APPENDIX A

WATERFORD 3 EDG RELIABILITY PROGRAM

DESCRIPTION

AND

COMPARISON

WITH USNRC REGULATORY GUIDE 1.155

SECTION 1.2

Appendix A

The NRC on January 15, 1992 issued the Waterford 3 Safety Evaluation Report (SER) on Station Blackout (SBO). Section 2.6 of the SER stated that the licensee did not specifically state that a reliability program in accordance with R.G. 1.155, Section 1.2, will be implemented. The SER stated that the licensee should implement an EDG reliability program which as a minimum meets the guidance of R.G. 1.155, section 1.2. Waterford 3 on February 28, 1992 via letter W3F192-0015 apprised the NRC that a description of the Waterford 3 EDG reliability program was available as part of the SBO evaluation of record. The elements of the EDG reliability program were described, and Waterford 3 conveyed the EDG reliability program meets the intent of regulatory position 1.2 of Regulatory Guide 1.155. However, Waterford 3 also conveyed to the NRC items 1 through 5 of Regulatory Guide 1.155, section 1.2, were generally stated and were subject to interpretation. Accordingly Appendix A provides detailed information regarding the EDG reliability program specifically addressing how the elements of the EDG reliability program described in section 1.2 of Regulatory Guide 1.155 are implemented.

Section 1.2 of Regulatory Guide 1.155 states that an EDG reliability program would typically be comprised of the following elements or activities (or their equivalent):

1. Individual EDG reliability target levels consistent with the plant category and coping duration selected from Table 2.

2. Surveillance testing and reliability monitoring programs designed to track EDG performance and to support maintenance activities.

3. A maintenance program that ensures that the target EDG reliability is being achieved and that provides a capability for failure analysis and root-cause investigations.

4. An information and data collection system that services the elements of the reliability program and that monitors achieved EDG reliability levels against target values.

5. Identified responsibilities for the major program elements and a management oversight program for reviewing reliability levels being achieved and ensuring that the program is functioning properly.

The Waterford 3 EDG Reliability Program description relative to each of the items of section 1.2 of Regulatory Guide 1.155 is the following:

Appendix A

1. Individual EDG Reliability Targets

Waterford 3 on April 14, 1989 via letter W3P89-0510 identified to the NRC the Waterford 3 individual target reliability of 0.975. The EDG target reliability was established in accordance with the plant category and coping duration selected from Table 2 of Regulatory Guide 1.155.

2. Surveillance Testing and Reliability Monitoring

Surveillance Testing for the EDG is performed in accordance with Technical Specification 3/4.8.1. The technical specification surveillances involve tasks which require the operation of the diesel generators and support systems. Table One (1) identifies the applicable surveillances, procedures, frequencies, modes, and support systems.

A number of different reliability or trending programs are in place at Waterford 3. The Event Analysis and Reporting (EAR&R) Manager is responsible for the overall administration of the Plant Trending Program. Procedure UNT-007-025, "Plant Trending Program," specifies the essential elements which the trending programs shall contain. Categorically, these elements involve data collection, evaluation of trended data, and trending of follow-up actions. The Maintenance Superintendent has overall responsibility for the Maintenance Department Trending Program. This program includes the identification of components and parameters to be trended; the collection, compilation, and segration of data; the analysis of collected data; and the initiation of any corrective maintenance. Typical parameters which are trended on a monthly frequency in accordance with procedure MD-01-016, "Failure and Trend Analysis," by maintenance for the EDGs are oil sample analysis, cylinder exhaust temperature, and peak cylinder pressure. The Systems Engineer is responsible for performing trending of the EDGs in accordance with procedure PE-01-009, "Emergency Diesel Generators Data Trending and Evaluations". The Systems Engineer trends key performance indicators to detect early signs of wear, fouling of heat transfer surfaces, loss of fluid system pressure, unreliability, or loss of capacity. Some of the EDG key performance indicators which are trended are shown in Table Two (2). The Systems Engineer evaluates technical specification surveillance data and trending data, and the data is maintained in a binder. The Systems Engineer prepares a quarterly report which documents EDG performance during each quarter. The quarterly report documents the Waterford 3 target reliability, exceedence trigger values (20, 50, and 100 demands), and actual failures (20, 50, and 100 demands).

Adverse trends and abnormal conditions observed as a result of technical specification surveillances or reliability monitoring are identified through a Condition Identification (CI) in accordance with procedure UNT-005-002, "Condition Identification." The basic elements for a condition adverse to quality addressed by a CI are: deficiency identification and immediate action; root cause determination; corrective action determination; prioritization of corrective action; and tracking and closure. Management places a high level of attention to assure EDG CIs are promptly prioritized and that routine repairs that affect diesel operability are promptly fixed. Routine repairs not affecting diesel operability are scheduled for the next diesel maintenance outage. Non-routine repairs are dispositioned by the Systems Engineer.

3. Maintenance Program

The Waterford 3 maintenance program consists of corrective and preventive maintenance elements. Corrective actions are identified and reported in accordance with UNT-005-002, "Condition Identification" and corrected in accordance with UNT-005-015, "Work Authorization." Entergy Operations Waterford 3 employees are responsible for reporting and identifying abnormal conditions upon observation and initiating a CI to obtain resolution. Conditions adverse to quality are required to be identified as a Nonconformance Condition Identification (NCI). The elements for conditions adverse to quality are: deficiency identification and immediate action; root cause determination; corrective action determination, prioritization of corrective action, and tracking and closure.

The EDG preventive maintenance program consists of 210 electrical, 179 I&C, and 53 mechanical maintenance tasks. Typical electrical equipment includes relays, circuit breakers, voltmeters, synchroscopes, frequency meters, anmeters, varmeters, and tranducers. Typical electrical preventive tasks include calibrations, replacements, functional tests, and maintenance. The I&C tasks consists primarily of calibrations, functional tests, or cleaning and inspection of indicators and switches. The mechanical maintenance tasks are described in mechanical maintenance procedures; MM-003-015, "18 Month Emergency Diesel Engine Inspection," MM-003-041 (currently under preparation) "5 Year Emergency Diesel Engine Inspection," and MM-003-42, "Ten Year Emergency Diesel Engine Inspection". The types of preventive maintenance and procedures performed are listed in Tables Three (3), Four (4), and Five (5) respectively.

Appendix A

Failure analysis is performed in accordance with procedures UNT-006-003, "Equipment Failure Trending" and MD-001-016 "Failure and Trend Analysis". Root cause determinations are performed in accordance with procedure UNT-006-016 "Root Cause Investigation and Analysis." The Reliability Engineering Supervisor is responsible for the periodic review of plant specific equipment failure data, industry failure data, and industry failure reports, such as the NPRDS Component Failure Analysis Report (CFAR) to determine the need to perform a Unit Availability Investigation (UAI). A UAI is a detailed review and analysis of component failures to determine the underlying causes of the failure, determine component reliability, and make recommendations for improvement. A component may become a UAI candidate when anyone of the following UAI criteria is met:

- A single component accounts for more than 2000 lost megawatt hours.
- There are excessive failures of components. The threshold for excessive failures are: three failure per quarter for aggregate of components of the same make and model. Two failures per annum for the same piece part of a single component.
- A specific component failure rate exceeds the industry average by a factor of 2, as indicated by the NPRDS CFAR or other industry failure reports.
- Routine trends, as identified by Maintenance or Systems Engineering, indicate a high failure rate.
- Analysis of failure trends indicates a need for further investigation.
- Management recommends an investigation.

Every calendar quarter, Systems Engineering and Maintenance Engineering are provided a list of components with excessive corrective maintenance activities as well as components that may need a root cause analysis. As discussed in item 2, the Maintenance Superintendent and the Systems Engineer are responsible for performing trending in accordance with procedures UNT-007-025 and PE-01-009. In accordance with procedure UNT-007-025, the discipline planners are responsible for ensuring that a review of any history stored in SIMs is performed when planning corrective maintenance Work Authorizations, identifying abnormally repetitive maintenance items, and using the results of trending analysis in enhancing work packages and corrective maintenance. In accordance with

procedure PE-01-009, the Systems Engineer is responsible for investigating those items not meeting performance indicators, determining the cause of variances that might have an effect on EDG reliability, and improving EDG reliability.

Root cause investigations can be initiated by a department manager. Root cause investigations are performed by the Event and Analysis organization. The need for a Root Cause Investigation (RCI) is based on a condition meeting certain threshold criteria documented in procedure UNT-006-016. Some of the RCI threshold criteria include: events involving reliability determined to be significant due to its causes or consequences; problem trends, patterns, or failure rates that have a strong potential to lead to a significant event, or deficiencies in design or maintenance that likely could cause a significant event.

4. Information and Data Collection System

NPRDS and SIMs are the data collection systems and data bases used to service the elements of the EDG reliability program. These data bases store equipment failure and repair histories. Reliability Engineering uses these data bases to determine the reliability and failure trends of components. NPRDS and SIMs are also used by the systems and maintenance engineers for assessing the reliability and failure trends of components. Reliability Engineering issues a Monthly Availability Report and a Quarterly Trend Report based on the assessment of the reliability and failure trends of components. The EDGs are a major component of these assessments and reports. The Monthly Availability Report and the Quarterly Trend Report are made available to management and engineering personnel. The EDG Systems Engineer also receives the RAMIS report produced by Maintenance from the SIMs data base. The RAMIS report is issued on a weekly schedule, and it tabulates all open CIs indexed by system. The Systems Engineer uses a manual data collection system to monitor achieved EDG reliabilities. The manual data collection systems is a log of all valid start and load demands and failures for the EDGs. In accordance with procedure PE-01-009, the Systems Engineer issues a quarterly performance report for the EDGs. As discussed in item 2, the quarterly report documents the Waterford 3 target reliability, exceedence trigger values (20, 50, and 100 demands). The report is issued to the Technical Services Manager and other senior management personnel including the General Manager, Plant Operations.

5. Responsibilities

Responsibilities for the program elements are delineated in procedures. The Systems Engineer is responsible for the overall reliability of the EDGs in accordance with procedures PE-01-005, "Systems Engineering Program" and PE-01-009, "Emergency Diesel Generators Data Trending and Evaluations." Reliability Engineering is responsible for monitoring equipment failures in accordance with procedure UNT-006-003, "Equipment Failure Trending". Event Analysis Response and Reporting are responsible for performing investigations and root cause determinations in accordance with procedure UNT-006-016 "Root Cause Investigation and Analysis". Management personnel are informed of the performance of the EDGs via the Systems Engineering Quarterly Report, the Quarterly Trend Report, and the Monthly Availability Report.

Appendix A

Table One (1)

EDG Technical Specification Surveillances

Surveillance Number	Surveil-lance Procedure Number	Frequency	Modes :1:2:3:4:5:6:	Remarks
4.8.1.1.1.B	OP-903-067	Refueling Interval	:1:2:3:4:::	AC - Transfer Power to Alternate - Auto & Manual
4.8.1.1.2.A 1 thru 6	OP-903-068	See Table 4.8-1, STB	:1:2:3:4:::	AC - Diesel Start Etc., Staggered Test Basis
4.8.1.1.2.B	OP-903-068	Monthly & DG Run Equal to or Greater Than 1 hr.	:1:2:3:4:::	AC - Check Fuel for Water
4.8.1.1.2.C 1 thru 3	CE-2-100 CE-3-601 CE-3-602	Quarterly & Prior to Adding New Fuel to Tank	:1:2:3:4:::	AC - Fuel Sample
4.8.1.1.2.D 1 thru 12	OP-903-115 OP-903-116	Refueling Interval	:1:2:3:4:::	AC - DG Testing
4.8.1.1.2.E	MM-3-015	Refueling Interval (24 Months)	:1:2:3:4:::	AC - DG Insp.

Appendix A

Table One (1)

EDG Technical Specification Surveillances

Surveillance Number	Surveillance Procedure Number	Frequency	Modes :1:2:3:4:5:6:	Remarks
4.8.1.1.2.F	PE-5-031	10 Yrs. or After Any Modifications	:1:2:3:4:::	AC - DG Dual Start
4.8.1.1.2.G 1	MM-3-019	10 Yrs	:1:2:3:4:::	AC - Fuel Tank Cleaning
4.8.1.1.2.G 2	ISI Plan	10 Yrs	:1:2:3:4:::	AC - Fuel Sys. Hydro.
4.8.1.1.2.H	MM-3-019	Each Time Tank Is Drained	:1:2:3:4:::	AC - Fuel Tank Insp.
4.8.1.1.3	UNT-6-012	Each Failure	:1:2:3:4:5:6:	AC - Reporting DG Failure Per 6.9.2
4.8.1.2	OP-903-066, 067, 068, 115, 116, CE-2-100, 601, 602, MM-3-015, 019, PE-05-131	See Tech Spec.	:::::::::5:6:	AC Sources Shutdown - Same Surveillance As Modes 1, 2, 3, 4, Except 4.8.1.1.2A5 - One Train

Appendix A

Table Two (2)

EDG Key Performance Tending Indicators

Lube Oil Pressure

Lube Oil Temperature, Engine In

Lube Oil Temperature, Engine Out

Lube Oil Filter Diff. Pressure

Lube Oil Strainer Diff. Pressure

Jacket Water (J.W.) Pressure

Jacket Water Temperature, Engine In

Jacket Water Temperature, Engine Out

Fuel Oil (F.O.) Pressure

F.O. Strainer Diff. Pressure

F.O. Filter Diff. Pressure

Starting Air Pressure Left

Starting Air Pressure Right

Turbo Charger Outlet Pressure

Turbo Charger L.O. Pressure

Cylinder Exhaust Temps

KW Load

Appendix A

Table Three (3)

EDG Preventive Maintenance and Procedures

18 Month Inspection

Preparation for Entering Crankcase

Measurement of Crankshaft Web Deflection

Measurement and Recording of Main and Rod Bearing Clearances (Jacking Method)

Outboard Bearing Inspection

Cylinder Liners, Piston Skirts, All Bolts, and All Locking Devices

Inspection from Inside Crankcase

Removal, Testing, and Installation of Fuel Injection Nozzles and Borescope Inspection of Cylinder Liners

Rocker Arm Assemblies Inspection (Without Disassembly)

Valve Timing and Tappet Clearance Check

Auxiliary Drive at Forward End Inspection

Main Drive at Aft End Inspection

Crankcase Closure

Crankcase and Cylinder Head Breather Inspection

Air Inlet System Inspection

Checking of Turbocharger Rotor for Freedom of Rotation

Lube Oil Full-Flow Filter and Strainer Inspection

Fuel Oil Filter, Strainer, and Turbocharger Lube Oil Filter Inspection

Hydraulic Governor Inspection

Engine Analysis and Vibration Survey

Appendix A

Table Four (4)

EDG Preventive Maintenance and Procedures

Five Year Inspection[1]

Preparation for Entering Crankcase

Measurement of Crankshaft Web Deflection

Measurement and Recording of Main and Rod Bearing Clearances (Jacking Method)

Flexible Line Replacement, Internal and External

Outboard Bearing Inspection

Cylinder Liners, Piston Skirts, All Bolts, and All Locking Devices Inspection from Inside Crankcase

Removal, Testing and Installation of Fuel Injection Nozzles and Borescope Inspection of Cylinder Liners

Rocker Arm Assemblies Inspection (Without Disassembly)

Removal, Calibration, and Installation of Fuel Injection Pumps

Valve Timing and Tappet Clearance Check

Auxiliary Drive at Forward End Inspection

Main Drive at Aft End Inspection

Crankcase Closure

Crankcase and Cylinder Head Breather Inspection

Air Inlet System Inspection

Checking of Turbocharger Rotor for Freedom of Rotation

Lube Oil Full-flow Filter and Strainer Inspection

Fuel Oil Filter, Strainer, Turbocharger Lube Oil Filter Inspection

Hydraulic Governor Inspection

Engine-driven Main Lube Oil Pump Inspection

Appendix A
Table Four (4)
EDG Preventive Maintenance and Procedures
Five Year Inspection (1)
(Continued)

Circulating Oil Pump Inspection

Standby Oil Pump Inspection

Engine-driven Fuel Oil Booster Pump Inspection

Motor-driven Standby Fuel Oil Booster Pump Inspection

Engine-driven Jacket Water Pump Inspection

Circulating Jacket Water Pump Inspection

Lubricating Oil Cooler Inspection

Jacket Water Cooler Inspection

Exhaust Silencer Inspection

Engine Analysis and Vibration Survey

(1) Procedure MM-003-041 Currently Under Preparation

Appendix A

Table Five (5)

EDG Preventive Maintenance and Procedures

Ten Year Inspection

Preparation for Entering Crankcase

Measurement of Crankshaft Web Deflection

Measurement and Recording of Main and Rod Bearing Clearances (Jacking Method)

Flexible Line Replacement, Internal and External

Outboard Bearing Inspection

Cylinder Liners, Piston Skirts, All Bolts, and All Locking Devices Inspection from Inside Crankcase

Removal, Testing, and Installation of Fuel Injection Nozzles and Borescope Inspection of Cylinder Liners

Rocker Arm Assemblies Inspection (Without Disassembly)

Removal, Calibration, and Installation of Fuel Injection Pumps

Valve Timing and Tappet Clearance Check

Auxiliary Drive at Forward End Inspection

Main Drive at Aft End Inspection

Crankcase Closure

Crankcase and Cylinder Head Breather Inspection

Air Inlet System Inspection

Turbocharger Removal

Checking of Turbocharger Rotor for Freedom of Rotation

Turbocharger Installation

Lube Oil Full-flow Filter and Strainer Inspection

Fuel Oil Filter, Strainer, and Turbocharger Lube Oil Filter Inspection

Appendix A
Table Five (5)
EDG Preventative Maintenance and Procedures
Ten Year Inspection
(Continued)

Hydraulic Governor Inspection

Engine-driven Main Lube Oil Pump Inspection

Circulating Oil Pump Inspection

Standby Oil Pump Inspection

Engine-driven Fuel Oil Booster Pump Inspection

Motor-driven Standby Fuel Oil Booster Pump Inspection

Engine-driven Jacket Water Pump Inspection

Circulating Jacket Water Pump Inspection

Lubricating Oil Cooler Inspection

Jacket Water Cooler Inspection

Standpipe Inspection

Exhaust Silencer Inspection

Engine Power Cylinder Compression Test

Engine Analysis and Vibration Survey

APPENDIX B

Loads Shed On Battery 3A-DC-S, 3B-DC-S and 3AB-DC-S

The NRC on January 15, 1992 issued the Waterford 3 Safety Evaluation Report (SER) on Station Blackout (SBO). The SER, section 2.2.2, Recommendations (1) and (2), stated that the licensee should justify the shedding of the control room monitoring systems (instrumentation) and that the licensee should identify the specific loads shed by the plant and justify shedding of these loads. Waterford 3 on February 28, 1992 via letter W3F192-0015 concurred with recommendations (1) and (2). Waterford 3 also apprised the NRC that the specific loads which are shed during an SBO would be identified and that justification would be provided for each load which is shed. Appendix B provides this information.

As noted in letter W3F192-0015, Waterford 3 plans to replace batteries 3A-DC-S, 3B-DC-S, and 3AB-DC-S with new batteries. Each new battery will provide 10% design margin at a temperature of 70°F. However, the new batteries will not have a life of 20 years, and the new batteries will have to be replaced when the performance test or service test indicate a capacity of less than 100%, (i.e., there is no aging factor). The temperatures in the battery rooms will be procedurally maintained between 78°-82°F. This temperature control will provide additional operational flexibility.

The need to make a change to procedure OP-902-005 has been identified. During an SBO, the start signal to the EDG is present due to an undervoltage signal on the 4.16KV buses. The start signal also maintains the solenoid valves associated with the EDG air receivers in the open position, thus allowing the air receivers to discharge. The change required for procedure OP-902-005 is for the opening of the circuit breakers for the EDG control power. This change will allow the EDG air receivers to recharge without any concurrent depressurization. The change will also preclude the possibility that the EDGs could inadvertently start while personnel are troubleshooting the EDGs thus obviating a potential personnel hazard.

The battery calculations were revised in May 1992 to account for two circuit breaker spring charging motors. Each of these motors has a 60 amp inrush current when the 4.16KV breakers are automatically closed in the last minute of a station blackout. The inrush currents result in additional voltage drop at the battery terminals. Battery 3B-DC-S is slightly more loaded than battery 3A-DC-S. In order to compensate for these additional loads, the revised calculations incorporated stripping of the EDG control circuits (discussed above) within 30 minutes of the SBO event. This assures that there is adequate voltage (105V) at the terminals of the Static Uninterruptible Supplies (SUPS) during the last minute of the SBO. The SUPS do not trip if the terminal voltage drops below 105VDC. The ability of the SUPS to provide regulated output current at the lower input voltage of 101VDC will be verified by the end of RF5. The control power is restored prior to starting the respective diesel. A standing Instruction was issued in May 1992 to address the necessary operator actions. Procedure OP-902-005 will be revised by the end of RF5 to address the necessary operator actions.

LOAD SHEDDING BATTERY 3A-DC-S

The following DC breakers are opened within 30 minutes of onset of station blackout.

	ID NUMBER	LOAD SUPPLIED
1 2 3	LTN-EBKR-322-1 LTN-EBKR-322-2 LTN-EBKR-322-3	These breakers power DC lights in the control room area behind the control boards and two lights for BOP boards. After the cabinet doors have been opened, there are no further actions necessary in the rear of the main control room. This action conserves batteries and reduces heat load in the control room.
*4	EG-EBKR-A-11 CWD 2319	Diesel Generator 3A-S Control Panel Feeder No. 1. EDG is considered unavailable for SBO.
*5	EG-EBKR-A-12 CWD 2319	Diesel Generator 3A-S Control Panel Feeder No. 2 EDG is considered unavailable for SBO.
6	EGF-EBKR-A-13 CWD 2308	This breaker powers the emergency diesel generator (EDG) "A" fuel oil booster pump. In coping with SBO, the EDG is considered unavailable and the booster pump is not required. At Waterford 3, the fuel oil day tank is located at a higher elevation than the EDG. The static head pressure is adequate to maintain fuel oil pressure for starting the EDG.
7	ID-EBKR-A-35	See PDP-390 for itemizing loads deenergized.
*8	EG-EBKR-1A-1 CWD 2315	Diesel Generator 3A-S Non-Critical Control Power. EDG is considered unavailable for SBO.
*9	EG-EBKR-1A-13 CWD 2315	Diesel Generator 3A-S Non-Critical Control Power. EDG is considered unavailable for SBO.

The 120V AC breakers for static uninterruptible power supplies SMA and SMC are identified individually.

*Pending change for Procedure OP-902-005.

Breaker ID-EBKR-A-35 on 3A-DC-S is opened by operator. As a result, PDP-390 is de-energized and the following loads loose power from static uninterruptible power supply 3A-S:

	ID NUMBER	LOAD SUPPLIED
1	CVC-EBKR-90A-1 CWD 300	Power feeder breaker for solenoid valve CVC-101, Letdown Containment Isolation (fails closed) - not needed as letdown is isolated.
2	SI-EBKR-90A-2 CWD 940	Feeder breaker for solenoid valve SI-6011. SIS Sump Sample Isolation (fails open) - not needed as a SIS Sump Sample is not needed.
3	CVC-EBKR-90A-3 CWD 302	Feeder breaker for solenoid valve CVC-109. Letdown Containment Isolation - not needed as Letdown is isolated. CCW solenoid valve CC-636/2. CCW to Letdown Heat Exchanger (fails open) - not needed as CCW not available.
4	LWM-EBKR-90A-4 CWD 753	Circuit for Hi level switches for flooding in various areas -35 elevation in RAB. Not needed as no flooding is postulated in RAB. Separate Sump level Hi alarms are available.
5	BAM-EBKR-90A-5 CWD 346	Valve BAM-126A in the recirculation line between boric acid make-up tank A and boric acid pump A (fails closed). BAM Pump "A" not running. No recirculation path needed.
6	SI-EBKR-90A-6 CWD 552	Back-up power for indication lights for motor operated isolation valve for safety injection tank 1A. This valve has the 480V AC power feeder breaker procedurally open and locked during normal plant operation. Power for position indication lights is provided by the 120V back-up supply. This circuit also provides back-up power for position indication for normally close valve SI-401A. This valve is in shutdown cooling line Loop 2 and not required for SBO.
7	BAM-EBKR-90A-7 CWD 351	Power for boric acid pump B recirculation valve BAM-126B in the recirculation line between boric acid make-up tank A and boric acid pump A (fails closed). BAM Pump "A" not operating. No recirculation path needed.

	ID NUMBER	LOAD SUPPLIED
8	SI-EBKR-90A-8 CWD 564	Same as circuit 6 except indication lights are for MOV status indication for SI tank 2A only.
9	SI-EBKR-90A-9 CWD 532	Shutdown cooling line A flow control valve SI-120A (fail open valve). During SBO, LPSI pumps are not available and flow control is not required.
10	BAM-EBKR-90A-10 CWD 345, 350	Annunciator circuit of boric acid pumps A&B. During SBO these pumps are not available and are not required. Loss of status indication is not a concern.
11	CC-EBKR-90A-11 CWD 834	Solenoid operated Component Cooling Water (CCW) train A isolation valves CC-200A and CC-72 . These valves fail close and isolate supply and return headers for redundant trains. During SBO the CCW is not available.
12	RC-EBKR-90A-12 CWD 269	Auxiliary relays in auxiliary panel 1 that provide per issive contacts for closure of valves in circuits 6 and 8. These valves are not required for SBO.
13	CC-EBKR-90A-13 CWD 838	Solenoid valve CC-501 in the common supply side of Component Cooling Water (CCW). Loss of power to this valve isolates the non-safety loads on the CCW.
14	CVR-EBKR-90A-14 CWD 1130	Containment vacuum relief valve CVR-201. Loss of power prevents this valve from opening. During SBO the pressure inside the containment is expected to be higher than normal.
15	CC-EBKR-90A-15 CWD's 701, 704	Solenoid valves CC-126A and B for CCW discharge header isolation, CC-114A and B for suction header isolation and associated isolation relays for isolating common circuits in the A, AB and B trains. Valves fail open. CCW is not available.
16	SI-EBKR-90A-16 CWD 520	LPSI pump A minimum flow isolation valve SI-1161A. This fail open valve is used for recirculation. LPSI is not available for SBO.

	ID NUMBER	LOAD SUPPLIED
17	IA-EBKR-90A-17 CWD 997	Instrument air containment isolation valve IA-909. Instrument air is not available for SBO and the valve fails closed on loss of power.
18	CAR-EBKR-90A-18 CWD A1030	Containment Pressure Exhaust Valve CAR-200B (fails closed). Valve used for Containment Pressure Control but support systems are unavailable, CAR-200B is not needed.
19	CC-EBKR-90A-19 CWD 749	Dry tower A isolation and bypass valves CC-135A and CC-134A. Not needed as CCW is not operating. Valves fail "as-is".
20	Spare	
21	CC-EBKR-90A-21 CWD 840	Fuel pool temperature control valve CC-620-1 (fails open). During SBO, CCW is not available, hence, valve position is not a concern.
22	DC-EBKR-90A-22 CWD 2563	Power supply for DC voltage transducer for remote indication. During SBO, local DC voltmeter is available.
23	CVR-EBKR-90A-23 CWD 618	Containment Pressure Transmitter Isolation Valve CVR-401A (fails closed) - Transmitter output controls CVR. Not needed as CVR valves are de-energized.
24	Spare	
25	SI-EBKR-90A-25 CWD 504	Backup power for position indication of MOV for reactor coolant loop 1 hot leg injection isolation valve SI-502A. This is a normally "locked close" valve, is not required for containment isolation and loss of indication during SBO is not a concern.
26	CVC-EBKR-90A-26 CWD 357	Solenoid operated valve CVC-510. Fail closed valve in the boric acid make-up line to the volume control tank.

	ID NUMBER	LOAD SUPPLIED
27	CVC-EBKR-90A-27 CWD 381	Valve CVC-218A in charging line to loop 1A. Valve fails close on loss of power. No impact on SBO coping as charging pumps are not available.
28	CS-EBKR-90A-28 CWDs 589, 548	Shutdown cooling heat exchanger "A" outlet temperature recorder. Heat exchanger is not required for coping with SBO. LPSI pump A header discharge temperature recorder. Loss of recorder is not a concern as LPSI pump is not available.
29	ARM-EBKR-90A-29 CWD 2673	Isolation valves ARM-110 and 103 for containment atmosphere radiation monitors. These valves are fail close and are required to close on CIAS Not needed as other indications of containment atmospheric conditions are available.
30	SI-EBKR-90A-30 CWD 593	RCS loop 1 hot leg injection drain valve SI-301. Normally closed valve, required to stay closed for SBO.
31	CVC-EBKR-90A-31 CWD 294	Pressurizer auxiliary spray valve CVC-216A. Not needed as charging pumps are not available.
32	HVC-EBKR-90A-32 CWD 1146	Control Room Emergency Filtration Unit "A" intake and return air dampers, fail open on loss of power. During SBO, HVAC is not available.
33	CB-EBKR-90A-33 CWD 625	Position indicating lights located in the control room for the personnel lock internal door. Not required during SBO as containment entry is not anticipated.
34	EFS-EBKR-90A-34 CWD 170	Isolation panel auxiliary relays; loss of power to these relays precludes start of pumps for SI, chillers and charging.
35	RFR-EBKR-90A-35 CWD 1045	Essential Chiller A Control Power - Control Power not necessary as chiller is not operating.

	ID NUMBER	LOAD SUPPLIED
36	ESF-EBKR-90A-36 CWD 170	Auxiliary panel relays. Contacts from these relays bypass overload contacts in safety related AC motor operated valves which would operate with a SIAS, RAS or CIAS present. Valves will not operate as AC power is not available.
37	EG-EBKR-90A-37 CWD 2321	Control Power to hour meter and annunciator for Diesel Generator A.
38	Spare	
39	Spare	
40	Spare	
41	EG-EBKR-90A-41 CWD 2306	CCW to EDG A CC-413A (fails open) - not needed as CCW pumps are not running.
42	EG-EBKR-90A-42 CWD 2318, 2319	Temperature scanner and DG-3A-S engine status indicating lights in control room.
43	Spare	
44	HVF-EBKR-90A-44 CWD 1234	FHB Emerg. Filtration Unit A Damper and Rad. Monitor "A" - not needed as Filtration Units not operating.
45	SSL-EBKR-90A-45 CWD 923	SG 2 Sample Isolation Valve (SSL-8006B) - (fails closed) - not needed as no CCW available to sample coolers.
46	CC-EBKR-90A-46 CWD 847	CCW to Shutdown Cooling Heat Exchanger. CC-963A - not needed as CCW pumps are not available.
47	SSL-EBKR-90A-47 CWD 929	MS Outlet Line Sample Isolation Valve SSL-301A.
48	ANN-EBKR-90A-48 CWD 2935	CP-18 Annunciators Safety Channel A - not needed as equipment with annunciation on this panel has no power.

	ID NUMBER	LOAD SUPPLIED
49	SBV-EBKR-90A-49 CWD 1254, 1149, 1138	(1) SBVS/FHB Train "A" Diff Pressure Recorder (2) Cont. Rm. Emerg. Fltr Unit S-8 (3A-SA) Flow (3) Containment Cooler HVAC AH-1 (3C-SA) in/out temperature recorder (4) Containment Cooler HVAC AH-1 (3A-SA) in/out temperature recorder
50	Spare	
51	PSL-EBKR-90A-51 CWD 922	SG #1 Sample Isolation Valve SSL-8006A (fails closed) - same comments as circuit 45.
52	ARM-EBKR-90A-52 CWD 2660	Containment Purge Isol. "A" Rad. Monitor - not needed because power is not available to Containment Purge Valves.
53	ARM-EBKR-90A-53 CWD 2660	Control Room Isolation "A" Rad. Monitor - not needed because outside air intakes fail closed and no power available to Control Room Emergency Filtration Units.
54	ARM-EBKR-90A-54 CWD 2662	Containment Purge Isolation "A" Rad. Monitor - same comment as circuit 52.
55	Spare	
56	ARM-EBKR-90A-56 CWD 2662	FHB Isolation "A" Rad. Monitor - not needed because Isolation Dampers fail close and no power available to Fuel Handling Building Emergency Filtration Units.
57	ARM-EBKR-90A-57 CWD 2685	Control Room Isolation "A" Rad. Monitors - same comment as circuit 53.
58	ARM-EBKR-90A-58 CWD 2686	FHB Isolation "A" Rad. Monitors - same comment as circuit 56.
59	Spare	
60	ARM-EBKR-90A-60 CWD 2669	CP-14 for post LOCA Shield Building radiation monitors recorders.
61	ARM-EBKR-90A-61 CWD 2596	Safety Loop "A" radiation monitors isolation device. Loss of communication with radiation computer RM-11.

LOAD SHEDDING BATTERY 3B-DC-S

The following DC breakers are opened within 30 minutes of onset of station blackout.

	ID NUMBER	LOAD SUPPLIED
1.	LTN-EBKR-323-2	DC lights in the control room behind the control boards. (Same as "A" Battery.)
2.	LTN-EBKR-323-3	
3.	LTN-EBKR-323-4	
*4.	EG-EBKR-B-11 CWD 2368	Diesel Generator 3B-S Control Panel Feeder No. 1. EDG is considered unavailable for SBO.
*5.	EG-EBKR-B-12 CWD 2369	Diesel Generator 3B-S Control Panel Feeder No. 2. EDG is considered unavailable for SBO.
6.	EGF-EBKR-B-13 CWD 2358	EDG "B" fuel oil booster pump. Same as EDG "A".
7.	ID-EBKR-B-35	See PDP-391 for itemizing loads deenergized.
*8.	EG-EBKR-1B-1 CWD 2365	Diesel Generator 3B-S Non-Critical Control Power. EDG is considered unavailable for SBO.
*9.	EG-EBKR-1B-13 CWD 2365	Diesel Generator 3B-S Non-Critical Control Power. EDG is considered unavailable for SBO.

The 120V AC breakers for static uninterruptible power supplies SMB and SMD are identified individually.

*Pending change for Procedure OP-902-005.

Breaker ID-EBKR-B-35 on 3B-DC-S is opened by operator. As a result, PDP-391 is de-energized and the following loads loose power from static uninterruptible power supply 3B-S:

	ID NUMBER	LOAD SUPPLIED
1	CVC-EBKR-91B-1 CWD 301	Power feeder breaker for solenoid valve CVC-102, Letdown Containment Isolation (fails closed) - not needed as letdown is isolated.
2	SI-EBKR-91B-2 CWD 939	Feeder breaker for solenoid valve SI-6012. SIS Sump Sample Isolation (fails open) - not needed as a SIS Sump Sample is not needed.
3	HVC-EBKR-91B-3 CWD 1151	Power to the following recorders: (a) HVC-IDPR-5061B; Control Room Emergency Filter Flow S8 (3B-SB).
	CWD 1138	(b) CCS-ITR-5155B; Containment Cooler HVAC AH-1 (3B-SB) - Air In/Out Temperature Recorder. CCS-ITR-5150B; Containment Cooler HVAC AH-1 (3B-SB) - Air In/Out Temperature Recorder.
	CWD 1263	(c) SBV-IDPR-0551B; SBVS/FHB Train "B" Differential Pressure Recorder.
4	LWM-EBKR-91B-4 CWD 803	Circuit for Hi level switches for flooding in various areas -35 elevation in RAB. Not needed as no flooding is postulated in RAB. Separate sump level Hi alarms are available.
5	Spare	
6	SI-EBKR-91B-6 CWD 558	Back-up power for indication lights for motor operated isolation valve for safety injection tank 1B. This valve has the 480V AC power feeder breaker procedurally open and locked during normal plant operation. Power for position indication lights is provided by the 120V back-up supply. This circuit also provides back-up power for position indication for normally close valve SI-401B. This valve is in shutdown cooling line Loop 1 and not required for SBO.
7	Spare	

	ID NUMBER	LOAD SUPPLIED
8	SI-EBKR-91B-8 CWD 570	Same as circuit 6 except indication lights are for MOV status indication for SI tank 2B only.
9	SI-EBKR-91B-9 CWD 532	Shutdown cooling line B flow control valve SI-129B (fail open valve). During SBO, LPSI pumps are not available and flow control is not required.
10	BAM-EBKR-91B-10 CWD 548	Shutdown Cooling (SDC) Temperature Recorder - not needed as SDC is not available. Containment Pressure, SIS Sump Level and Temperature - not needed for trending.
11	CC-EBKR-91B-11 CWD 836	Solenoid operated Component Cooling Water (CCW) train B isolation valves CC-200B and CC-563. These valves fail close and isolate supply and return headers for redundant trains. During SBO the CCW is not available.
12	RC-EBKR-91B-12 CWD 269	Auxiliary relays in auxiliary panel 2 that provide permissive contacts for closure of valves in circuits 6 and 8. These valves are not required for SBO.
13	CC-EBKR-91B-13 CWD 838	Solenoid valve CC-562 in the common supply side of Component Cooling Water (CCW). Loss of power to this valve isolates the non-safety loads on the CCW.
14	CVR-EBKR-91B-14 CWD 1131	Containment vacuum relief valve CVR-101. Loss of power prevents this valve from opening. During SBO the pressure inside the containment is expected to be higher than normal.
15	CC-EBKR-91B-15 CWD 702, 703, 704, 799	Solenoid valves CC-127A and B for CCW discharge header isolation, CC-115A and B for suction header isolation and associated isolation relays for isolating common circuits in the A, AB and B trains. Valves fail open. CCW is not available. Alternate feed to "B" CCW Dry Tower Isolation Valve for Control Room fire.
16	SI-EBKR-91B-16 CWD 520	LPSI pump B minimum flow isolation va[illegible] SI-1161B. This fail open valve is us[illegible] recirculation. LPSI is not available [illegible] SBO.

	ID NUMBER	LOAD SUPPLIED
17	CC-EBKR-91B-17 CWD 799	Dry tower B isolation and bypass valves CC-135-B and CC-134-B. Not needed as CCW is not operating.
18	Spare	
19	CC-EBKR-91B-19 CWD 545	Nitrogen Containment Isolation Valve NG-157 fails close. Closes on CIAS.
20	Spare	
21	CC-EBKR-91B-21 CWD 841	Fuel pool temperature control valve CC-620-2 (fails open). During SBO, CCW is not available, hence, valve position is not a concern.
22	DC-EBKR-91B-22 CWD 2563	Power supply for DC voltage transducer for remote indication. During SBO, local DC voltmeter is available.
23	CVR-EBKR-91B-23 CWD 518	Containment Pressure Transmitter Isolation Valve CVR-401B (fails close[illegible]) - Transmitter output controls CVR. Not needed as CVR valves are de-energized.
24	Spare	
25	SI-EBKR-91B-25 CWD 513	Backup power for position indication of MOV for reactor coolant loop 2 hot leg injection isolation vale SI-[illegible] 1B. This is a normally "locked close" valve, [illegible] not required for containment isolation and loss of indication during SBO is not a concern.
26	ARM-EBKR-91B-26 CWD 2673	Isolation valve ARM-109 for containment atmosphere radiation monitors. This valve fails close and is required to close on CIAS. Not needed as other indications of containment atmospheric conditions are available.

	ID NUMBER	LOAD SUPPLIED
27	Spare	
28	SI-EBKR-91B-28 CWD 598	RCS loop 2 hot leg injection drain valve SI-302. Normally closed valve, required to stay closed for SBO.
29	CVC-EBKR-91B-29 CWD 382	Valve CVC-218B in charging line to loop 2A. Valve fails close on loss of power. No impact on SBO coping as charging pumps are not available.
30	CAR-EBKR-91B-30 CWD B1030	Exhaust Heater "B" Upstream Isolation Valve CAR-202B. CAR's is not needed for this event.
31	CVC-EBKR-91B-31 CWD 295	Pressurizer auxiliary spray valve CVC-216B. Not needed as charging pumps are not available.
32	HVC-EBKR-91B-32 CWD 1147	Control Room Emergency Filter Unit B Dampers - Dampers not needed because Filter Unit not available.
33	CB-EBKR-91B-33 CWD 625	Position indicating lights located in the control room for the personnel lock internal door. Not required during SBO as containment entry is not anticipated.
34	EFS-EBKR-91B-34 CWD 170	Isolation panel auxiliary relays; loss of power to these relays precludes start of pumps for SI, chillers and charging.
35	RFR-EBKR-91B-35 CWD 1055	Essential Chiller B Control Power - Control Power not necessary as chiller is not operating.
36	ESF-EBKR-91B-36 CWD 170	Auxiliary panel relays. Contacts from these relays bypass overload contacts in safety related AC motor operated valves which would operate with a SIAS, RAS or CIAS present. Valves will not operate as AC power is not available.

	ID NUMBER	LOAD SUPPLIED
37	EG-EBKR-91B-37 CWD 2321	Control Power to hour meter and annunciator for Diesel Generator B.
38	Spare	
39	Spare	
40	Spare	
41	EG-EBKR-91B-41 CWD 2356	CCW to EDG A CC-413B (fails open) - not needed as CCW pumps are not running.
42	EG-EBKR-91B-42 CWD 2368, 2369	Temperature scanner and DG-3B-S engine status indicating lights in control room.
43	Spare	
44	HVF-EBKR-91B-44 CWD 1236	FHB Emerg. Filtration Unit B Damper and Rad. Monitor "B" - not needed as Filtration Units not operating.
45	SSL-EBKR-91B-45 CWD 923	SG 2 Sample Isolation Valve (SSL-8004B) - (fails closed) - not needed as no CCW available to sample coolers.
46	CC-EBKR-91B-46 CWD 848	CCW to Shutdown Cooling Heat Exchanger. CC-963B - not needed as CCW pumps are not available.
47	SSL-EBKR-91B-47 CWD 929	MS Outlet Line Sample Isol. Valve SSL-301B.
48	ANN-EBKR-91B-48 CWD 2935	CP-18 Annunciators Safety Channel B - not needed as equipment with annunciation on this panel has no power.
49	SSL-EBKR-91B-49 CWD 922	SG #1 Sample Isolation Valve SSL-8004A (fails closed) - same comments as circuit 45.
50	ARM-EBKR-91B-50 CWD 2661	Containment Purge Isol. "B" Rad. Monitor - not needed because power is not available to Containment Purge Valves.
51	ARM-EBKR-91B-51 CWD 2679	Control Room Isolation "B" Rad. Monitor - not needed because outside air intakes fail closed and no power available to Control Room Emergency Filtration Units.

	ID NUMBER	LOAD SUPPLIED
52	ARM-EBKR-91B-52 CWD 2663	Containment Purge Isolation "B" Rad. Monitor - same comment as circuit 50.
53	Spare	
54	ARM-EBKR-91B-54 CWD 2688	FHB Isolation "B" Rad. Monitor - not needed because Isolation Dampers fail close and no power available to Fuel Handling Building Emergency Filtration Units.
55	ARM-EBKR-91B-55 CWD 2681	Control Room Isolation "B" Rad. Monitors - same comment as circuit 51.
56	ARM-EBKR-91B-56 CWD 2687	FHB Isolation "B" Rad. Monitors - same comment as circuit 54.
57	Spare	
58	ARM-EBKR-91B-58 CWD 2666	CP-14 for post LOCA Shield Building radiation monitors recorders. LOCA not postulated.
59	ARM-EBKR-91B-59 CWD 2598	Safety Loop "B" radiation monitors isolation device. Loss of communication with Radiation computer RM-11.

SMA

PDP 3MA-S; B289, Sheet 143

CKT #	BREAKER	LOAD SUPPLIED
1	PPS-EBKR-MA-1 CWD 2783	Feeder for PPS/CPC interface cabinet CP-10. This cabinet feeds power to CPC/CPIA Test/Enable Test Circuit. Test circuit not necessary when plant shutdown because CPC's have already performed their function. 10^{-4}% DNBR/LPD bypass - Bypass not necessary until ready to start up. NI - Sub Channel to CPC - CPCs' not necessary as Channel has already performed its Safety Function. PPS/CPC Interface - not necessary because CPC has already performed its Safety Function.
2	PPS-EBKR-MA-2 CWD 176	Feeder for CP-22. This is the Core Protection Calculator (CPC) associated with the plant protection system. All four CPC's inoperable - already performed their intended function - not needed when plant shut down. CEA Positions - indication lost when breaker open - Rods are inserted by gravity. Indication not needed. Incore Detectors - Incore Detector main function is to provide power indication to COLSS. COLSS is not used when plant is shutdown.
3	PAC-EBKR-MA-3 CWD 2912	Process Analogue Cabinet CP-48 power. This cabinet has the logic for control and annunciation of Component Cooling Water (CCW) equipment (i.e., CCW temperature control, dry cooling tower fan logic, and wet cooling tower "A" level). This cabinet also sends signals for containment pressure wide range recorder. The CCW is not available for SBO and the pressure recorder is not required as other pressure indication is available.

CKT #	BREAKER	LOAD SUPPLIED
7 8	PPS-EBKR-MA-7 CWD 176 PPS-EBKR-MA-8 CWD 176	Primary and back-up channel "A" multiplexors associated with CP-22 (i.e., the CPC) as discussed for Ckt 2, CP-22 is not required for coping with SBO. Hence, the mux. input to plant computer is not required.
9	RC-EBKR-MA-9 CWD 269	Power for pressurizer pressure relays RC-EREL 269-F and RC-EREL-269G. These relays take low and low low pressure input and operate slave relays. One slave relay permits remote opening of motor operated (MOV), RCS shutdown cooling valve. The second slave relay provides permissive for opening MOVs associated with Safety Injection Tanks 1A and 2A. These three MOVs do not have A.C. power.
10	RC-EBKR-MA-10 CWD 273, 201	Pressurizer level chart recorder and reactor coolant loop 1 hot leg temperature recorders (RC-ILR-0110XY and RC-ITR-0102HA). Level and temperature indication is available.
14	PAC-EBKR-MA-14 CWD 226	Channel "A" of RCP speed sensor input to CPC. During SBO, the RCPs are not operating and CPCs have performed their function.
15	VLP-EBKR-MA-15 CWD 262	Provides power to loose parts monitoring panel. Loose Parts monitoring is only required in Modes 1 & 2.
17	ESF-EBKR-MA-17 CWD 160	ESFAS auxiliary relay cabinet "A" alarms and actuation relays. De-energizing the ESFAS relays does not actuate any equipment due to loss of A.C. The alarms do not provide any useful information.
18	SG-EBKR-MA-18 CWD 210, 212	Power for chart recorders for steam generator No. 1 pressure and level (SG-IPR-1013A, SG-ILR-1113A, SG-ILR-1123A). Steam Generator Pressure and level indication is available.
19	ESF-EBKR-MA-19 CWD 160	ESFAS auxiliary relay cabinet "A" alarms and actuation relays. De-energizing the ESFAS relays does not actuate any equipment due to loss of A.C. The alarms do not provide any useful information.

CKT #	BREAKER	LOAD SUPPLIED
20	ENI-EBKR-MA-20 CWD 189	Power to the following recorder: (a) Excore linear power channel "A" recorder ENI-IJR-0002A. Scale is set for power operation only. (b) RC ITR 0102CA, Recorder for RC loop 1 cold leg temperature. Temperature indication is available. (c) RC-IPR-0102A, Recorder for pressurizer pressure. Pressure indication is available.

SMB
PDP 3MB-S; B289, Sheet 144

CKT #	BREAKER	LOAD SUPPLIED
1	PPS-EBKR-MB-1 CWD 2701	Same as circuit No. 1, SMA.
2	PPS-EBKR-MB-2 CWD 177	Same as circuit No. 2, SMA.
3	PAC-EBKR-MB-3 CWD 2912	Process Analogue Cabinet CP-49 powering ('B' train) Same as circuit No. 3, SMA.
7	PPS-EBKR-MB-7 CWD 177	Same as SMA circuit No. 7.
8	PPS-EBKR-MB-8 CWD 177	Same as SMA circuit No. 8.
9	RC-EBKR-MB-9 CWD 269	Power for pressurizer pressure relays RC-EREL-269 H/J. Same as circuit No. 9, SMA except SI Tanks 1B and 2B.
14	PAC-EBKR-MB-14 CWD 226	Same as circuit No. 14 for SMA.
15	VLP-EBKR-MB-15 CWD 262	Same as circuit No. 15 for SMA.
17	ESF-EBKR-MB-17 CWD 160	Same as SMA circuit No. 17.
19	ESF-EBKR-MB-19 CWD 160	Same as SMA circuit No. 19.
20	ENI-EBKR-MB-20 CWD 189	Power to the following recorders: (a) Excore linear power channel "B" recorder ENI-IJR-0002B. Scale is set for power operations only. (b) Refueling water pool level recorder SI-IIR-0305.

SMC
PDP 3MC-S; B289, Sheet 145

CKT #	BREAKER	LOAD SUPPLIED
1	PPS-EBKR-MC-1 CWD 2702	Same as circuit No. 1, SMA.
2	PPS-EBKR-MC-2 CWD 178	Same as circuit No. 2, SMA.
4	PAC-EBKR-MC-4 CWD 2912	Process Analog Cabinet CP-41 power. This cabinet has the logic for control and annunciation of RAB HVAC system air handling units and the water chiller system.
7	PPS-EBKR-MC-7 CWD 178	Same as SMA circuit No. 7.
8	PPS-EBKR-MC-8 CWD 178	Same as SMA circuit No. 8.
9	RC-EBKR-MC-9	Auxiliary relays RC-EREL-270E. The 270E relay provides permissive for opening RCS Loop 2 shutdown cooling valve. The RCS Loop 2 cooling valve does not have to be opened during SBO.
14	PAC-EBKR-MC-14 CWD 226	Same as circuit 14, SMA.
15	VLP-EBKR-MC-15 CWD 262	Same as circuit 15, SMA.
17	ESF-EBKR-MC-17 CWD 165	Same as SMA circuit No. 17.
19	ESF-EBKR-MC-19 CWD 165	Same as SMA circuit No. 19.
20	ENI-EBKR-MC-20 CWD 189	Power to the following recorders: (a) Excore linear power channel "C" recorder ENI-IJR-0002C. Scale is set for power operations only. (b) RC-IUR-0101A1 and A2, Core Exit Temperature and RCS/Upper Head saturation margin temperature. (c) RC-IUR-0102A1, Calculated Core Temperature. (d) RC-ILR-2103A1 and A2 Plenum and Head Vessel Level.

SMD
PDP 1MD-S; B289, Sheet 146

CKT #	BREAKER	LOAD SUPPLIED
1	PPS-EBKR-MD-1 CWD 2703	Same as circuit No. 1, SMA.
2	PPS-EBKR-MD-2 CWD 179	Same as circuit No. 2, SMA.
4	PAC-EBKR-MD-4 CWD 2912	Process Analog Cabinet CP-44 power. This cabinet has the logic for control and annunciation of RAB HVAC system air handling units and Containment Fan Cooler Water Outlet Temperature.
7	PPS-EBKR-MD-7 CWD 179	Same as SMA circuit No. 7.
8	PPS-EBKR-MD-8 CWD 179	Same as SMA circuit No. 8.
9	RC-EBKR-MD-9 CWD 270	Auxiliary relay RC-EREL-270F. The 270F relay provides permissive for opening RCS Loop 1 shutdown cooling valve. The RCS Loop 1 cooling valve does not have to be opened during SBO.
14	PAC-EBKR-MD-14 CWD 226	Same as circuit No. 14, SMA.
15	VLP-EBKR-MD-15 CWD 262	Same as circuit No. 15, SMA.
17	EFS-EBKR-MD-17 CWD 165	Same as SMA circuit No. 17.
19	EFS-EBKR-MD-7 CWD 165	Same as SMA circuit No. 19.
20	ENI-EBKR-MD-20 CWD 189	Power to the following recorders: (a) Excore linear power channel "D" recorder ENI-1JR-0002D. Scale is set for power operations only. (b) RC-IUR-0101B1 and B2 Core Exit Temperature and RCS/Upper Head saturation margin temperature. (c) RC-IUR-0102B1, Calculated Core Temperature. (d) RC-ILR-2103B1 and B2 Plenum and Head Vessel Level.

LOAD SHEDDING BATTERY 3AB-DC-S

The following AC breakers for SUPS 3AB-S are opened within 30 minutes of onset of station blackout.

	ID NUMBER	LOAD SUPPLIED
1.	ID-EBKR-1AB-35	Feeder breaker for non-1E PDP 345 AB.
2.	ID-EBKR-1AB-37	Feeder breaker for non-1E PDP-3AB2.
3.	ID-EBKR-1AB-38	Feeder breaker for non-1E PDP-396AB.

The following DC breakers are opened within 30 minutes of onset of Station Blackout:

4.	LOF-EBKR-AB-17	Feedpump "A" emergency oil pump.
5.	LOF-EBKR-AB-18	Feedpump "B" emergency oil pump.

NOTE: The loads associated with above PDPs are detailed in this attachment.

The following 125V DC breakers are opened after turbine has stopped:

6.	SO-EBKR-AB-8	Air seal oil backup pump for turbine.
7.	LCG-EBKR-AB-10	Emergency bearing oil pump for turbine.

Breaker ID-EBKR-1AB-35 is opened by operator. As a result, PDP 345-AB is shed and the following non 1E loads loose power the non-1E SUPS 3AB. (PDP 345-AB, B-289 Sheet 149)

CKT #	ID NUMBER	LOAD SUPPLIED
1	Spare	
2	NG-EBKR-45AB-2 CWD 1657	Status indication for motor operated Steam Generator No. 1 & No. 2 nitrogen valves (2MS-V697, 2MS-V698). Valves locked closed.
3	CCS-EBKR-45AB-3 CWD 829	Containment Fan Coolers 'B' & 'D' condensate pot optical flow detectors.
4	Spare	
5	CMU-EBKR-45AB-5 CWD 1530	Condensate Storage Pool Inlet Valve CMU-138, fails close.
6	LWM-EBKR-45AB-6 CWD 674	Recorder LWM-IFR-0647 for Liquid Waste Discharge Flow and Radiation Recorder
	CWD 314	RCS Boron Concentration Analyzer Indicator CVC-IAI-0203
	CWD 315	Letdown Radiation Recorder PRM-IRR-0202
	CWD 353	Concentrate Boric Acid Makeup Flow Recorder BAM-IFR-0210Y
	CWD 354	Primary Water Makeup Flow Recorder PMU-IFR-0210X
	CWD 471	Boron Management System Liquid Waste Discharge Flow and Rad. Recorder BM-IFRR-0627
	CWD 690	GWM-IFRR-0648, Gaseous Waste Management System Discharge Flow and Radiation Recorder
	CWD 2880	Computer Trend Recorder PMC-IUR-0001 and PMC-IUR-0002
7	ARM-EBKR-45AB-7 CWD 2596	Radiation Monitoring Safety Loop 'A' Isolation Device. Communication link to RM-11. Monitors are not required.

CKT #	ID NUMBER	LOAD SUPPLIED
8	FW-EBKR-45AB-8 CWD 1502	Steam Generator No. 1 Steam Flow Recorder FW-IFR-1011; 1111. Scaled for power operation. Steam Generator Downcomer Level Recorder SG-ILR-1105; 1111. Scaled for power operation.
	CWD 1682	Steam Generator No. 1 & No. 2 Outlet Temp. Recorder MS-ITR-0301A, B
9	ARM-EBKR-45AB-9 CWD 2598	Radiation Monitoring Safety Loop B Isolation Device. Radiation Computer RM-11 communication link.
10	PRM-EBKR-45AB-10 CWD 315	LCP-65 Balance of plant equipment.
11	ARM-EBKR-45AB-11 CWD 2690	Main Steam Line 1 Radiation Monitor, Recorder and Indicator
12	ARM-EBKR-45AB-12 CWD 2691	Main Steam Line 2 Radiation Monitor, Recorder and Indicator
13	RC-EBKR-45AB-13 CWD 274	Pressurizer Level and Level Setpoint Recorder RC-ILR-0110. Let down is isolated.
	CWD 188	Neutron Flux Log power level and Neutron Level start-up channel 1 & 2 recorders. (ENI-IJR-0005/6)
	CWD 200	RC-ITR-0121 RRS 1 & 2 TAVG./T. Ref recorder RC-ITR-0111 RRS 1 & 2 TAVG./T. Ref recorder
	CWD 206	RC-ITR-0115 RCP 1 Cold Leg Temperature wide range recorder. Temperature indication is available for SDO.
	CWD 264	Pressurizer pressure recorder RC-IPR-0100. Other instrumentation is available.
	CWD 190	Neutron Flux Level start-up indicators.
	CWD 314	RCS boron concentration analyzer recorder.
14	CDC-EBKR-45AB-14 CWD 1145	CEDM Cooling Units Inlet Dampers Logic Circuit

CKT #	ID NUMBER	LOAD SUPPLIED
15	RC-EBKR-45AB-15 CWD 274, 273, 264	Pressurizer Pressure and Level Control Logic. Let down is isolated. No charging available.
16	FS-EBKR-45AB-16 CWD 631	Control Logic for Annunciators Fuel Pool Level Hi (H0902) and Fuel Pool Level Low (H1002)
17	Spare	
18	CED-EBKR-45AB-18 CWD 159	CEA CRT Power Supply
19	RMC-EBKR-45AB-19 CWD 1589	CRT and Keyboard for Radiation Monitoring Computer A, Main Computer. Not available for SBO.
20	CVC-EBKR-45AB-20 CWD 380	Charging Pumps Header Discharge Valve CVC-209 fails open.
21	RMC-EBKR-45AB-21 CWD 2539	Printer for Radiation Monitoring Computer 'B', Standby Computer
22	HVC-EBKR-45AB-22 CWD 1162	Control Room Area Normal and Purge Dampers; 1. D-45 HVC-ISV-0301 fails closed; Supervisors Office Purge Damper 2. D-46 HVC-ISV-0303 fails open, Locker Rooms Exhaust Dampers 3. D-68 HVC-ISV-0302 fails open, Toilet Exhaust Damper
23	IC-EBKR-45AB-23 CWD 2780	Power supplies for transducers in instrument cabinets that furnish inputs to plant computer.
24	HVC-EBKR-45AB-24 CWD 1164	Control power to D-62, Computer Room Air Handling Unit Inlet Damper (fails closed) and D-63 Computer Room Air Handling Unit Exhaust Damper (fails closed).
25	IC-EBKR-45AB-25 CWD 2786	Power supplies for transducers that furnish inputs to plant computer.

CKT #	ID NUMBER	LOAD SUPPLIED
26	RCC-EBKR-45AB-26 CWD 1028	Reactor Cavity Air Temp. Recorder (RCC-ITR-5011) and Computer Trend Recorders
27	IC-EBKR-45AB-27 CWD 2786	Same as CKT 25.
28	RC-EBKR-45AB-28 CWD 229	RCP 1A Upper & Middle Seal Cavity Pressure Indicator and Vapor Cavity Pressure Indicator
29	RC-EBKR-45AB-29 CWD 259	Same as CKT 28 for RCP 1B.
30	RC-EBKR-45AB-30 CWD 249	Same as CKT 28 for RCP 2A.
31	RC-EBKR-45AB-31 CWD 259	Same as CKT 28 for RCP 2B.
32	Spare	
33	RWM-EBKR-45AB-33 CWD 692	Spent Resin Solidification Programmer Logic Controller
34	CMT-EBKR-45AB-34	Two duplex receptacles For Herco Console Ckts. in Computer Room.
35	HVC-EBKR-45AB-35 CWD 904	Chlorine Monitor and Auxiliary Relays.
36	FPD-EBKR-45AB-36	Annulus Smoke Detection Pnl. FPE-6

Breaker ID-EBKR-1AB-37 is opened by operator. As a result, the following non-1E loads loose power from the non-1E Static Uninterruptible Power Supply (SUPS) 3AB. (PDP 3AB2; B-289, Sheet 142)

CKT#	ID NUMBER	LOAD SUPPLIED
1	Spare	
2	FW-EBKR-2AB-2 CWD 1452	Main Feedwater Pump Turbine"A" monitoring instrumentation.
3	AB-EBKR-2AB-3 CWD 1720	Auxiliary Boiler Control Panel required for plant start-up only.
4	FW-EBKR-2AB-4 CWD 1482	Main Feedwater Pump Turbine "B" monitoring instrumentation.
5	SO-EBKR-2AB-5 CWD 2121	Hydrogen system seal oil metering and supply unit. Provides Local indication only.
6	TUR-EBKR-2AB-6 CWD 17.	Main turbine turning gear lever.
7	TUR-EBKR-2AB-7 CWD 1831	Power drawer for main turbine governor valve position and speed indication.
8	GG-EBKR-2AB-8 CWD 2119	Main turbine H_2 system metering panel.
9	GEN-EBKR-2AB-9 CWD 2108	Main generator excitation switchgear ground detector.
10	GG-EBKR-2AB-10 CWD 2121	Main generator conductivity recorder.
11	FP-EBKR-2AB-11 CWD 1323	Diesel driven fire pump #1 control panel. Power supply for battery chargers.
12	FP-EBKR-2AB-12 CWD 1325	Diesel driven fire pump #2 control panel. Power supply for battery chargers.
13	IC-EBKR-2AB-13 CWD 2787	Power for transmitters for computer inputs related to heater drains, fire protection supplemental chillers, condensate, etc. Plant computer not available for the duration of SBO.

CKT#	ID NUMBER	LOAD SUPPLIED
14	ABF-EBKR-2AB-14 CWD 1720	Auxiliary boiler burner control cabinet.
15	IC-EBKR-2AB-15 CWD 2782	Power for transmitters for computer inputs related to instrument air, gland steam, extraction steam, reheat steam, etc.
16	GEN-EBKR-2AB-16 CWD 2101	Main generator excitation system transducers.
17	IA-EBKR-2AB-17 CWD 995	Instrument air dryer bypass valve. Instrument air is not available during SBO.
18	GG-EBKR-2AB-18 CWD 2140	Main generator H_2 control annunciator panel power supply.
19	Spare	
20	IA-EBKR-2AB-20 CWD 995	Instrument air dryer control panel. Instrument air is not available during SBO.
21	CW-EBKR-2AB-21 CWD 995	Circulating water system vacuum breakers.
22	CW-EBKR-2AB-22 CWD 1980	Relay logic for circulating water system.
23	LOG-EBKR-2AB-23 CWD 1791	Motor space heaters for turbine building MCC 3AB313 motors.
24	TURB-EBKR-2AB-24 CWD N1824	Turbine supervisory instrument cabinet.
25	IA-EBKR-2AB-25 CWD 996	Instrument air dryer "B" control panel. Instrument air is not available during SBO.
26 28	DC-EBKR-2AB-26 DC-EBKR-2AB-28 CWD 2563	Bus voltage transmitters for input to plant computer. Plant computer is not available or required for the duration of SBO.
27	Spare	
29	Spare	

CKT#	ID NUMBER	LOAD SUPPLIED
30	AE-EBKR-2AB-30 CWD 996	Motor space heaters for motors fed from MCC 3A211 and 3B211.
31	Spare	
32	Spare	
33	Spare	
34	Spare	
35	Spare	
36	Spare	
37	Spare	
38	FW-EBKR-2AB-38 CWD 1437	FWPT "A" governor valve control circuit.
39	Spare	
40	FW-EBKR-2AB-40 CWD 1467	FWPT "B" governor valve control circuit.

Breaker ID-EBKR-1AB-38 is opened by operator. As a result, the following non-1E loads loose power from the non-1E Static Uninterruptible Power Supply SUPS 3AB, (PDP 396-AB; B-289, Sheet 150)

CKT #	ID NUMBER	LOAD SUPPLIED
1.	SI-EBKR-96AB-1 CWD 499	Solenoid valve SI-0342 for SI tank drain to reactor drain tank. This valve fails close.
2.	CC-EBKR-96AB-2 CWD 306	Position indication for let down temperature control valve CC-636.
3.	Spare	
4.	RC-EBKR-96AB-4 CWD 296	Position indication for pressurizer spray control valves RC-301A and RC-301B.
5.	RC-EBKR-96AB-5 CWD 326	Valve PC-602 for controlled RCP bleed-off to the Quench tank. Valve fails open.
6.	CVC-EBKR-96AB-6 CWD 303	Letdown flow control valves (CVC-113A and CVC-113B) selector relays. For SBO, letdown is isolated. These valves are not required.
7.	CVC-EBKR-96AB-7 CWD 316	Letdown ion exchangers by pass valve CVC-140.
8.	FW-EBKR-96AB-8 CWD 1528	Feedwater line #2 to blowdown valve FW-179A position indicati[illegible].
9.	CVC-EBKR-96AB-9 CWD 320	Volume control tank inlet valve CVC-169. Valve fails to VCT. For SBO letdown has been isolated.
10.	CVC-EBKR-96AB-10 CWD 310	Control Power for E/P selector relays for letdown back pressure control val[illegible]s CVC-123A and 123B.
11.	GWM-EBKR-96AB-11 CWD 323	Power for volume control tank vent valve GWM-112. Valve fails close.
12.	FW-EBKR-96AB-12 CWD 1457	Main feedwater pump "A' recirculation valve FW-111A.
13.	BAM-EBKR-96AB-13 CWD 355	Boric acid make-up control valve BAM-141.
	CWD 353	Boric acid make-up instrumentation

CKT #	ID NUMBER	LOAD SUPPLIED
14	FW-EBKR-96AB-14 CWD 1487	Main feedwater pump "B" recirculation valve FW-111B.
15	PMU-EBKR-96AB-15 CWD 356	Valve PMU-144 for primary make-up water to volume control tank.
16	PAC-EBKR-96AB-16 CWD 2912	Non 1E Control Panel 16 power and annunciation supply. PAC for balance of plant systems.
17	CVC-EBKR-96AB-17 CWD 909	Broad range gas monitor "A" for toxic chemical gases. HVAC system is not operational for SBO.
18	PAC-EBKR-96AB-18 CWD 2912	Control panel 50 (Non 1E) power and annunciation supply. PAC for balance of plant systems.
19	Spare	
20	CDC-EBKR-96AB-20 CWD 1145	CEDM cooling units inlet dampers.
21	BAM-EBKR-96AB-21 CWD 361	Normally closed, fail close valve BAM-143 for boration bypass.
22	HVC-EBKR-96AB-22 CWD 909	Broad range gas monitor "B" for toxic chemical gases. HVAC system is not operational for SBO.
23	HVC-EBKR-96AB-23 CWD 1502	Valve FW-173A for open/close main feedwater SG1 valve.
24	ATS-EBKR-96AB-24 CWD 2976A	Control circuit for diverse reactor trip system.
25	CC-EBKR-96AB-25 CWD 280	Component Cooling Water (CCW) inlet and outlet valves CC-6651A and CC-679A for RCP 1A cooling coils.
26	CC-EBKR-96AB-26 CWD 281	CCW inlet and outlet valves CC-6651B and CC-679B for RCP 1B cooling coils.
27	CC-EBKR-96AB-27 CWD 282	CCW inlet and outlet valves CC-666A and CC-680A for RCP 2A cooling coils.
28	CC-EBKR-96AB-28 CWD 283	CCW inlet and outlet valves CC-666B and CC-680B for RCP 2B cooling coils.

CKT #	ID NUMBER	LOAD SUPPLIED
29	Spare	
30	Spare	
31	Spare	
32	Spare	
33	Spare	
34	EN1-EBKR-96AB-34 CWD 118	Reactivity computer power supply. Required for plant start-up.
35	CED-EBKR-96AB-35 CWD 2730	Power for instrumentation buss associated with CEDMCS cabinet 1.
36	Spare	
37	CED-EBKR-96AB-37 CWD 2732	Power for instrumentation buss associated with CEDMCS cabinet 2.
38	Spare	
39	CED-EBKR-96AB-39 CWD 2733	Power for instrumentation buss associated with CEDMCS cabinet 3.
40	Spare	
41	CED-EBKR-96AB-41 CWD 2749	Power for instrumentation buss associated with CEDMCS cabinet 4.
42	Spare	