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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATING TO ELECTRICAL SYSTEM CHANGES FOR FIRE PROTECTION

CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT

DOCKET NO. 50-213

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1. INTRODUCTION

In order to meet 10 CFR 50, Appendix R requirements for safe shutdown of the plant, the licensee is adding a new switchgear building, relocating and adding electrical equipment and cables, and providing means for isolating electrical power sources and control in the event of fires, particularly in the existing switchgear room, diesel generator rooms, the cable spreading area or the main control room. Selected "B" Division equipment will be repowered and/or controlled from the new switchgear room. For fires in the new switchgear room, the necessary Divisional A equipment will be powered from the existing switchgear room and controlled from the main control room.

Presently, the plant has one common switchgear room containing both Division "A" and "B" batteries, dc distribution, 120V ac inverters, 480V load centers and 480V motor control centers (MCCs).

This safety evaluation focuses on the electrical design of the new switchgear facilities. It does not evaluate whether the motors and valves to be powered or controlled from the new switchgear room, or from other rooms in case of a fire in the new switchgear room, are sufficient for a safe shutdown of the plant in case of fires. It is understood that a separate safety evaluation will address the Appendix R shutdown considerations following postulated fires in various fire areas. However, this evaluation does address the divisional separation (physical and electrical) of the Division A and Division B power supplies and controls for normal operation, and the electrical separation/isolation of the Division B power supplies and controls from those in Division A for fires in the existing switchgear room or control room.

2 SYSTEM CHANGES

2.1 General Description

2.1.1 Electrical Equipment

Figure 1 shows the system changes to the 4160V and 480V ac emergency systems. The new 480V buses in the new switchgear room will be powered through a new 4160V/480V transformer powered from the existing Division B emergency bus. An alternate, normally open supply tie is provided from a 480V bus in the existing switchgear room. Division B equipment, such as the diesel generator auxiliaries, battery chargers, and the constant voltage transformers (CVTs) to the vital ac panel will be powered from the new 480V Division B buses. Other electrical equipment, redundant to that powered by Division A and necessary for shutdown in the event of fires in other areas, will also be powered from these new 480V Division B buses.

Figure 2 shows the system changes to the 125V dc emergency buses. The Division B 125V dc bus will essentially be extended into the new switchgear room by a tie from the existing Division B 125V dc bus. The Division B 125V dc bus extension will supply power to the Division B inverters for the 120V ac vital panels, to the Division B emergency diesel generator (EDG) and its associated 4160V bus, and to selected loads required for safe shutdown in event of fires in other areas. Battery 1B is an existing battery which will be relocated from the existing switchgear room to the new switchgear room.

Figure 3 shows the system additions for the new switchgear room for power supply to the Division B vital panels. These vital panels will serve as the power source for a new remote instrument panel to be located in the new switchgear room. In addition to the instrumentation required for the new switchgear room, the instrument panel will include transfer provisions and control circuitry for remote speed control of the metering charging pump and control of the suction

AC SYSTEM NEW CONFIGURATION

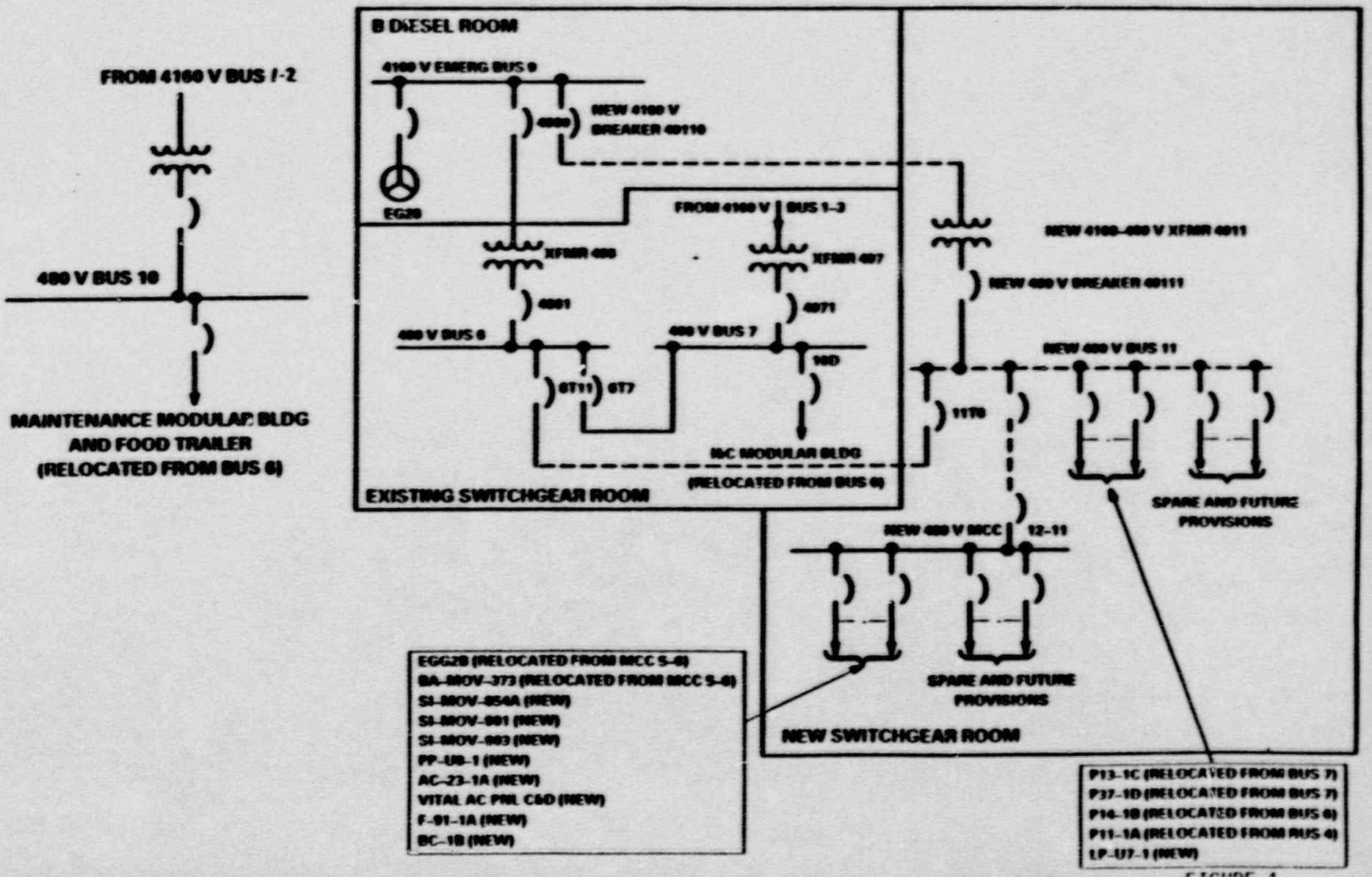

FIGURE 1

DC SYSTEM NEW CONFIGURATION

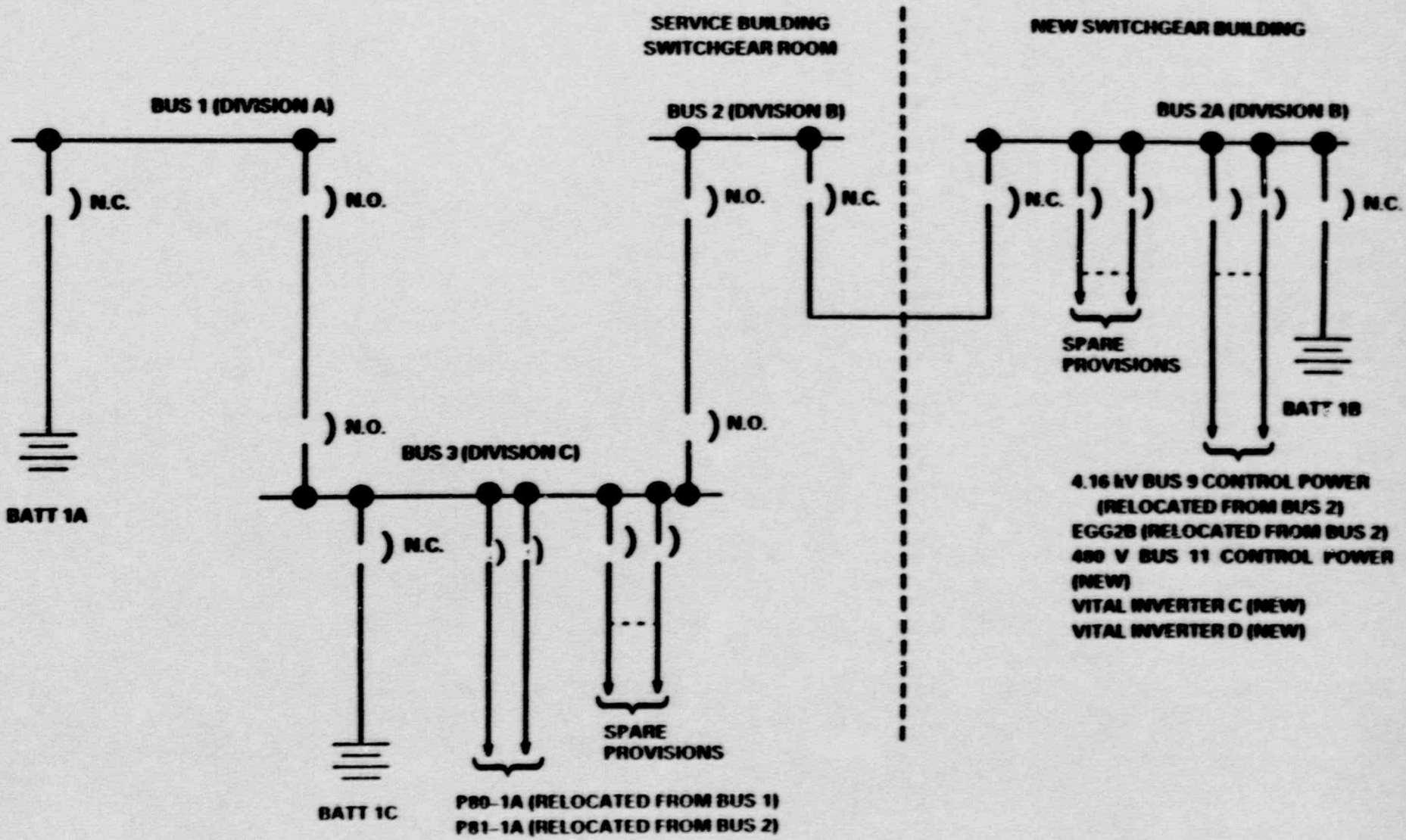

FIGURE 2

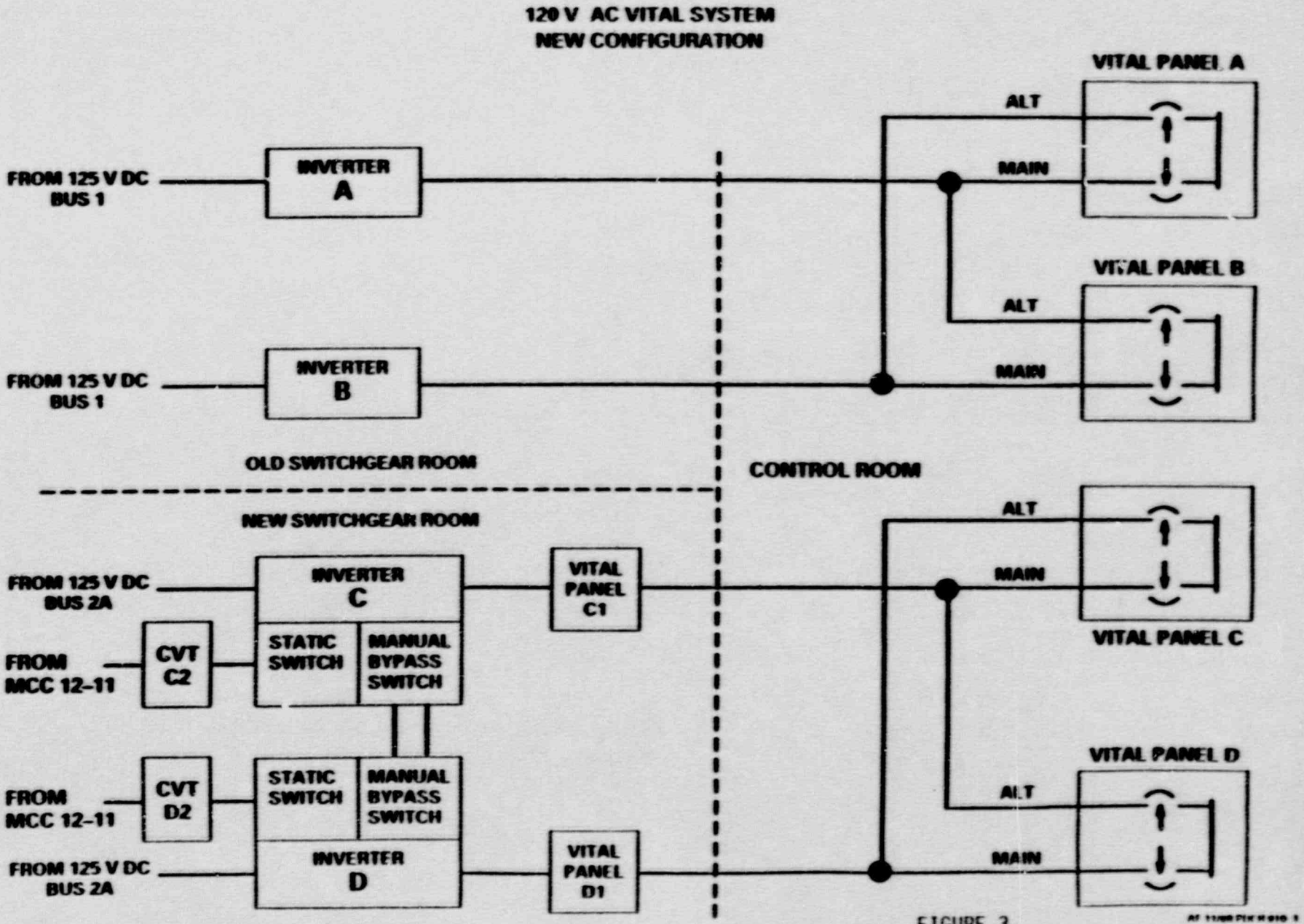
120 V AC VITAL SYSTEM
NEW CONFIGURATION
VITAL PANEL A
ALT
MAIN
FROM 125 V DC
BUS 1
INVERTER
A
VITAL PANEL B
ALT
MAIN
FROM 125 V DC
BUS 1
INVERTER
B
OLD SWITCHGEAR ROOM
CONTROL ROOM
NEW SWITCHGEAR ROOM
ALT
MAIN
FROM 125 V DC
BUS 2A
INVERTER
C
VITAL
PANEL
C1
VITAL PANEL C
FROM
MCC 12-11
CVT
C2
STATIC
SWITCH
MANUAL
BYPASS
SWITCH
VITAL PANEL D
ALT
MAIN
FROM
MCC 12-11
CVT
D2
STATIC
SWITCH
MANUAL
BYPASS
SWITCH
FROM 125 V DC
BUS 2A
INVERTER
D
VITAL
PANEL
D1

FIGURE 3

valve associated with the metering charging pump from the new switchgear room. An instrument indication transfer switch will also be provided to allow local monitoring of core exit temperature.

Also, to be added in the new switchgear room is a local/remote transfer switch panel referred to as the Appendix R transfer panel (ARTP). The ARTP will be used for isolation and redirection of control circuits to enable an operator to manually control the necessary Appendix R circuits in the event of a fire that would prevent control of the circuits from the main control room.

All the new equipment except the remote instrument panel is designed as QA Category I and Seismic Category I. The new remote instrument panel is installed in accordance with Seismic Category II/I requirements. The inputs to the non-Class 1E instruments will be electrically isolated from the Class 1E instruments using Foxboro process instrument and isolation nests. The power supply for the non-Class 1E instrumentation will be electrically separated from the 1E class power supply by fuses in Panel FU-HCP which is powered from Vital Distribution Panel C1. There is also a molded case load breaker from Panel C1 to Panel FU-HCP.

2.1.2 New Raceways And Cable

Power, control and instrumentation circuitry to certain Division B equipment and loads needed for alternate shutdown in case of fires in various areas in the plant is being relocated from the present switchgear room to the new switchgear room. The raceways for safe shutdown equipment are designated as QA Category I and supported as Seismic Class I. The raceway is designed to meet the separation requirements of Regulatory Guide 1.75 and 10 CFR 50, Appendix R. Fire protection and cable separation to ensure circuit availability will be achieved by encasing raceway runs with an approved 3-hour fire rated barrier assembly. Due to the insulating characteristics of the wrap, some ampacity derating will occur. Calculations have been made to ensure that the ampacity of the cables is adequate with this derating.

All cables are purchased QA Category I and are environmentally qualified to meet the LOCA environment inside containment. The cables are flame retardant and meet the requirements of IEEE 383-1974 and Regulatory Guide 1.131. The cable insulation is rated for 90 degrees C conductor temperature and is suitable for wet applications. Cable ampacity and derating factors are in accordance with applicable ICEA standards. Calculations have been made to ensure adequate sizing, including voltage drop.

In order to repower selected loads from the new switchgear room, existing cables associated with these loads will be terminated. Existing cables that are no longer required after the loads are transferred will either be removed or discontinued. Abandoned conduit will be removed to the extent necessary to install the new conduit. The majority of the new cables will be installed in existing cable trays. The raceway percent fill will be within the design limits of the raceway, and will normally be limited to 40% fill of a 4-inch loading depth for power and control cables, and to 60% fill of a 4-inch loading depth for instrumentation cables. The cables and raceways will be designed to meet the separation requirements of Regulatory Guide 1.75 and IEEE Standard 384. Those cables supporting safe shutdown of the plant will also be designed to meet the separation requirements of 10 CFR 50, Appendix R, Section III G. Any exceptions which may be required to these requirements will be documented.

2.2 Power Supply To New Emergency 480V Load Center

2.2.1 New 4160V Circuit Breaker

The present Division B 4160V emergency bus in diesel generator building room 2B will be extended by adding a new circuit breaker cubicle adjacent to the existing cubicles. The bus connection between the new cubicles and the existing switchgear will be a bolted connection. The new breaker cubicle is designed to Seismic Category I requirements. The breaker will be Class 1E with ratings matched to

ratings of the existing switchgear. Maximum fault currents to these breakers are not affected by the system additions being made. Control power for the new breaker will be supplied from the existing 125V dc which supplies the other 4160V breakers. The 125V dc supply has been evaluated and determined to be adequate. Fuses protect the existing 125V dc supply from faults in the new cubicle. Remote control and annunciation of the 4160V breaker will be provided by cables to the main control room. The existing Appendix R knife switch KS located in the diesel generator room 2B will provide a means for isolating these cables from the control room, thus allowing local operation in the diesel generator building. The operation of the knife switches is annunciated in the control room.

The breaker is not tripped automatically under accident or loss of offsite power conditions. The breaker connects new Class 1E loads of approximately 244 kVA to the diesel generator. Calculations have been made to show that the added load is within the generator rating and that voltage levels are adequate.

2.2.2 New 4160/480V Transformer

A new 4160/480V 1500/2000 kVA transformer will be installed in the new switchgear room to supply the new 480V load center. The transformer is sized to accommodate the 480V loads necessary for plant shutdown with spare capacity for future needs. The impedance is less than that of the existing load center transformers in order to provide for adequate voltage levels. Correspondingly, a higher interrupting rating has been selected for the 480V breakers to accommodate the lower impedance. Power supply to the cooling fans is obtained from the transformer itself. Loss of power to the fans, and transformer high winding temperature will be alarmed in the control room.

2.2.3 New Incoming Breaker To 480V Bus 11

The incoming breaker from the 4160/480V transformer to 480V load center Bus 11 is rated at 3000 amperes consistent with the transformer rating. The breaker has an interrupting rating of 42,000 amperes, which exceeds the maximum calculated fault at Bus 11. The breaker is controlled normally from the main control board, consistent with the incoming breakers of the other 480V load centers. The

breaker control can be isolated from the control room for fire protection using the Appendix R transfer panel (ARTP) in the new switchgear room.

2.2.4 New 480V Bus Tie

A new 480V circuit is being added from the existing 480V load center Bus 6 in the existing switchgear room to 480V Bus 11 in the new switchgear room. The breaker in the new switchgear room is normally open and controlled locally by administrative procedure. The breaker would only be closed for a backup source when the 4160/480V supply is open. Trip annunciation for the breaker is provided in the main control room.

2.3 New Division B 480V AC Buses

2.3.1 New 480V Load Center Bus 11

A new 480V load center Bus 11 will be installed in the new switchgear room. Time and instantaneous overcurrent protection, undervoltage relaying and ground protection will be provided. A local voltmeter and a remote voltmeter in the main control room will be provided. Alarms for overvoltage, bus ground and loss of dc voltage will be provided in the main control room. Appendix R concerns require that the bus undervoltage and the bus undervoltage lockout relays be located in the new switchgear room rather than the main control room. However the undervoltage lockout relays are designed to be electrically reset so that they can be remotely reset from the control room. A reset switch and status indicating light is provided in the main control room. This circuitry can be isolated for a fire in the main control room using the Appendix R transfer panel (ARTP) in the new switchgear room.

The new 480V Bus 11 will power a new 480V motor control center (MCC) and various Appendix R loads which are presently powered from the existing switchgear room. These loads are described below.

2.3.2 New 480V Bus 11 Loads

Several loads which are presently powered from the existing switchgear room will be repowered from Bus 11 in the new switchgear room. This repowering, coupled with the rerouting of the power cables, will ensure that a minimum of required safe shutdown loads will be operable for a fire in any given Appendix R fire area.

The loads to be powered from the 480V Bus 11 are as follows:

- Service Water Pump P-37-1D
- RHR Pump P-14-1B
- CCW Pump P-13-1C
- Charging Metering Pump P-11-1A

The control circuits for the above pumps will be modified to incorporate the addition of contacts from the ARTP. When the transfer switch is in the normal position, the control circuits are functionally identical to the present. When the switch is moved to the local position, any interlocks to devices in the control room or existing switchgear room are isolated. For example, the remote trip/close capability of the load breakers are bypassed, such that the breaker must be operated using the open/close pushbuttons located on the front of the breaker. For pumps P-37-1D and P-13-1C, the Bus 11 undervoltage lockout in the breaker close circuit is bypassed when the ARTB is in the "local" position. A Bus 11 undervoltage will still trip the pumps, but the lockout relay does not need to be reset prior to restarting the pumps after the bus voltage has been restored.

When the ARTB switch is moved to the local position, a separate set of control fuses is switched into the circuits to replace the fuses normally in the circuit that may have blown due to fire induced faults occurring before the transfer switch operation.

The existing control room ammeters for P-37-1D, P-14-1B and P-13-1C will be replaced by meters driven by current transducers. The transducers are in the new switchgear room and thereby preclude the potential of damage to the current transformers in the event that a meter circuit is opened in the control room.

New 480V Bus 11 will also supply power to a new non-Class 1E 480V distribution panel used primarily for heating, ventilation and air conditioning (HVAC) for other floors in the new switchgear building other than the third floor which is used for the new Class 1E switchgear. The breaker is controlled locally. However, it is tripped automatically on receipt of a safety injection or loss-of-offsite power signal. This reduces the loading on the Class 1E system

2.3.3 New 480V MCC Bus 12-11

The feeder breaker to the new 480V MCC Bus 12-11 is controlled locally by push-buttons. This is consistent with existing feeders to MCCs. Trip annunciation of the breakers is provided in the main control room. The loads from Bus 12-11 are supplied through molded case circuit breakers. The short circuit rating of the molded case circuit breakers and motor circuit protectors are 42,000 amperes, which is greater than the calculated maximum short circuit current. The breakers are coordinated with the MCC 12-11 feeder breaker. The breakers and starters will supply the following loads:

- HPSI Pump Cross Tie Valve SI-MOV-901
- RWST Return Isolation Valve SI-MOV-903
- HPSI Pump 15-1A Suction Isolation Valve SI-MOV-854A
- RWST To Charging Pump Valve BA MOV-373
- Battery Charger BC-1B
- Alternate Feed To Inverter Panel C1
- Alternate Feed To Inverter Panel D1
- 480V Supply To Distribution Panel EGG2B
- Switchgear Room Air Handling Unit AC-23-1A
- Battery Room Duct Heater UH-36-1A
- Battery Room Exhaust Fan F-91-1A
- Transformer For 120/208V Distribution Panel
- Power Distribution Panel LP-U7-1

Valves SI-MOV-901, SI-MOV-903, SI-MOV-854A and BA-MOV-373 powered from the new switchgear room are redundant to valves SI-MOV-902, SI-MOV-904, SI-MOV-854B and BA-MOV-32 which are powered from the existing switchgear room, Division A.

Control switches and indicating lights for each MOV will be provided in the main control room. For BA-MOV-373 which may be required for safe shutdown in the event of a fire, the ARTB in the new switchgear room will provide a means for isolating the control, indication and interlock circuitry from the control room similar to that for the motor loads discussed in Paragraph 2.3.2

MCC 12-11 supplies a Class 1E 120/208 volt distribution panel through a 15kVA transformer. The panel and transformer are located in separate cubicles of MCC 12-11. All 120V load breakers are single pole, molded case with an interrupting capacity of 10,000A. This exceeds the maximum fault current. The 120V load breakers are coordinated with the infeed 3 phase 208V breaker.

The 120/208V distribution panel feeds the following loads:

- HVAC Damper Control Panel
- Metering Pump P11-1A Speed Controller
- Valve CH-AOV-278
- Halon System HVAC Shutdown Circuits
- Radio Base Station Cabinet

The metering pump P11-1A speed controller and air operated valve CH-AOV-278 which is in suction path of the metering pump will have provisions so that they can be operated from the new switchgear room as well as from the main control room. A new electronic control station will be installed in the main control panel in place of an existing pneumatic control station for control of the metering pump speed. A second electronic control station will be supplied in the new switchgear building. A keylock transfer switch will be utilized at the new instrument panel in the new switchgear room to transfer speed control from the main control room to the remote instrument panel. The ARTB will be used to transfer control of Valve CH-AOV-278 from the main control room to the new instrument panel.

2.4 New Division B 125VDC

A new 125V dc Bus 2A will be installed in the new switchgear room. It will be supplied by a new battery charger BC-1B and Battery 1B, also located in the new switchgear room. A normally closed tie will connect existing Bus 2 to Bus 2A in the existing switchgear room. Both buses 2 and 2A will be used to supply Division B loads.

2.4.1 New 125V DC Bus 2A

Bus 2A will be Class 1E and rated 125V dc and 800 amperes. The bus will be monitored for undervoltage and for a grounded pole. An undervoltage or grounded condition will be alarmed in the main control room. Load breakers on Bus 2A are molded case circuit breakers having an interrupting rating of 14,000 amperes. This is greater than the calculated maximum fault current. Bus 2A will supply the following loads:

- Vital Inverter C Power Supply
- Vital Inverter D Power Supply
- 125V DC Distribution Panel EGG2B
- 125V DC Control Power To 4160V Bus 9 Switchgear
- 125V DC Control Power To 480V Bus 11 Switchgear
- 125V DC Bus 3 Loads
- Emergency Turbine Oil Pump P-81-1A Power Supply
- Emergency Air Side Hydrogen Seal Oil Pump P-80-1A

Coordination is achieved such that faults on the Bus 2A loads will trip the load breakers prior to the main breaker feeding Bus 2A. Faults on the load cables within short distances from Bus 2A could potentially trip the main breaker. However, this single failure will not trip the Train A dc system.

2.4.2 New Battery Charger BC-1B

The new Class 1E battery charger is rated 125V dc, 300 A, 37.5kW. The battery charger can supply the load with the battery disconnected. Calculations show that the battery charger is adequate to supply the normal worst case load or to restore the battery to full charge within a 24 hour period.

The battery charger has an ac input breaker and a dc output breaker. Alarms for dc overvoltage, undervoltage, reverse current, low current, and ac undervoltage are provided locally. These alarms are combined into a summary alarm which is annunciated in the control room to indicate BC-1B battery charger trouble.

2.4.3 New Battery 1B

The new Battery 1B is identical to the existing station batteries. It consists of 60 lead acid cells with lead-calcium grid, rated 125V dc, 1200 ampere-hour capacity at the 8-hour discharge rate at 77 degrees F. The battery breaker is located in Bus 2A switchgear. The licensee has confirmed that battery banks 1A and 1B are adequately sized for the worst case three hour load profile consistent with IEEE Standard 485.

2.4.4 Test Plan

The test plan is devised to verify that the controls and indications and new circuit breakers are functional. The dc buses will receive low resistance and insulation resistance checks. The battery chargers will receive a full load test and voltage regulation check. The batteries will be tested for intercell resistance and a discharge test using the applicable load profile, conducted in accordance with IEEE Standard 450-1975.

2.5 120V Vital AC System

The vital ac system consists of two Class 1E inverters, two constant voltage transformers and two 120V ac distribution panels C1 and D1. The components are installed to withstand design basis earthquakes. Normal feed to the inverters is from 125V dc Bus 2A. Upon loss of voltage to a vital bus, power supply is switched over by a static transfer switch to a 7.5kVA, 480/120V CVT fed from MCC 12-11. A manual bypass switch is provided in each inverter to enable load sharing in the event that an inverter and its alternate source are not available. The vital panels C1 and D1 feed Division B related Appendix R instrumentation at the new remote instrument panel in the new switchgear room and vital panels C and D in the main control room. All load breakers from vital panels C1 and D1 are single pole, molded case breakers with an interrupting capacity of 10,000A. The new remote instrument panel is seismically installed and designed to Seismic Category II/I criteria. The power supply to the non-Class 1E instrumentation is electrically isolated from the Class 1E power source by means of circuit breakers in Panel FU-HCP which is powered from Vital Distribution Panel C1, and the feeder breaker between Panel C1 and Panel FU-HCP. Proper coordination exists among the circuit breakers to Panel C1, to Panel FU-HCP and to the Appendix R instrumentation.

2.6 Control Room Changes

2.6.1 Annunciator Windows

The following new annunciator window labels will be added in the main control room:

- Trouble - New Switchgear Room Ventilation System
- DC Bus 2A Low Voltage
- DC Bus 2A Circuit Ground
- DC Bus 3 Low Voltage
- DC Bus 3 Circuit Ground
- Transformer No. 11 Breaker Trip
- Load Center Trouble - Xfmr 4911
- 480V Bus 11 Overvoltage Alarm

- 480V Bus 11 DC Control Failure
- C and D Vital AC Trouble
- Battery Charger C Trouble
- Station Battery Breaker Open
- Battery Charger B Trouble
- Appendix R Xfer Panel Sw. Off Normal Pos.

2.6.2 Meters, Switches And Lights

The following switches, meters and lights will be added to the main control board or auxiliary control board. These devices and the panels that they are installed in have been seismically qualified to preclude failure during a seismic event. Human factors have been considered in the arrangement of these switches, indicating lights and meters. The manufacturer and types are consistent with the existing switches, meters and lights on the main control board:

- Circuit breaker control switch for 4.16 KV Breaker 49110 and indicating lights
- Circuit breaker control switch for 480V Breaker 49111
- Bus 11 overvoltage relay reset pushbutton
- Bus 11 undervoltage lockout relay reset pushbutton
- Ammeter selector switch for 4.16kV Breaker 49110
- AC ammeter for Transformer 4911 primary current
- DC ammeter for Battery Charger 1B
- DC ammeter for Battery Charger 1C
- AC voltmeter for 480V Bus 11
- DC voltmeter for 125V DC Bus 2A
- DC voltmeter for 125V DC Bus 3
- 480V Bus 11 undervoltage lockout power normal light

2.7 Power Supply To Existing 120V AC Semi-Vital Panels

A new Division B emergency power supply from MCC 12-11 in the new switchgear room will provide emergency backup power to the existing 120V ac semi-vital panels in the main control room. Normal supply to these panels will be from MCC 5 in the existing switchgear room. A new automatic transfer switch will be installed in the main control room to automatically transfer power from the main control room to the new switchgear room upon low voltage or loss of normal power supply from MCC 5. Retransfer to the normal source automatically starts when a bus voltage sensor detects restoration of the normal source. Two existing semi-vital voltmeters located in the main control room will be rewired so that one voltmeter will measure normal power supply voltage and the other emergency power supply voltage. The existing semi-vital low voltage annunciator-alarm will be rewired to provide an alarm for low voltage. The Division B supply will be obtained from MCC 12-11 and two parallel connected 480/120 SOLA regulating transformers. Circuit breaker coordination and adequacy was previously discussed under Paragraph 2.3.3.

2.8 Other Additions And Changes

A new radio repeater/base station will be provided in the new switchgear building to minimize dead spots in the plant UHF communication system. It will be installed to withstand design basis earthquakes and designed to Seismic Category II/I criteria.

Power supplies in the existing switchgear room that were previously used for Appendix R loads that will now be supplied from the new switchgear room will be disconnected and the cables removed or terminated.

A new 125V dc Bus 3 will be added in the existing switchgear room and used to supply selected existing non-Class 1E loads. Normally locked open ties from Bus 3 to Class 1E buses 1 and 2 will be locally operated by a kirk-key such that only one breaker can be closed at a time. A new battery charger fed from non-Class 1E MCC 6-7 will be provided. Existing Battery 1C will be used.

An existing tie between 125V dc buses 1 and 2 will be removed. The existing battery 1A will be removed and the existing battery 1B renamed 1A.

A new Class 1E MCC 13-4 will be installed in the existing switchgear room to provide power to Division A loads. The MCC will receive power supply from the existing 480V Bus 11 in the existing switchgear room using an existing circuit breaker that will become available following transfer of its load to the new switchgear room. This existing breaker will be coordinated with the Bus 4 main breaker and the downstream breakers on MCC 13-4. Cables, conduits and cable trays will be designed to meet the separation criteria of Regulatory Guide 1.75 and applicable portions of IEEE-384.

3. EVALUATION

The electrical equipment and control facilities being installed in the new switchgear room will provide a remote shutdown location and capability should fires occur in the existing switchgear room or in the main control room. Re-routing of cables to and from from the new switchgear room to and from selected equipment in the plant will provide also for safe shutdown of the plant for fires in other areas of the plant. Without this separation, a single fire could have disabled the power supply to both Division A and Division B equipment, one of which is needed for safe shutdown. The new switchgear and associated changes should therefore substantially improve safety by reducing the possibility of fires or similar events from causing common mode failures which could prevent or complicate the safe shutdown of the plant.

We have reviewed the proposed changes and additions to see that they meet desired quality and adequacy standards, and to ensure that electrical faults or equipment failures do not cascade or propagate into common mode failures.

We find that all safety related equipment is classified and qualified as Class 1E. Transformers, buses, circuit breakers, battery chargers, batteries, inverters and cables are sized to meet the requirements of the projected loads. Circuit breakers have been selected with the capability to interrupt the maximum fault current, and to coordinate with upstream circuit breakers so that the consequences of faults do not cascade upstream.

A new 4160/480V transformer will provide additional capacity for the new 480V loads to be added and for future load growth on the 480V buses. A low impedance has been selected for the transformer to limit voltage drops to the 480V system. Voltage drop calculations have been made to ensure adequate voltages to the downstream system. A new normally open tie between the existing 480V Bus 6 and the new 480V Bus 11 will provide emergency backup for the normal transformer supply. Provision is made to ensure that the 4160/480V connection and the 480V tie are not closed simultaneously since available fault current at Bus 6 could exceed the Bus 6 breaker ratings if Bus 6 is supplied from Bus 11.

A new 125V dc Bus 3 in the existing switchgear room, and the associated battery charger will increase the capacity of the 125V dc system. Although this bus will be used to power non-safety loads, it will reduce the loading on the Class 1E 125V dc system by shifting loads from the safety buses.

The Division B 125V dc Bus 2A in the new switchgear room is physically separated from the existing 125V dc Bus 2 in the existing switchgear room for fire protection concerns. However, there is an electrical tie between the two buses. The bus tie is coordinated to trip prior to the main breaker feeding Bus 2A from the battery such that fire induced faults in the existing switchgear room will not cause loss of power to bus 2A. With respect to voltage adequacy at Bus 2, the bus tie cable has been sized and voltage calculations made to ensure that a minimum of 105V dc is maintained at Bus 2.

Existing MCC-5 can be powered from Division A or Division B. MCC-12-11 is powered from Division B. The 120V ac semi-vital panels have alternate feeds from MCC-5 and MCC-12-11 through 480/120V SOLA regulating transformers as discussed in Section 2.7. The transfer from MCC-5 to MCC-12-11, or visa versa, is by an automatic two pole double throw transfer switch which has single point vulnerability, although simultaneous closure to both Divisions would require a catastrophic failure. The licensee states that the SOLA regulating transformers limit fault currents on the secondary side to twice the full-load rating and on the primary side to less than the full load rating. They therefore act as effective isolation devices. If they should fail as a regulating device, the feeder breakers from MCC-5 or MCC-12-11 would serve as backup. Any significant simultaneous impact on MCCs 5 and 12-11 (or a concurrent impact if an automatic transfer is made into a fault) would require at least four simultaneous/concurrent failures. We therefore find that Divisional separation is not compromised by the single point vulnerability of the automatic transfer switch, or by an automatic transfer into a fault.

Controls, indication and alarms are being added to the main control room so that the electrical equipment in the new switchgear room can be normally and adequately controlled from the main control room. Transfer switches in the new switchgear room permit the control and monitoring of Appendix R loads to be transferred to the new switchgear room. The transfer switches effectively electrically isolate the power supply, control and monitoring cables required for safe shutdown of the plant from the effect of fire in the main control room. The transfer operation also introduces alternate circuit breaker/fuses in the power supply circuitry from the new switchgear room so that circuit breaker/fuses opened due to faults in the main control room do not make the alternate shutdown equipment inoperable.

Equipment and cables being added are installed to maintain Division A and Division B electrical and physical separation. Also, train separation within a division is maintained to the extent practical, and the criteria of Regulatory Guide 1.75 and IEEE Standard 384 are adhered to in the new switchgear building and in other parts of the plant to the extent practical. Physical separation

or protection of redundant electrical equipment to meet the criteria of Regulatory Guide 1.75 were not the bases for the existing design. Thus, although the additions may not meet current standards in all instances throughout the plant, they do in most instances, and represent a substantial improvement as compared to the initially licensed facility.

The licensee has not positively stated that they will meet the Appendix R separation criteria throughout the plant. They have committed to document any instances in which the criteria are not met. The licensee should alert the NRC staff to any such instances, and the documentation should be retained and made available for possible NRC review.

4. SUMMARY AND CONCLUSION

A new switchgear room is being installed in a new building at the Haddam Neck plant to provide a remote shutdown capability in case of fires in the main control room or existing switchgear room. This new shutdown facility, plus other changes being made, will also provide alternate shutdown means for fires in other areas of the plant.

The new switchgear room will provide power, control and monitoring for selected Division B shutdown equipment. For a fire in the new switchgear room, the existing Division A shutdown power sources in the existing switchgear room would be used. Control and monitoring would be from the main control room. The switchgear in the new switchgear room will likewise normally be controlled from the main control room. However, in case of a fire in the main control room, control would be transferred to the new switchgear room.

The proposed electrical system design has been evaluated against the applicable NRC general design criteria (GDC), regulatory guides (RGs), and other standards. We find that the electrical safety equipment and systems are properly classified as 1E, meet the redundancy requirements of Regulatory Guide 1.6 and in general meet the separation criteria of Regulatory Guide 1.75. In the few areas of the

existing plant where the separation does not fully meet the criteria of Regulatory Guide 1.75, it at least meets the design basis of the existing plant.

The licensee has not positively stated that they will meet the Appendix R separation criteria throughout the plant. They have committed to document any instances in which the criteria are not met. The licensee should alert the NRC staff to any such instances, and make the documentation available for NRC Regional review.

The electrical equipment has been found adequate to meet the expected steady state and short circuit loadings. Circuit breaker coordination between upstream and downstream breakers has been properly considered. The new electrical additions and changes should substantially improve plant safety by eliminating certain common cause failure scenarios while maintaining adequate electrical capability, separation and redundancy. We therefore find the proposed electrical additions and changes to be acceptable.

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