US2T, and US3T connect buses 1A1 and 1B1, 1A2 and 1Bs, and 1A3 and 1B3, respectively. Electrical interlocks are provided to prevent paralleling the redundant diesel generators for tie breakers US1T, US2T, and US3T, such that the breakers cannot be closed unless the supply breaker for one or both buses is open. Additionally, when the cross tie is closed, the normal supply breaker cannot be closed. Electrical interlocks exist to prevent paralleling buses 1C and 1D by closing tie breaker ED. Closure of tie breaker ED is prevented when both EG breakers are closed, the main feed breakers to buses 1C and 1D are closed, or a fault exists on either EG or on buses 1C or 1D. Additionally, when breaker ED is closed, neither EG breaker can be closed. Closure of the main feed breakers or automatic fast-start of the emergency generators causes breaker ED to trip.

Automatic transfer of load groups between redundant trains by means of automatic-transfer switches or contact transfer panels occurs in seven locations. Automatic transfer switches are used to supply power to MCC 1AB2, vital lighting distribution panel #1, vital AC power panel #1 (VACP-1), continuous instrument panel #3, and instrument panel #4. Contact transfer panels provide power to protection system panels #1 and #2.

Evaluation. The redundant onsite emergency AC power systems have seven automatic transfers of loads/load groups between redundant trains. This is not in compliance with current licensing requirements. The manual interconnections of emergency buses have the required interlocks to prevent inadvertent paralleling of redundant sources.

3.2 DC Systems

Discussion. The Oyster Creek Unit 1 125 V DC system consists of three batteries, three chargers, two motor-generator (MG) sets, and the associated distribution system. Battery A supplies distribution center A which is also supplied by MG set A and a static charger. Battery B supplies distribution center B which is also supplied by MG set B and the same static charger as distribution center A. Interlocks exist to prevent the static charger from supplying both bus A and B at the same time, and to prevent the charger and either MG set from supplying the same bus simultaneously. However, MG set A, MG set B, and the charger are all normally powered from MCC 1B2 (EG2). Therefore, the two trains cannot be considered independent unless the loss of MCC 1B2 is assumed. In that case, distribution centers A and B are powered by independent redundant supplies (batteries A and B, respectively). Battery C supplies distribution center C which is also supplied by two static chargers (C1 and C2). No interlocks prevent chargers C1 and C2 from supplying bus C simultaneously. However, both chargers are supplied by the same bus, MCC 1A2. Battery C, its charger and their power supply, and distribution center C are independent of the other two batteries, their chargers and power supplies, and distribution centers.

There are no manual means to interconnect distribution centers A, B, and C except the previously-mentioned shared static charger between buses A and B. The breakers for that tie are mechanically interlocked to prevent simultaneous closure.

There are three automatic-transfer switches which supply load groups from either bus A or B. They supply DC power panel D (DC-D), DC power panel E (DC-E), and isolation valves MCC DC-1. Under normal conditions (MCC 1B2 energized), these load groups are powered from the same source (EG2). Therefore, the automatic transfer does not involve transfer of loads between redundant sources. However, a loss of MCC 1B2 results in the automatic transfer of load groups between redundant sources (batteries A and B).

Evaluation. The 125 V DC system has one location for manual connection between redundant trains A and B. Mechanical interlocks exist as required to prevent inadverte[illegible]alleling of redundant sources. Three automatic transfers of power to load groups from distribution center A to the redundant distribution center B exist. These automatic transfers are not in compliance with current licensing requirements.

4.0 SUMMARY

The review of docketed information and plant electrical drawings indicates that the Oyster Creek Unit 1 onsite AC emergency redundant power sources and distribution system do not meet the current licensing requirements for indpendence of onsite power systems. The AC system has seven automatic transfers of loads/load groups between redundant sources, while the 125 V DC has three automatic transfers of power between redundant sources, which are not in compliance with current licensing criteria for independence of onsite power systems.

5.0 REFERENCES

1. General Design Criterion 17, "Electrical Power System," of Appendix A, "General Design Criteria of Nuclear Power Plants," to

10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

2. "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems," Regulatory Guide 1.6.

3. Jersey Central Power and Light Co. Drawings 3001-7, 3002, 3013, 3028-12, 3033-0, 0223R0173, 0116B8328.

SEP TECHNICAL EVALUATION
TOPIC VIII-3.B

DC POWER SYSTEM BUS VOLTAGE
MONITORING AND ANNUNCIATION

OYSTER CREEK

1.0 INTRODUCTION

The objective of this review is to determine if the DC power system bus voltage monitoring and annunciation are in compliance with current licensing criteria for Class IE DC power systems.

The specific requirements for DC power system monitoring derive from the general requirements embodied in Sections 5.3.2(4), 5.3.3(5), and 5.3.4(5) of IEEE Standard 308-1974[1], and in Regulatory Guide 1.47[2]. In summary, these general requirements simply state that the DC system (batteries, distribution systems, and chargers) shall be monitored to the extent that it is shown to be ready to perform its intended function.

2.0 CRITERIA

As a minimum, the following indications and alarms of the Class IE DC power system(s) status shall be provided in the control room:[3]

- Battery current (ammeter-charge/discharge)
- Battery charger output current (ammeter)
- DC bus voltage (voltmeter)
- Battery charger output voltage (voltmeter)
- Battery high discharge rate alarm
- DC bus undervoltage and overvoltage alarm
- DC bus ground alarm (for ungrounded system)
- Battery breaker(s) or fuse(s) open alarm

- Battery charger output breaker(s) or fuse(s) open alarm
- Battery charger trouble alarm (one alarm for a number of abnormal conditions which are usually indicated locally).

3.0 DISCUSSION AND EVALUATION

3.1 Discussion. Two 125 V batteries (B and C), four battery chargers, and two DC buses comprise the Oyster Creek Class IE DC power systems.[4] Control room indication consists of bus voltmeters (two), charger voltmeters (two), a bus ground alarm (bus B), a bus ground detector light (bus C), battery charger failure alarms (four), and a "Normal Supply Off" annunciator.

3.2 Evaluation. The Oyster Creek control room has no indication of battery current, battery charger current, battery high discharge rate, bus under/overvoltage, battery breaker status, or charger breaker status. Therefore, the Oyster Creek DC power systems monitoring is not in compliance with current licensing criteria.

4.0 SUMMARY

Of 11 parameters currently required to be indicated or alarmed in the control room, only four are indicated or alarmed in the Oyster Creek control room. Therefore, the Oyster Creek DC power systems are not monitored in compliance with current licensing criteria.

5.0 REFRENCES

1. IEEE Standard 308-1974, "Standard Criteria for Class IE Power Systems for Nuclear Power Generating Stations."

2. Regulatory Guide 1.74, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems."

3. NRC Memorandum, PSB (Rosa) to SEPB (Crutchfield), "DC System Monitoring and Annunciation," dated October 16, 1979.

4. Letter, Jersey Central Power and Light Company (Finfrock) to NRR (Ziemann), "SEP Topic VIII-3.B, DC Power System Bus Voltage Monitoring and Annunciation," dated September 4, 1979.

SEP TECHNICAL EVALUATION

TOPIC VIII-4
ELECTRICAL PENETRATIONS OF REACTOR CONTAINMENT

OYSTER CREEK NUCLEAR STATION

1.0 INTRODUCTION

This review is part of the Systematic Evaluation Program (SEP), Topic VIII-4. The objective of this review is to determine the capability of the electrical penetrations of the reactor containment to withstand short circuit conditions of the worst expected transient fault current resulting from single random failures of circuit overload protection devices.

General Design Criterion 50, "Containment Design Basis" of Appendix A, "General Design Criteria for Nuclear Power Plants" to 10 CFR Part 50 requires that penetrations be designed so that the containment structure can, without exceeding the design leakage rate, accommodate the calculated pressure, temperature, and other environmental conditions resulting from any loss-of-coolant accident (LOCA).

IEEE Standard 317, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations", as augmented by Regulatory Guide 1.63, provides a basis of electrical penetrations acceptable to the staff.

Specifically, this review will examine the protection of typical electrical penetrations in the containment structure to determine the ability of the protective devices to clear faults prior to exceeding the penetration design rating under LOCA temperatures.

2.0 CRITERIA

IEEE Standard 317, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations" as supplemented by

Nuclear Regulatory Commission Regulatory Guide 1.63, "Electric Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants" provides the basis acceptable to the NRC staff. The following criteria are used in this report to determine compliance with current licensing requirements:

(1) IEEE Standard 317, Paragraph 4.2.4 -- "The rated short circuit current and duration shall be the maximum short circuit current in amperes that the conductors of a circuit can carry for a specified duration (based on the operating time of the primary overcurrent protective device or apparatus of the circuit) following continuous operation at rated continuous current without the temperature of the conductors exceeding their short circuit design limit with all other conductors in the assembly carrying their rated continuous current under the specified normal environmental conditions."

This paragraph is augmented by Regulatory Guide 1.63, Paragraph C-1 -- "The electric penetration assembly should be designed to withstand, without loss of mechanical integrity, the maximum possible fault current versus time conditions that could occur given single random failures of circuit overload protection devices."

(2) IEEE Standard 317, Paragraph 4.2.5 -- "The rated maximum duration of rated short circuit current shall be the maximum time that the conductors of a circuit can carry rated short circuit current based on the operating time of the backup protective device or apparatus, during which the electrical integrity may be lost, but for which the penetration assembly shall maintain containment integrity."

3.0 DISCUSSION AND EVALUATION

In this evaluation, the results of typical containment penetrations being at LOCA temperature initially concurrent with a random failure of the circuit protective devices will be analyzed.

Jersey Central Power and Light provided information (Reference 1) on typical penetrations. No evaluation of the data was provided. Jersey Central Power and Light has established a temperature limit of 350°F (177°C) before seal failure for the two penetrations based on testing. Maximum short circuit current available (I_{sc}) was provided by Jersey Central Power and Light for a three-phase bolted fault. Rated current (I_r) for each penetration was also provided.

The following formula (Reference 3) was used to determine the time allowed before a short circuit would cause the penetration to heat up to the temperature limit.

$$t = \frac{A^2}{I^2} \quad .0297 \log \frac{T_2+234}{T_1+234} \qquad \text{(Formula 1)}$$

where

- t = time in seconds
- I = current in amperes
- A = conductor area in circular mils
- T_1 = initial temperature (138°C, LOCA condition)
- T_2 = maximum penetration temperature before failure.

This is based on the heating effect of the short circuit current on the conductor and does not take into account heat losses of the conductor. For times less than several seconds, this heat loss is negligible.

In evaluating the capability of the penetration to withstand a LOCA temperature with a short circuit current, Formula 1 was used to calculate the time required to heat the conductor from the LOCA temperature to penetration failure temperature for currents from rated current to maximum short circuit current in 20% increments. Times for the primary and secondary overcurrent devices to interupt these fault currents were calculated. Where breaker ratings provided by the licensee indicated minimum and maximum fault clearing times, the maximum time was used for conservatism.

3.1 Typical Low Voltage (0-1000 V) Penetration. Jersey Central Power and Light has identified penetration #11 (GE type NS04) as being typical of low voltage penetrations. This penetration provides 460 V ac power to Drywell Recirculation Fan RF-1-1.

This penetration uses #2 AWG cable and has a continuous current rating of 66 amps. The maximum short circuit current has been determined by JCP to be 4200 amps. Jersey Central Power and Light has established 352°F (177°C) as the limiting temperature before seal failure based on testing (Reference 2). At the maximum short circuit current (4200 amps), overtemperature will be reached in 0.31 second from LOCA temperature initially.

From LOCA temperature initially, the primary breaker will operate to clear any fault current prior to attaining the penetration seal limiting temperature.

From LOCA temperature initially, the secondary breaker will not operate to clear any fault currents prior to exceeding the 352°F (177°C) penetration seal temperature limit.

3.1.1 Low Voltage Penetration Evaluation. With the initial penetration temperature at 138°C (LOCA), penetration #11 does not meet current licensing requirements of RG 1.63 and IEEE Std. 317 with a random failure of the primary breaker.

3.2 Typical Medium Voltage (>1000 V) Penetration. Jersey Central Power and Light has identified penetration #20 (GE type NS03) as being typical of medium voltage penetrations. This penetration provides 4160 V ac power to Reactor Recirculation Pump Motor NG01-B.

This penetration uses 500 MCM cable with a continuous current rating of 475 amps. The maximum available short circuit current has been determined by JCP to be 1800 amps. Jersey Central Power and Light has established 352°F (177°C) as the limiting temperature before seal failure based on testing (Reference 2). At the maximum short circuit current (1800 amps), overtemperature would be reached in 98 seconds from LOCA temperature initially.

There are no circuit protective devices located between the motor generator output and the Reactor Recirculation Pump Motor. Overcurrent protection is provided by a differential current sensing relay and a line overcurrent sensing relay, each of which will operate to trip the motor generator by securing power to the motor generator motor and opening the generator field windings. At ≥90 amps of current difference between phases, the differential relay will cause a trip of the motor generator in 0.7 second or less. At line currents in excess of 360 amps, the overcurrent relay will cause a trip of the motor generator in 0.17 second or less.

For a three-phase short circuit condition, it cannot be assumed that sufficient current differences will exist to cause the differential relay to operate and trip the motor generator. Therefore, operation of this relay cannot be expected to clear fault currents prior to exceeding the penetration seal temperature limit of 177°C. For fault currents producing current differences between phases in excess of 90 amps, this relay will operate to trip the motor generator prior to reaching the penetration seal temperature limit.

The line overcurrent relay will operate to clear all fault currents prior to reaching the penetration seal temperature limit of 177°C.

3.2.1 Medium Voltage Penetration Evaluation. From LOCA temperature initially, penetration #20 does not meet current requirements with a failure of the line overcurrent relay since the differential relay cannot be assumed to operate for a three-phase short circuit. With a failure of the differential relay, the penetration will not exceed its design limits for any fault currents, since the overcurrent relay will clear the fault in sufficient time to prevent exceeding the 352°F limit.

4.0 SUMMARY

From LOCA temperature, neither penetration #11 nor #20 meet the current licensing requirements of RG 1.63 and IEEE Std. 317 for a short circuit fault and failure of the primary protective device.

The review of Topic III-12, "Environmental Qualification," may result in changes to the electrical penetration design and therefore, the resolution of the subject SEP topic will be deferred to the integrated assessment, at which time, any requirements imposed as a result of this review will take into consideration design changes resulting from other topics.

5.0 REFERENCES

1. Jersey Central Power and Light letter (Finfrock) to NRC (Ziemann) dated April 24, 1979.

2. Final Description and Safety Analysis Report, Oyster Creek Nuclear Station, Ammendment 62 (Docket No. 50-219-102).

3. IPC&A Publication P-32-382, "Short Circuit Characteristics of Insulated Cable."