Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379

Jack L. Wilson
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April 16, 1992

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) - UNITS 1 AND 2 - RESPONSE TO NRC SAFETY EVALUATION (SE) ON THE CONFORMANCE WITH THE STATION BLACKOUT (SBO) RULE (10 CFR 50.63)

References: 1. NRC letter to TVA dated Janaury 14, 1992, "Station Blackout Analysis - Sequoyah Nuclear Plant, Units 1 and 2 (TAC NOS. M68603 and M68604)"

2. TVA letter to NRC dated April 18, 1989, "TVA's Station Blackout (SBO) Evaluation Results Pursuant to 10 CFR 50.63 for the Browns Ferry and Sequoyah Nuclear Plants"

This letter provides the requested response to the Reference 1 NRC letter, which transmitted the SE regarding SQN's compliance to the SBO Rule 10 CFR 50.63. By Reference 1, NRC concluded that SQN Units 1 and 2 cannot be considered to be in complete conformance with 10 CFR 50.63. NRC requested that TVA submit a revised response for SQN no later than April 16, 1992. NRC requested that TVA address each of the staff's recommendations for SQN to resolve the identified nonconformances. The issue of SQN conformance to the SBO rule remains open until the acceptable resolution of NRC's concerns are completed.

Enclosure 1 contains TVA's response to each of the staff's recommendations in Reference 1. Enclosure 2 provides the commitments contained in this submittal. The commitments contained in this letter supersede SQN Commitments Nos. 2 and 5 in Reference 2. The other commitments in Reference 2 are not affected by this submittal.

A050 /1

Please direct questions concerning this issue to Keith C. Weller at (615) 843-7527.

Sincerely,

J. L. Wilson

Enclosures
cc (Enclosures):

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ENCLOSURE 1

Response to NRC's Station Blackout (SBO)
Analysis for Sequoyah Nuclear Plant (SQN)

The following provides TVA's response to each of NRC's requests and/or recommendations contained in the January 14, 1992, letter and attached safety evaluation.

1. NRC Recommendation:

   "The licensee should submit the battery capacity calculation and identify the loads that will be shed. The battery capacity verification and any resulting modification or procedure changes should be included in the documentation supporting the SBO submittals that is to be maintained by the licensee."

   Response:

   The 125-volt (V) vital batteries are evaluated for the 4-hour SBO event in Calculation SQN-SBO-001. The 250-V station battery has been evaluated for the 4-hour event in Calculation SQN-CPS-031. Both calculations consider loads to be shed during an SBO event and these loads are listed in Attachment 1. These loads are manually removed and the actions are assumed to be taken at 30 minutes into the event (except for the main turbine emergency bearing oil pump that requires removal at 3.5 hours into the SBO event). These lists are preliminary in that revisions are planned as discussed below. TVA will update these lists by December 15, 1992, in conjunction with other changes discussed in this enclosure. The final lists will reflect the loads that will be maintained such that the operator will have the capability to monitor core conditions and to remove residual heat during the 4-hour SBO event.

   TVA evaluated the safe shutdown path available during an SBO event and developed a list of components and instrumentation that are required to maintain the safe shutdown path utilizing the turbine-driven auxiliary feedwater (AFW) pump (see Attachment 3). No components were shed that are necessary to support the shutdown path. Loads that are removed are not required. The station batteries are necessary to provide control of the switchyard. The loads removed from these batteries during the SBO event are not those required for access to offsite power at the end of the event. The loading information, including the load profiles, is in Attachments 2A and 2B for the vital batteries and station batteries, respectively.

   Operations has requested that additional loads remain energized for an SBO event that are powered by the vital batteries through the vital alternating-current (ac) power system. These loads include one train of reactor vessel level instrumentation and the interplant radio system. This additional equipment is not among the minimum set of components that are required to mitigate the SBO event. However, the Battery Capacity Calculation SQN-SBO-001 will be revised to account for the additional loading. Marked-up pages of the calculation have been included in Attachments 2A and 2B to reflect these additional loads.

It should be noted that Battery Calculation SQN-SBO-001 is not in its final form as indicated by the commitments contained in this submittal and therefore the entire battery calculation will not be submitted to NRC at this time. Portions of interest are being provided in the attachment. The existing calculations are, however, available for NRC review upon request.

2. NRC Recommendation:

"If the above cited modification is not made to the compressed air system, the licensee should perform a habitability assessment, including the lighting and communication equipment, for the areas in which operators need to be to operate the ARVs and the AFW flow control valves."

Response:

The operation of the turbine-driven, AFW pump level control valves has previously been evaluated as requiring a supplemental air supply in order to function during the 4-hour SBO event. A new design using fail open valves with on-off control, which do not use a continuous bleed controller, will be implemented. These valves will open at the initiation of the event and operate a limited number of times during the event. The flow to and level in the steam generators (SGs) are monitored from the main control room, and the flow magnitude is manually controlled by varying the turbine speed to control the SG level. The capability for controlling the AFW flow has been tested on the SQN simulator with acceptable results. With this modification to the valves and the procedure revision to the control strategy for the turbine, supplemental air to the level control valves will be reduced substantially from the original SBO proposal such that compressed-air bottles or additional accumulators will not be required for SBO. No local manual operator action will be required. Since the mitigation of the SBO event will be proceduralized, there will be no additional compensatory measures required.

Atmospheric-relief valve operation for SBO will not be required because SQN's design basis is hot standby for safe shutdown. Because the rule requires the plant to be capable of achieving and maintaining safe shutdown, hot standby was the objective. The strategy for the chosen SBO mitigation is based on the use of the safety-relief valves that lift automatically at preset pressures. The cooldown option using the atmospheric-relief valves will be available and controlled manually from a nonhostile environment if it is necessary to prevent damage to the reactor coolant pump (RCP) seals.

TVA has the capability to cool the reactor in the event of excessive leakage at the RCP seals. This capability is proceduralized in Emergency Contingency Instruction (ECA) 0.0. ECA 0.0 is a broader emergency procedure than that required for 10 CFR 50.63. This emergency procedure considers the failure of an RCP seal and the required cooldown that is needed to reduce the outflow of reactor coolant by reducing system pressure. The cooldown is performed by operating atmospheric-relief valves for SGs 1 and 4. Hand operators (with extension rods) for these valves are located in the 480-V shutdown board rooms near the main control room. Sound-powered telephones are available in these rooms for communication to the control room. In addition, hand-held flashlights are available to the operators as well as permanently installed emergency and Appendix R lighting for travel to and operation of these valves.

3. NRC Recommendation:

"The licensee should: 1) provide a detailed description of the computer code used to perform the heat-up analyses; and 2) ensure that it has considered areas which house SBO response equipment as areas of concern, including the switchgear room, cable spreading room, inverter room, etc."

Response:

The Martin Marietta Interactive Thermal Analysis System (MITAS), Version 2.0 (MITAS II), is an improved digital computer software system designed to solve the lumped parameter; e.g., resistor-capacitor thermal analogue network representations of the physical thermal systems using finite difference techniques.

The models developed to simulate the SBO conditions assume one-dimensional heat transfer through each heat flow path. Walls, floors, and ceilings were modeled as series of the diffusion nodes tied together by conductors. Diffusion nodes have the ability to store energy based on their thermal capacitance. These nodes are initialized to normal maximum temperatures before starting the event based on assigned boundary conditions and are allowed to change during the transient. Thus, realistic temperature gradients are formed through the walls, floors, and ceiling before and during the event. Room air is also modeled as a diffusion node and is tied (via surface conductors) to the walls, floor, and ceiling surface nodes. The SBO heat loads are applied directly to the room air node. The forward differencing subroutine is called on in the VARIABLES1 section of the program to compute the transient temperatures.

Equipment required to operate during an SBO has been evaluated and listed in Attachment 3 except as noted in the following paragraphs. Calculation SQN-SQS2-0077 was issued to determine temperature transients during a 4-hour SBO event for the main control room, 125-V battery and battery board rooms, 250-V battery and battery board rooms, penetration rooms, and pipe chases. The conclusion of this calculation was that the equipment in the areas considered was acceptable.

Additionally, the 480-V board rooms that contain the vital inverters should not be subjected to temperatures above 110 degrees Fahrenheit (F) during the 4-hour SBO event. This engineering judgement is based on the temperatures measured in the vital battery rooms during the performance of Special Test ST-7 for reactor coolant system natural circulation during initial plant start-up in which ac power was removed. The only ac power used during the special test was to supply the cooling associated with the RCP seals. The temperature in the battery rooms did not increase during the 2-hour test. The battery rooms are adjacent to the 480-V board rooms, and the doors on the battery rooms were opened frequently such that air was exchanged with the battery rooms. With ac power removed, there will not be any significant heat sources in the areas other than the vital inverters. The vital inverter procurement required them to be designed to operate continuously in the range of 32-122 degrees F. To confirm the engineering judgement, a transient heat balance calculation for the 480-V board rooms will be performed using a computer code with the results documented in Calculation SQN-SBO-001.

The cable spreading room, switchgear room, and turbine building do not contain active equipment required to mitigate the SBO event. Since no active SBO equipment is located in these areas, no analysis is required or neccussary. Even though the cable spreading and switchgear rooms have not been evaluated using a thermal transient analysis, Calculation TI-ECS-95, "10CFR50, Appendix R, Heating, Ventilating, and Air-Conditioning Review," was issued to evaluate the loss of heating, ventilating, and air conditioning (HVAC) for areas required for safe shutdown of the plant. The cable spreading and switchgear rooms are justified as not requiring ventilation for the 72-hour duration of an Appendix R event. A 4-hour SBO condition duration with reduced cable heat loading and only emergency lighting is bounded by the TI-ECS-95 analysis.

4. NRC Recommendation:

"In addition to the detailed description of the computer code discussed in Section 2.2.4 above, the licensee should provide the input parameters (i.e., initial room temperature, heat loads, etc.) for the staff to review. The licensee should also establish a procedure to ensure that the control room complex temperature during normal power operation will not exceed the assumed initial temperature used in the heat-up calculation."

Response:

Before the SBO, temperatures (including boundary temperatures) were assumed to be at their normal maximum value given on the applicable environmental data drawings. These temperatures are representative of the maximum normal operating conditions that would occur during the summer months. A steady-state MITAS run was made under these conditions to initialize walls, floor, and ceiling diffusion node temperatures before the start of the event.

At the start of the SBO, boundary temperatures were instantly increased to their design basis event (DBE) loss of coolant accident (LOCA) values (again obtained from the environmental data drawings) with the exception of the spreading room that was set to its abnormal maximum temperature. Use of the DBE LOCA temperatures is conservative since they are steady-state values that take many hours to attain. These temperatures consider full DBE LOCA heat loads resulting from the safety-related and non-safety-related equipment and cables, many of which will not be energized during an SBO.

Also, the DBE LOCA condition does not take credit for the operation of any non-safety-related HVAC. For the spreading room, a DBE LOCA temperature was not listed for this space on Environmental Data Drawing 47E235-25 as the room is not impacted by the DBE LOCA. As such, the abnormal maximum temperature has been chosen for the cable spreading room.

Periodic Instruction 0-PI-OPS-000-606.0 is an existing plant instruction that verifies ambient temperatures in critical spaces are within limits and records these temperatures once per shift. Historical data documented by these reports was used as the basis for establishing the maximum and minimum normal temperatures shown on the Environmental Data Drawings (47E235 series) that are used in the thermal transient analysis. This procedure contains limits for ambient temperatures and requires actions to notify appropriate organizations to ensure correction of out-of-limit conditions. Since this procedure exists, there is no need to establish a new program.

5. NRC Recommendation:

"In addition to the detailed description of the computer code discussed in Section 2.2.4 above, the licensee should provide the information (see Appendix A to SAIC TER) as requested by the staff's consultant."

Science Applications International Corporation (SAIC) Request:

"Provide information that supports the west valve vault temperature studies bounding an SBO event with the steam relief."

Response:

The following is a summary of the evaluation for this response:

1. Historical data recorded during an HVAC failure with maximum outdoor air temperatures while the plant was in Mode 1 operation listed a maximum temperature in the west main steam valve vault (MSVV) of 163 degrees F.

2. TVA has evaluated the SBO heat load in the west MSVV against the Mode 1 normal heat load and concluded that the SBO load is lower. Therefore, the maximum temperature in an SBO event would be less than 163 degrees F.

3. Extensive environmental response analyses considering main steam line and main feedwater line break temperature profiles in the west MSVV are the basis for equipment qualification of 10 CFR 50.49 components necessary for safe shutdown.

4. No operator entry into the west MSVV will be required during an SBO.

The west MSVV temperature exceeds 120 degrees F and contains components required to mitigate an SBO event. This area is considered by TVA to be a dominant area of concern and is acceptable based on the evaluation contained in SQN-SBO-001 and the discussion above.

The following provides additional details of this evaluation:

An SBO event is initiated by a loss of offsite power to the nuclear station with the unit operating at 100 percent power. Regulations and guidelines require event mitigation such that the core damage frequency, associated with an SBO event, is reduced to approximately 10^{-5} per year for the average site. Part of the event mitigation is to ensure that the components located inside the building areas will remain qualified to perform their mitigative functions given the event conditions inside the containing building.

In order to ensure that the event mitigation equipment located within the west MSVV can withstand the environmental effects of an SBO, TVA proposes to utilize the plant-specific experience and the test data. Comparison to the test data is allowable to provide reasonable assurance of the operability of equipment in accordance with the Nuclear Management and Resources Council (NUMARC) guidelines (Appendix F, Section F.7).

In 1988, the temperature in the west MSVV was monitored with the unit in Mode 1. During the monitoring period, the non-safety-related ventilation system failed causing temperatures in the valve vault to rise to 163 degrees F in localized areas. This occurred with an outside ambient temperature of 97 degrees F. TVA then performed an assessment and determined that 10 CFR 50.49 equipment remained operable. Since the test was performed with the unit in Mode 1, the heat sources in the room bound those for the SBO event. Hence, the temperature rise in the west MSVV because of the SBO event will remain below 163 degrees F. The following discussions will demonstrate this position.

The primary heat sources in the west MSVV during Mode 1 operation are the main steam and main feedwater piping. About 2,450 square feet (ft^2) of heat transfer surface area is included in these two piping systems within the west MSVV (main steam, 2,000 ft^2; main feedwater, 450 ft^2). Although insulated, the heat loss to the region through the insulation is substantial. When ventilation terminates, the air becomes stagnant and heat becomes entrapped in the room. Hence, the temperature rises upon failure of the ventilation system. Upon occurrence of an SBO, these two heat sources are reduced because of valve actions but are partially offset by the addition of other heat sources.

The AFW system is activated following reactor trip and subsequently generates two other sources of heat input to the west MSVV. The turbine-driven AFW supply piping and the turbine-driven AFW pump steam-exhaust vent line are also routed through the MSVV. The turbine-driven AFW exhaust vent stack includes about 175 ft^2 of noninsulated piping exposed to the MSVV environment, and the AFW supply contributes approximately 100 ft^2 of noninsulated exposed surface area. However, since the main steam isolation valves will isolate, the amount of exposed main steam piping will be reduced to approximately 1,500 ft^2 during the SBO. Note that the steam supply line of the turbine-driven AFW pump is normally charged with steam. This heat source exists during Mode 1 operation and is included with the main steam piping area.

The exhaust piping of the turbine-driven AFW pump does not provide a large heat source to the west MSVV. After passing through the AFW pump turbine, the steam temperature is reduced to 228 degrees F. This is the maximum temperature that the exhaust piping can reach. Although noninsulated, the amount of exposed surface area is relatively small and heat input to the environment is limited. The temperature difference between the piping surface and MSVV ambient conditions will be small and result in a low heat flux into the room. Any additional heat supplied by the AFW turbine exhaust piping will be offset by the AFW supply piping. The supply source for the AFW (condensate storage tank) is not expected to exceed temperatures of approximately 100 degrees F. As air temperature rises above 100 degrees F, more heat will be absorbed by the AFW supply piping.

Following reactor trip, the steam system pressure rises. The power-operated relief valves or the main steam safety valves (MSSVs) are required to dissipate the sensible heat of the primary coolant and the residual heat generated by the core. The power-operated relief valves are assumed inoperable and the steam relief path is through the MSSV via vent stacks. Only one of the five steam-safety valves per SG is required to maintain adequate heat removal; therefore, two vent stacks will experience exposure to steam temperatures (one stack each for Loops 1 and 4) in the west MSVV. Approximately 475 ft^2 of noninsulated surface area is exposed to the ambient atmosphere in the valve vault.

TVA calculations have found that because of throttling processes, the steam temperature will drop to about 380 degrees F after passing through the MSSV. This is the maximum temperature that the vent stack will reach. Although noninsulated, the energy input will not cause a significant air temperature rise in the 4-hour SBO event duration. The relatively large volume of air in the valve vault will require a much higher heat input to cause a significant rise in temperature. Also to be considered is the fact that during the SBO, the main steam isolation valve will close and isolate approximately 500 ft^2 of steam piping from steam flow. This piping, along with the main feedwater piping (also isolated during the event), will begin to cool and contribute less and less heat to the valve vault environment. This decrease in heat load, along with that of other equipment deenergized by the SBO event, will adequately compensate for the MSSV vent stacks.

TVA has conducted extensive environmental response analyses on the west MSVV, considering high energy line breaks. The maximum temperature expected in this room for a main steam line break, considering the effects of superheated steam, exceeds 425 degrees F for a short duration. The west MSVV temperature profile for a feedwater line break rises quickly to 300 degrees F and slowly decreases to about 190 degrees F in four hours. Present equipment qualification studies have demonstrated the ability of 10 CFR 50.49 components inside the west MSVV to withstand these conditions. Therefore, sufficient margin is available to ensure that 10 CFR 50.49 components in the west MSVV can also withstand the environmental conditions generated by an SBO. Calculation SQN-SBO-001 will be revised to document the preceding engineering evaluation. It should be noted that operator entry into this area will not be required following the change to the turbine-driven AFW valves.

6. NRC Recommendation:

"The licensee should include a full description, including the nature and objectives, of any required modifications in the documentation supporting the SBO submittals that is to be maintained."

Response:

The only modifications required are the AFW valve changes previously described. This modification for Unit 2 is planned to be completed by restart following the Cycle 6 refueling outage. This is consistent with the 2-year commitments made in the original SBO submittal dated April 18, 1989. The Unit 1 Cycle 6 refueling outage is scheduled to begin in less than 10 months of the anticipated acceptance of TVA's SBO response by NRC. This would not be sufficient time for the procurement and design of the new control system. Therefore, for Unit 1, TVA commits to completing this modification by start-up following the Cycle 7 refueling outage scheduled for October 1994. This commitment might exceed two years from NRC's approval of SQN's SBO proposal.

The SBO supporting documentation for these modifications and the SBO strategy are maintained in a similar manner to other commitments, statements, procedures, and descriptions. This documentation includes, but is not limited to, engineering calculations, design change packages, training rosters, and 10 CFR 50.59 evaluations.

7. NRC Recommendation:

"The licensee needs to list equipment that will be used to provide information and/or to support plant coping during an SBO and should verify that SBO equipment is covered by an appropriate quality assurance (QA) program consistent with the guidance of RG 1.155, Appendix A. Furthermore, this verification should be documented as part of the package supporting the SBO Rule Response."

Response:

The SBO equipment that is safety related is already required to be in a QA operability program. The [illegible]s-1E distribution required to provide offsite power to the safety-related busses is required to be operable in accordance with Technical Specification (TS) 3.8.1.1. The 250-V station battery is inspected periodically and is scheduled for capacity testing every five years. The condensate storage tank has a TS requirement that the inventory of condensate be maintained above 190,000 gallons. The other SBO mitigation equipment is safety related. For the above reasons, the equipment required for coping with SBO are reasonably assured operability should the event occur. SBO-required equipment is contained in Attachment 3.

TVA will establish an augmented QA program to be applied to components required for coping with the SBO event that will be consistent with the guidance of Regulatory Guide (RG) 1.155, Appendix A.

8. NRC Recommendation:

"The licensee should provide confirmation and include the documentation supporting the SBO submittals that a program meeting as a minimum the guidance of RG 1.155, Position 1.2, is in place or will be implemented."

Response:

The present reliability program for the emergency diesel generator unit (EDGU) does no[illegible]et the requirements of RG 1.155; however, these procedures wil[illegible] revised to incorporate requirements from RG 1.155 as to the E[illegible] target reliability and maintenance programs necessary to maintain [illegible]is reliability. The present reliability for the EDGUs as of March 13, 1992, is 99 percent for the average of all four emergency onsite supplies. This is an improvement from those values committed to for SBO. The data for the last 20, 50, and 100 diesel starts is:

EDGU	Twenty	Fifty	One Hundred
1A	20	50	99
2A	19	49	99
1B	20	50	99
2B	20	50	99

Data from 0-SI-OPS-082-007M

This table lists the successful start and load-run attempts. The number of failures is the difference between the column heading and the number listed in the column for a particular diesel generator (DG).

Review of SAIC's technical evaluation report (TER) identified three additional concerns not described in the safety evaluation. The concerns are addrrssed below:

9. SAIC Concern 1:

"The licensee needs to ensure that it has considered field flashing at the end of the four-hour SBO event when determining the adequacy of the DG battery capacity."

Response:

The EDGU batteries do not have capacity to supply control power to the diesels for the entire duration of an SBO event. Since the failed diesel is, by definition, a contributing cause of the SBO event, it is are not considered required for coping. At the onset of an SBO, the operators will send a team to the DG building to troubleshoot and attempt to repair the failed EDGUs. The DG starting air system will perform a starting sequence and then lock out. This first start sequence depletes the normal supply of starting air; and, until the trouble is found and corrected, the second starting air supply is not connected. It would be up to the team that is sent to make the repairs to turn off the battery if deemed necessary. In any event, only one more start sequence remains in the back-up starting air supply.

If the engine is capable of being started, the voltage on the generator will build up without field flash. This occurs because of residual magnetism in the field (rotor) iron. Since the delay of a few seconds is not critical at the end of the 4-hour event, flashing the field is not required.

The control power to the 6.9-kilovolt shutdown boards will be available at the time of the event to connect the emergency ac should it become available.

The DG batteries were discussed in the supplemental response to NRC dated April 5, 1990, in which it was stated that the battery did not have the capacity to cope the 4-hour duration of an SBO event.

10. SAIC Concern 2:

"We did not receive any information on whether the licensee used any exclusion criteria in addition to those given in RG 1.155. . . . One value which cannot be excluded . . . requires manual action if it needs to be closed during an SBO event."

Response:

The exclusion criteria of NUMARC 87-00, as endorsed by RG 1.155, were used for containment isolation valves. After reviewing the TER discussion on the CVCS containment isolation valve (not identified), it is believed that the discussion applies to Valve 62-63 on Penetration X-44. This valve is identified in TVA Calculation SQN-SQS2-0078, Revision 0, as a valve that requires manual action for an SBO event. The other CVCS isolation valves are also reviewed in this calculation.

11. SAIC Concern 3:

"The licensee needs to include the manual closure of this valve in an appropriate procedure and ensure that the valve is accessible."

Response:

SQN Nuclear Engineering performed an analysis of the mechanical containment isolation system to determine the capability to isolate containment within the guidelines of NUMARC 87-00 during an SBO event. Mechanical penetrations were reviewed. Out of this analysis, six valves were identified that would require manual operation per NUMARC 87-00, Steps 2 and 3, in the event that containment isolation is needed during an SBO event. These six valves are located in "habitable areas" and would therefore be accessible for manual closure if containment isolation were required during an SBO event. Plant operating procedures will be revised as committed to in TVA's letter to NRC dated April 18, 1989, to incorporate necessary operator actions to accomplish closure and/or verification of closure of these valves in the event that containment isolation is required during an SBO event.

ENCLOSURE 2

List of Commitments

1. Calculation SQN-SBO-001 will be revised to include additional station blackout (SBO) equipment, to address heat-up of the areas where the vital inverters are located, to include the west main steam valve vault discussions, to update the emergency diesel generator reliability assessment, and t[illegible]ain additional loads for SBO events by December 15, 1992.

2. TVA will install new fail-open level control valves on the turbine-driven auxiliary feedwater pump with on-off control and sufficient air supply for 4-hour remote operation during an SBO event and implement required SBO procedures by restart from the Cycle 7 refueling outage for Unit 1.

3. TVA will install new fail-open level control valves on the turbine-driven auxiliary feedwater pump with on-off control and sufficient air supply for 4-hour remote operation during an SBO event and implement required SBO procedures by restart from the Cycle 6 refueling outage for Unit 2.

   Note: Commitments 2 and 3 above supersede SQN's Commitments Nos. 2 and 5 in TVA's letter to NRC dated April 18, 1989.

4. TVA will institute a quality assurance program for SBO components that is governed by site procedures and meets the requirements of Regulatory Guide (RG) 1.155, Appendix A, within one year after the issuance of a safety evaluation report (SER) by NRC on Sequoyah's SBO.

5. TVA will revise the procedures for the emergency diesel generator reliability program to incorporate requirements from RG 1.155, Position 1.2, within one year after the issuance of an SER by NRC on Sequoyah's SBO.

ATTACHMENT 1

LIST OF LOADS THAT ARE REMOVED DURING STATION BLACKOUT

Lists are excerpted from Electrical calculations SQN-CPS-031 and SQN-SBO-001.

ATTACHMENT 1
LIST OF LOADS REMOVED DURING SBO
DC BUSSES

The following is a list of loads that must be removed from the 125 V Vital Battery Board I within 30 minutes, in order to meet SBO requirements. Other Battery Board removed loads are similar.

Breaker	Load Description
204	6.9 KV Shutdown Bd 1A-A Backup Bus Alternate Feeder
205	480 V Shutdown Bd 1A1-A Backup Bus Alternate Feeder
206	480 V Shutdown Bd 1A2-A Backup Bus Alternate Feeder
207	480 V Auxiliary Building Common Board Normal Feeder
214	Rod Drive Power Switchgear Bkr 1A 1-L-115A
215	Gas Waste Disposal Panel 0-L-2C
222	Gas Analyzer 0-L-206
223	Unit 1 Remote RCP Oil Level
224	Boric Acid Evaporator Package A 0-L-1A
301	6.9 KV Shutdown Bd 2A-A Normal Bus Alternate Feeder
302	480 V Shutdown Bd 2A1-A Normal Bus Alternate Feeder
303	480 V Shutdown Bd 2A2-A Normal Bus Alternate Feeder
304	6.9 KV Shutdown Bd 2A1-A Backup Bus Normal Feeder
305	480 V Shutdown Bd 2A1-A Backup Bus Normal Feeder
306	480 V Shutdown Bd 2A2-A Backup Bus Normal Feeder
313	Auxiliary Relay Rack 1-R-54
315	Generator Auxiliaries Panel Annunciator 1-L-39
319	Unit 1 Reactor Trip SWGR Bypass Breaker BYA
320	Unit 1 Reactor Trip SWGR Trip Bkr RTA
328	Unit 1 Annunciator Panel 1-L-236

ATTACHMENT 1
LIST OF LOADS REMOVED DURING SBO
DC BUSSES

The following is a list of loads that must be removed from the 250 V Station Battery System in order to meet SBO requirements.

Breaker	Load Description	Time Limit
401	TSC Inverter	Turned off at 30 minutes into SBO event.
404	Main Turbine Emergency Bearing Oil Pump	Turned off at 210 minutes into SBO event.
525	Generator DC Seal Oil Pump	Turned off at 30 minutes into SBO event.
527	MFPT Emergency Bearing Oil Pump 1A	Turned off at 30 minutes into SBO event.
528	Computer Inverter 1	Turned off at 30 minutes into SBO event.
529	Preferred Inverter 1	Turned off at 30 minutes into SBO event.
530	MFPT Emergency Bearing Oil Pump 1B	Turned off at 30 minutes into SBO event.

ATTACHMENT 1
LIST OF LOADS REMOVED DURING SBO
VITAL AC POWER SYSTEM

BKR NO	VITAL INVERTER 1-I Load Description	SAFETY RELATED
7	ERCW & CNTMT RAD MON 1-RE-90-106, -133	YES
12	RAD RATE METERS, PNL 0-M-12	YES
13	RAD MON. 0-RE-90-125	YES
17	PAS SOLENOID VALVES, 1-L-572/C	YES
19	TOILET, LOCKER, & SPREAD RM ISOL DMPRS	YES
20	BOP PROCESS INST CONT RACK	YES
22	AB STM ISOL VALVE FCV-12-82, PNL 1-M-9	YES
23	CONT PURGE AIR EXH. RAD MON, 1-RE-90-130	YES
30	AUX DRYER TRAIN A	YES
32	BORIC ACID TANK A HTR A-A CONT, 1-L-303	YES
33	AB GAS TRTMNT FAN A-A MOD DMPR, 0-L-429	YES
34	BORIC ACID TANK C HTR A-A CONT, 0-L-306	YES
35	RAD MON 0-RE-90-205	YES
36	RCP 1 UV & UF RELAYS	YES
37	PROCESS CONT GRP 1, PNL 1-R-14	NO
38	INST BUS I, PNL 0-M-27B	NO
39	PLUGMOLD INST BUS 1, PNL 1-M-5	NO
40	PLUGMOLD INST BUS 1, PNL 1-M-6	NO
41	INST BUS 1 & PIC-1-6A, -31A, 1-M-4	NO
42	FIRE PMP 2A-A SEP RELAYS	NO
43	AB GEN EXH FAN 1A FLOW CONT, 0-L-426	NO
46	PR-30-310	YES
	VITAL INVERTER 1-II	
7	ERCW/CNTMNT RAD MON 0-RE-90-134,1-RE-90-112	YES
10	RB ISOL VLVE FCV-32-102A, -102B, JB2674	YES
11	AUX COMP B AUX BLDG ISOL VLV, FCV-32-85	YES
12	RAD RATE METERS, 0-M-12	YES
13	RAD MON 0-RE-90-126	YES
17	PAS SOL VLVS, 1-M-10	YES
19	TOILET, LOCKER, SPRD RM ISOL DMPR, 1-R-78	YES
20	BOP PROC INST CONT RACK, 1-R-131	YES
22	AUX BLR STM ISOL VLV FCV-12-79, 1-M-9	YES
23	CONT PRGE AIR EXH MON, 1-RE-90-131	YES
26	AUX RELAY RACK SEP AND AUX RELAYS, 1-R-78	YES
30	AUX DRYER TRAIN B	YES
32	BORIC ACID TNK A HTR B-B CONT, 1-L-304	YES
33	AUX BLDG GAS TRTMNT FAN B-B MOD DMPR 0-L-428	YES
34	BORIC ACID TANK C HTR B-B CONT, 0-L-305	YES
35	RAD MON 0-RE-90-206	YES
36	RCP 2 UV & UF RELAYS	YES
37	PROCESS CONT GROUP 2, 1-R-17	NO
38	INST BUS 2, 0-M-27B	NO
39	PLUGMOLD INST BUS 2, 1-M-3	NO
40	PLUGMOLD INST BUS 2, 1-M-6	NO
41	ACOUSTIC FLOW MON, 0-M-27A	NO
42	FIRE PUMP 2B-B SEP RELAYS, JB3718	NO
43	AUX GEN EXH FAN 1B FLOW CONT, 0-L-427	NO

ATTACHMENT 1
LIST OF LOADS REMOVED DURING SBO
VITAL AC POWER SYSTEM

BKR NO	VITAL INVERTER 1-III Load Description	SAFETY RELATED
7	RCP 3 UV & UF RELAYS	YES
14	INST BUS AND XFMR PWR, 1-M-3	NO
15	AUX CONT PNL A INST BUS, 1-L-11A	NO
16	PROCESS CONT GRP 3, 1-R-20	NO
17	BOP PROC.INST CONT RACK, 1-R-126	NO
18	CONTROL ROOM DOORS SECURITY LOCK	NO
19	EGTS FILTER TRAIN A, 0-L-25	NO
22	AUX BLDG INST A BUS 1, 1-L-57	NO
23	AUX RELAY RACK A BUS, 1-R-76	NO
24	AUX RELAY RACK C BUS, 1-R-76	NO
25	NSSS AUX RELAY RACK A BUS, 1-R-58	NO
26	AUX CONT PANEL A BUS, 1-L-10	NO
27	AUX RELAY RACK A BUS, 1-R-75	NO
28	SSPS CONT RM DEMUX, 1-M-22	NO
29	AUX CONT PNL C RLY BUS, 1-L-10	NO
30	AUX CONT PNL A INST BUS, 1-L-10	NO
31	CONT AIR HDR A MOIST ALM, JB281	NO
32	AUX RELAY RACK A BUS, 1-R-52	NO
34	POST ACC MON PNL, 1-M-5	NO
	VITAL INVERTER 1-IV	
7	RCP 4 UV & UF RELAYS	YES
14	INST BUS 4, 1-M-4	NO
15	AUX CONT PNL B INST BUS, 1-L-11B	NO
16	PROCESS CONT GRP 4, 1-R-22	NO
17	BOP PROCESS INST CONT RACK, 1-R-122	NO
19	AUX BLDG INST BD BUS 2, 0-L-23	NO
20	BOP PROCESS INST CONT RACK, 1-R-130	NO
21	BACKUP CONTROL INST LOOPS	NO
22	AUX BLDG INST BD BUS 1, 0-L-283	NO
23	AUX RELAY RACK B BUS, 1-R-76	NO
24	NSSS AUX RELAY RACK C BUS, 1-R-58	NO
25	NSSS AUX RELAY RACK B BUS, 1-R-58	NO
26	AUX RELAY RACK B BUS, 1-R-75	NO
27	AUX RELAY RACK C BUS, 1-R-75	NO
28	AUX CONT PNL B RELAY BUS, 1-L-10	NO
29	AUX CONT PNL B INST BUS, 1-L-10	NO
31	CONT AIR HDR B MOIST ALARM, JB281	NO
32	AUX RLY RCK B BUS, 1-R-72	NO
33	AUX RLY RCK C BUS, 1-R-72	NO
34	POST ACC MON 2, 1-M-4	NO
36	LOCA H2 CNTMNT FLOW MON, 1-M-10	NO
39	FEED TO BKR 37, 38	NO

ATTACHMENT 1
LIST OF LOADS REMOVED DURING SBO
VITAL AC POWER SYSTEM

BKR NO	VITAL INVERTER 2-I Load Description	SAFETY RELATED
14	INST BUS 1 & PIC-1-6A, -31A	NO
15	PLUGMOLD INST BUS 1 PNL, 2-M-5	NO
16	PLUGMOLD INST BUS 1 PNL, 2-M-6	NO
17	PROCESS CONT GROUP PNL, 2-R-14	NO
18	BOP PROC. INST CONT RACK, 2-R-126	NO
19	AUX CONT PNL A INST BUS, 2-L-11A	NO
20	BOP PROC CONT INST RACK, 2-R-128	NO
22	AUX BLDG INST A BUS, 2-L-57	NO
23	AUX RELAY RACK A BUS, 2-R-76	NO
24	AUX RELAY RACK C BUS, 2-R-76	NO
25	NSSS AUX RELAY RACK A BUS, 2-R-58	NO
26	AUX CONT PNL A RELAY BUS, 2-L-10	NO
27	AUX RELAY RACK A BUS, 2-R-75	NO
28	SSPS CONT RM DEMUX, 2-M-22	NO
29	AUX CONT PNL A INST BUS, 2-L-10	NO
32	AUX RELAY RACK A BUS, 2-R-32	NO
34	POST ACCIDENT MON 1, 2-M-5	NO
36	LOCA H2 CNTMT FLOW MON, 2-M-10	NO
	VITAL INVERTER 2-II	
7	RCP 2 UV & UF RELAYS	YES
14	PROCESS CONT GROUP 2, 2-R-17	NO
15	PLUGMOLD INST BUS 2, 2-M-3	NO
16	AUX CONT PNL B INST BUS, 2-L-11B	NO
17	PLUGMOLD INST BUS 2, 2-M-6	NO
18	BOP PROCESS INST CONT RACK, 2-R-122	NO
20	BOP PROCESS INST CONT RACK, 2-R-130	NO
22	AUX BLDG INST B BUS 1, 2-L-299	NO
23	AUX RELAY RACK B BUS, 2-R-76	NO
24	NSSS AUX RELAY RACK C BUS, 2-R-58	NO
25	NSSS AUX RELAY RACK B BUS, 1-R-58	NO
26	AUX RELAY RACK B BUS, 2-R-75	NO
27	AUX RELAY RACK C BUS, 2-R-7	NO
28	AUX CONT PNL B RELAY BUS, 2-L-10	NO
30	AUX CONT PNL B INST BUS, 2-L-10	NO
32	AUX RELAY RACK B BUS, 2-R-72	NO
33	AUX RELAY RACK C BUS, 2-R-72	NO
34	POST ACCIDENT MON, 2-M-4	NO
36	LOCA H2 CNTMT FLOW MON, 2-M-10	NO
48	NIS INSTRUMENT POWER	NO

ATTACHMENT 1
LIST OF LOADS REMOVED DURING SBO
VITAL AC POWER SUSTEM

BKR NO	VITAL INVERTER 2-III Load Description	SAFETY RELATED
7	CONT RAD MON 2-RE-90-106	YES
10	REACTOR BLDG ISOL VALVE, FCV-32-81A,-81B	YES
12	RADIATION RATE METERS & 2-RI-90-106, 0-M-12	YES
13	RCP 3 UV & UF RELAYS	YES
17	PAS SOLENOID VLVS, 2-M-10	YES
20	BOP PROCESS INSTR CONT RACK, 2-R-128	YES
23	CONT PURGE AIR EXHAUST RAD MON	YES
32	BORIC ACID TNK B HTR A-A CONT, 2-L-303	YES
37	PROCESS CONT GRP 3, 2-R-20	NO
46	MAIN STEAM RADIATION MON. (2-RX-90-424)	NO
48	PWR RANGE PEN RECORDER, 2-M-13	NO
	VITAL INVERTER 2-IV	
7	CONTAINMENT RAD MON 2-RE-90-112	YES
8	CONTAINMENT ANNULUS DP, 0-M-27B	YES
10	RB ISOL VLV, FCV-32-103A,-103B,-111A,-111B	YES
12	RAD RATE MTRS & 2-RI-90-112, 0-M-12	YES
13	RCP 4 UV & UF RELAYS	YES
17	PAS SOL VLVS 2-M-10, 2-L-572/D	YES
20	BOP PROCESS INST CONT RACK, 2-R-131	YES
32	BORIC ACID TNK B HEATER B-B CONT, 2-L-304	YES
37	PROCESS CONT GRP 4, 2-R-22	NO

ATTACHMENT 2A

125 VOLT VITAL BATTERY LOADING PROFILE

Excerpted from Electrical Calculation SQN-SBO-001.

APPENDIX A
VITAL BATTERY EVALUATION

Prepared by: [signature] 3/28/89
Reviewed by: [signature] 3/29/89

LOAD DUTY CYCLE FOR VITAL BATTERY I

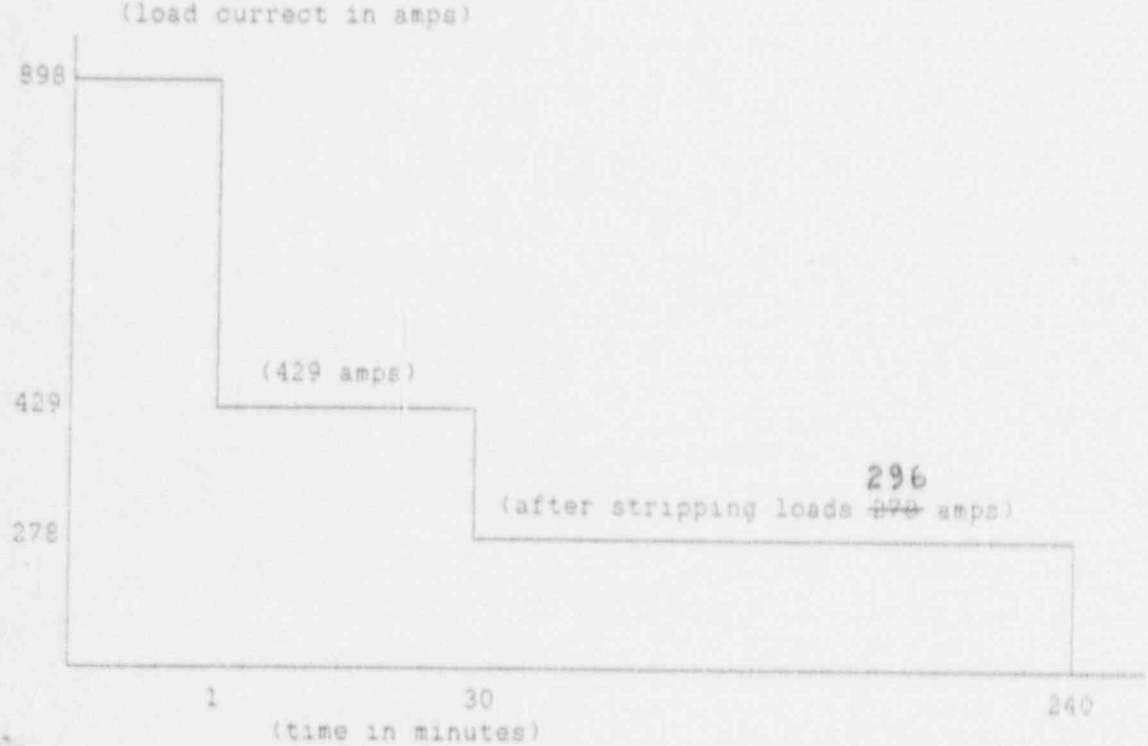


FIGURE 1

The load tabulations result in the following loads and times for Vital Battery I. These load values will be used to verify that the Vital Batteries can meet the four hour duty requirement imposed by the plant/power system SBO evaluation. The duty cycle curve is then constructed from the load data.

From: t= 0 seconds to 5 seconds-	897.53 amps	Per IEEE 485, The load current is assumed to be 898 amps for first min.
t= 5 seconds to 1 minute -	649.23 amps	
t= 1 minute to 30 minutes-	428.91 amps	
t= 30 minutes to 4-hours-	~~278.14~~ 296 amps	

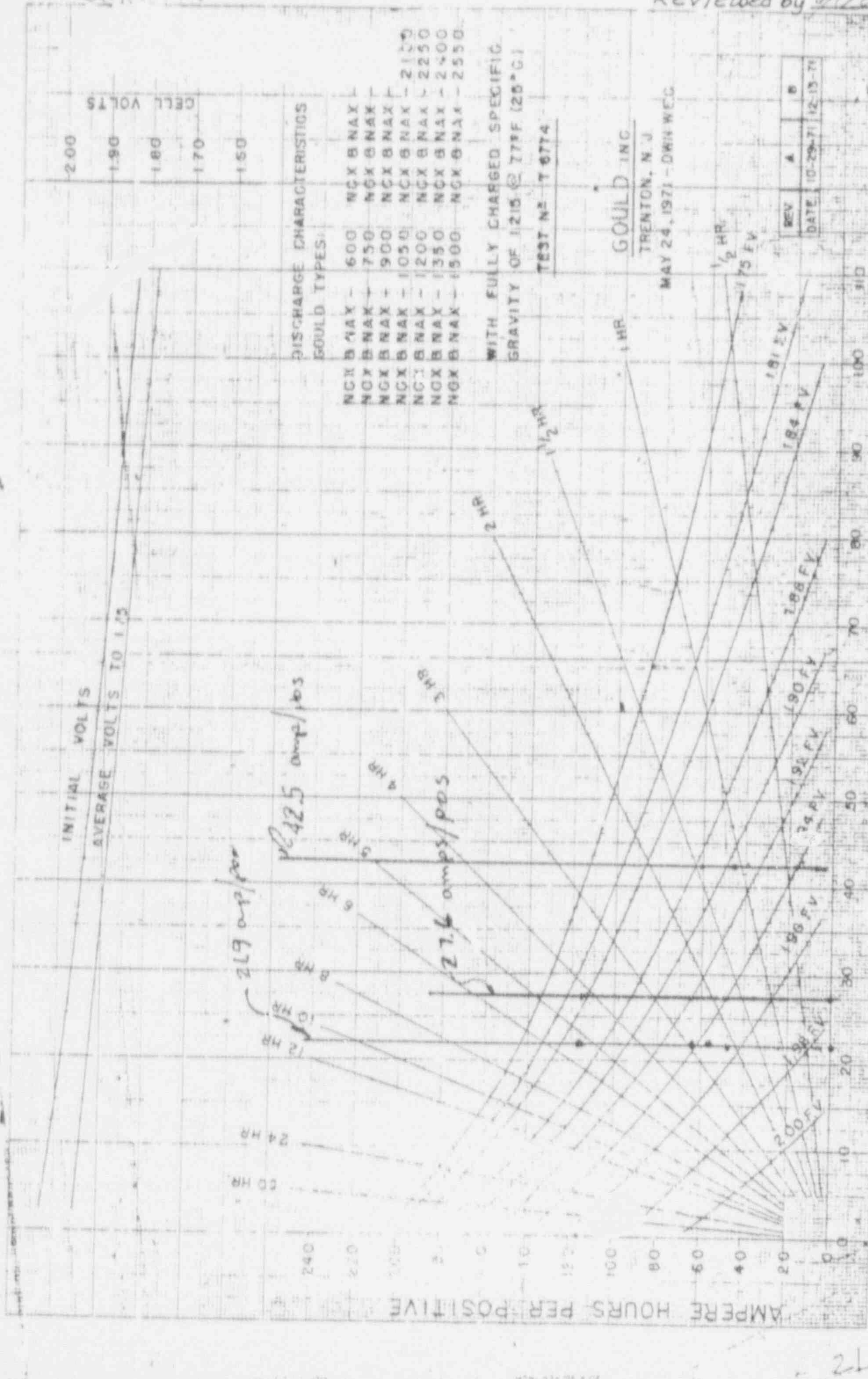
8.0 SUMMARY OF RESULTS

The vital battery system, with load stripping, has the capacity to supply the required loads for the required duty cycle with approximately 10 per cent excess capacity. The voltage at the battery terminals at the end of the SBO 4-hour discharge is 110.1 volts and the minimum voltage required for operability is 105.0 volts.

FIGURE 3

Prepared by

Reviewed by



TC-107011

29 103

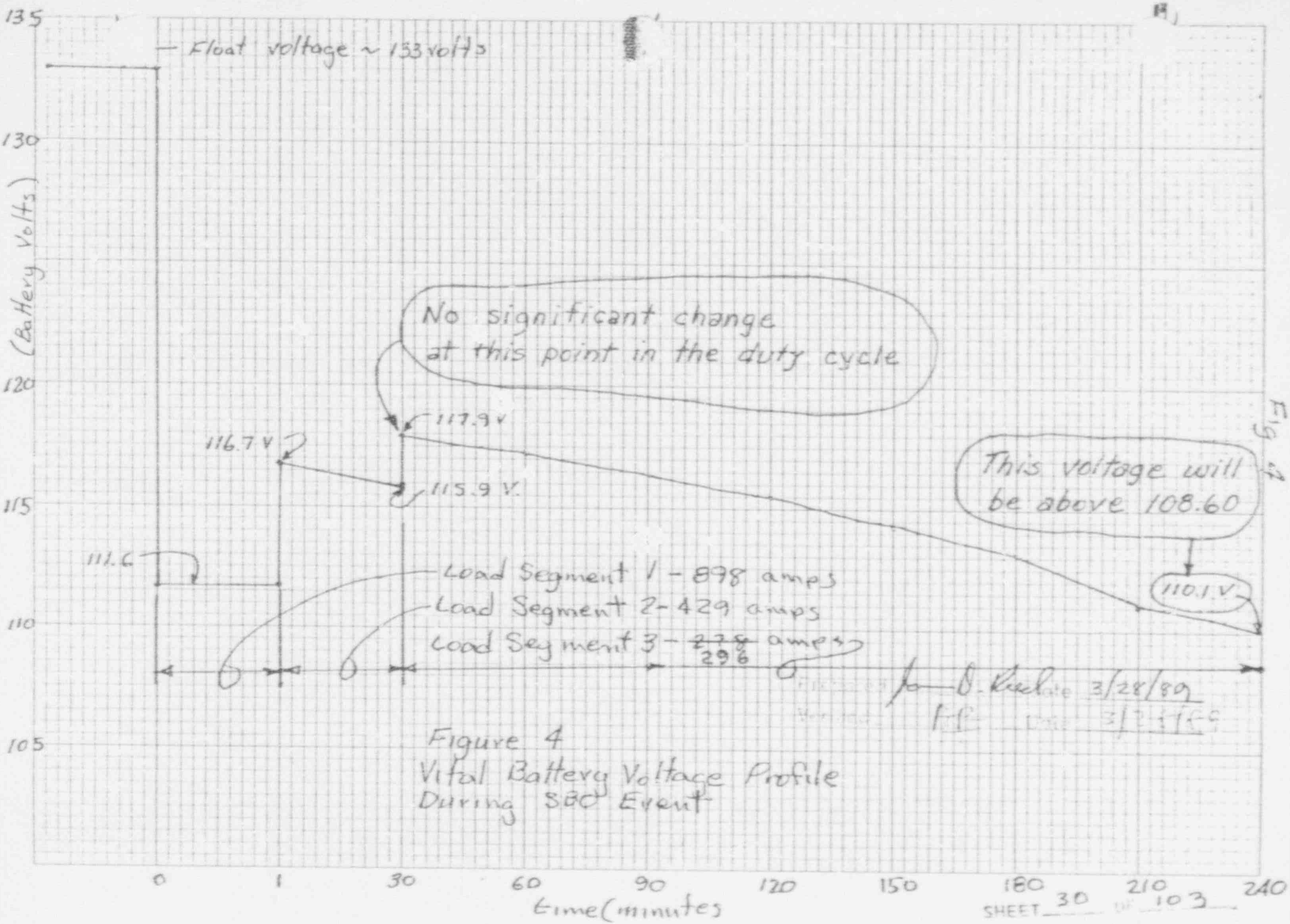


Figure 4
Vital Battery Voltage Profile
During SBO Event

3/28/89

SHEET 30 OF 103

APPENDIX A
FIGURE ~~2~~ 25 JPR 3/28/89

Prepared by: [signature] 3/28/89
Reviewed by: [signature] 3/28/89

CELL SIZING WORKSHEET - IEEE 485

CELL TYPE NCX-2100 MINIMUM CELL VOLTAGE 1.75 MIN TEMPERATURE 60 F

Load (Ampere)	Change in Load	Time in Minutes	Time to end (Minutes)	Amps/pos	Sub * Total	Total *
SECTION 1						
A1= 898	A1= 898	M1= 1	T=M1= 1	160	5.61	
SECTION 2						5.61
A1= 898	A1= 898	M1= 1	T=M1+M2= 30	102.1	8.79	
A2= 429	A2-A1= -469	M2= 29	T=M2= 29	103.5	-4.53	
SECTION 3						4.26
A1= 898	A1= 898	M1= 1	T=M1+M2+M3= 240	31.8	28.24	
A2= 429	A2-A1= -469	M2= 29	T=M2+M3= 239	31.9	-14.70	
A3= ~~278~~ 296	A3-A2= ~~-151~~ -133	M3= 210	T=M3= 210	35.0	~~-4.31~~ -3.80	
SECTION 4						~~9.23~~ 9.74
	A1=	M1=	T=M1+..+M4=			
A2=	A2-A1=	M2=	T=M2+M3+M4=			
A3=	A3-A2=	M3=	T=M3+M4=			
A4=	A4-A3=	M4=	T=M4			
SECTION 5						
A1=	A1=	M1=	T=M1+..+M5=			
A2=	A2-A1=	M2=	T=M2+..+M4=			
A3=	A3-A2=	M3=	T=M3+M4+M5=			
A4=	A4-A3=	M4=	T=M4+M5			
A5=	A5-A4=	M5=	T=M5			

* = Positive Plates

TEMPERATURE CORRECTION FACTOR= 1.11 AGING FACTOR = 1.25 NUMBER OF PLATES AVAILABLE= 14

HIGHEST PLATES REQUIRED X 1.11 X 1.25 = ~~12.81~~ 13.51 PLATES

TABLE 1 APPENDIX A

CIRCUIT NAME	CKT BKR	0.00 TO 0.05 Secs	0.05 TO 1.00 mins	1.00 TO 30 Mins	30.00 TO 240 Mins	LOAD SHED
6.9 KV SDBD 1A1-A	201	0.00	78.16	0.00	0.00	NO
NBNF		3.17	3.17	3.17	3.17	NO
		0.00	1.19	1.19	1.19	NO
		1.50	0.00	0.00	0.00	NO
480V SDBD 1A1-A	202	0.94	0.94	0.94	0.94	NO
NBNF		0.00	6.00	0.00	0.00	NO
480V SDBD 1A2-A	203	0.00	10.00	0.00	0.00	NO
NBNF		1.14	1.14	1.14	1.14	NO
6.9 KV SDBD 1A-A	204	1.96	0.00	0.00	0.00	YES
BBAF		1.60	1.60	1.60	0.00	YES
		0.00	0.64	0.64	0.00	YES
480 V SDBD 1A1-A	205	0.00	2.00	0.00	0.00	YES
BBAF		0.54	0.54	0.54	0.00	YES
480V SDBD 1A2-A	206	0.00	2.00	0.00	0.00	YES
BBAF		0 54	0.54	0.54	0.00	YES
480 V AUX BLDG	207	0.00	4.00	0.00	0.00	YES
COMMON BOARD		10.00	0.00	0.00	0.00	YES
		1.61	1.61	1.61	0.00	YES
FUSE ASSEMBLY- COL A	210	11.19	11.19	11.19	11.19	NO
FUSE ASSEMBLY- COL B	211	4.48	4.48	4.48	4.48	NO
FUSE ASSEMBLY- COL C	212	6.41	6.41	6.41	6.41	NO
FUSE ASSEMBLY- COL D	213	8.51	8.51	8.51	8.51	NO
ROD DRIVE PWR SWGR	214	0.04	0.04	0.04	0.00	YES
GAS PANEL 0-L-2	215	0.95	0.95	0.95	0.00	YES
RESPONSE TIME TSTING	221	0.00	0.00	0.00	0.00	NO
GAS ANALYZER 0-L-206	222	0.00	0.00	0.00	0.00	YES
U1 RCP REM OIL LEVEL	223	2.24	2.24	2.24	0.00	YES
6.9 KV SDBD 2A-A	301	0.00	78.16	0.00	0.00	YES
NBAF		1.56	0.00	0.00	0.00	YES
		3.21	3.21	3.21	0.00	YES
		0.00	1.14	1.14	0.00	YES
480 V SDBD 2A1-A	302	0.00	6.00	0.00	0.00	YES
NBAF		0.96	0.86	0.86	0.00	YES
480 V SDBD 2A2-A	303	1.18	1.18	1.18	0.00	YES
NBAF		0.00	8.00	0.00	0.00	YES

TABLE 1 APPENDIX A

Prepared Jon D. Reed Date 3/28/89
[illegible] Date [illegible]

CIRCUIT NAME	CKT BKR	0.00 TO 0.05 Secs	0.05 TO 1.00 mins	1.00 TO 30 Mins	30.00 TO 240 Mins	LOAD SHED
6.9 KV SDBD 2A-A BBNF	304	1.96	0.00	0.00	0.00	YES
		1.60	1.60	1.60	0.00	YES
		0.00	0.00	0.00	0.00	YES
		0.00	0.64	0.64	0.00	YES
480 V SDBD 2A1-A BBNF	305	0.00	2.00	0.00	0.00	YES
		0.54	0.54	0.54	0.00	YES
480 V SDBD 2A2-A BBNF	306	0.54	0.54	0.54	0.00	YES
		0.00	2.00	0.00	0.00	YES
DC BUS FILTER	308	0.08	0.08	0.08	0.08	NO
AUX RELAY RACK 1-R-54	313	0.00	0.00	0.00	0.00	YES
GEN AUX ANN PKG	315	3.40	3.40	3.40	0.00	YES
BORIC ACID PKGO-L1A	318	0.71	0.71	0.71	0.00	YES
BYPASS BKR BYA TR A	319	0.04	0.04	0.04	0.00	YES
RX TRIP BKR RTA	320	2.00	0.04	0.04	0.00	YES
U1- AUX FD PMP TURB	321	0.00	12.00	0.00	0.00	NO
		2.84	2.84	2.84	2.84	NO
DC LTG CAB LD-1	325	550.00	96.00	96.00	96.00	NO
VITAL INV 1-I	326	116.08	116.08	116.08	~~87.35~~ 99.35 *	NO
VITAL INV 2-I	327	98.85	98.85	98.85	~~54.84~~ 60.84 *	NO
UNIT 1 ANN PANEL 1-L-236	328	56.00	56.00	56.00	0.00	YES
TOTALS		898.35	639.23	428.91	~~278.14~~ 296.14	

These loads increased as a result of adding RVLIS and In-Plant VHF Radio back to Vital Inverter Load List.

ATTACHMENT 2B

250 VOLT STATION BATTERY LOAD PROFILE

Excerpted from Electrical Calculation SQN-CPS-031.

SQN-CPS-031

Table 1A Page 1 of 2

250 STATION BATTERY LOADING CALCULATION
EBOP Running for 3-hours

Prepared by JPR 10/27/9[illegible]
Reviewed by [illegible] /10/2[illegible]

CIRCUIT NAME	CKT BKR	0.00 TO 10 Secs	10 s. TO 1.00 mins	1.00 TO 30 Mins	30.00 TO 180 Mins	180 To 239 Mins	239 To 240 Mins	Normal Current
205 V Turbine Bldg Bd 1 Normal Feeder	201	21.74 255.00	21.74	21.74	21.74	21.74	21.74 25.00	21.74
205 V Turbine Bldg Bd 2 Alt. Feeder	202	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elec Cont Bd Dist Pnl 7 & 8 Nor Fdr	203	35.00 168.00	35.00	35.00	35.00	35.00	35.00 24.00	35.00
Elec Cont Bd Dist Pnl 6 Alt Fdr	303	0.00 0.00	0.00	0.00	0.00	0.00	0.00	0.00
TSC Inverter	401	145.45 0.00	145.45	145.45	0.00	0.00	0.00	0.00
Turbine EBOP Unit 1 Normal Feeder	404	0.00	0.00 910.00	283.64	283.64	0.00	0.00	0.00
Turbine EBOP Unit 2 Alternate Feeder	405	0.00	0.00 0.00	0.00	0.00	0.00	0.00	0.00
Electric Shop Test Bench	409	0.00	0.00	0.00	0.00	0.00	0.00	0.00
480 V Water Supply Bd. Normal Feeder	501	0.61 5.00	0.61	0.61	0.61	0.61	0.61 5.00	0.61
480 V Svce Bldg Wtr Normal Feeder	502	0.61 5.00	0.61	0.61	0.61	0.61	0.61 5.00	0.61
480 V Unit Bd 1A Normal Feeder	507	1.50 20.00	1.50	1.50	1.50	1.50	1.50	1.50
480 V Unit Bd 2A Alternate Feeder	508	0.00 0.00	0.00	0.00	0.00	0.00	0.00	0.00
480 V Unit Bd 1B Normal Feeder	509	1.76 30.00	1.76	1.76	1.76	1.76	1.76	1.76
480 V Unit Bd 2A Alternate Feeder	510	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SQN-CPS-031

Table 1A Page 2 of 2

250 STATION BATTERY LOADING CALCULATION Prepared by JDR
EBOP Running for 3-hours Reviewed by [illegible]

CIRCUIT NAME	CKT BKR	0.00 TO 10 Secs	10 s. TO 1.00 mins	1.00 TO 30 Mins	30.00 TO 180 Mins	180 To 239 Mins	239 To 240 Mins	Normal Current
250 Battery Bd Bus Filter	512	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Turbine Trip Bus A Unit 1	516	1.40 0.00	1.40	1.40	1.40	1.40	1.40	1.40
Turbine Trip Bus A Unit 2	519	1.40 0.00	1.40	1.40	1.40	1.40	1.40	1.40
Main Feed Pump Trb A Trip Bus Unit 1	523	2.06 0.40	2.06	2.06	2.06	2.06	2.06	2.06
Main Feed Pump Trb B Trip Bus Unit 1	524	2.06 0.40	2.06	2.06	2.06	2.06	2.06	2.06
Gen DC Seal Oil Pmp Normal Feeder Unit 1	525	0.00 318.50	99.27	99.27	0.00	0.00	0.00	0.00
Gen DC Seal Oil Pmp Alt. Feeder Unit 2	526	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFPT Emerg Brg Oil Pmp 1A Unit 1	527	0.00	0.00 105.35	32.84	0.00	0.00	0.00	0.00
Computer Inverter 1	528	48.48	48.48	48.48	0.00	0.00	0.00	0.00
Preferred Inverter 1	529	58.18	58.18	58.18	0.00	0.00	0.00	0.00
MFPT Emerg Brg Oil Pmp 1B Unit 1	530	0.00	0.00 105.35	32.84	0.00	0.00	0.00	0.00
TOTALS		1122.55	1540.22	768.83	351.78	68.14	127.14	68.14

The motor amps are adnusted for average voltage over the duty cycle. Refer to Section 5.0.

Table 1B Sheet 1 of 2

250 STATION BATTERY LOADING CALCULATION SQN-CPS-031
EBOP Running for 4-hours

Prepared by JDR / 10/2?/90
Reviewed by [illegible] / 10/27/90

CIRCUIT NAME	CKT BKR	0.00 TO 10 Secs	10 s. TO 1.00 mins	1.00 TO 30 Mins	30.00 TO 239 Mins	239 To 240 Mins	Normal Current
205 V Turbine Bldg Bd 1 Normal Feeder	201	21.74 255.00	21.74	21.74	21.74	21.74 25.00	21.74
205 V Turbine Bldg Bd 2 Alt. Feeder	202	0.00	0.00	0.00	0.00	0.00	0.00
Elec Cont Bd Dist Pnl 7 & 8 Nor Fdr	203	35.00 168.00	35.00	35.00	35.00	35.00 24.00	35.00
Elec Cont Bd Dist Pnl 6 Alt Fdr	303	0.00 0.00	0.00	0.00	0.00	0.00	0.00
TSC Inverter 1	401	145.45 0.00	145.45	145.45	0.00	0.00	0.00
Turbine EBOP Unit 1 Normal Feeder	404	0.00	0.00 910.00	283.64	283.64	0.00	0.00
Turbine EBOP Unit 2 Alternate Feeder	405	0.00	0.00 0.00	0.00	0.00	0.00	0.00
Electric Shop Test Bench	409	0.00	0.00	0.00	0.00	0.00	0.00
480 V Water Supply Bd. Normal Feeder	501	0.61 5.00	0.61	0.61	0.61	0.61 5.00	0.61
480 V Svce Bldg Wtr Normal Feeder	502	0.61 5.00	0.61	0.61	0.61	0.61 5.00	0.61
480 V Unit Bd 1A Normal Feeder	507	1.50 20.00	1.50	1.50	1.50	1.50	1.50
480 V Unit Bd 2A Alternate Feeder	508	0.00 0.00	0.00	0.00	0.00	0.00	0.00
480 V Unit Bd 1B Normal Feeder	509	1.76 30.00	1.76	1.76	1.76	1.76	1.76

Table 1B Sheet 2 of 2

250 STATION BATTERY LOADING CALCULATION SQN-CPS-031
EBOP Running for 4-hours

Prepared by JPR / 10/27/90
Reviewed by MGG / 10/27/90

CIRCUIT NAME	CKT BKR	0.00 TO 10 Secs	10 s. TO 1.00 mins	1.00 TO 30 Mins	30.00 TO 239 Mins	239 To 240 Mins	Normal Current
480 V Unit Bd 2A Alternate Feeder	510	0.00	0.00	0.00	0.00	0.00	0.00
250 Battery Bd Bus Filter	512	0.00	0.00	0.00	0.00	0.00	0.00
Turbine Trip Bus A Unit 1	516	1.40 0.00	1.40	1.40	1.40	1.40	1.40
Turbine Trip Bus A Unit 2	519	1.40 0.00	1.40	1.40	1.40	1.40	1.40
Main Feed Pump Trb A Trip Bus Unit 1	523	2.06 0.40	2.06	2.06	2.06	2.06	2.06
Main Feed Pump Trb B Trip Bus Unit 1	524	2.06 0.40	2.06	2.06	2.06	2.06	2.06
Gen DC Seal Oil Pmp Normal Feeder Unit 1	525	0.00 318.50	99.27	99.27	0.00	0.00	0.00
Gen DC Seal Oil Pmp Alt. Feeder Unit 2	526	0.00	0.00	0.00	0.00	0.00	0.00
MFPT Emerg Brg Oil Pmp 1A Unit 1	527	0.00	0.00 105.35	32.84	0.00	0.00	0.00
Computer Inverter 1	528	48.48	48.48	48.48	0.00	0.00	0.00
Preferred Inverter 1	529	58.18	58.18	58.18	0.00	0.00	0.00
MFPT Emerg Brg Oil Pmp 1B Unit 1	530	0.00	0.00 105.35	32.84	0.00	0.00	0.00
TOTALS		1122.55	1540.22	768.83	351.78	127.14	68.14

The motor amps are adjusted for average voltage over the duty cycle.
Refer to Section 5.0.

Prepared by JAR, 10/27/90

Reviewed by [signature], 10/27/90

PERIOD	LOAD IN AMPS	CHANGE LOAD	INDUR. PER.	TIME TO END	RATE AMP/POS	PLATES REQ'D	TOTAL FOR PER.
1	1540.22	1540.22	1	1	160.00	9.63	9.63
							13.36
2	1540.22	1540.22	1	30	97.00	15.88	
	768.83	-771.39	29	29	97.50	-7.91	7.97
							11.05
3	1540.22	1540.22	1	180	39.00	39.49	
	768.83	-771.39	29	179	39.00	-19.78	
	351.78	-417.06	150	150	43.00	-9.70	10.01
							13.90
4	1540.22	1540.22	1	239	32.00	48.13	
	768.83	-771.39	29	238	32.00	-24.11	
	351.78	-417.06	150	209	33.00	-12.64	
	68.14	-283.64	59	59	73.00	-3.89	7.50
							10.41
5	1540.22	1540.22	1	240	32.00	48.13	
	768.83	-771.39	29	239	32.00	-24.11	
	351.78	-417.06	150	210	33.00	-12.64	
	68.14	-283.64	59	60	73.00	-3.89	
	127.14	59.00	1	1	160.00	0.37	7.87
							10.92

TOTAL NO. OF PLATELATES------------- 13.90
INCLUDES AGING AND AND TEMP. CORRECTION

REMAINING DESIGN MGN MAGIN % --------- 0.75

Table 2A
IEEE 485 Work Sheet
EVOP on for 3-Hours

Prepared by JDR, 10/27/90

Checked by [illegible], 10/27/90

IEEE 485 Work Sheet
EBOP Running 4-hours

PER IOD	LOAD IN AMPS	CHANGE LOAD	INDUR. PER.	TIME TO END	RATE AMP/POS	PLATES REQ'D	TOTAL FOR PER.
1	1540.22	1540.22	1	1	160.00	9.63	9.63
							13.36
2	1540.22	1540.22	1	30	97.00	15.88	
	768.83	-771.39	29	29	97.50	-7.91	7.97
							11.05
3	1540.22	1540.22	1	239	32.00	48.13	
	768.83	-771.39	29	238	32.00	-24.11	
	351.78	-417.06	209	209	33.00	-12.64	11.39
							15.80
4	1540.22	1540.22	1	240	32.00	48.13	
	768.83	-771.39	29	239	32.00	-24.11	
	351.78	-417.06	209	210	33.00	-12.64	
	127.14	-224.64	1	1	160 00	-1.40	9.98
							13.85

TOTAL NO. OF PLATELATES------------- 15.80
INCLUDES AGING AND AND TEMP. CORRECTION

REMAINING DESIGN MARGIN IN % ----- -12.86

Table 2B
IEEE 485 Work Sheet
EBOP on for 4-hour

Prepared: JDR 10/31/90
checked: [illegible] 10/31/90

250V STATION BATTERY
EBOP RUNNING 3 HOURS

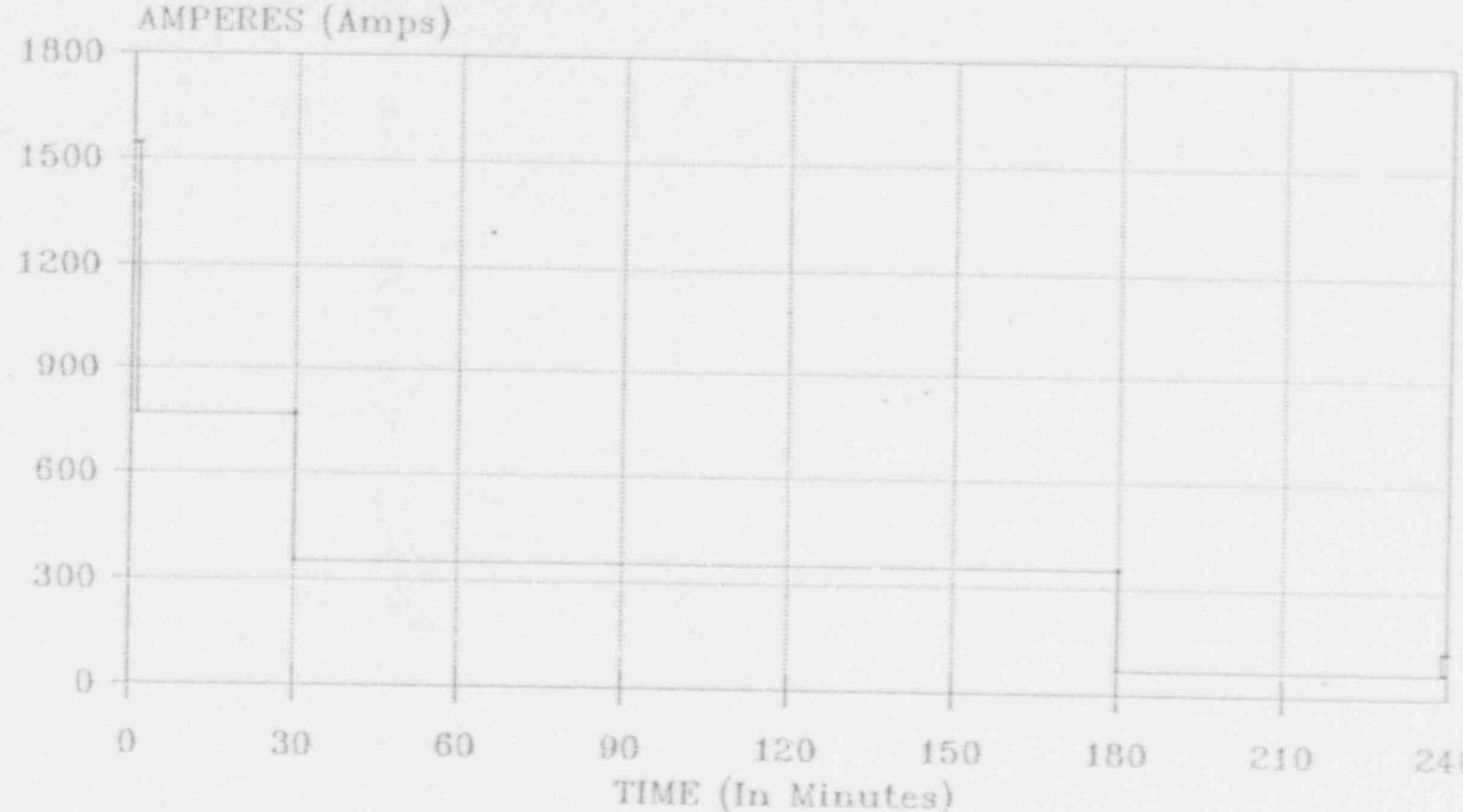


FIGURE 1A

SQN-CPS-031

page 20A

prepared: JDR 10/31/90

checked: [illegible] 10/31/90

250V STATION BATTERY
EBOP RUNNING 4 HOURS

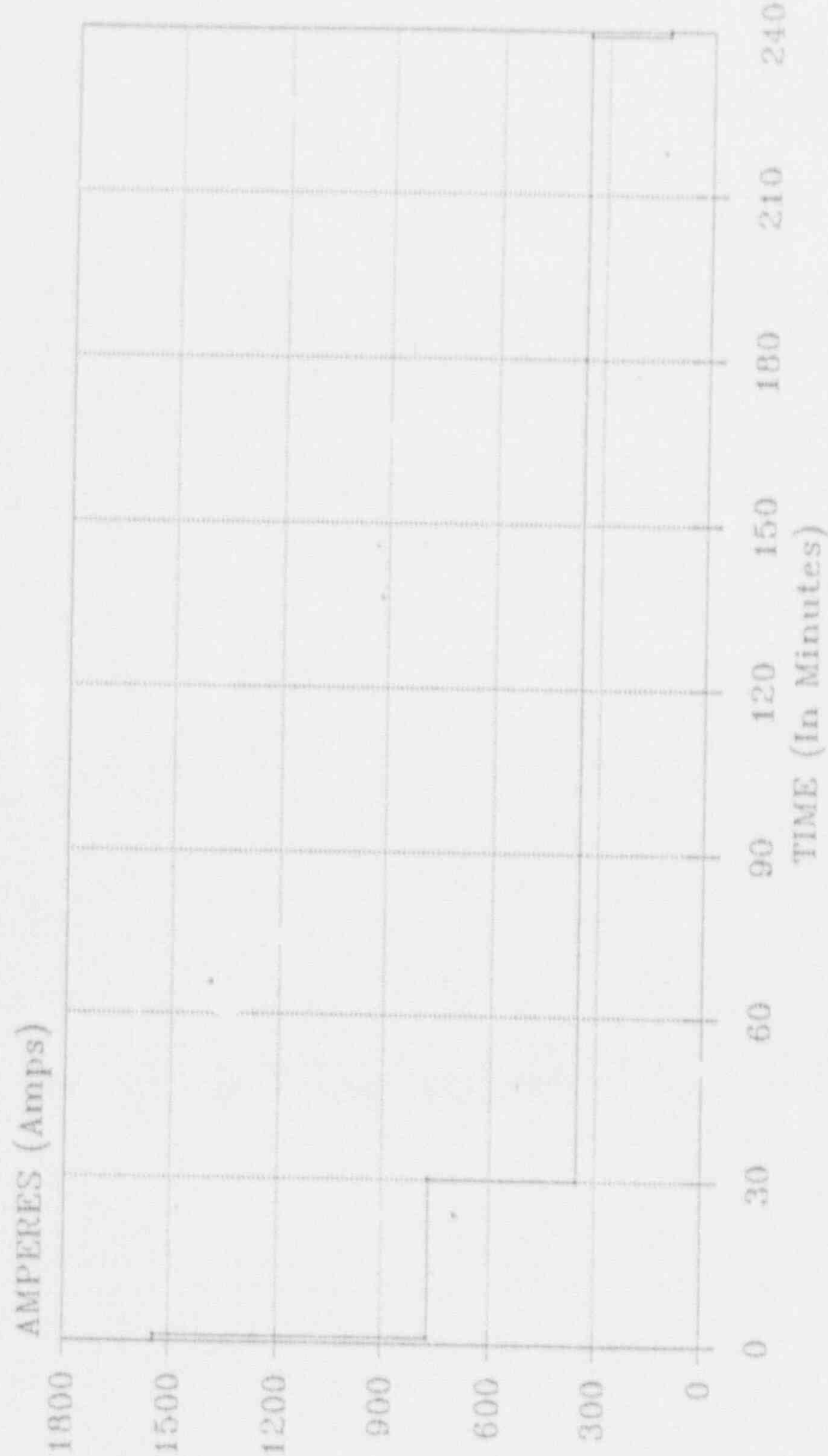
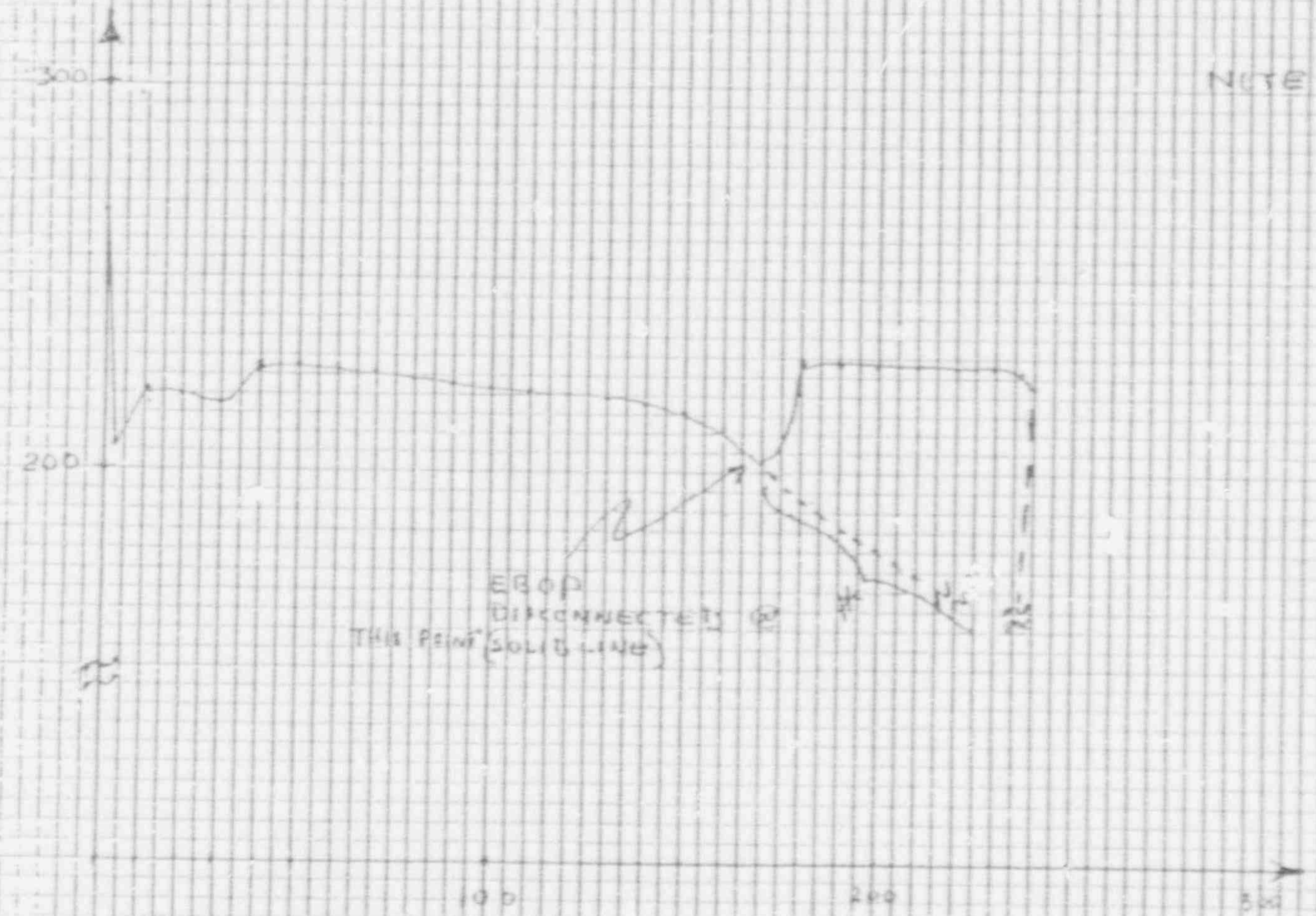


FIGURE 1B

PREPARED : [illegible] 10/22/90
CHECKED : [illegible] 10/22/90

250V Station Battery Voltage Profile
(LCWN-29) (FROM COLUMN 9, PAGES 18&19)



NOTE: BROKEN LINE IS FOR EBOP RUNING FOR 4 HOURS.

* Possible damage region to motor & battery

FIG 2

ATTACHMENT 3

COPING STRATEGY FOR A STATION BLACKOUT EVENT

Excerpted from Electrical Calculation SQN-SBO-001.

Appendix J
Prepared [illegible] Date 3/[illegible]
Reviewed [illegible] Date 3/17/89

SQN COPING STRATEGY AND MINIMAL EQUIPMENT NECESSARY FOR COPING WITH A STATION BLACKOUT

1.0 Purpose

The purpose of this appendix is to provide the strategy and a list of the equipment needed to survive a 4-hour Station Blackout at Sequoyah Nuclear Plant.

2.0 Introduction

The strategy to cope for four hours with the complete loss of all ac power at Sequoyah is presented in the Analysis and Results section of this appendix. The equipment list and he logic used in its compilation follows. Additional information regarding the location of this equipment is provided in Table J-1.

3.0 Analysis and Results - Coping Strategy

3.1 First phase time period - 0 to 30 minutes

a. Monitor reactor incore temperature and pressure. Use turbine driven auxiliary feedwater to maintain steam generator level and use steam generator safety relief valves to maintain steam generator pressure (or manual control of atmospheric relief valves).

b. If restoration of AC power is not likely within 30 minutes of initial loss of power:

(1) Prepare to shed load on 125 ~~VDC~~ V Vital DC, 120 V Vital Inverters system and the 250 V DC Station Battery. ~~The 250 VDC* system does not require load shedding.~~

(2) Prepare to remove loads on the 6.9 kv Shutdown boards in preparation for regaining one or more emergency diesel generators.

(3) Achieve level control of the appropriate steam generator ~~level control valves~~ (within 15 minutes of station blackout).

3.2 Second phase time period - 30 minutes to restoration of AC power

a. Shed unnecessary loads from the 125 VDC system, 120 V Vital AC system and 250 V DC Station Battery System.

b. Remove major loads from the 6.9 kv common and unit boards.

c. Continue manual control, if required, of the appropriate steam generator level ~~control valves.~~

*The 250 VDC system is required for operation of the switchyard breakers.

3.0 Analysis and Results - Coping Strategy (Continued)

3.3 Restoration of AC power by recovering offsite power. Return to normal procedures.

3.4 Restoration of AC power by recovering two or more emergency diesel generators. Return to normal loss of offsite power procedure.

3.5 Restoration of AC power by recovering one diesel generator.

SCOPE: This scenario is for an event that is not required by the design basis of the plant and is not required by the SBO rule. It is presented here as an enhancement to the coping strategy.

a. Line [illegible] such that adequate cooling water is available to cool the [illegible] EDGU.

b. Es[illegible] at ERCW at the ERCW/condensate switch-over valv[illegible]tion of the depletion of the condensate inve[illegible]

c. Establ[illegible] component cooling water pump, aligned to the ERCW train that is available.

d. Establish a centrifugal charging pump on each unit. The charging pump on the 6.9 KV shutdown board associated with the operable diesel will receive power normally; however, the opposite unit charging pump must be powered by the limited capacity intertie bus. All the loads on the opposite unit shutdown board that is connected to the operable diesel generator must be shed except for the centrifugal charging pump.

e. Establish 480v AC power to the vital battery charger that is associated with the operable diesel generator.

f. Lighting and HVAC loads necessary to support the above equipment should be manually connected as necessary.

g. The 250 V DC station battery chargers can be manually connected to all diesels except 2B-B and will be used to control the switchyard circuit breakers when off site power is returned. If 2B-B is the operable diesel, then power to the charger can be supplied by jumpering.

It is felt that this strategy will be sufficient to regain and maintain control given recovery of one diesel generator following an SBO event. This configuration is only a stop gap measure that is to maintain core stability for about 24-hours until off site power is restored or until additional diesels are restored.

4.0 Analysis and Results - Equipment List

4.1 Steam Generator

Only one steam generator is required to remove heat from the reactor coolant system under station blackout conditions (Reference 1). (Boildown in all four steam generators is available for some time period immediately after reactor trip.) However, the steam generator used to remove heat from the RCS, i.e., the one that is fed by auxiliary feedwater, must also be one that is supplying steam to the turbine driven auxiliary feedwater pump. Only steam generators 1 and 4 are capable of this. Therefore, either steam generator 1 or steam generator 4 is considered necessary for use during station blackout. Which of the two is used will be determined by the system alignment prior to the station blackout event.

4.2 125 VDC Vital Power System (includes Vital AC)

a. Provides control and instrumentation power primarily to turbine driven auxiliary feedwater pump.

b. Provides emergency lighting.

c. Provides instrument power to monitor temperatures and pressures within the reactor coolant system and for level control for the AFW system (and to monitor the condition of the core and Reactor Coolant System parameters).

4.3 Steam Generator Safety Valves

The operator should rely on the steam generator safety valves to dump steam from the steam generators and to transfer heat from the steam generators to the ultimate heat sink; in this case the atmosphere. The steam generator safety valves require no operator action and no supporting systems to operate. The manually operated atmospheric relief valves are available, if required, for depressurizing the RCS.
If steam generator 1 is used for heat removal:

Unit 1	Unit 2
1-VLV-1-522	2-VLV-1-522
1-VLV-1-523	2-VLV-1-523
1-VLV-1-524	2-VLV-1-524
1-VLV-1-525	2-VLV-1-525
1-VLV-1-526	2-VLV-1-526

If steam generator 4 is used for heat removal:

Unit 1	Unit 2
1-VLV-1-527	2-VLV-1-527
1-VLV-1-528	2-VLV-1-528
1-VLV-1-529	2-VLV-1-529
1-VLV-1-530	2-VLV-1-530
1-VLV-1-531	2-VLV-1-531

NOTE: SG ~~PORVs~~ ARVs will be available but are not required to meet station blackout requirements.

4.4 Auxiliary Feedwater System Pump

The operator will use the turbine driven portion of the auxiliary feedwater system to supply water from the condensate storage tanks to the appropriate steam generator.

AFW turbine driven pump (includes FCV-1-51, FCV-1-52, and associated controls). For Unit 1, 125 VDC Battery Board III (normal feeder) is required. For Unit 2 125 VDC Battery Board I (normal feeder) is required.

4.5 Steam Supply to AFW Turbine Driven Pump

The operator will use these valves to supply steam to operate the turbine driven AFW pump.

If steam generator 1 is used for heat removal:

Unit 1	Unit 2
1-FCV-1-15	2-FCV-1-15
1-VLV-3-891	2-VLV-3-891
1-FCV-1-18	2-FCV-1-18
1-FCV-1-17	2-FCV-1-17

If steam generator 4 is used for heat removal:

Unit 1	Unit 2
1-FCV-1-16	2-FCV-1-16
1-VLV-3-892	2-VLV-3-892
1-FCV-1-18	2-FCV-1-18
1-FCV-1-17	2-FCV-1-17

4.6 Steam Generator Level Control Valves

The AFW steam generator level control valves are used to control the flow of AFW to the steam generator. The level control valves from the turbine driven pump to steam generators 1 and 4 are air-operated valves. Initially, they can be controlled remotely using the control air in their associated air accumulators. When the accumulators are depleted, the valves will close and must then be controlled manually or the quantity of control air reserve must be increased.

If steam generator 1 is used for heat removal:

Unit 1	Unit 2
1-VLV-3-869 - locked open	2-VLV-3-869 - locked open
1-LCV-3-174	2-LCV-3-174
1-VLV-3-873	2-VLV-3-873
1-VLV-3-877 - locked open	2-VLV-3-877 - locked open
*1-LT-3-174	*2-LT-3-174

Appendix J
Prepared [signature] Date [illegible]
Reviewed William [signature] Date 3/17/89

4.6 Steam Generator Level Control Valves (Continued)

If steam generator 4 is used for heat removal:

Unit 1	Unit 2
1-VLV-3-870 - locked open	2-VLV-3-870 - locked open
1-LCV-3-175	2-LCV-3-175
1-VLV-3-874	2-VLV-3-874
1-VLV-3-878 - locked open	2-VLV-3-878 - locked open
*1-LT-3-175	*2-LT-3-175

*These level transmitters are required prior to establishment of manual control of the steam generator level control valves.

4.7 AFW Condensate Supply

The condensate storage tanks are the water supply for the AFW system. Either condensate storage tank A or B can be used to supply water to the AFW system.

If condensate storage tank A is used:

Unit 1	Unit 2
0-VLV-2-504 - locked open	0-VLV-2-504 - locked open
0-VLV-3-800 - locked open	0-VLV-3-800 - locked open
1-VLV-3-809 - locked open	2-VLV-3-809 - locked open
1-VLV-3-810 - check valve	2-VLV-3-810 - check valve

If condensate storage tank B is used:

Unit 1	Unit 2
0-VLV-2-505 - locked open	0-VLV-2-505 - locked open
0-VLV-3-800 - locked open	0-VLV-3-800 - locked open
1-VLV-3-809 - locked open	2-VLV-3-809 - locked open
1-VLV-3-810 - check valve	2-VLV-3-810 - check valve

4.8 Instrumentation

The operator is required to both monitor and control the RCS heat removal process during the period a station blackout exists. To monitor the heat removal process the operator needs to know the conditions within the RCS. To control the process, he must control the steam generator since the steam generator is controlling the heat removal process.

To monitor the heat removal process:

Incore Thermocouples - 60, 54, 44, 41 - Provides the operator with an indication of the core temperature.

Pressurizer Pressure - PI-68-323 - Provides the operator with the RCS pressure.

4.8 Instrumentation (Continued)

These two parameters allow the operator to determine if successful core cooling is being accomplished.

To control the heat removal process:

Steam generator level indication allows the operator to control AFW flow to match the decay heat level and control the heat removal process.

Steam generator 1 (if used) level:

Unit 1	Unit 2
1-LI-3-38	2-LI-3-38
1-LI-3-42	2-LI-3-42

Steam generator 4 (if used) level:

Unit 1	Unit 2
1-LI-3-106	2-LI-3-106
1-LI-3-110	2-LI-3-110

Steam generator pressure indication allows the operator to verify that the heat removal process is occurring properly.

Steam generator 1 (if used) pressure:

Unit 1	Unit 2
1-PI-1-5	2-PI-1-5

Steam generator 4 (if used) pressure:

Unit 1	Unit 2
1-PI-1-30	2-PI-1-30

5.0 References

5.1 Westinghouse Owners Group Emergency Response Guidelines, Background Volume E-0, ECA-0, High Pressure Version, Revision 1, Westinghouse Electric Corporation, September 1, 1983.

5.2 Sequoyah Nuclear Plant Phase I Probabilistic Risk Assessment, Draft Report, Reliability and Performance, Tennessee Valley Authority, September 1988.

5.3 Emergency Contingency Instruction - Loss of all AC Power, ECA-0.0, R3.

5.4 Abnormal Operating Instruction - Loss of Offsite Power, AOI-35, R11.

5.5 Emergency Plan Implementing Procedure, EPIP-6, R1.

5.6 Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, NUMARC 87-00, Nuclear Management and Resources Council Inc., October 1988.

5.7 Sequoyah Nuclear Plant Master Components List.

5.8. TVA Drawings: 47W400-1E, R5
47W400-2E, R3
47W415-1, R11
47W420-55, R0
47W427-1, R20
47W427-2, R18
45N230, R13

6.0 Conclusions

No conclusions are made. This appendix describes a coping strategy. The system capabilities and capacities are described elsewhere in this calculation.

Table J.1

EQUIPMENT LOCATIONS

Component	Location*
125 VDC Vital Battery I (0-BATB-249-QV)	749-A4Q
125 VDC Vital Battery Board I (0-BDG-249-KE)	734-A4Q
125 VDC Vital Battery II (0-BATB-249-QW)	749-A5Q
125 VDC Vital Battery Board II (0-BDG-249-KF)	734-A5Q
125 VDC Vital Battery III (0-BATB-250-QX)	749-A11Q
125 VDC Vital Battery Board III (0-BDG-250-KG)	734-A11Q
125 VDC Vital Battery IV (0-BATB-250-QY)	749-A12Q
125 VDC Vital Battery Board IV (0-BDG-250-KH)	734-A12Q
1-VLV-1-522 (2-VLV-1-522)	735-WMSVR
1-VLV-1-523 (2-VLV-1-523)	740-WMSVR
1-VLV-1-524 (2-VLV-1-524)	735-WMSVR
1-VLV-1-525 (2-VLV-1-525)	740-WMSVR
1-VLV-1-526 (2-VLV-1-526)	735-WMSVR
1-VLV-1-527 (2-VLV-1-527)	740-WMSVR
1-VLV-1-528 (2-VLV-1-528)	735-WMSVR
1-VLV-1-529 (2-VLV-1-529)	740-WMSVR
1-VLV-1-530 (2-VLV-1-530)	735-WMSVR
1-VLV-1-531 (2-VLV-1-531)	740-WMSVR
Unit 1 Turbine Driven AFW Pump (1-PMP-3-142)	669-A1T
Unit 2 Turbine Driven AFW Pump (2-PMP-3-142)	669-A15T
1-FCV-1-51	669-A1T
2-FCV-1-51	669-A15T
1-FCV-1-52	669-A1T
2-FCV-1-52	669-A15T
1-FCV-1-15 (2-FCV-1-15)	725-WMSVR
1-VLV-3-891 (2-VLV-3-891)	706-WMSVR
1-FCV-1-16 (2-FCV-1-16)	725-WMSVR
1-VLV-3-892 (2-VLV-3-892)	706-WMSVR
1-FCV-1-18 (2-FCV-1-18)	725-WMSVR
1-FCV-1-17 (2-FCV-1-17)	725-WMSVR
1-VLV-3-869 (2-VLV-3-869)	706-WMSVR
1-LCV-3-174	706-WVR
2-LCV-3-174	723-WVR
1-VLV-3-873 (2-VLV-3-873)	706-WMSVR
1-VLV-3-877 (2-VLV-3-877)	706-WMSVR
1-VLV-3-870 (2-VLV-3-870)	706-WMSVR

*Locations are given as 'elevation-coordinates' or 'elevation-room' where:

WMSVR = West Main Steam Valve Room
WVR = West Vault Room

Table J.1 (Continued)

EQUIPMENT LOCATIONS

Component	Location*
1-LCV-3-175	706-WVR
2-LCV-3-175	723-WVR
1-VLV-3-874 (2-VLV-3-874)	706-WMSVR
1-VLV-3-878 (2-VLV-3-878)	706-WMSVR
0-VLV-3-800	690-A15Q
1-VLV-3-809	669-A1T
2-VLV-3-809	669-A15T
1-VLV-3-810	669-A1T
2-VLV-3-810	669-A15T
0-VLV-2-504	685-T15K
0-VLV-2-505	685-T15K
1-LT-3-174	697-AZ 72° 30'
2-LT-3-174	699'2"-AZ 78°30'
1-LT-3-175	697-AZ 256°30'
2-LT-3-175	712'9"-AZ 76°

*Locations are given as 'elevation-coordinates' or 'elevation-room' where:

WMSVR = West Main Steam Valve Room
WVR = West Vault Room

The 120v Vital AC Inverters and Vital AC Power Boards are to be added to this list. Inverters are located in the Aux Bldg at EL 749 in the 480v Board Rooms. The AC Power Boards are located in the Associated Battery Board rooms.

ATTACHMENT 4

Key Input Parameters for Sensitivity Studies With Station Blackout Similarities

HEAT LOADS

RCS ambient heat loss

modelled as a slab with RCS natural circulation cooldown

pressurizer cooldown rate	4.152 °F/hr
RCS cooldown rate	7.92 °F/hr

upper compartment electrical heat loads

cooler fan motors (3)	114,525 BTU/hr
lighting	12,799 BTU/hr

lower compartment electrical heat loads

CRDM fan motors (2)	426,033 BTU/hr
lighting	13,311 BTU/hr
primary concrete shield	15,000 BTU/hr
cooler fan motors (3)	458,460 BTU/hr
RCP motor (4)	3,000,000 BTU/hr
CRDM motor	280,000 BTU/hr

RCS mass release

Time (sec)	Mass (lbm/sec)	Energy (BTU/lbm)**
0.0	18.0	576.0
1550.0	14.0	576.0
1551.0	0.0	576.0
3400.0	0.0	576.0
3401.0	14.0	567.0
3600.0	14.0	567.0
3601.0	0.0	567.0
7000.0	0.0	567.0
7001.0	15.0	552.0
7200.0	15.0	552.0
14400.0	0.0	552.0
14401.0	16.0	523.0

** corresponding estimated liquid enthalpy at upper head liquid temperatures

COMPARTMENT VOLUMES AND INITIAL TEMPERATURES

upper compartment	651,000 ft^3	117 °F
lower compartment	248,388 ft^3	189 °F
dead ended compartments	129,900 ft^3	120 °F
annulus	375,000 ft^3	108 °F
ice compartment	110,521 ft^3	35 °F
ice upper plenum	54,940 ft^3	42 °F