REPORT ON NRC IE BULLETIN 79-27, LOSS OF NON-CLASS 1E INSTRUMENTATION AND CONTROL POWER SYSTEM BUS DURING OPERATION

April 19, 1982

Table of Contents

IE Bulletin 79-27 Report

E23rg2

GGNS STUDY FOR IE BULLETIN 79-27

I. INTRODUCTION

This study constitutes MP&L's written response to NRC IE Bulletin 79-27, transmitted in a November 30, 1979, letter from James O'Reilly to N. L. Stampley and GGNS Safety Evaluation Report (SER), NUREG 0831, as License condition 1.11(9).

IE Bulletin 79-27 requires a review of all plant electrical busses powering safety and non-safety related instrumentation and control devices to identify those busses that would prevent the ability to attain a cold shutdown condition if de-energized, and to ensure that emergency procedures are adequate to address the loss of such busses. Additionally, the IE Bulletin requires a re-review of IE Circular 79-02, FAILURE OF 120-VOLT VITAL AC POWER SUPPLIES (January 11, 1979), to include both 1E and non-class 1E safety related power supply inverters.

This report contains the scope of the GGNS IEB 79-27 study the review method utilized, and a summary of findings.

II. SCOPE

The scope of this IEB 79-27 study includes the systems required to place and maintain the plant in a cold shutdown condition:

- Nuclear Boiler Instrumentation (pressure, level, temperature, core flow)
- High Pressure Core Spray
- Residual Heat Removal
- Standby AC Power System (Diesel Generators)
- Standby Service Water
- Automatic Depressurization System
- Low Pressure Core Spray (LPCS)
- Reactor Core Isolation Cooling
- Containment Instrument and Control System

The indication and control functions of the following systems, directly involved in bringing the plant to cold shutdown, were also included in the evaluation.

- Control Rod Drive System
- Feedwater Control System
- Reactor Recirculation System
- Neutron Monitoring System
- Turbine Control and Bypass Systems
- Condensate and Feedwater System

These systems are predominantly fed from class 1E Division I, II, and III 4.16 KV busses 15AA, 16AB, and 17AC, each with a diesel generator as backup power, and the class 1E Division I, II, and III 125 VDC busses 11DA, 11DB, and 11DC. A limited number of components fed from non-class 1E sources were also reviewed.

These systems, in whole or in part, are used to achieve cold shutdown under worst-case loss-of-power conditions including a loss-of-coolant accident. Independent of the event that initiates plant shutdown (whether a normal plant shutdown or a forced plant shutdown), the reactor is normally brought to approximately 100 psig using either the main condenser or, in the case of loss of offsite power or other conditions where the main condenser is unavailable, the RCIC and HPCS systems, together with either the steam condensing mode of the RHR system or the nuclear boiler pressure relief system.

For the purposes of this study the worst-case failure is assumed to be loss of offsite power and one ESF power Division. It should be noted that operation of either Divisions I and III or II and III can be completely lost without affecting safe shutdown capability. Operation of Division I (only) or operation of Division II (only) is sufficient to achieve safe shutdown. For failure of Divisions I or II, the following systems are assumed functional:

a. Division I Fails, Division II and III Functional:

Failed Systems	Functional Systems
RHR Loop A	HPCS
LPCS	ADS
	RHR Loops B and C

b. Division II Fails, Division I and III Functional:

Failed Systems	Functional Systems
RHR Loops B and C	HPCS
	ADS
	RHR Loop A
	LPCS

For a failure of Division III (HPCS) (only), all the above systems except HPCS would be functional, again providing adequate cooldown capability.

The ADS, HPCS, and RHR systems have suitable redundancy in components such that they can routinely perform their functions for both normal and forced plant shutdown-even assuming an additional failure of power source, offsite or onsite. Since the ADS, HPCS, and RHR systems are divisionally separated, no single failure, together with the loss of offsite power, is capable of preventing attainment of cold shutdown using these systems.

Accordingly, this study contains a review of the power supplies for these systems' instrumentation and controls, assesses the operational effects of loss of power (Attachments 1 and 2), and addresses the

adequacy of the plant emergency procedures used upon loss of power to the busses feeding the above systems (Attachment 3).

Finally, documentation of a review of IE circular 79-02 is included which address IEB 79-27, item 3 (Attachment 4).

III. METHOD OF REVIEW

A. All instruments and equipment connected to the major busses were enumerated on drawings initiated specifically for the IE Bulletin 79-27 review. Attachment 5 is an example of one of the 438 drawings. Using these drawings and drawings from which these were developed, each of the eight major plant systems listed in Part II above was reviewed for:

1) Power Source and Loss-of-Power (LOP) indications

Using the latest revised drawings, each component's power source was determined, a... g with indications of power failure available to control room operators. Alarms, loss of status or indication, or other effects were reviewed to determine if the loss of power would go undetected or compromise achievement of cold shutdown.

2) Power Source Diversity (for Redundant Components)

For redundant components, power sources were reviewed for diversity to assure that a single bus or breaker failure would not disable redundant systems or components.

3) Operational Effect on the System

For each component subjected to LOP, the operational effect on its system and other interfacing systems was evaluated to determine if an unknown or undetected condition would result.

B. Emergency procedures to be used upon loss of power to the busses supplying power to the systems in II above were reviewed for:

1) Diagnostics/alarms/indicators/symptoms resulting from the evaluation in A above.

2) The use of alternate indication or control circuits that may be powered from other busses.

3) Methods of restoring power to the bus.

IV. SUMMARY OF FINDINGS

A. This review of the class 1E and non-class 1E busses supplying equipment, instrumentation, and control power to systems used to place the plant in a cold shutdown condition has confirmed the reliability, diversity and redundancy of the systems referenced in Part II. Automatic indication is provided in the control room to

inform the operator that a system or part of a system is inoperable. General examples of indications of inoperability are listed below:

- If any circuit breaker of the referenced systems (required to place and maintain the plant in cold shutdown) is racked out, indication is provided in the control room.

- All motor control circuits related to the referenced systems are individually monitored. If control voltage is lost as a result of tripping of a motor-start feeder breaker or removal or a control circuit fuse, indication is provided in the control room.

- All the referenced systems which contain a control switch with test mode capability, or which may be put into a test mode by the insertion of a test jack, provide continuous control room indication that the test mode has been selected.

- Individual status indicators for each system are arranged together on the control room panels to indicate what function of the system is out of service, bypassed, or otherwise inoperable. All bypass and inoperability indicators, both at a system level and component level, are grouped only with items that will prevent a system from operating if needed. Indication of pressures, temperatures, and other system variables that are a result of system operation are not included with the status indicators. In addition to the indication, annuniciation is provided for each ESF system train. A bypass of one or more components within a system train actuates a corresponding annunciator to alarm the fact that a given system is out of service.

- The system of status lights for bypass indication, other display information available to the operator, and periodic testing provide assurance that the operator will be constantly aware of the status of these systems. The indication system (described previously) assures that frequent or routine bypass operations with control circuits or control power failures, which could affect system performance, are made obvious.

- All status indicator circuits for the systems in each ESF division are physically and electrically separated. This maintains independence of the systems which perform safety functions. The annunciator circuits are physically and electrically isolated from safety circuits so that no credible failure of the annunciator circuits will have an adverse effect on safety.

- Many status indicators are provided with dual lamps as indicated in AECM-82/86, dated March 11, 1982 (Human Factors Engineering Review). Dual lamps can be tested by depressing the indicators. Annunciators can be tested by depressing the annunciator test switches in the control room.

- The diversity of alarms and indications associated with the loss of the class 1E (and non-class 1E) instrumentation and control circuits assures that in no case can the ability to place the plant in a cold shutdown condition be compromised.

Consequently, no design modifications resulting from this review are required.

B. The review of the emergency procedures used by operators indicated that some revision and updating was required. GGNS Operations have updated emergency procedures to agree with IEB 79-27 study results as further explained in Attachment 3.

C. The documentation referenced in Attachment 4 in response to IE Circular 79-02 indicates no further action is required or warranted.

1. SYSTEM REVIEWS AND RECOMMENDATIONS

I. NUCLEAR BOILER INSTRUMENTATION

The primary Nuclear Boiler parameters required to determine if cold shutdown is being achieved are reactor vessel level and pressure. Additionally, indication of in-vessel temperatures and core coolant flow provide confirming evidence of approach to and attainment of cold shutdown.

The power sources for these parameter measurement channels which are displayed in the Control Room are listed in Attachment 2.

A. RV LEVEL/PRESSURE INDICATIONS

Nuclear Boiler Instrumentation System B21 provides diverse redundant indications of RV level and pressure. Two post-accident-monitor recorders 1B21-UR-R623A and B provide continuous indication and trend of these key reactor parameters. Recorder A is fed from ESF Division I and recorder B from ESF Division II - providing indication to the control room operator under worst-case conditions of loss of offsite power and one ESF division. Additional RV level indication is provided by wide-range level indicator 1B21-LI-R604, powered from ESF Division I through RPS MG Set A; and fuel zone level recorder 1B21-LR-R615, fed from inverter 1Y80 (Non-ESF) backed up by Division I MCC 15B42. All but one of the above devices are located on control room panel 1H13-P601: 1B21-LI-R604 is located on 1H13-P680.

Loss of power to a single 1E (or non-1E) bus will not deprive the control room operators of reactor vessel level or pressure instrumentation. Sufficient diversity and redundancy of power supplies exists to assure that under worst case loss-of-power conditions, these key reactor parameter indicators will be available to verify that the plant is being placed in a cold shutdown condition.

Primary indications of loss-of-power to these system B21 channels is a downscale reading on the indicators; failure of power supply to the recorders is evidenced by loss of motion of the indicator/-pen and non-movement of the chart.

B. REACTOR VESSEL TEMPERATURES

Nuclear Boiler System temperature instrumentation available to the Control Room operator for achieving cold shutdown consists of reactor vessel temperature measured at the bottom head, vessel top head flange, and the recirculation pump suction temperatures. Attachment 2 lists the power source for these temperature recorders in the Control Room. Although these recorders, 1B21-TR-R643 and 1B33-TR-R604, are located in one of the "back" cabinets, 1H13-P614, which is not directly viewable from the operating consoles, the secondary importance of these parameters does not require continuous operator surveillance.

The power for these recorders is fed from inverter 1Y80, backed up by automatic switchover to ESF Division I MCC 15B42. This power source and backup is considered adequately reliable to assure that these indicators will be available under worst case loss of power conditions. Primary indications of loss of power to these instrument channels is evidenced by loss of motion of the point printer and non-movement of the chart.

C. CORE FLOW INDICATIONS

Under normal cool down conditions (reactor recirculation system in operation), heat removal from the reactor core is proportional to coolant flow. Since total core coolant flow passes through the jet pumps, indication of total jet pump flow and core differential pressure (dP) will provide the control room operator additional verification of approach to cold shutdown.

As shown in Attachment 2, core flow and dP indications are displayed on panel H13-P680. The power for this instrumentation is provided by inverter 1Y80, backed up by automatic switchover to ESF Division I MCC 15B42. This power source and backup is considered adequately reliable to assure that these indications will be available under worst-case loss of power conditions. Primary indications of loss of power to the flow indicator is a downscale reading; the recorder fails downscale.

It should be noted that loss of these control room flow indications (blown fuse, etc.) does not deprive the operator of this parameter; local dP indicators are available for remote verification of core flow.

Under loss of offsite power conditions, the reactor recirculation system does not operate, hence core flow indication would be of minimal use -- the operator must use vessel level and pressure as primary indication of cooldown.

D. RECOMMENDATIONS - Nuclear Boiler Instrumentation

Required Changes - None

II. HIGH PRESSURE CORE SPRAY (HPCS)

A. The High Pressure Core Spray (HPCS) System is self-contained except for its initiation signal source and connection to offsite power through the plant AC power distribution system. All system instruments and controls are fed from ESF Division III AC and DC buses. Loss of plant power to Division III 4.16KV bus 17AC initiates an HPCS diesel-generator start and all Division III loads are then carried by the diesel-generator.

4.16KV bus 17AC feeds MCC 17B01, which in turn feeds MCC 17B11. Loss of power to MCC 17B01 removes the HPCS system from service, but numerous alarms and indications of such a loss are available to the control room operator. Loss of MCC 17B11 removes HPCS DG fuel oil and service water controls, with consequent alarms alerting the control room operator to these losses also.

System process indications in the control room consist of HPCS pump discharge pressure and flow; inboard and outboard test valve position indications; and various AC/DC power supply indications and alarms. Sufficient indications are available to enable the operator to quickly assess the magnitude of a power loss in the HPCS controls and instrumentation.

B. RECOMMENDATIONS - HPCS

Required Changes - None

III. RESIDUAL HEAT REMOVAL (RHR)

A. The Residual Heat Removal System (RHR A, B/C) power supplies are adequately divided to preclude total loss of the systems due to a single failure. RHR A components, instruments and controls are fed from ESF Division I bus 15AA; RHR B and C are fed from ESF Division II bus 16AB. Numerous loss of power alarms and indication are available to the control room operator -- both for major bus losses and for AC/DC control power losses.

System process indications in the control room consist of pump flow, heat exchanger level and pressure controls, valve position indicators, standby service water flow indication, and heat exchanger outlet water conductivity (Attachment 2). Loss of power to these devices is indicated by a downscale reading. Loss of power to the RHR multipoint temperature recorder is evidenced by loss of motion of the point printer and non-movement of the chart.

B. RECOMMENDATIONS - RHR

Required Changes - None

IV. STANDBY AC POWER SYSTEM (Diesel Generators)

A. The onsite class 1E AC power source of each of the three ESF buses is a diesel generator connected exclusively to that bus. The diesel generator starts automatically on a LOCA signal or following the loss of the offsite power source feeding the respective ESF bus. All AC and DC control and instrumentation power for circuit breakers, DG controls and instruments, and annunciators for a given ESF power Division are fed exclusively from the respective ESF sources. The diesel generator sets for Unit 1 are identified as:

(1) Set 11 for ESF bus 15AA - Division I

(2) Set 12 for ESF bus 16AB - Division II

(3) Set 13 for ESF (HPCS) bus 17AC - Division III (discussed in Part II of this Attachment)

Controls and instrumentation available to the control room operator include:

a) AC bus voltage, frequency, and amps for incoming power and the diesel generator; ESF DC bus voltage; breaker status indicators

b) syncroscope

c) fuel oil tank level indication

d) system status indications

All the above instruments fail downscale on loss of power. Attachment 2 contains a list of the instruments and their power supplies.

The DG crankcase fans are powered from ESF buses. Additionally, sufficient redundancy is incorporated into DG standby support systems so as not to compromise the ability of the diesel generators to start upon loss of offsite power. Most of the functions of these systems are performed by the DG set when it is operating; i.e., lube oil heating, jacket water heating, etc. Loss of power to buses feeding these DG standby support systems is alarmed in the control room.

B. RECOMMENDATIONS - Standby AC Power Systems

Required Changes - None

V. STANDBY SERVICE WATER (SSW)

A. The Standby Service Water (SSW) system, containing the plant ultimate heat sink, is designed to remove heat from plant auxiliaries that are required for safe reactor shutdown. It is designed to perform its cooling function following a LOCA, automatically and without operator action, assuming a single failure or passive failure coincident with loss of offsite power.

The SSW system power supplies are adequately divided to preclude total loss of the system due to a single failure. SSW loop A components, instruments, and controls are fed from ESF Division I bus 15AA; SSW loop B is fed from ESF Division II bus 16AB. Several loss of power alarms and indications are available to the control room operator--both for major bus losses and for AC/DC control power losses.

System process indications in the control room consist of pressure and flow recorders and basin level recorders. HPCS service water pressure and flow are indicated also. (See Attachment 2.) All indicators and recorders fail downscale on loss of power to the instrument.

B. RECOMMENDATIONS

Required Changes - None

VI. AUTOMATIC DEPRESSURIZATION SYSTEM (ADS)

A. The Automatic Depressurization System (ADS) serves to provide reactor depressurization in case of HPCS system failure. In the event of a small line break in the reactor coolant system, ADS depressurizes the reactor allowing the Emergency Core Cooling System to flood the core. In all cases, it is one of several alternate methods of achieving cold shutdown under accident or off-normal conditions.

The ADS is an ESF Division I (ADS A) and Division II (ADS B) system, except that only one set of relief valves is provided. Each relief valve can be actuated by either of two solenoid-operated pilot valves--one operated by trip system A and the other by trip system B. Logic relays, manual controls, and instrumentation are mounted so that Division I and Division II separation is maintained. Separation from Division III is similarly maintained.

All the power for ADS initiation is fed from the 125 VDC system--ADS channel A through 1DA1 breaker 72-11A23; ADS channel B through 1DB1 through breaker 72-11B34. Sufficient alarms are provided to alert the control room operator of loss of DC power to either channel. Additionally, loss of power to any one solenoid valve or its actuation logic train is indicated on the control panel.

The only AC power supply associated with the ADS is the power supply for the SRV downstream temperature recorder (Attachment 2). Failure of the power supply to the recorder is evidenced by loss of motion of the point printer and non-movement of the chart.

B. RECOMMENDATIONS

Required Changes - None

VII. LOW PRESSURE CORE SPRAY (LPCS) SYSTEM

The Low Pressure Core Spray (LPCS) system is a safety system not normally used to achieve cold shutdown. This system, in conjunction with the ADS, is capable of cooling the core, independent of any other core cooling. It is included in this report as a system capable of placing the plant in a cold shutdown condition--especially under Design Basis Accident line break condition. It is functionally backed up by RHR-A/LPCI mode (Division I), which is further backed up by RHR-B and C (Division II) and HPCS (Division III).

The LPCS system power supplies are exclusively fed from ESF Division I AC and DC sources. Adequate loss of power alarms and indicators are available to alert the control room operator of loss of power to system controls and instrumentation.

System process indication in the control room consists of a system flow indicator. (See Attachment 2.) The indicator fails downscale on loss of power.

B. RECOMMENDATIONS

Required Changes - None

VIII. REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

The Reactor Core Isolation Cooling system maintains reactor water level by providing makeup water in the event the reactor becomes isolated from the main condenser, isolated in hot standby, or if a complete plant shutdown occurs with loss of normal feedwater flow (and preceding depressurized shutdown cooling). The RCIC AC and DC power sources are separated into ESF Division I and Division II. Consequently, the system can only be used if both ESF Division I and Division II are available.

There are numerous alarms and indications to alert the operator to loss of power to instruments and control circuits. System process indication in the control room consists of RCIC turbine pressures and flow and RCIC pump pressures and flow. (See Attachment 2.) All control room RCIC instruments fail downscale on loss of power.

B. RECOMMENDATIONS

Required Changes - None

2. POWER SUPPLY LISTS

I. NUCLEAR BOILER INSTRUMENTATION

RV LEVEL/PRESSURE INDICATIONS

REC/IND.	REC/IND. POWER SUPPLY	SENSOR	SENSOR POWER SUPPLY	FAILURE MODE
1B21-LR-R615 RPV Fuel Zone Level*** (1H13-P601)	08-1Y74-22 via Inverter 1Y80*	1B21-LT-N044C	Same as Recorder	Downscale
1B21-LI-R610 Rx Level Fuel Zone*** (1H13-P601)	Same as Sensor	1B21-LT-N044D	08-1Y74-22 via Inverter 1Y80*	Downscale
1B21-UR-R623A Post Accident Monitor (Rx. Press & Level) (1H13-P601)	52-1P56119 (Div. I)	1B21-LT-N091A 1B21-PT-N062A	125 VDC Bus 11DA, Bkr. 72-11A18	As Is
1B21-UR-R623B Post Accident Monitor (Rx. Press & Level) (1H13-P601)	52-1P66117 (Div. II)	1B21-LT-N091B 1B21-PT-N062B	125 VDC Bus 11DB, Bkr. 72-11B14	As Is
1B21-LI-R604 RPV Water Level Wide Range (1H13-P680)	Same as Sensor	1B21-LT-N081C	52-1C71108**	Downscale
1B21-LI-R605 RPV Level Shutdown Range *** (1H13-P601)	Same as Sensor	1B21-LT-N027	08-1Y74-22 via Inverter 1Y80*	Downscale

* Backup from Div. I MCC 15342 (Automatic Switchover)
** Div. I through RPS MG Set A
***Calibrated for use under depressurized conditions only.

I. NUCLEAR BOILER INSTRUMENTATION (Con't)

RV TEMPERATURE INDICATIONS

IND/REC.	IND./REC. POWER SUPPLY	SENSOR	TRANSMITTER POWER SUPPLY	FAILURE MODE
1B21-TR-R643 Reactor Vessel Temp. Monitoring (1H13-P614)	08-1Y74-24 via Inverter 1Y80*	1B21-TE-N029A,B 1B21-TE-N030A,B	08-1Y74-22 via Inverter 1Y80*	As Is
1B33-TR-R604 Recirc. A&B Water Temperature (1H13-P614)	08-1Y74-30 via Inverter 1Y80*	1B33-TE-N023A,B	Same As Recorder	As Is

CORE FLOW INDICATIONS

IND/REC	IND./REC. POWER SUPPLY	SENSORS	TRANSMITTER POWER SUPPLY	FAILURE MODE
1B33-UR-R613 Core DP/Total Jet Pump Flow (1H13-P680)	08-1Y74-26 via Inverter 1Y80*	1B33-PT-N037**	Same As Recorder	Downscale
1B33-FI-R611A,B,C,D Cal. Jet Pump Flow (1H13-P680)	Same as above	1B33-PT-N038A, B, C, D	Same as above	Downscale
1B33-FI-R612A,B Loop A, B Jet Pump Total Flow (1H13-P680)	Same as above	1B33-PT-N037**	Same as above	Downscale

* Backup from Div. I MCC 15B42 (Automatic Switchover)
**Summed inputs from 24 Jet Pump dP transmitters

II. HIGH PRESSURE CORE SPRAY

CONTROL ROOM INDICATIONS - Panel 1H13-P601-16B

REC/IND.	REC./IND. POWER SUPPLY	SENSOR	SENSOR POWER SUPPLY	FAILURE MODE
1E22-PI-R601 Pump Disch. Press	125 VDC ESF 11DC	1E22-PT-N051	Same as indicator	Downscale
1E22-FI-R603 HPCS Flow	125 VDC ESF 11DC	1E22-FT-N005	Same as indicator	Downscale
1E22-ZI-R606 INBD Test Valve 011 Position	125 VDC ESF 11DC	1E22-ZT-N008	Same as indicator	Downscale
1E22-ZI-R604 OUTBD Test Valve F010 Position	125 VDC ESF 11DC	1E22-ZT-N010	Same as indicator	Downscale
1P81-LI-R600 DG13 Fuel Oil Stg Tk	52-1P71125	1P81-LT-N001	Same as indicator	Downscale (on panel 1H13-P870-5B
1P81-LI-R601 DG13 Fuel Oil Day Tk	52-1P71125	1P81-LT-N004	Same as indicator	Downscale (on panel 1H13-P870-5B
1E22-SI-R612	Incoming Frequency	All electrical instruments fed from respective AC or DC source		Midscale
1E22-EI-R611	Incoming Voltage			Downscale
1E22-SI-R613	(Syncroscope)			N/A
1E22-EI-R614	Running Voltage			Downscale
1E22-ST-R615	Running Frequency			Midscale
1E22-EI-R610	4.16KV Bus 17AC			Downscale
1E22-EI-R617	480 MCC 17B01			Downscale
1E22-EI-R618	125 DC Bus 11DC			Downscale
1E22-II-R622	152-1706 Amps			Downscale
1E22-II-R619	152-1704 Amps			Downscale
1E22-II-R620	152-1705 Amps			Downscale
1E22-II-R621	MCC 17B01 INCM FDR 152-1703			Downscale
1E22-II-R616	HPCS Pump Motor Amps			Downscale
1E22-II-R607	DG 13 Amps			Downscale
1E22-JI-R608	DG 13 Vars			Midscale
1E22-JI-R609	DG 13 Watts			Downscale

III. RESIDUAL HEAT REMOVAL (RHR-A) (DIV. I)

CONTROL ROOM INDICATIONS - Panel 1H13-P601

REC/IND.	REC./IND. POWER SUPPLY	SENSOR	SENSOR POWER SUPPLY	FAILURE MODE
1E12-ZI-R609A Hx A Vnt Vlv F074A Posn	7211A31 Off 125 VDC Bus 11DA	1E12-ZT-N133A	Same as indicator	Downscale
1E12-ZI-R608A Hx A Vnt Vlv F073A Posn	Same as above	1E12-ZT-N134A	Same as indicator	Downscale
1E12-ZI-R611A x A Outlet 003A Posn	Same as above	1E12-ZT-N117A	Same as indicator	Downscale
1E12-ZI-R612A Hx A Bypass F048A Posn	Same as above	1E12-ZT-N118A	Same as indicator	Downscale
1E12-CI-R610A Hx A Out Conductivity	52-1P53104	1E12-CE-N001A	Same as indicator	Downscale
1E12-PI-R605-1 RHR to RCIC Press*	52-1P56120	1E12-PT-N028	Same as indicator	Downscale
1E12-PI-R606A-1 RHR Hx A Steam Press**	52-1P56120	1E12-PT-N026A	Same as indicator	Downscale
1E12-LI-R604A-1 RHR Hx A Level***	52-1P56120	1E12-LT-N008A	Same as indicator	Downscale
1E12-FI-R602A RHR Hx A SSW Flow	52-1P56120	1E12-FT-N007A	Same as indicator	Downscale
1E12-FI-R603A RHR Pump A Disch Flow	52-1P56120	1E12-FT-N015A	Same as indicator	Downscale

* Controller 1E12-PK-R605 on same power supply
** Controller 1E12-PK-R606A on same power supply
***Controller 1E12-LK-R604A on same power supply

III. RESIDUAL HEAT REMOVAL (RHR B/C) DIV. II

CONTROL ROOM INDICATIONS - Panel 1H13-P601

REC/IND.	REC./IND. POWER SUPPLY	SENSOR	SENSOR POWER SUPPLY	FAILURE MODE
1E12-ZI-R609B Hx B Vnt Vlv F074B Posn	72-11B38 Off 125 VDC Bus 11DB	1E12-ZT-N133B	Same as indicator	Downscale
1E12-ZI-R608B Hx B Vnt Vlv F073B Posn	Same as above	1E12-ZT-N134B	Same as indicator	Downscale
E12-ZI-R611B x B Outlet 003B Posn	Same as above	1E12-ZT-N117B	Same as indicator	Downscale
1E12-ZI-R612B Hx B Bypass F048B Posn	Same as above	1E12-ZT-N118B	Same as indicator	Downscale
1E12-CI-R610B Hx B Out Conductivity	52-1P63103	1E12-CE-N001B	Same as indicator	Downscale
1E12-TR-R601 RHR Temperatures	08-1476-18 Off inverter 1Y82*	See Drawing E-1181 Sh. 66 for list	N/A - Temperature elements	As Is
1E12-FI-R602B RHR HX B SSW Flow	52-1P66111	1E12-FT-N007B	Same as indicator	Downscale
1E12-FI-R603B RHR Pump B Disch Flow	52-1P66111	1E12-FT-N015B	Same as indicator	Downscale
1E12-FI-R603C RHR Pump C Disch Flow	52-1P66111	1E12-FT-N015C	Same as indicator	Downscale
1E12-PI-R606B-1 RHR Hx B Steam Press**	52-1P66111	1E12-PT-N026B	Same as indicator	Downscale
1E12-LI-R604B-1 RHR Hx B Level***	52-1P66111	1E12-LT-N008B	Same as indicator	Downscale

* Backed up by Div. II MCC 16B42 (Automatic Switchover)
** Controller 1E12-PK-R606B on same power supply
***Controller 1E12-LK-R604B on same power supply

IV. STANDBY AC POWER SYSTEM (Diesel Generators)

CONTROL ROOM INDICATIONS - DG's 11 and 12, panel 1H13-P864

Fuel Oil Levels

INDICATOR	A POWER SUPPLY	B POWER SUPPLY	SENSOR	FAILURE MODE
1P75-LI-R607A(B) Fuel Oil Level Day Tank A(B)	72-11A29 off 125 VDC Bus 11DA	72-11B23 off 125 VDC Bus 11DB	1P75-LT-N004A(B)	Downscale
1P75-LI-R608A(B) Fuel Oil Level tor Tank A(B)	52-1P56125	52-1P66123	1P75-LT-N001A(B)	Downscale

Electrical

Indicator	Label	FAILURE MODE
1R21-EI-R610A(B)	INCOMING VOLTS DIV I (DIV II)	Downscale
1R21-XI-R611A(B)	SYNCROSCOPE	Full scale "+" or
1R21-EI-612A(B)	RUNNING VOLTS DIV I (DIV II)	Downscale
1P75-EI-R600A(B)	DIESEL GEN 11 (12) AC VOLTS	Downscale
1P75-SI-R601A(B)	DIESEL GEN 11 (12) FREQUENCY	Midscale
1L21-EI-R603A(B)	125 VDC BUS 11DA (11DB)	Downscale
1P75-II-R604A(B)	DIESEL GEN 11 (12) AC AMPS	Downscale
1P75-EI-R605A(B)	DIESEL GEN 11 (12) FIELD DC VOLTS	Downscale
1P75-II-R606A(B)	DIESEL GEN 11 (12) FIELD DC AMP	Downscale
1P75-JI-R602A(B)	DIESEL GEN 11 (12) WATTS	Downscale
1P75-JI-R603A(B)	DIESEL GEN 11 (12) VARS	Downscale
1R21-II-R613A(B)	ESF XFMR #12 BUS 15AA (16AB) INCM FDR 152-1511 (1611)	Downscale
1R21-EI-R615A(B)	4.16 KV Bus 15AA (16AB)	Downscale
1R21-II-R616A(B)	ESF XFMR #21 BUS 15AA (16AB) INCM FDR 152-1501 (1601)	Downscale
1R21-II-R617A(B)	ESF XFMR #11 BUS 15AA (16AB) INCM FDR 152-1514 (1614)	Downscale

IV. STANDBY AC POWER SYSTEMS (Con't)

DIVISION I

Indicator	Label	Failure Mode
1R20-II-R627A	LCC 15BA4 INCM FDR 52-15401	Downscale
1R20-EI-R628A	480V LCC 15BA4	Downscale
1R20-II-R629A	LCC 15BA2 INCM FDR 52-15201	Downscale
1R20-EI-R630A	480V LCC BUS 15BA2	Downscale
1R20-II-R648A	LCC 15BA6 INCM FDR 52-15601	Downscale
R20-EI-R647A	480V LCC 15BA6	Downscale
R20-II-R631A	LCC 15BA5 INCM FDR 52-15501	Downscale
1R20-EI-R632A	480V LCC 15BA5	Downscale
1R20-II-R633A	LCC 15BA1 INCM FDR 52-15101	Downscale
1R20-EI-R634A	480V LCC 15BA1	Downscale
1R20-II-R635A	LCC 15BA3 INCM FDR 52-15301	Downscale
1R20-EI-R636A	480V LCC 15BA3	Downscale

DIVISION II

Indicator	Label	Failure Mode
1R20-II-R6273	LCC 16BB4 INCM FDR 52-16401	Downscale
1R20-EI-R6283	480V LCC 16BB4	Downscale
1R20-II-R6293	LCC 16BB2 INCM FDR 52-16201	Downscale
1R20-EI-R6303	480V LCC 16BB2	Downscale
1R20-EI-R6483	LCC 16BB6 INCM FDR 52-16601	Downscale
1R20-EI-R6473	480V LCC 16BB6	Downscale
1R20-EI-R6313	LCC 16BB5 INCM FDR 52-16501	Downscale
1R20-EI-R6323	480V LCC 16BB5	Downscale
1R20-II-R6333	LCC 16BB1 INCM FDR 52-16101	Downscale
1R20-EI-R6343	480V LCC 16BB1	Downscale
1R20-II-R6353	LCC 16BB3 INCM FDR 52-16301	Downscale
1R20-EI-43633	480V LCC 16BB3	Downscale

V. STANDBY SERVICE WATER (SSW)

CONTROL ROOM INDICATIONS - 1H13-P870

REC/IND.	REC./IND. POWER SUPPLY	SENSOR	SENSOR POWER SUPPLY	FAILURE MODE
1P41-LR-R604A SSW Basin A Level	52-1P56125	1P41-LT-N004A	Same as indicator	Downscale
1P41-UR-R606A SSW Loop A Flow/Press	52-1P56125	1P41-FT-N018A 1P41-FT-N020A 1P41-FT-N016A 1P41-PT-N009A	Same as indicator	Downscale
P41-LR-R604B SW Basin B Level	52-1P66123	1P41-LT-N004B	Same as indicator	Downscale
1P41-UR-R606B SSW Loop B Flow/Press	52-1P66123	1P41-FT-N018B 1P41-FT-N020B 1P41-FT-N016B 1P41-PT-N009B	Same as indicator	Downscale
1P41-PI-R602 SSW Loop C Press	Same as sensor	1P41-PT-N009C 1P41-FT-N016C	52-1P71125	Downscale
1P41-FI-R601 SSW Loop C Flow	Same as sensor	1P41-FT-N018C 1P41-FT-N016C	52-1P71125	Downscale

VI. AUTOMATIC DEPRESSURIZATION SYSTEM (ADS)

CONTROL ROOM INDICATIONS - 1H13-P614

REC/IND.	REC./IND. POWER SUPPLY	SENSORS	FAILURE MODE
1B21-TJR-R614 ADS Safety Valves Temperature	08-1Y71-25 off inverter 1Y79*	1B21-TE-N004A thru N004W	As Is

* Backed up by Div. I MCC 15B42 (Automatic Switchover)

VII. LOW PRESSURE CORE SPRAY (LPCS)

CONTROL ROOM INDICATIONS - Panel 1H13-P601

REC/IND.	REC./IND. POWER SUPPLY	SENSOR	SENSOR POWER SUPPLY	FAILURE MODE
1E21-FI-R600 LPCS Pump Disch Flow	52-1P56120	1E21-FT-N003A	Same as indicator	Downscale

VIII. REACTOR CORE ISOLATION COOLING (RCIC)

CONTROL ROOM INDICATIONS - Panel 1H13-P601

INDICATOR	INDICATOR POWER SUPPLY*	SENSOR	SENSOR POWER SUPPLY	FAILURE MODE
1E51-PI-R602 Inlet Press RCIC Turbine	72-11A32	1E51-PT-N007	Same as indicator	Downscale
1E51-SI-R605 RCIC Turbine Speed	72-11A24	On Turbine	Self-powered	Downscale
1E51-PI-R603 RCIC Turbine Exh Pressure	72-11A18	1E51-PT-N056A	Same as indicator	Downscale
1E51-PI-R604 RCIC Pump Suction Pressure	72-11A18	1E51-PT-N052	Same as indicator	Reads "0"
1E51-PI-R601 RCIC Pump Disch Pressure	72-11A18	1E51-PT-N050	Same as indicator	Downscale
1E51-PI-R606 RCIC Pump Disch Flow	72-11A32	1E51-FT-N003	Same as indicator	Downscale
1E51-FK-R600 RCIC Flow Control	72-11A32	1E51-FT-N003	Same as indicator	Downscale

* All fed from 125 VDC Bus 11DA

3. PROCEDURE REVIEW

IE Bulletin 79-27 directed licensees to review their emergency procedures that are used by control room operators upon loss of power to buses feeding power to instrument and control system used for achieving cold shutdown.

This applies to the Alarm Response Instructions (ARI's) for the ESF Division I, II, and III buses which provide power to the systems listed in Section II. Additionally, selected safety-related Emergency Procedures (EP's) and Off-Normal Event Procedures (ONEP's) were reviewed.

The ARI's which address loss of power to the ESF buses are as follows:

ESF Division I	AC and DC	04-1-02-1H13-P864-1A-A1 thru H4
ESF Division II	AC and DC	04-1-02-1H13-P864-2A-A1 thru H4
ESF Division III (HPCS)	AC and DD	04-1-02-1H13-P601-1A-A1 thru H5

The ARI's have been reviewed and revised by CGNS Operations. Some alarm panel window engravings have been changed and some windows have been moved to other panels in response to human factors requirements. The ARI review is now complete. The ARI review addressed the items contained in paragraph 2a, b, and c of IE Bulletin 79-27 and assured that the procedures included the referenced requirements.

Emergency Procedures (EP's) and Off-Normal Emergency Procedures (ONEP's) which may be used (in whole or in part) to place the plant in a cold shutdown condition were reviewed for effects of power loss in accordance with the requirements of IEB 79-27. The procedures reviewed were:

Procedure Number	Title
05-S-01-EP-1	Level Control
05-S-01-EP-2	Cooldown
05-S-01-EP-3	Containment Control
05-S-01-EP-4	Level Restoration
05-S-01-EP-5	Rapid RPV Depressurization
05-S-01-EP-6	Core Cooling Without Injection
05-S-01-EP-7	Core Cooling Without Level Restoration
05-S-01-EP-8	Alternate Shutdown Cooling
05-S-01-EP-9	RPV Flooding
05-S-01-EP-10	Reactivity Control
05-S-02-II-1	Shutdown from Remote Shutdown Panel
05-S-02-III-9	Loss of HPCS
05-S-02-III-10	Loss of RCIC
05-S-02-V-2	Loss of TBCW

Results of the procedure review and the revised procedure status are:

Annunciator Response Instructions

ARI's 04-1-02-1H13-P864-1A, P864-2A, & P601-16A revised

Off-Normal Event Procedures

All ONEP's revised - Revision 10 status

Emergency Procedures

Procedure revisions continuing.

RE-REVIEW OF IE CIRCULAR NO. 79-02 FAILURE OF 120 VOLT VITAL AC POWER SUPPLIES, DATED JANUARY 11, 1979

IE Bulletin 79-27 directed licenseees to re-review IE Circular 79-02 to include both class 1E and non-class 1E safety-related power supply inverters. In response to this item, reference is made to the following documents (copies attached):

a) GGNS Comment Control Form dated 12 March 1979, P. H. Skinner to A. S. McCurdy

b) Letter, dated 25 May, 1979, A. Zaccaria (Bechtel) to L. F. Dale (MP&L)

c) Memo, dated 11 April 1980, R. A. Ambrosino to C. K. McCoy

The referenced documentation provides the response to IE Circular 79-02 requested in Bulletin 79-02. No further action is required.

GRAND GULF NUCLEA[illegible] ATION - UNITS 1 AND

COMMENT CONTROL FORM

STARTUP FORM 5.1

DATE 12 March 77

TO A. McCurdy

FROM P.H. Stein

Document Number: IE Circular No. 79-02

Document Title: Failure of 120 Volt vital A.C. power supplies

Comment No.	Page No.	Paragraphs Line or Dwg. Grid No.	Comment	Resolution
1.		Para 1	A time delay is designed into 1H62 systems,	
			but differs in that inverters will	
			transfer automatically back to the normal	
			source in ± time seconds following reavailability	
2		Para. 2	1H62 system does not have a "Normal" A.C. input.	
3		Para 3	Vendor adjusted setpoints for 1H62 inverter static	
			transfer switch are 70% of nominal output voltage and	
			120% of full load output. These will be verified to the	
			preoperational test to verify these setpoints.	
4		Para. 4	Normal Maintenance and calibration procedures will	
			cover this task	[illegible]

Bechtel Power Corporation
Engineers—Constructors
15740 Shady Grove Road
Gaithersburg, Maryland 20760
301-948-2700

May 25, 1979

Mr. L. F. Dale
Nuclear Project Manager
Mississippi Power & Light Company
P. O. Box 1640
Jackson, Mississippi 39205

Dear Mr. Dale:

Nuclear QA Is Applicable
Middle South Energy, Inc.
Grand Gulf Nuclear Station
Bechtel Job No. 9645
File: 0262/E-079.0/L-860.0
Re: BMP-79/50, dated
February 6, 1979
IE Circular No. 79-02
MPB-79/0327

We have reviewed the IE Circular No. 79-02 entitled "Failure of 120 Volt AC Power Supplies" from the NRC enclosed with your letter dated February 6, 1979 and have the following comments to make.

1. There is no class IE 120VAC Uninterruptible power supply of the type described in the IE circular No. 79-02 on the Grand Gulf Project. However there is a 120/240VAC uninterruptible power supply (BOP) for supplying power to computers, security system etc. for this, Static Inverters supplied by Solid State Controls Inc., are used.

2. The problems described in the IE circular were unique to the design of Arkansas Nuclear Station (ANS) Unit 2 design and is not applicable to the Grand Gulf 120/240VAC system design. The main differences are:

   a. There is no Under Voltage device with fixed or adjustable time delay to shut down the D.C. incoming power supply on GGNS inverters as was the case in ANS 2 inverters.

   b. ANS 2 utilized an uncontrolled rectifier as the main source of power to the Static Inverters. This could have resulted in the passing of high voltage surges on the AC system to the inverter resulting in blown fuses. On Grand Gulf the main power source for the inverters is 125VDC BUS which in turn receives power through Battery charges which have a regulated output.

GGNS
FILE COPY

RECEIVED
MAY 1979

c. On Grand Gulf, we immediately annunciate the operation of Static Transfer Switch to preclude the possibility of continued operation of 120/240V power supplies from the alternate AC power sources, without the knowledge of the operator.

If you have any further questions, please do not hesitate to call us.

Very truly yours,

A. Zaccaria
Project Engineer

IDM:vr

cc: J. P. McGaughy, Jr.
G. K. McCoy
W. L. Nail
T. E. Reaves
Dr. D. C. Gibbs
J. N. Ward
R. L. Scott
D. M. Lake
H. H. Weber

MEMO TO: C. K. McCoy

FROM: R. A. Ambrosino

SUBJECT: IE Circular 79-02, "Failure of 120 Volt Vital AC Power Supplies"

In September, 1978, Arkansas Nuclear One (ANO) Unit 2 while in hot functional testing preceding initial criticality, suffered a degradation of both independent off-site power sources. This produced an undervoltage condition on the Engineered Safety Feature (ESF) buses and caused an inadvertent ESF acutation. It was determined that the ESF actuation occurred on a loss of at least two of the uninterruptable 120 volt vital AC power sources. Investigation revealed that all four of the Solidstate Controls Inc. (SCI) inverter static switches had automatically transferred to the alternate power supply. A single conclusive cause of the undesired SCI inverter static switch transfer could not be identified. However, the following problems were noted:

1. The setting of time delay relays for the low voltage trip, were not verified during either preoperational testing or subsequent maintenance.

2. A DC fuse within the inverter component on one SCI inverter, was found blown. This could have been due to an excessive DC voltage to the inverter component caused by a transient on the 480 volt AC input.

3. The SCI inverter static switch is designed to transfer to an alternate source on inverter overcurrent and undercurrent. Possibly the instantaneous inductive load caused setpoints to be exceeded.

The circular requested certain determinations be made. These accompanied by a response (from memo to ASM from PHS dated 3/12/79) are shown below:

1. Determine whether or not time delay circuitry is used in inverter units. If so, have they been adjusted to the appropriate setpoint as required by equipment and the integrated system design.

   Response:

   A time delay is designed into the 1L62 system (inverters). It differs in that the inverters will transfer back to the normal source in less than two seconds following reavailability of power.

2. Determine if the AC input voltage and transformer tap settings are optimized to prevent exceeding the inverter component name plate maximum rated DC input voltage in the event of high AC input voltage transient.

Response:

The vendor adjusted setpoints for 1L62 inverter static transfer switches are 70% of nominal output voltage and 120% of full load output. Steps will be added during preoperational testing to verify these setpoints.

3. If an alternate 120 volt source is used in your design, determine if the protection transfer circuitry of the inverter has been optimized within design limits to ensure maximum possible availability of the inverter system during transient loading conditions.

Response:

The 1L62 system does not have a "normal" AC input. It is fed from a 125 VDC bus.

4. Determine if the administrative controls employed by your facility ensures operability of safety systems after its (e.g., time delay relays, switches, etc.) have been subjected to maintenance or testing.

Response:

Normal maintenance and calibration procedures will cover this task.

It should be noted that there is no class IE 120 VAC uninterruptible power supply, as mentioned, at Grand Gulf (Bechtel letter MPB-79/0327). However, there is a 120/240 VAC uninterruptible (BOP) power supply which employs SCI static inverters.

Additionally, the problems described are unique to the design of ANO Unit 2 and are not applicable to the Grand Gulf 120/240 VAC system design.

R. A. Ambrosino
4-11-80

TGJ/WRP/RAA:pjc
Attachments
cc: L. Pentecost
C. R. Hutchinson
File

MCC CUBE NO	POWER PANEL	POWER PANEL DRAWING	FAILURE MODES	ALARM INDICATION	BKR NO	CONTROL POWER SUPPLY	CONTROL POWER SUPPLY DRAWING	FAILURE MODES	ALARM INDICATION	FUSE NO	CIRCUIT I.D. (ENGLISH DESCRIPTION)	SYSTEM NO	SCHEMATIC OR LOOP NO	FAILURE MODES	CONTROL ROOM ALARM INDICATION	CONTROL DEVICES	INSTRUMENTS	OTHER INDICATION	PRIMARY EFFECTS	SECONDARY EFFECTS	REMARKS
17	21P41	E-0080-08	2141-37 1E#21P41	NONE NONE	18						CONDUCTIVITY ANALYZER	G17	J-0351-08	2P141-18 F08	NONE NONE		CT15-N367A	METER WILL READ ZERO	ANALYZER WILL NOT OPERATE	LOSE CAPABILITY TO MONITOR CONDUCTIVITY FOR TANK A004A	
											CONDUCTIVITY ANALYZER	G17	J-0351-08	2P141-19 F09	NONE NONE		CT15-N369B	METER WILL READ ZERO	ANALYZER WILL NOT OPERATE	LOSE CAPABILITY TO MONITOR CONDUCTIVITY FOR TANK A004B	
											CONDUCTIVITY ANALYZER	G17	J-0351-08	2P141-19 F10	NONE NONE		CT15-N303A	METER WILL READ ZERO	ANALYZER WILL NOT OPERATE	LOSE CAPABILITY TO MONITOR CONDENSATE RETURN LINE CONDUCTIVITY FOR EVAPORATOR D007	MAY GET HIGH CONDUCTIVITY WATER RETURNING TO CNDS STRG TK SINCE F434A WILL NOT CLOSE ON HIGH CONDUCTIVITY
											CONDUCTIVITY ANALYZER	G17	J-0351-08	2P141-19 F11	NONE NONE		CT15-N303B	METER WILL READ ZERO	ANALYZER WILL NOT OPERATE	LOSE CAPABILITY TO MONITOR CONDENSATE RETURN LINE CONDUCTIVITY FOR EVAPORATOR D008	MAY GET HIGH CONDUCTIVITY WATER RETURNING TO CNDS STRG TK SINCE F434B WILL NOT CLOSE ON HIGH CONDUCTIVITY
											PH ANALYZER	G17	J-0381-08	2P141-18 F12	NONE NONE		AIT5-N087	METER WILL READ ZERO	ANALYZER WILL NOT OPERATE	LOSE CAPABILITY TO MONITOR PH FOR TANK A005	
					20						MOV SPACE HEATER MOISTURE SEPARATOR OUTLET MOV F203B-N	N64	E-2155-02	2P141-20	NONE				LOSS OF SPACE HEATER	POSSIBLE CONDENSATION PROBLEM	
					21						RADWASTE BLDG VENT SYS HOOD EXHAUST DAMPER	V41	E-0128-10	2P141-21	NONE	F033-B-N			DAMPER WILL FAIL AS IS	IF DAMPER FAILS IN FULLY CLOSED POSITION, LOSE CAPABILITY TO USE ASSOCIATED EXHAUST HOOD. IF DAMPER FAILS IN OPEN POSITION, NONE	
					22						MOV SPACE HEATER VERT SECTION B	N28	N/A	2P141-22	NONE				LOSS OF SPACE HEATER	POSSIBLE CONDENSATION PROBLEM	NO MOV AT PRESENT TIME
					23						LIQUID RADWASTE SYSTEM 120 VOLT RECEPTACLES	G17	E-0201-08	2P141-23	NONE				LOSE RECEPTACLES ON SH22-P088	NONE	
					24						PROCESS RADIATION MONITORING SYSTEM OFF GAS POST-TREATMENT SAMPLE PANEL	D17	E-2177-08	2P141-24	NONE	2017-J013					
					25						LIQUID RADWASTE SYSTEM LOGIC FEEDER	G17	E-0201-08	2P141-25	NONE				LOSS OF RADWASTE INTERLOCK LOGIC	LIQUID RADWASTE SYSTEM OUT OF SERVICE	THE CONVERSION TO MODICON LOGIC WILL HAVE DIFFERENT POWER REQUIREMENTS
					26						PROCESS RADIATION MONITORING SYSTEM	D17	E-2177-08	2P141-26	NONE	PUMP 01 PUMP 02			PUMPS WILL NOT RUN	LOSE CAPABILITY TO TAKE A SAMPLE AT PANEL 2017-J013	LOSE CAPABILITY TO MONITOR OFF GAS ACTIVITY
					27						LIQUID RADWASTE SYSTEM 120 VOLTS RECEPTACLES	G17	E-0201-08	2P141-27	NONE				LOSE RECEPTACLES ON SH22-P186	NONE	
					28						MOV SPACE HEATER CDRSR TANK A OUT WYE STRAINER MOV F228A-N	G17	E-0201-04	2P141-28	NONE				LOSS OF SPACE HEATER	POSSIBLE CONDENSATION PROBLEM	
											MOV SPACE HEATER CDRSR TANK A DRAIN MOV F223A-N	G17	E-0201-02	2P141-28	NONE				LOSS OF SPACE HEATER	POSSIBLE CONDENSATION PROBLEM	
					29						LIQUID RADWASTE SYSTEM 120 VOLTS RECEPTACLES	G17	E-0201-08	2P141-29	NONE				LOSE RECEPTACLES ON SH22-P088	NONE	
					30						MOV SPACE HEATER MISC CHEM WASTE EVAP F238-N	G17	E-0201-04	2P141-30	NONE				LOSS OF SPACE HEATER	POSSIBLE CONDENSATION PROBLEM	

34.5 KV BUS	
FAILURE MODES	ALARM INDICATION
352-1101	SA/25706 XA-LP6/2
BUS 11R	SA/25702 XA-LP6/1

6.9 KV BUS	
FAILURE MODES	ALARM INDICATION
252-1101	SA/25706 XA-LP6/2 SA/25704
VFMR 11B	SA/21770 XA-L7/8 SA/25710 SA/25725
U/V	XA-LP6/1

LOAD CENTER	
FAILURE MODES	ALARM INDICATION
252-1102 XFMR	SA/20570B N/A
52-21401	SA/20570B XA-L71B
U/V	SA/20570B XA-L857

MCC	
FAILURE MODES	ALARM INDICATION
52-21408	SA/20570B XA-L71B

SINGLE LINES	
34.5 KV BUS	E-0013
6.9 KV BUS	E-1004
LOAD CENTER	E-0019
MCC	E-0080

NO	ELECTRICAL	CONTROL SYSTEMS	DATE
0	[signature]	[signature]	7-27-81

REVISIONS

BECHTEL
GAITHERSBURG, MARYLAND

MISSISSIPPI POWER & LIGHT COMPANY
GRAND GULF NUCLEAR STATION
UNITS 1 & 2

CONTROLS AND INSTRUMENTS SUPPLIED BY:
34.5 KV BUS 11R
6.9 KV BUS 11HD BKR 252-1101
LOAD CENTER 21B04 BKR 252-1102
MCC 21B41

JOB NO	DRAWING NO	REV
9645	2107 SH 5	0