ILLINOIS POWER COMPANY

U-0350
L30-81 (11-30)-6
500 SOUTH 27TH STREET, DECATUR, ILLINOIS 62525

November 30, 1981

Mr. James R. Miller, Chief
Standardization & Special Projects Branch
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Miller:

Clinton Power Station Unit 1
Docket No. 50-461

Attached are details related to the following items which were discussed with James Lazevnick, Power System Branch, during a meeting of November 30, 1981 to resolve issues for the Clinton SER:

ISSUES

Diesel Generator Automatic Fast Transfer Capability

Diesel Generator Circuit Breaker Trip and Lockout During Test

Number of Hours to Charge Batteries

Load Sequencer with Offsite Power

Separation of Conduit from Open Raceways

Containment Building Polar Crane Penetration

Thermal Overload Protection Device Bypass

Correction to Response for PSB Question 40.107

HPCS Diesel Generator Fast Transfer (Verbal Question)

HPCS Diesel Generator Automatic Separation from Test Mode (Verbal Question)

DC Monitoring Instrumentation

Division 3 Off Line Battery Charging

The above items are considered by the NRC and IP to be closed for CPS Licensing purposes.

B001
s/1

The two items listed below are considered by the NRC and IP to be confirmatory for CPS Licensing purposes. As agreed with Mr. Lazevnick information for the two items is attached.

ISSUES

Adequacy of Station Electric Distribution System Voltage

Automatic Transfer from Onsite Source to Offsite Source (Verbal Question)

In addition, additional information pertaining to Reactor Trip System Power Supplies is enclosed per Mr. Lazevnick's request.

As agreed to during the meeting, FSAR changes to include the pertinent information will be made in a future amendment.

Sincerely,

J. D. Geier

J. D. Geier
Manager
Nuclear Station Engineering

ALR/em

Attachments

cc: J. H. Williams, NRC Clinton Project Manager
H. H. Livermore, NRC Resident Inspector
J. Lazevnick, NRC Power Systems Branch

Issue

Diesel Generator Automatic Fast Transfer Capability (8.3.1)

Response

In response to the NRC's position that automatic transfer from the onsite source to the offsite source is unacceptable the design of the 1E 4KV buses control logic is being revised to require operator action to allow transfer from the onsite to the offsite source. Since automatic transfer, fast or slow, is prevented, the addition of a synchronizing check relay permissive contact is no longer required, and will not be added.

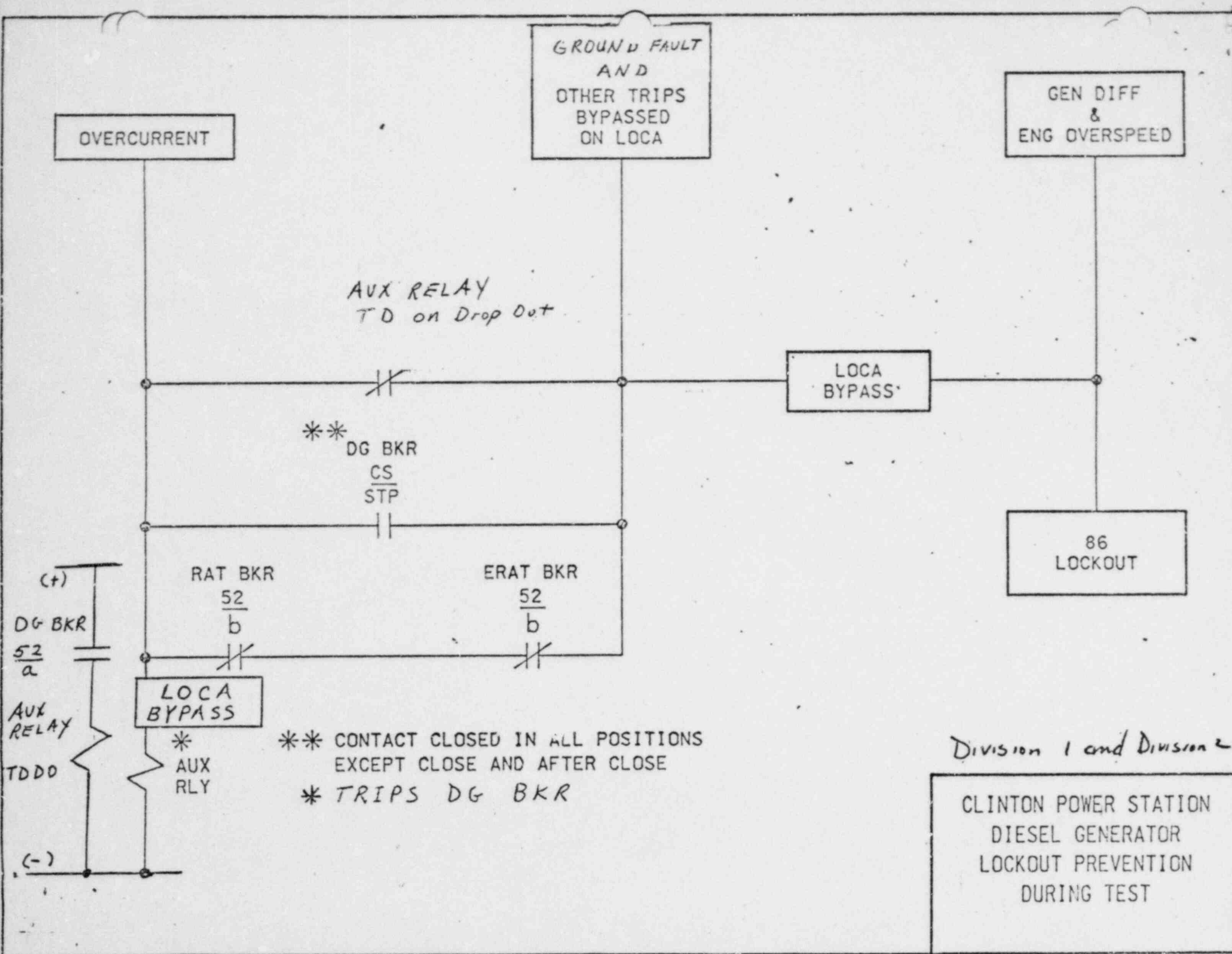
Issue

Diesel Generator Circuit Breaker Trip and Lockout During Test (8.3.1).

Response

PSE SER issue #7.

Provisions are being provided to separate DG from offsite source on LOOP signal during test.



CLINTON POWER STATION
DIESEL GENERATOR
LOCKOUT PREVENTION
DURING TEST

Issue

Number of Hours to Charge Batteries (8.3.2)

Response

As submitted at November PSB meeting.

040.130 In response to Grand Gulf question 040.31, it was indicated that the lead calcium type of batteries used at Clinton Power Station do not require a periodic equalizing charge. In section 8.3.2.1.2.4 of the Clinton FSAR, you state that the battery chargers have a manually initiated equalizing charge timer. Provide information on the use of the equalizing charge capability indicating when it will be used, the level it sets the battery voltage to, and whether the loads can tolerate this voltage level if connected to the bus. Also, indicate whether the battery charger can operate stably as a battery eliminator to supply the dc loads without the battery connected to the bus.

Answer: Division 1, 2, and 4 lead calcium batteries are floated at 2.20 to 2.25V/cell, which eliminates the periodic equalization of the battery at regular intervals. However, the batteries are equalized whenever they are partially or fully discharged due to loss of AC power or testing. The manually initiated equalizing charge timer is provided as an option. It may or may not be used. The battery charger is set to supply 2.33V/cell to equalize the battery. All the dc equipment connected to the dc bus can tolerate the dc bus equalizing voltage. The battery chargers may operate stably as a battery eliminator. But, they have not been qualified by the manufacturer as a battery eliminator. Rev. 1

Division 3 batteries are floated at 2.2V/cell, which eliminates the periodic equalization of the battery at regular intervals. However, the batteries are equalized whenever they are partially or fully discharged due to loss of AC power or testing. During equalizing, all dc equipment, except the NSPS inverter, is transferred to a separate battery charger and fed at normal float voltage. The inverter is designed to operate at the 140-V dc equalizing voltage.

The Division 3 DC loads (except NSPS inverter) are connected to a DC distribution bus which is connected via a breaker to the battery bus. The battery, normal battery charger and NSPS inverter are connected to the battery bus. A breaker connected to the DC distribution bus allows the spare battery charger to be connected to power DC loads during equalizing. During equalizing, the breaker which connects the battery bus and the distribution bus is placed in the open position. The spare battery charger is powered from a non-IE power source. Rev 2

Issue

Use of Load Sequencer with Offsite Power (8.4.4).

Response

See attached.

Action Required

None

Issue

The use of a single load sequencer for sequential loading of the onsite power sources requires the following:

1. A demonstration of the reliability of the sequencer.

2. A detailed analysis to show that there are no credible sneak circuits or common mode failures in the sequencer design that could render both onsite and offsite sources unavailable

Response

All 4KV loads for ESF divisions 1 and 2 are tripped on loss of bus voltage, except feeders to 480 Volt Unit Substations A, B, 1A and 1B. Drywell Chillers (1VP04CA and 1VP04CB) and Fuel Pool Cooling Pumps (1FC02PA and 1FC02PB) are not automatically sequenced on the bus, but require manual operator action to energize. The LPCS pump motor does not utilize a timer.

The remaining loads on these buses are the Shutdown Service Water Pumps (1SX01PA and 1SX01PB), and Residual Heat Removal Pumps (1E12-C002A, 1E12-C002B, 1E12-C002C). After restoration of bus voltage, these motors are each sequenced on their respective divisional buses by electrically independent class 1E timers.

Each Shutdown Service Water Pump utilizes a Westinghouse type TD-5 time located in its respective switchgear cubicle (Cubicle 1AP07ED for 1SX01PA and Cubicle 1AP09EG for 1SX01PB).

The RHR pump motors utilize independent class 1E solid state timers at their respective divisional panels in the main control room (Division 1 is at 1H13-P661 and Division 2 is at 1H13-P662).

All timers on 480 volt unit substations and motor control centers
will be Agastat Series 7000 and located in the respective 480V
2 switchgear or 480V motor control center cubicles. Note HVAC Control
Room Refrigeration Units 0VC13CA and 0VC13CB are manually restarted
after loss of bus voltage.

All timers are independent and are qualified for class 1E use. Since all timers are physically separate and electrically independent, the only common failure mode would be simultaneous individual failures of the timers.

The maximum failure rate of one of these devices as provided in subsection 4.2.2 of Appendix D to IEEE-Std-500-1977 (based on WASH 1400) is 160 failures per 10^6 operations. Therefore, the probability of two timers (one per division) failing simultaneously would be 2.56×10^{-8}, which is extremely unlikely.

Furthermore, since all relays will be functionally checked during preoperational testing, the incipient failure rate will be practically zero.

In the unlikely event that one of the four timers fails, this will only result in a loss of one load on one division.

Issue

Separation of Class 1E Cables in conduit from Open Raceways (8.4.7).

Response

The NRC states on page 39 of the SER that separation of Class 1E cables in conduit from divisional Class 1E and non-Class 1E cables in open raceways by a minimum of one inch is acceptable only if the conduit is located below the open raceway.

Section 5.1.4 of IEEE 384-1974 states: "The minimum distance between these redundant enclosed raceways and between barriers and raceways shall be one (1) inch."

The Clinton Station maintains a minimum of one (1) inch between the side of an open tray and conduit adjacent to it which contains 1E cable. The tray side and the conduit each form a barrier separated by one (1) inch. The Clinton design of conduit adjacent to tray meets the requirements of IEEE 384.

For Class 1E cables in conduit located above redundant divisional Class 1E or non-Class 1E open raceways, Illinois Power commits to installing cable tray covers on the open trays located below the conduit. Figure 5 of IEEE 384-1974 will be used as a guide for determining the length of the tray covers.

a) For conduit traversing open tray at 90 degrees, the tray cover length will be two feet plus the conduit (or bank of conduit) diameter. (regardless of plant area)

b) For conduit traversing open tray at less than 90 degrees, the tray cover length will be long enough such that all points along the conduit are a minimum of one foot from any uncovered portion of the tray. (regardless of plant area)

Note

Covers will be added to open trays below conduits only where the trays do not meet the IEEE 384-1974 vertical separation criteria of 3 feet from the conduit in cable spreading areas and 5 feet from the conduit in general plant areas.

Action Required

None

Issue

The scheme for protection of the Containment Building polar crane utilizes primary protection consisting of a 480 volt class 1E feeder breaker with a solid state trip device. Backup protection is provided by the class 1E main feed breaker to the 480 volt bus which is tripped by an inverse time-overcurrent relay we will require in the Technical Specifications that the feeder breaker to the crane be locked open during reactor operation.

Response

The attached graph shows the thermal capability curve for a single 350 MCM penetration feedthru. Also shown plotted on the graph are coordination curves representing actual settings for the polar crane CO-8 overcurrent relay and the primary breaker SS-14 solid state trip device.

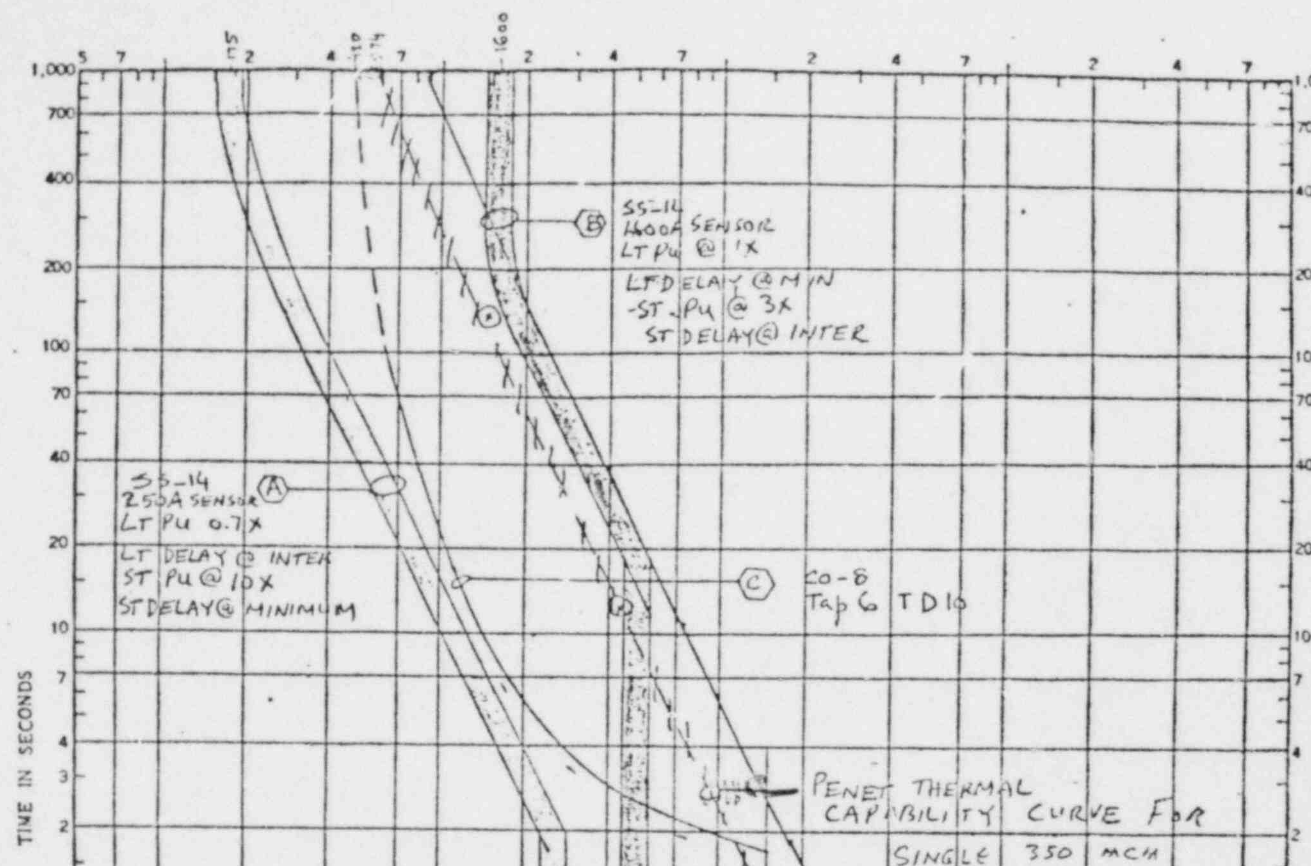
The graph shows that the coordination curves for both the CO-8 and SS-14 are well below the withstand capability curve of a single 350 MCM cable.

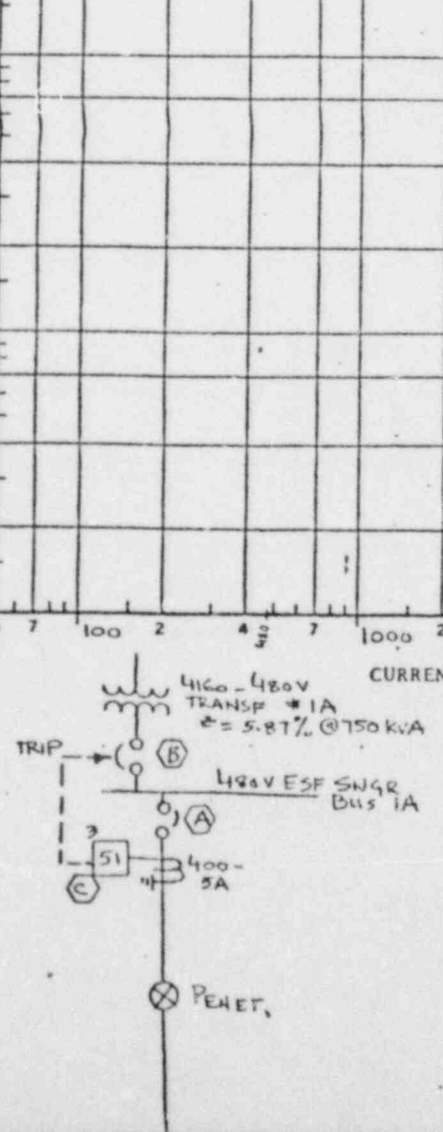
The current input at rated horsepower output of the polar crane is much less than the single 350 MCM cable thermal capability. Should the loss of one of the penetration parallel 350 MCM conductors occur, both the SS-14 and the CO-8 will adequately protect the remaining 350 MCM cable within the containment penetration.

Therefore, it is not necessary to lock open the polar crane feeder breaker during reactor operation and, as agreed, IP rescinds its earlier commitment to add Tech Spec surveillance requirements on this feeder breaker.

Action Required

None





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Rev. 0	Date 7/24/81
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SARGENT & LUNDY ENGINEERS

6-15-70

CONTAINMENT BUILDING
POLAR CRANE 1HC01G
BREAKER & RELAY SETTINGS
COORDINATION

Issue

Some thermal overload protection devices (that are integral with the motor starter for electric motors on motor-operated valves) are bypassed in one direction; i.e., the "close" circuit. Some are bypassed in both directions; i.e., the "open" and "close" circuits. Verify that consideration was given to bypassed overloads such that in all cases the motor operated valve will perform its safety function when required.

Response

Regulatory Guide 1.106 "Thermal Overload Protection For Electric Motors On Motor-Operated Valves" describes a method acceptable to the NRC staff of applying thermal overload protection devices that are integral with the motor starter for electric motors on motor-operated valves. This method ensures that the thermal overload protection devices will not needlessly prevent the motor-operated valve from performing its safety-related function.

Clinton Power Station has committed to R.G. 1.106 (Rev. 1, March, 1977) and FSAR section 8.1.6.1.19 describes our conformance.

Basically, the safety function and it's "direction" (i.e., open circuit or close circuit or both circuits) of each 1E MOV is determined. The thermal overload is continuously bypassed in that safety direction unless the motor is placed in the test position. In the test mode, the thermal overloads are temporarily placed in the circuit. Therefore, IP does state that consideration was given to bypassed overloads such that in all cases, the motor-operated valve will perform its safety function when required.

Action Required

None

Safety Evaluation Report
Open Issue #5
Page 19
PSB 40.107

Issue

Identify blocks of 1E loads and the times they are sequenced onto their respective 1E bus.

Response

This issue is closed by the revised response to PSB question 40.107.

The following revisions to the response to PSB question 40.107 will be made in response to additional verbal questions on Division 1 and Division 2 loads.

1. Revise starting KVA for Division 2 at time 0 seconds to be 6,975.
2. Revise 4.16 KV switchgear 1B1 RHR Pumps 1B,1C load at time 5 seconds to be 760.9 (Page 1 of 12, Division 2). Rev. 1
3. Revise totals for 4.16 KV switchgear 1B1 at time 0 seconds to be 1178.3 and at time 5 seconds to be 801.0.
4. Revise 480 V Unit Substation 1B switchgear 1 Heat removal Condition Unit Motor Efficiency to be 92, load at time 0 seconds to be 108.69.
5. Revise totals for 480 V Unit Substation 1B for time 0 seconds to be 360.88.

Additional Verbal Question

Question: Does the HPCS Diesel Generator utilize a fast transfer scheme similar to the Division 1 and Division 2 Diesel Generator? The logic diagrams do not show this.

Response: Division 3 does utilize a fast transfer scheme similar to Divisions 1 and 2. The E02-1HP99 drawings show this. Division 3 will be revised to prevent auto transfer from the Diesel Generator to an offsite source.

Draft SER
Additional Verbal Question

Question: Will the HPCS Diesel Generator automatically separate from the test mode upon receipt of a safety injection signal? The FSAR indicates this is true, but the logic diagrams do not show this.

Response: The HPCS Diesel Generator will separate from the test mode upon receipt of a safety injection signal. E02-1HP99 Sheet 109 shows the circuits to accomplish this separation. The logic diagrams will be revised to reflect this feature.

Issue

DC Monitoring Instrumentation

Response

Additional response to 40.133

The Division 3 alarms and indications listed above will be changed to include the following:

A battery charger failure alarm which monitors the battery charger DC output voltage for high voltage, low voltage, and battery charger output current for no/low current, will be provided. This alarm will be grouped with other HPCS DC alarms and will alarm in the main control room. The low voltage alarm set point will be selected to allow prompt indication of a off normal battery float voltage condition.

This addition to the Division 3 alarms and indications, allows the Division 3 DC system to be monitored to the extent necessary to assure that it will be available to perform its safety function.

Issue

Division 3 off line battery charging.

Response

Division 3 batteries are floated at 2.2V/cell, which eliminates the periodic equalization of the battery at regular intervals. However, the batteries are equalized whenever they are partially or fully discharged due to loss of AC power or testing. During equalizing, all dc equipment, except the NSPS inverter, is transfered to a separate battery charger and fed at normal float voltage. The inverter is designed to operate at the 140-V dc equalizing voltage.

In response to additional questions on the spare charger alarms and loads, the following response was provided.

Local indication of DC current and DC voltage is provided. High DC voltage will trip AC source breaker and provide an alarm. Low DC voltage will provide an alarm. The setpoints of the voltage alarm relays will provide prompt alarming of an off normal DC voltage condition. Division 3 DC load bus supplies HPCS instrumentation and control. It also supplies 125 VDC power to the Division 3 portion of the NSPS. Division 3 battery offline equalizing will be performed in accordance with written procedures.

Action Required

None

Issue

Adequacy of Station Electric Distribution System Voltage (8.2.4)

Response

As submitted at November PSB meeting, Bethesda, and additional response sent to Jim Lazevnick 11-24-81.

See attached.

Action Required

None

Additional Response to PSB Question 40.135

1. All continuous duty motors which are susceptable to voltages less than 90% of rated motor voltage under degraded voltage conditions either have a 1.15 service factor or are designed with rated horsepowers at least 10% higher than the required brake horsepower.

2. The first level of under voltage relays will be set at 78% of 4160 volts (time dial 2) for Divisions 1 & 2. A similar characteristic will be created for Division 3 using the instantaneous under voltage relays with a timer. When the diesel generator is supplying the loads, load shedding will be blocked. Spurious transfers are precluded by the 78% setting, which is sufficiently lower than the minimum transient voltages which occur while starting motors from offsite sources.

   One timer will be utilized for the 2nd level under voltage scheme. Preliminary data lists the starting time of the largest 1E motor, with worst case source voltage, as approximately 10 seconds or less. Based on this information, the timer will be set at 15 seconds. Motor starting time is presently being verified. After this timer has timed out, the loads will automatically transfer to the onsite power source. Instrumentation and controls will not be damaged by this degraded voltage for this short time period.

3. See attached table I.

4. The minimum and maximum voltage ranges of the offsite sources used for the voltage drop calculation are as follows:

   a. Normal Operating Voltage Range During Plant Life for 345 kV system: 355.4 kV to 362.2 kV.

   b. Normal Operating Voltage Range During Plant Life for 138 kV system: 135.5 kV to 142.6 kV.

   c. Minimum voltage during most severe contingency (i.e., single or double line circuit failure) under which the RAT would be required to successfully start up Clinton and the ERAT supply Clinton LOCA and/or shutdown.

   345 kV System = 1.010 per unit

   138 kV System = .935 per unit

5. See attached Table I.

6. Since only one timer is provided (setting discussed in item 2), there will be no LOCA bypass.

7. There will be no automatic transfer from the onsite source to off site source.

8. See item 2.

9. Startup of the 270 HP control room HVAC chiller OVC13CA on 480V ESF switchgear Bus A when ERAT is carrying LOCA loads will cause the most severe voltage dip at the 480V level. The effect at the 480V level is more severe under this condition than starting the largest 4kV motor.

The starting voltage at the chiller is expected to be 364V and the bus voltage will be 367V. This 367V at the switchgear bus will cause the following minimum voltages at other equipment terminals:

EQUIPMENT	VOLTAGE	# OF EQUIPMENT RATED VOLTAGE
1. 480V MCC	364	75.8%
2. 460V MCC	352	76.5%
3. 480/120 Regulated Transformers	366	76.25%
4. 480-120/208 Non-Regulated	94/163	78.3%

All motors are designed to deliver rated full rated torque without damage for infrequent one-minute intervals at 75% of rated motor terminal voltage.

Under voltage relays and overcurrent relays at the 4160V and 480V level are set to override motor starting transients and, therefore, will not cause spurious trips during motor starting. Note 480V under voltage relays are for alarm only.

Dropout voltage for relays and contractors are substantially lower than the minimum expected voltage during this transient conductor. Therefore, relays and contactors will not drop out.

The instrumentation will not be damaged during anticipated low voltage transients.

10. The Technical Specifications (Section 3/4 3.3) allow tolerance at 4kV for second level under voltage relay which corresponds to about 19 volts based on the setpoint of 3715 volts. Therefore, the setpoint in the technical specification for second level will be specified as 3734 ± 19 volts which will correspond to a relay setpoint of 106.2 ± .5 volts (based on 4200-120V potential transformers).

    The low tolerance of the setpoint corresponds to 3715 volts at the 4kV level which is the minimum value for successful operation of equipment at all levels. The high tolerance corresponds to 3753 volts at the 4kV level and is substantially lower than the worst case minimum expected voltage of 3848 volts to preclude spurious trips.

    We have contacted relay manufacturer, and he has advised us that there is no draft in setpoint of 2nd level of UV relays.

TABLE I

CASE	NO LOAD VOLTAGE AT: 120V NSPS and Regulated Bus Volt	%	NO LOAD VOLTAGE AT: 208/120V Non-Regulated Bus Volt	%	MINIMUM RUN VOLTAGE AT: 120V NSPS and Regulated Bus Volt	%	MINIMUM RUN VOLTAGE AT: 208/120V Non-Regulated Bus Volt	%
Start Up From RAT	120V±2% (Guaranteed Output)		228/131	109	120V±2% (Guaranteed Output)		194/112	93.3
LOCA Operation From RAT	120V±2% (Guaranteed Output)		228/131	109	120V±2% (Guaranteed Output)		197/114	95.0
Shutdown From RAT	120V±2% (Guaranteed Output)		228/131	109	120V±2% (Guaranteed Output)		191/110	91.7
Normal ESF Load + DG Test From RAT	120V±2% (Guaranteed Output)		228/131	109	120V±2% (Guaranteed Output)		203/117	97.5
LOCA Operation From ERAT	120V±2% (Guaranteed Output)		232/134	*111.7	120V±2% (Guaranteed Output)		189/109	90.8
Shutdown From ERAT	120V±2% (Guaranteed Output)		232/134	*111.7	120V±2% (Guaranteed Output)		194/112	93.3
DG Test From ERAT	120V±2% (Guaranteed Output)		232/134	*111.7	120V±2% (Guaranteed Output)		194/112	93.3

NOTE

* No-load voltage has been calculated without considering any voltage drop through the ERAT, 480V substation, or in the feeder. Since there will always be some drop in this equipment, 111.7% at 480-208/120V non-regulating transformer is considered acceptable.

Per discussion with the NRC on November 4th and 5th, 1981, the capability for the Clinton 1E 4KV buses to auto transfer from the onsite source to an offsite source is not acceptable. The NRC's requires that an acceptable design include the capability for restoring preferred power to the respective safety bus by manual actuation only.

To meet this requirement, the Clinton 1E 4KV bus control logic will be revised to require operator action to allow transfer from the onsite source to an offsite source.

Issue

The RPS and MSIV solenoid circuit wiring is run in conduit and the conduits may be run with divisional wiring. Tests and analyses have been performed which show that the conduit (with no separation) provides adequate separation between Class 1E circuits and the non-1E special solenoid circuits.

Also, non-1E fire detection, intercom, and utility services wiring in PGCC floor sections are in conduit and the conduit may run in any divisional duct. All conduits are grounded to ensure that hot shorts in internal wiring will melt upstream fuses which will provide short circuit protection that limits the fault to the non-divisional cables.

Additional information is required from the applicant describing the tests and analyses performed to show that the RPS and MSIV conduits provide adequate separation when routed with divisional circuits. Test data is also required from the applicant to show adequate separation is maintained in PGCC conduits. The test must be performed assuming the upstream fuses fail.

After discussing by phone with the applicant and GE (on 11-17-81)*, the test report for electrical fire separation capability of flexible conduit, the following information was requested:

1. Was the conduit under test closed at one end or both?

2. Was the selection of a 2/c #10 AWG wire in the test the worst case for both RPS/MSIV and PGCC and why? Include cables sizes for PGCC and RPS/MSIV.

3. State how the test (which was performed in open air) was corrected for different heat rate characteristics encountered by the conduits for RPS/MSIV and PGCC which would be buried by energized cables.

4. For the test cable not in conduit, what size conductor and insulation voltage was used?

* See attached telecon memo of 11/17/81.

Issue

5. State how the test showed no damage to cable outside the conduit if the cable and conduit were buried in other energized cable would be encountered by the divisional cable around PGCC and RPS/MSIV.

6. Where did the test cable fail?

7. For an arcing fault, a concentrated heat rise at that point on the conduit could occur. Describe how the test covered this.

8. State how the test corrected for the ambient temperature encountered by conduits buried by energized cables.

Response

The information requested by the NRC is being investigated. The test report as written does not give details to answer the questions. Personnel in Daytona Beach, Florida who were involved with the actual test are gathering information. An additional conference call to the NRC is planned the week of November 30 , 1981.

Action Required

Obtain answers to the questions presented by the NRC.

NUCLEAR POWER SYSTEMS DIVISION
San Jose, California

November 17, 1981

SUBJECT: TELECON 11/17/81

Participants

Tom Spry	IPC
Jim Lazevnick	NRC
F. C. Downey	GE
W. H. Hendrix	GE
D. L. Foreman	GE

This is to document discussion of NRC questions on the Clinton NSPS power distribution in a telecon with the above listed individuals.

1) Relay Plant Reference Design

As discussed, a reference plant for power distribution is any of the BWR relay designs. Hatch would be the best reference since this is the plant where questions concerning the protective circuitry first came up.

The relay designs use two non-1E MG sets to supply RPS and MSIV solenoids and logic. Outputs of these MG sets to the busses are now through the protective circuitry to ensure that the busses remain within class 1E parameters.

2) Description of Clinton Inverter Design

The power arrangement for Clinton will be similar to the relay plant power distribution. The inverters, which will be class 1E equipment, will be the equivalent of the MG set, which is non 1E on the relay plants. Each inverter output will power a solenoid bus for normal operaton. The A bus will power all "A" solenoids and the B bus will power all "B" solenoids. During bypass mode the bus is powered through a regulating transformer (class 1E) from a non 1E power source.

3) Description of Power Monitor for the Inverter Output

The inverter output will have a power monitor system to disconnect its output should the inverter controls fail to maintain the class 1E voltage parameters. The monitor will trip the inverter output breaker upon sensing an over voltage, undervoltage, or underfrequency condition at the inverter output. (The power monitor system is also class 1E.)

The power monitor circuits will be circuitry other than that used for inverter controls. The monitor will trip the output breaker during normal or bypass operation of the inverter.

4) Logic Comparison

The logic for final actuation will be the same as on the relay plants, 1 out of 2 twice.

5) Tech Specs

A Tech Spec limit will be imposed when on the bypass to limit operation in the bypass mode. Only one bus will be allowed to be on the bypass at any one time. The time limit for the bypass mode will be affected by the fact that the power monitor is not redundant when on the bypass.

The tech spec time limit is still to be determined.