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Georgia Power
the southern electric system

HL-1588
000269

May 3, 1991

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

PLANT HATCH - UNITS 1, 2
NRC DOCKETS 50-321, 50-366
OPERATING LICENSES DPR-57, NPF-5
SUPPLEMENTAL RESPONSE TO STATION BLACKOUT

Gentlemen:

On March 5, 1991, Georgia Power Company (GPC) received an NRC Safety Evaluation Report (SER) relative to the Station Blackout (SBO) Rule. The SER was issued following a review of GPC submittals dated April 12, 1989 and March 27, 1990, and supporting information provided in August and September 1989. The SER requested GPC re-evaluate areas of concern and submit the results to the NRC within 60 days.

The enclosure provides GPC's response for each issue identified in the SER. GPC intends to implement the modifications and procedure changes to which we have committed within 2 years following receipt of a satisfactory SER.

Please contact this office if you have questions.

Sincerely,

J. T. Beckham, Jr.

GKM/cr

Enclosure: Supplemental Response to Station Blackout

cc: (See next page.)

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Georgia Power

U.S. Nuclear Regulatory Commission
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ENCLOSURE
PLANT HATCH UNITS 1,2
NRC DOCKETS 50-321, 50-366
OPERATING LICENSES DPR-57, NPF-5
SUPPLEMENTAL RESPONSE TO STATION BLACKOUT

INTRODUCTION:

This document supplements the previous submittals provided by Georgia Power Company (GPC) on April 12, 1989, March 27, 1990, August 29,1990, and in September 1989. This document specifically addresses each item identified as a Recommendation in the NRC Station Blackout Safety Evaluation Report (SER) transmitted to Mr. W. G. Hairston, III from Kahtan N. Jabbour, dated March 5, 1991. This enclosure is formatted such that each evaluation item is summarized, and the NRC recommendation and GPC's response to each recommendation are presented.

Based on the information contained herein, GPC has committed to the following additional actions:

1. Reducing the current limit setting of the station service battery chargers on both the station blackout (SBO) and nonblackout (NBO) units.

2. Providing the operator with guidance to open necessary control room cabinet doors within 30 minutes if control room temperature exceeds 100°F.

3. Providing procedural guidance to ensure the availability of the 1B diesel as the alternate AC (AAC) source for the SBO unit in the event a high drywell loss of coolant accident (LOCA) signal is received or is expected to be received on the NBO unit.

4. Providing in plant procedures a list of AC-powered valves whose positions must be verified once power is restored following an SBO.

5. Replacing a minimum of 20 percent of the ceiling tiles in the Health Physics (HP) area of the Control Building and 20 percent of the tiles in the main control room (MCR) with "egg crate" panels.

This document, along with previous submittals, provides full and complete evidence the E. I. Hatch Units 1 and 2 will be in full conformance with the SBO Rule and the guidance of Regulatory Guide (RG) 1.155. All plant and procedural modifications required by this document and the other submittals will be completed within 2 years following receipt of a satisfactory SER.

SUPPLEMENTAL RESPONSE TO STATION BLACKOUT

NRC EVALUATION ITEM 2.2.2 - PROPOSED AAC POWER SOURCE

The staff agrees with the licensee that EDG 1B (or any one of the other two EDGs) can be designated as an AAC power source. However, the licensee needs to re-evaluate the load reduction scheme such that the EDG 1B loading is within its 2000 hour rating. Also, NUMARC-8700, Appendix B, paragraph B.12, states that the AAC system should be demonstrated by initial test to be capable of powering the necessary equipment within 1 hour and should be capable of maintaining the voltage and frequency within the limits of established industry standards.

NRC Recommendation:

The licensee should 1) re-evaluate the loads and provide a load reduction scheme such that the EDG 1B loading will be below 3100 kW while coping with an SBO, 2) implement design modification and procedure changes to prevent EDG 1B shifting from the SBO unit to the NBO unit if the NBO unit receives a high drywell pressure signal, and 3) demonstrate by initial test the capability of EDG 1B to power the necessary SBO equipment within 1 hour, while maintaining voltage and frequency within limits consistent with the established industry standards in accordance with NUMARC-8700, Appendix B, paragraphs B.9 and B.12. The results of the analyses and tests for the above items should be included with the documentation maintained by the licensee in support of the SBO submittals.

GPC Response:

1. As stated in previous submittals to the NRC, GPC has completed analyses which demonstrate that during the 4-hour coping duration of an SBO, suppression pool cooling (SPC) is not required. Without SPC, emergency diesel generator (EDG) loading could be reduced to approximately 1390 kW, well within the 2850 continuous rating of the diesel.

   Actual loading of the EDG during an SBO event would be per the Plant Hatch Emergency Operating Procedures (EOPs) which are symptom-oriented and were developed in accordance with the NRC-approved BWROG Emergency Procedure Guidelines (EPGs), Revision 4. The operator will be provided a list of loads which can be manually stripped from the emergency buses, if required, to reduce EDG loading. However, plant procedures provide EDG loading limits which allow the operator to load the diesels to their 7-day rating. This method of procedural guidance allows essential equipment to be loaded first on the EDG, and if capacity permits, other important equipment (e.g., suppression pool or drywell cooling) may be added. Suppression pool cooling would add a substantial load to the EDG, since a residual heat removal (RHR) pump and an RHR service water (RHRSW) pump are required.

SUPPLEMENTAL RESPONSE TO STATION BLACKOUT

The EDGs have a 7-day (168-hour) rating of 3250 kW per the manufacturer. The EDG can be loaded up to 3250 kW for the duration of the SBO event (4 hours). It is unnecessarily restrictive to require the EDG loading be limited to the 2000-hour rating.

2. Implementation of this design modification is not necessary for conformance to the SBO Rule and, therefore, is not being scheduled at this time. GPC will implement procedural changes to prevent EDG 1B from shifting from the SBO unit to the NBO unit if a high drywell pressure signal in the NBO unit is received.

   Operating procedures currently require the operator to vent the NBO unit drywell through the standby gas treatment (SBGT) system prior to reaching the high drywell pressure setpoint during non-LOCA events. Venting may be accomplished through lines in the drywell purge and vent system. In addition, plant procedures will be revised to provide specific guidance to the operator on restoring drywell cooling to the NBO unit immediately following the loss of offsite power (LOSP). This provision will prevent a high drywell pressure signal from occurring on the NBO unit. In the event the operator determines he cannot keep drywell pressure less than the LOCA signal setpoint, procedural guidance on how to maintain the swing EDG on the SBO unit will be provided. These manual actions will assure the availability of EDG 1B to the SBO unit.

3. EDG 1B is verified capable of powering the necessary SBO equipment, which, as stated previously, is far below its continuous rating. GPC does not intend to test the EDG at its 7-day rating of 3250 kW; however, we have proposed to routinely test the EDG to ≥3000 kW.

   At Plant Hatch, all equipment required to load EDG 1B during an SBO currently exists per the original licensed design of the plant. That is, all required controls for the electrical lineup presently exist on panels located in the MCR. GPC will perform a verification walkthrough to demonstrate that required actions to support loading the AAC can be reasonably assured within 1 hour.

   Verification that the EDG 1B can support the loads required during an SBO is provided in the following three ways:

   a. Dynamic loading analyses prepared by the diesel generator manufacturer establish procedural limits on existing diesel generator loading when large pump load additions are to be made. These limits ensure the transient response of the diesel generator to the large load additions will remain within industry-accepted voltage and frequency parameters.

b. Testing performed in accordance with the plant's Technical Specifications ensures proper EDG operation. GPC has submitted proposed Unit 1 and Unit 2 Technical Specification changes regarding the testing requirements of the EDGs, including EDG 1B. (Reference GPC letter HL-790, dated January 10, 1990, and HL-1411, dated January 21, 1991.) The proposed changes call for a 24-hour EDG load test with loads ≥3000 kW for the first 2 hours and loads between 2775 and 2825 kW for the remaining 22 hours of the test. Testing will be required every 18 months.

GPC's discussions with the Staff on our proposed Technical Specifications changes have indicated this proposed loading is consistent with current NRC guidance on overload testing. As stated in the Basis for Proposed Technical Specifications Changes section (GPC letter HL-790) and in the GPC response to the followup NRC request for information (GPC letter HL-1411), it is GPC's position that testing the EDG to its maximum rated capacity is not desirable and could result in accelerated engine wear and substantial additional maintenance. The testing levels proposed are consistent with the recommendations of the EDG manufacturer and are compatible with the recommendations of GL 84-15. The proposed EDG testing level, if approved by the NRC, is sufficient to provide reasonable assurance the EDG is physically capable of carrying SBO loads, and is substantially more than 2547 kW, which is the current loading requirement for the 1B 18-month test.

c. The diesel engine is rated by the manufacturer at 3250 kW for 168 hours and has been load tested by the manufacturer to loads up to 3250 kW in support of the rating.

NRC EVALUATION ITEM 2.3.2 - CLASS 1E BATTERY CAPACITY

The staff agrees with the licensee's assessment except for the following concerns:

1. The licensee has taken credit for the ability to operate the DC powered RCIC suction valves but has not included the power requirements for these valves in the battery 2A calculations.

2. The battery calculation has listed four operations of the RCIC steam isolation valves but has not addressed why four operations are needed.

3. The licensee has stated the operability of station service battery chargers may be affected by high temperatures in the Control Building. The licensee needs to define the extent of the potential problem and determine the appropriate corrective actions. This could affect the battery chargers for both the SBO and the NBO unit.

SUPPLEMENTAL RESPONSE TO STATION BLACKOUT

NRC Recommendation:

a. The licensee needs to reverify their assessment that the battery has sufficient capacity to power all normal battery backed monitoring and electrical systems and controls for the required SBO duration and recovery therefrom, taking into account the RCIC suction valves. The calculation should also address the utilization of the four operations of the RCIC system isolation valves.

b. The licensee should evaluate and take the appropriate corrective actions, as necessary, to preserve the operability of the station service battery chargers that may be affected by the high temperatures in the Control Building.

The results of the analyses and the assumptions used should be submitted to the NRC staff for review and also included with the documentation maintained by the licensee in support of the SBO submittals.

GPC Response:

1. The battery sizing calculations considered operation of all RCIC suction valves (E51-F010, E51-F029, and E51-F031 for Unit 1, and 2E51-F010, 2E51-F029, and 2E51-F031 for Unit 2). Additionally, the battery sizing calculations considered all the connected loads to the DC system, including those used during an SBO event.

   The RCIC system is normally lined up to take suction from the condensate storage tank (CST). Normal configuration is such that upon receiving either a CST low-level alarm or a suppression pool high-level alarm, the suction for the RCIC pump will automatically begin to shift from the CST to the suppression pool. However, it should be noted the Hatch EOPs instruct the operator to prevent automatic shifting of RCIC to the suppression pool on a suppression pool high-level alarm, thereby allowing use of the cleaner, cooler CST water source, if available. Even if the transfer occurs, it should only occur once for any given transient.

2. For conservatism, four operations were assumed in the battery calculations. Only one operation of the RCIC system is expected, since plant procedures will provide guidance to the operator for regulating RCIC system flow during an SBO. Note that an "operation" of the valve is considered either opening or closing. Thus, a RCIC trip and reset may require two "operations."

3. The current limit setting of the charges will be turned down by manual action during the SBO to ensure operability at high temperature. The station service battery chargers located in both the SBO and NBO units are designed to operate at 110 percent of the nominal current rating at ambient temperatures up to 104°F. With the DC current at 110 percent of the nominal rating and the ambient temperature higher than 104°F, the molded-case DC output circuit breaker internal to the charger is subject to spurious tripping. By changing the current limit setting of the chargers from 110 percent to 80 percent of the nominal rating, the vendor indicated the breaker will operate acceptably at ambient temperatures up to 135°F. GPC may elect to replace the station battery chargers with a new model qualified to operate at temperatures above 135°F. If the new chargers are installed, this manual action would not be necessary.

   The operability of the battery system and supported equipment will not be adversely affected by reducing the current limit setting. The setting will be changed from 110 percent to 80 percent by manual operator action prior to reloading the chargers back onto the EDGs. This action will be included in the plant operating procedures. The procedures will also address returning the current limit to 110 percent after ambient temperatures have dropped below 104°F on both units.

NRC EVALUATION ITEM 2.3.4 - EFFECT OF LOSS OF VENTILATION

The staff agrees with the licensee's stated results except in the following areas: 1) control room, 2) containment/drywell, and 3) battery charger area.

NRC Recommendation:

The licensee should reevaluate the effects of loss of ventilation for areas identified in this section and correct the deficiencies. If the licensee's reevaluation shows that additional procedural changes or hardware modifications are necessary to ensure equipment operability in the above-mentioned areas, the licensee should implement the appropriate procedure changes or modifications accordingly. The licensee should submit the results of the analysis, and assumptions used, for NRC staff review, and also maintain these analyses in the documentation supporting the SBO submittal. In addition, procedural controls should be established to open control room cabinet doors within 30 minutes from the onset of SBO to provide adequate air mixing to maintain cabinet temperatures in equilibrium with the control room temperature.

GPC Response:

GPC has re-evaluated the effects of loss of ventilation for the 1) control room, 2) containment/drywell, and 3) battery charger area. Based on this re-evaluation, GPC has committed to the following actions:

1. Reducing the current limit setting of the station service battery chargers on both the SBO and NBO units.

2. Providing the operator with guidance to open necessary control room cabinet doors within 30 minutes if control room temperature exceeds 100°F.

3. Replacing a minimum of 20 percent of the ceiling tiles in the HP area of the Control Building and 20 percent of the tiles in the MCR with "egg crate" panels.

The assumptions and results of the evaluations for each area are summarized in the following section.

Detailed Discussion of NRC Recommendations

1. Control Room

As indicated in the GPC March 27, 1990 submittal to the NRC, a detailed calculation was completed for the MCR to determine it is not a dominant area of concern (DAC) as defined by NUMARC-8700. This analysis was completed utilizing the computer program PCFLUD. The major assumptions used in the calculation, as well as the results, are as follows:

Major Assumptions

1. The coping duration is 4 hours.

2. Fifty percent of MCR cooling will be available after 1 hour. This is a worst-case assumption based on a Unit 1 SBO. Additional cooling would be available if the SBO were to occur on Unit 2.

3. A normal initial operating temperature of 76°F was assumed, since the MCR is cooled by a safety-related cooling system.

4. The MCR is surrounded on three sides by the Turbine Building. The initial temperature of the Turbine Building was conservatively assumed to be 110°F and instantaneously reach a steady-state temperature of 140°F following the SBO. The west wall is exposed to the outside and was assumed to be at 96°F drybulb and 77°F wet bulb, consistent with ASHRAE guidance.

5. The heat load within the MCR assumes one unit is not experiencing an SBO and the other is blacked out.

6. A minimum of 20 percent of the ceiling tiles in the MCR will be replaced with the "egg-crate" panels to permit free convection of the MCR air with the space above the acoustical tiles.

Results

The results of the calculation show the temperature of the MCR is less than 120°F after 4 hours. A curve showing the calculated results is included as Attachment 1. Since the control room is not a DAC, credit was not taken for operators opening the panel doors. However, the back doors of the front main control panels have been permanently removed. Operators will be instructed to open necessary control panel doors within 30 minutes of an SBO event if control room temperature exceeds 100°F. Taking this action at 100°F will limit the temperatures in the panels to well below their qualification temperature.

2. Containment/Drywell

NUMARC 8700, Section 2.7, states that temperatures resulting from a loss of ventilation during an SBO are enveloped by the LOCA and high-energy line break (HELB) environmental profiles. As stated in a GPC submittal dated March 19, 1990, all equipment located in the containment/drywell that is required to operate during the 4-hour duration of an SBO has been qualified to operate in a harsh environment per the requirements of 10 CFR 50.49. The design basis events analyzed under 10 CFR 50.49 are a large-break LOCA and a HELB. The results of the LOCA/HELB analyses are discussed briefly below, with the detailed results and assumptions referenced to the GE LOCA/HELB report number NESO-52-0583, dated June 1983. It is GPC's position the SBO equipment has been qualified to harsher conditions than would be expected during an SBO. A review of the SBO component qualification data shows limiting components were qualified to 340°F for 3 hours.

As part of the Hatch Environmental Qualification (EQ) Program and 10 CFR 50.49 requirements, General Electric (GE) analyzed a spectrum of steam line breaks within the drywell. The accident scenarios analyzed included three steam line breaks, with break areas of 0.01 ft^2, 0.1 ft^2, and 0.5 ft^2. The results and major assumptions of the GE analyses are documented in NSEO-52-0583. These HELB accident scenarios were assumed to occur coincident with a LOSP. Credit for drywell cooling was not taken for the duration of the event.

Results

The accident profiles generated for the LOCA and HELB accidents in the above analyses were combined to produce a worst-case enveloping curve titled "Composite of LOCA Temperature and Pressure Profiles." This

curve (Attachment 2) was used in the Hatch EQ Program as a basis for qualification of safety-related equipment inside the drywell. The composite curve indicates a resultant drywell peak temperature of 329°F for the first 20 minutes of the event. After 20 minutes, drywell sprays are assumed to be manually initiated by the operator. Once the sprays are in the drywell, temperature declines linearly to approximately 240°F after 4 hours and approximately 110°F after 180 days. Spray initiation is not consistent with the actions to be taken if an SBO were to occur.

The major assumptions used in analyzing LOCA and HELB events, and an SBO event both include a coincident LOSP and a loss of the drywell cooling units for the duration of the event. However, the LOCA and HELB accidents will see higher drywell temperatures due to the sharp rise in temperature and humidity that occurs as the result of a rapid release of energy. Based on these assumptions and the resulting composite accident profile discussed earlier, the resulting temperature response for a LOCA and HELB accident scenario will envelope the temperature response resulting from an SBO. Additionally, the most limiting components required for an SBO have been tested to a temperature of 340°F for a minimum of 3 hours, thus adding additional conservatism and enveloping expected drywell temperatures during an SBO.

3. <u>Battery Charger Area</u>

As reported in the Supplemental Response to Station Blackout submitted to the NRC on March 27, 1990, a detailed Control Building calculation was completed in support of SBO. This analysis was completed utilizing the computer program PCFLUD. The major assumptions and the results of the submittal are as follows:

<u>Major Assumptions</u>

1. A coping duration of 4 hours is identified for SBO.

2. A normal initial compartment temperature of 90°F is used in the PCFLUD heatup model. This temperature is based on actual temperature readings, taken by field personnel, of the metal panel surfaces throughout the Control Building elevation (el) 130-ft area.

3. The heatup of the 130-ft elevation is the enveloping case. Almost all major electrical equipment required during SBO is located on the 130-ft elevation which has the highest heat load in the Control Building. Therefore, the SBO temperature response of the entire Control Building (except the MCR) will be qualified based on the temperature response at the 130-ft elevation.

4. For conservatism, the Control Building is assumed to be surrounded by the Turbine Building on three sides. The initial temperature of the Turbine Building was assumed to be 110°F and instantaneously reach a steady-state temperature of 140°F following the SBO. The west wall is exposed to the outside and was assumed to be at 96°F drybulb and 77°F wet bulb, consistent with ASHRAE guidance.

5. The PCFLUD model developed for this calculation assumes the suspended ceiling in the HP area does not offer significant resistance to the density-driven, natural-convection heat flow to the concrete ceiling above. Standard acoustical tile is used. To validate this assumption, some of the acoustical tile will be replaced with "egg crate" panels to permit free convection of MCR air with the space above the acoustical tiles. The number of tiles to be replaced is not specifically stated in the calculation but will be, as a minimum, 20 percent of the total surface area.

6. Two compartments are assumed in this analysis. All rooms, except for those listed below, have normally open fire doors. The compartments whose doors are normally closed (except for the Unit 2 oil conditioner area) will not be included as part of the compartments:

   - RPS MG Set Rooms
   - Decon Room
   - Elevator
   - AC Room
   - HP Area Toilet
   - Stairs

7. Credit was taken for heat sinks in the HP area and the Unit 2 oil conditioner room. Since these areas have normally closed doors, a manual action to open the doors will be taken. In addition, several doors leading to the interior of the HP area will be opened.

8. The heat loads generated by electrical components were determined in accordance with methodologies described in various IEEE papers and information supplied by equipment manufacturers.

9. The analysis conservatively assumed Unit 1 was the SBO unit, since the ventilation loss in the Control Building is maximized.

Results

As evidenced in Attachment 3, the maximum area temperature at elevation 130 ft in the Plant Hatch Units 1 and 2 Control Building is 135°F during the 4-hour SBO duration. The temperature increase occurring after 2 hours is due to manual loading of the station service battery chargers on the EDG. All equipment in the Control Building required during an SBO will operate acceptably at this temperature, with the exception of the station service battery chargers discussed in GPC's response to NRC Evaluation Item 2.3.2.)

NRC EVALUATION ITEM 2.3.5 - CONTAINMENT ISOLATION

The licensee has correctly identified the containment isolation valves. However, since the AAC power is not available for the first hour after the onset of an SBO, the licensee should determine which valves and position indication require AAC power and include them in the appropriate procedure.

NRC Recommendation:

The licensee should determine which valves and position indicators will require power from the AAC source and ensure that each is identified in the appropriate plant procedures.

GPC Response:

GPC will modify procedures to require manual verification of valve position.

As stated in NUMARC 8700 and RG 1.155, appropriate containment integrity must be provided during the 4-hour SBO. Appropriate containment integrity is defined such that the capability for valve position indication and closure of certain containment isolation valves is provided, independent of the preferred Class 1E power supplies. Valves that require AAC for indication or operation are identified on the following pages. GPC intends to modify the station operations procedures to require manual verification of valve position if one of the following criteria cannot be met:

1. Another "fail closed" valve is in series with the valve in question.

2. A valve that is not dependent on the AAC (e.g., DC powered) for indication and operation is in series with the valve in question.

3. A normally closed manual valve is in series with the valve in question.

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It should be noted the valves powered from AAC power will have neither motive nor position indication power until AAC is available. Therefore, it is not credible to assume MOV movement until the AAC is available as the AAC provides the source for motive power. The operator will be provided a list of AC valves that do not meet one of the above three criteria and will be instructed to verify position and close the valve, if required. The justification to include or not include each valve in procedures is noted below:

Valve	Service	Justification
E51-F007	RCIC Steam Supply	This valve is normally open. Isolation is backed up by E51-F008 which is not AAC dependent.
E51-F003	RCIC Pump Torus	This valve is normally open. Suction Isolation is backed up by E51-F031 which is not AAC dependent.
E41-F002	HPCI Steam Supply	This valve is normally open. Isolation is backed up by E41-F003 which is not AAC dependent.
E11-F009	RHR Shutdown Suction	This valve is normally closed. Isolation is backed up by E11-F008 which is not AAC dependent.
E11-F004A-D	RHR Pump Torus Suction	These valves are normally open. These valves are in their required SBO position and do not require motion for an SBO. Valve position will be verified.
E11-F011A&B	RHR HX Condensate Drain	These valves are normally closed. These valves are in their required SBO position and do not require motion for an SBO. Valve position will be verified.
E11-F026A&B	RHR HX Condensate Drain Crosstie	These valves are normally closed. These valves are in their required SBO position and do not require motion for an SBO. Valve position will be verified.
E11-F028A&B	RHR Pump Test Isolation Valve	These valves are normally closed. These valves are in their required SBO position for the first hour. Valve position will be verified.

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Valve	Service	Justification
2E51-F007	RCIC Steam Supply	This valve is normally open. Isolation is backed up by 2E51-F008 which is not AAC dependent.
2E51-F003	RCIC Pump Torus Suction	This valve is normally open. Isolation is backed up by 2E51-F031 which is not AAC dependent.
2E41-F002	HPCI Steam Supply	This valve is normally open. Isolation is backed up by 2E41-F003 which is not AAC dependent.
2E11-F009	RHR Shutdown Suction	This valve is normally closed. Isolation is backed up by 2E11-F008 which is not AAC dependent.
2E11-F004A-D	RHR Pump Torus Suction	These valves are normally open. These valves are in their required SBO position and do not require motion for an SBO. Valve position will be verified.
2E11-F011A&B	RHR HX Condensate Drain	These valves are normally closed. These valves are in their required SBO position and do not require motion for an SBO. Valve position will be verified.
2E11-F026A	RHR HX Condensate Drain Crosstie	This valves are normally closed. These valves are in their required SBO position and do not require motion for an SBO. Valve position will be verified.
2E11-F028A&B	RHR Pump Test Isolation Valve	These valves are normally closed. These valves are in their required SBO position for the first hour. Valve position will be verified.

NRC EVALUATION ITEM 2.3.6 - REACTOR COOLANT INVENTORY

The licensee should clarify whether depressurization of the Reactor Pressure Vessel is necessary during SBO, especially, if suppression pool cooling is available at the time of AAC source availability (1 hour). After establishing the coping approach, the licensee should determine the peak suppression pool temperatures during any period without cooling, taking into consideration the localized pool temperatures and using the correct Heat Capacity Temperature Limit (HCTL) curve. The staff found inconsistencies among various backup analyses.

NRC Recommendation:

The Licensee should provide a clear description of the procedural guidance to the plant operators and define the approach that will be used to cope with an SBO event. After establishing this approach, the licensee should determine the peak suppression pool temperatures, taking into account localized suppression pool temperatures and using the correct HCTL curve. The licensee should submit the results of the analysis and the assumptions used for NRC review. The procedural guidance, assumptions, and supporting calculations should also be included in the SBO supporting documentation to be maintained by the licensee.

GPC Response:

It is GPC's position that clear procedural guidance is and will be available to cope with an SBO, regardless of the specifics of the deterministic SBO coping analysis.

The "inconsistencies" discussed in Attachment 1 to the NRC SER appear to be the following:

1. Ensure the suppression pool temperature rise will not cause operability problems for RCIC.

2. Ensure adequate net positive suction head (NPSH) is available for the low-pressure pumps after 4 hours without suppression pool cooling. (NRC SER Attachment 1 references a 200°F limit on bulk suppression pool temperature.)

3. SER Attachment 1 identified the scenario when SPC is placed in service 1 hour after the onset of SBO and requested GPC provide a clear description of the procedure guidance regarding RPV depressurization during SBO, consistent with the assumptions used in the supporting analysis.

4. Identify the proper HCTL curve and whether local (versus bulk) pool temperatures were considered in the HCTL development.

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GPC will briefly respond to each of these items and provide additional details on the adequacy of our coping analysis. These details will include the results of the analysis and the assumptions used.

Item 1

As stated previously, RCIC is normally aligned to the CST. Plant procedures instruct the operator to defeat the switch over to the suppression pool on high suppression pool level, thus alleviating any concerns regarding RCIC lube oil cooler operability. The CST water inventory is sufficient to satisfy SBO requirements as detailed below.

Item 2

Adequate NPSH will be available for the low-pressure RHR pump, even after 4 hours without suppression pool cooling. The Appendix R analysis used for the coping approach references a 200°F bulk pool temperature limit at 0 psig, but calculates a 211°F peak pool temperature at 8 psig. RHR pump operation is permitted at higher pool temperatures if torus pressure is above atmospheric pressure. The EOPs provide guidance on permissible pump flow rate at a given pool temperature and torus pressure. Attachment 4 of this enclosure provides an example of such a curve. Operating the RHR pumps within this guidance ensures adequate NPSH will be available and decreases the importance of an analytically-calculated peak suppression pool temperature.

Item 3

It is GPC's position that "clear procedure guidance" has and will be provided to the operator whether suppression pool cooling is initiated in 15 minutes, 1 hour, or 4 hours. The HCTL curve is insensitive to the specific inputs used in the Appendix R coping analysis which shows a bulk pool temperature of 165°F after 1 hour. If pool cooling was initiated at this time (as opposed to 4 hours into the event), the HCTL would probably not be exceeded, and rapid vessel depressurization would not be required. Whether or not vessel depressurization is required will depend upon other factors besides when pool cooling is initiated (e.g., initial pool temperature, actual decay heat, etc.). The benefit of the symptom-oriented EOPs is to make the specific scenario analyzed relatively unimportant. Thus, the usefulness of the coping evaluation is to provide a reasonable upper bound on expected parameters used in the EOPs (e.g., vessel pressure and water level, and containment pressure and temperature, etc.) and ensure the EOPs will cover the particular situation.

Item 4

A detailed discussion of local versus bulk pool temperature limits is provided in the following discussion of NRC recommendations. GPC is now using an HCTL based on Revision 4 of the EPGs which does not explicitly account for local/bulk temperature differences.

Detailed Discussion of NRC Recommendations

The plant EOPs provide guidance for plant operation under all operating conditions. During an SBO, controlled depressurizations may be required to maintain the plant within the limits of the appropriate HCTL curve presented in the Plant EOPs. The analyses show suppression pool cooling is not required during SBO. The coping approach, suppression peak pool temperatures, and HCTL curves are discussed below.

As stated in GPC's March 27, 1990 supplemental report for SBO, the coping approach assumes the RCIC system and one SRV will be used to maintain the plant in a hot shutdown condition for the 4-hour duration of SBO. After 4 hours, it is assumed power will be restored and the plant will be brought to a cold shutdown condition.

The coping approach for SBO was determined using analyses performed by GE for the 10 CFR 50 Appendix R Program. GE performed analyses of five different equipment sets that could be used to meet the requirements of 10 CFR 50 Appendix R and subsequently issued report NEDO-24372, "Minimum Systems Required for Safe Shutdown During A Fire in Edwin I Hatch Nuclear Power Station Units 1 and 2," dated October 1981. This report has been submitted to the NRC. Based on this analysis, Shutdown Path 1 in the Appendix R Program (the RCIC System and one SRV) was the equipment set evaluated by GPC to satisfy the SBO requirements.

GE later performed additional analyses of Appendix R Shutdown Paths 1 and 2 to account for subsequent plant modifications and general Appendix R Program evolution. As a result, GE issued report MED-03-0186, dated December 1985, portions of which have also been submitted to the NRC. In this analysis, GE re-evaluated the suppression pool temperature response for Appendix R Path 1 and demonstrated the RCIC system could maintain the plant in hot shutdown for the 4-hour duration of SBO without requiring suppression pool cooling. Suppression pool cooling will, however, be available within 1 hour when AAC power is available.

The major assumptions and results of the supporting analyses are as follows:

Major Assumptions

The NRC-approved GE evaluation model SAFE was used for GE Appendix R analysis MED-03-0186 to determine system response to SBO. The basic analysis assumptions are consistent with 10 CFR 50.48, 10 CFR 50 Appendix R and the plant EPGs. The key input assumptions are summarized below:

1. The reactor is assumed to be operating at 100-percent power and normal water level at the time of event initiation.

2. The event initiation occurs concurrently with LOSP.

3. The reactor scrams at event initiation either as a result of the concurrent LOSP or by manual action from the MCR.

4. The main steam isolation valves (MSIVs) begin to close at event initiation either as a result of a LOSP or due to manual closure.

5. Feedwater flow is assumed to ramp to zero in 5 seconds after the MSIVs are closed.

6. The 1979 ANS decay heat correlation is used to realistically model the reactor decay heat.

7. The initial temperature of the suppression pool is 95^{o}F, and containment pressure is 14.7 psia. The impact of higher initial pool temperatures on this event was addressed in GE proprietary report EAS-19-0388, "Elimination of the High Suppression Pool Temperature Limit for Plant Hatch Units 1 & 2," dated March 1988. GPC submitted this to the NRC on May 23, 1988 to justify elimination of the 95^{o}F Technical Specifications suppression pool temperature limit. The NRC did not approve elimination of this limit but did approve raising the limit to 100^{o}F.

8. The water level in the suppression pool is at the lowest level allowed by Plant Technical Specifications.

9. The suppression pool and the drywell are considered as an insulated volume.

10. Service water temperature is 95^{o}F.

11. The low-low set (LLS) function of the SRVs is assumed to be available.

12. Only one RHR pump and one RHRSW pump are available for decay heat removal.

13. The RCIC suction source was not specifically identified. The RCIC flow enthalpy was assumed to be a constant value of 58 Btu/lbm throughout the SBO event.

<u>Results</u>

Coping Approach

The Plant Hatch station operating procedures have been developed to support all expected plant operations. In the event of an abnormal or unexpected operating condition, the operator will be required to take action in accordance with the Plant Hatch symptom-oriented EOPs.

SUPPLEMENTAL RESPONSE TO STATION BLACKOUT

The EOPs were developed in accordance with the BWROG EPGs, Revision 4, which have been approved by the NRC. The EOPs, in concert with system operating procedures and recovery procedures, provide procedural guidance on how to mitigate expected and unexpected events based on the symptoms or operating conditions present during the event. During SBO, the operator will be required to: 1) control RPV water level, 2) maintain emergency diesel loads within the prescribed limits, 3) control RPV pressure such that the suppression pool HCTL will not be exceeded, and 4) ensure containment design limits and overall system design limits are not exceeded. All actions that must be initiated by the operator in response to an SBO event have been or will be incorporated into plant procedures.

Analyses completed for SBO concluded that sufficient equipment will be available to mitigate the consequences of an SBO. Decisions regarding specific equipment to be used during SBO will be made by the operator, based on his/her training and on information provided in the plant EOPs.

Plant procedures will also provide guidance regarding potential diesel loading reductions that may be required, as well as other manual operator actions that may be necessary to ensure AAC availability during an SBO.

A general overview of the sequence of events following onset of an SBO is discussed in the following three paragraphs. This sequence of events is based on the deterministic coping analysis associated with Appendix R.

Immediately following the onset of an SBO, plant operation will be controlled by DC sources. Within 1 hour, the operator will be required to start and load EDG 1B (AAC source) to provide emergency (AAC) power to equipment required for safe shutdown of the plant.

During the first 2.5 hours, reactor pressure will be automatically controlled by SRV actuations. As reactor inventory is lost due to SRV actuations, the RCIC system will be used to maintain reactor water level above the Level 1 setpoint.

Approximately 2.5 hours after the onset of SBO, the coping analysis assumes the operator may be required to manually actuate one SRV to reduce reactor vessel pressure and prevent reactor water level from reaching Level 8, which is the high water level trip for RCIC. This action is necessary to ensure suppression pool temperature will not exceed the HCTL. Although manual depressurization would reduce reactor inventory, the RCIC system will have sufficient capacity to maintain reactor water level above the Level 1 setpoint. Shutdown cooling using the low-pressure RHR system would be initiated by the operator 4 hours after the onset of SBO. At this time, normal power is assumed to be restored, and the SBO event is terminated.

Suppression Pool Temperature

Based on GE analysis MDE-03-0186 discussed earlier, the resulting suppression pool peak temperature and pressure for the Appendix R Safe Shutdown Path 1 (the RCIC system and one SRV) is 211°F and 8 psig, respectively. These results are within the specified containment design conditions of 281°F and 56 psig and are below the specified HCTL curve. Therefore, the results are acceptable.

The peak suppression pool temperature and pressure of 211°F and 8 psig, respectively, occurred approximately 4 hours following initiation of a LOSP and are within the boundaries of the Revision 4 HCTL curve. Suppression pool cooling is, therefore, not required for the 4-hour duration of SBO. However, depending on the emergency diesel loading conditions, the operator may elect to initiate suppression pool cooling 1 hour after event initiation per the plant EOPs.

As stated in GPC's March 27,1990 SBO submittal, the RCIC system is normally lined up to take suction from the CST. In the event of an SBO, RCIC will take suction from the CST until either the CST reaches its low-level setpoint or the suppression pool reaches its high-level setpoint. Upon reaching either of these limits, RCIC suction will automatically switch over to take suction from the suppression pool. However, per the plant EOPs, the operator will override the suppression pool high-level signal and keep RCIC suction aligned to the CST. The CST is the preferable suction source as it offers cleaner and cooler water. GE analysis MED-03-0186 did not specifically identify the RCIC suction source. However, GE has stated that if the suppression pool was used as the RCIC suction source, the peak suppression pool temperature would be no more than 2°F higher than the peak pool temperature calculated using the CST as the suction source.

The CST for each Plant Hatch unit is a 500,000-gallon tank constructed such that 100,000 gallons are dedicated for use by the HPCI and RCIC systems. Both CSTs meet the water source requirements for an SBO per NUMARC-8700. GPC has updated the CST inventory calculation to account for the CST being the RCIC suction source during the 4-hour duration of SBO. In the March 27, 1990 submittal, GPC stated that the RCIC suction source would shift to the suppression pool upon a suppression pool high-level signal. The updated calculation shows the RCIC system will require 80,000 gallons from the CST during SBO. Based on the above discussion, the CSTs will have sufficient capacity to satisfy RCIC requirements during an SBO. The CSTs are checked daily, and level indication for each tank is available in the MCR during normal operation.

Local Pool Temperature Limits

GPC provides the following response relative to the NRC's recommendation to "take into account localized suppression pool temperatures and (use) the correct HCTL curve:"

> The EOPs at Plant Hatch have been developed based on Revision 4 of the NRC-approved EPGs. The HCTL curve generated in Revision 4 of the EPGs does not account for local-to-bulk pool temperature differences, as did the HCTL curves in earlier EPG revisions. Justification for the higher HCTL curve in Revision 4 is GE report NEDO-30832, "Elimination of Limit on BWR Suppression Pool Temperature for SRV Discharge with Quenchers," dated December 1984. This report is currently under active review by the NRC and was approved for use to modify the HCTL in Revision 4 of the EPGs.
>
> Plant Hatch's licensing basis includes consideration of the local pool temperature limits specified in NUREGs 0661 and 0783. However, GPC's conformance to these limits was based on a specific set of deterministic scenarios which assumed suppression pool cooling was available. The SBO event is beyond Plant Hatch's original licensing basis and falls under the symptom-oriented emergency procedures. As such, GPC intends to use the Revision 4 HCTL curve which does not specifically account for local pool temperature limits.

HCTL Curve

The HCTL is defined as the highest suppression pool temperature at which initiation of RPV depressurization will not result in exceeding either the suppression pool design temperature or the primary containment pressure limit before the rate of energy transfer from the RPV to the containment is within the capacity of the containment vent. The temperature is a function of RPV pressure, and the limit is utilized to preclude failure of the containment or equipment necessary for the safe shutdown of the plant. The HCTL curves for Hatch Units 1 and 2 (Attachments 5 and 6, respectively) are presented in the plant EOPs. The HCTL curves are revised in response to plant modifications, and new or revised EPG guidelines. Plant EOPs will always contain the latest HTCL curve for each unit.

References 22 and 24 of the SAIC Technical Evaluation Report, dated November 1990, refer to GE analysis MDE-03-0186, dated 1985, and a memo from R. A. Glasby (Bechtel Power Corporation) to L. B. Long (Southern Company Services) dated 1982. Both documents addressed the HCTL curves that were valid at the time the documents were issued. These curves however, are no longer used at Plant Hatch.

NRC EVALUATION ITEM 2.6 - QUALITY ASSURANCE (QA) AND TECHNICAL SPECIFICATIONS

The licensee has stated that all SBO equipment is currently covered by QA programs with the exception of the reactor protection system (RPS) distribution system. The system is designed to be fail safe, and its failure will not adversely affect the plant's ability to achieve and maintain hot shutdown during an SBO. The importance of the RPS distribution system in coping with an SBO could not be determined. Therefore, the licensee needs to provide additional information regarding the importance of the RPS distribution system in coping with an SBO before compliance with the guidance of RG 1.155 can be evaluated.

NRC Recommendation:

1. The licensee should provide additional information regarding the importance of the RPS distribution system in coping with SBO, and 2. The licensee should identify the equipment powered from the RPS MG sets which is necessary during an SBO and include it in the QA program.

GPC Response:

The reactor protection system (RPS) motor-generator (MG) sets are not necessary to cope with an SBO and, therefore, will be deleted from the SBO Equipment List.

The RPS MG sets were originally added to the SBO Equipment List, since they provide power to MSIVs 2B21-F022A-D and 2B21-F028A-D, RHR HX outlet sample valves E11-F079A (Unit 1) and 2E11-F079A (Unit 2), and related fail-safe RPS instrumentation. The RPS MG sets are not required for SBO, as justified by the following:

1. The MSIVs fail to their closed position on loss of power and do not require power to achieve their required positions during an SBO. The MSIV valve position indication is not affected since it is powered from a DC source.

2. The RHR HX outlet sample valves are normally closed and are required closed during shutdown. These valves are exempted from the valve position indication guidance presented in NUMARC 8700 since they fail closed on loss of AC power and they are less than 3 inches in nominal diameter.

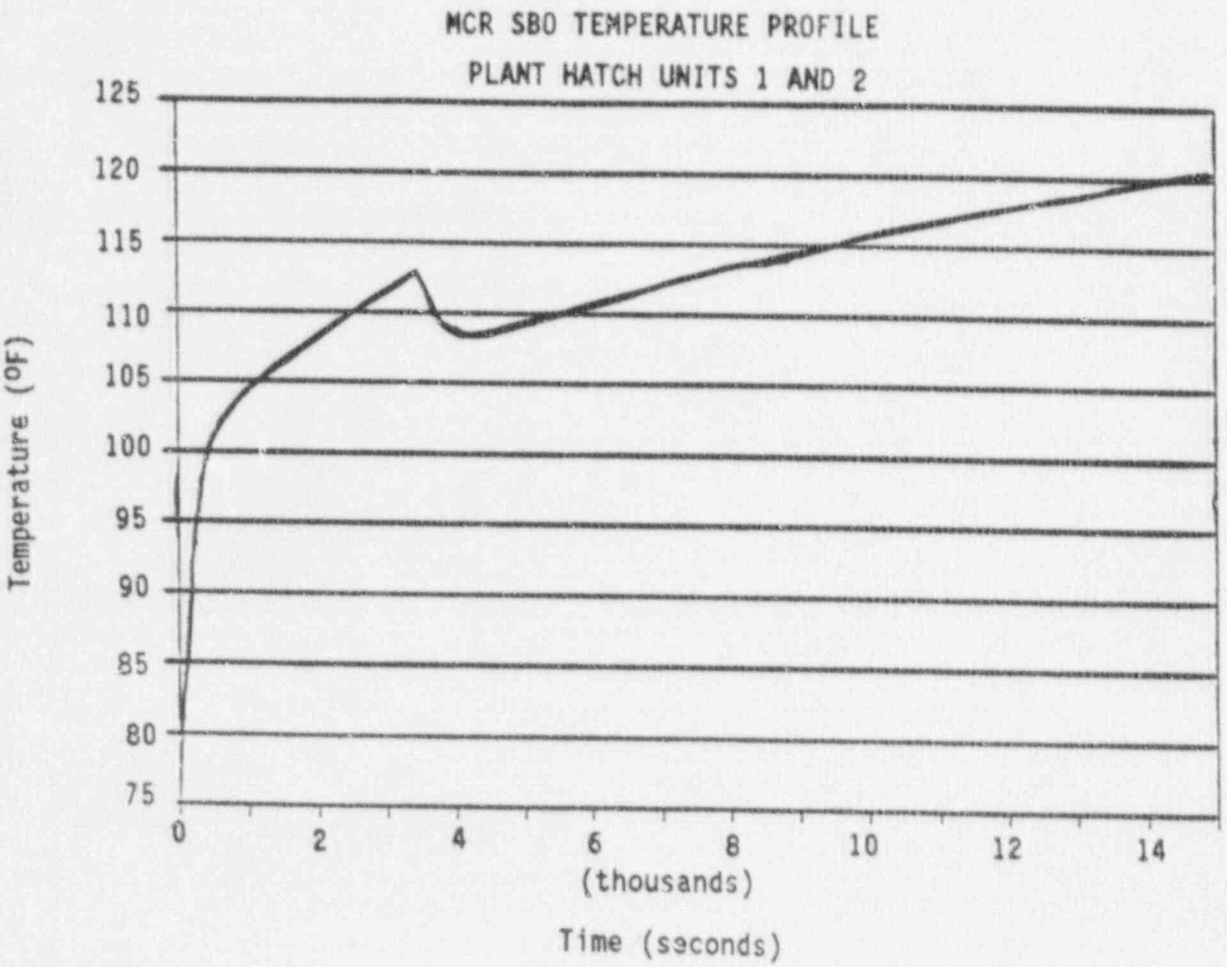
3. Related fail-safe RPS instrumentation includes: 1.) reactor pressure trip units 2B21-N678A-D and 2B31-N679A&D, and 2.) reactor water level trip units 2B21-N680A-D, 2B21-N681A-D, and 2B21-N682A-D. This instrumentation provides the trip signals for the RPS, the nuclear steam supply system (NSSS), and the pimary containment isolation

system (PCIS) functions. The design bases for these systems require they be fail-safe. Therefore, power is not required for functions to be accomplished or support actions required during the SBO coping duration.

Based on the above, the RPS MG set need not be re-energized when the AAC is available to support actions required for an SBO, although the operator may elect to do so if adequate capacity exists. The RPS MG sets, RPS distribution panels, and RPS instrumentation will be deleted from the SBO Equipment List.

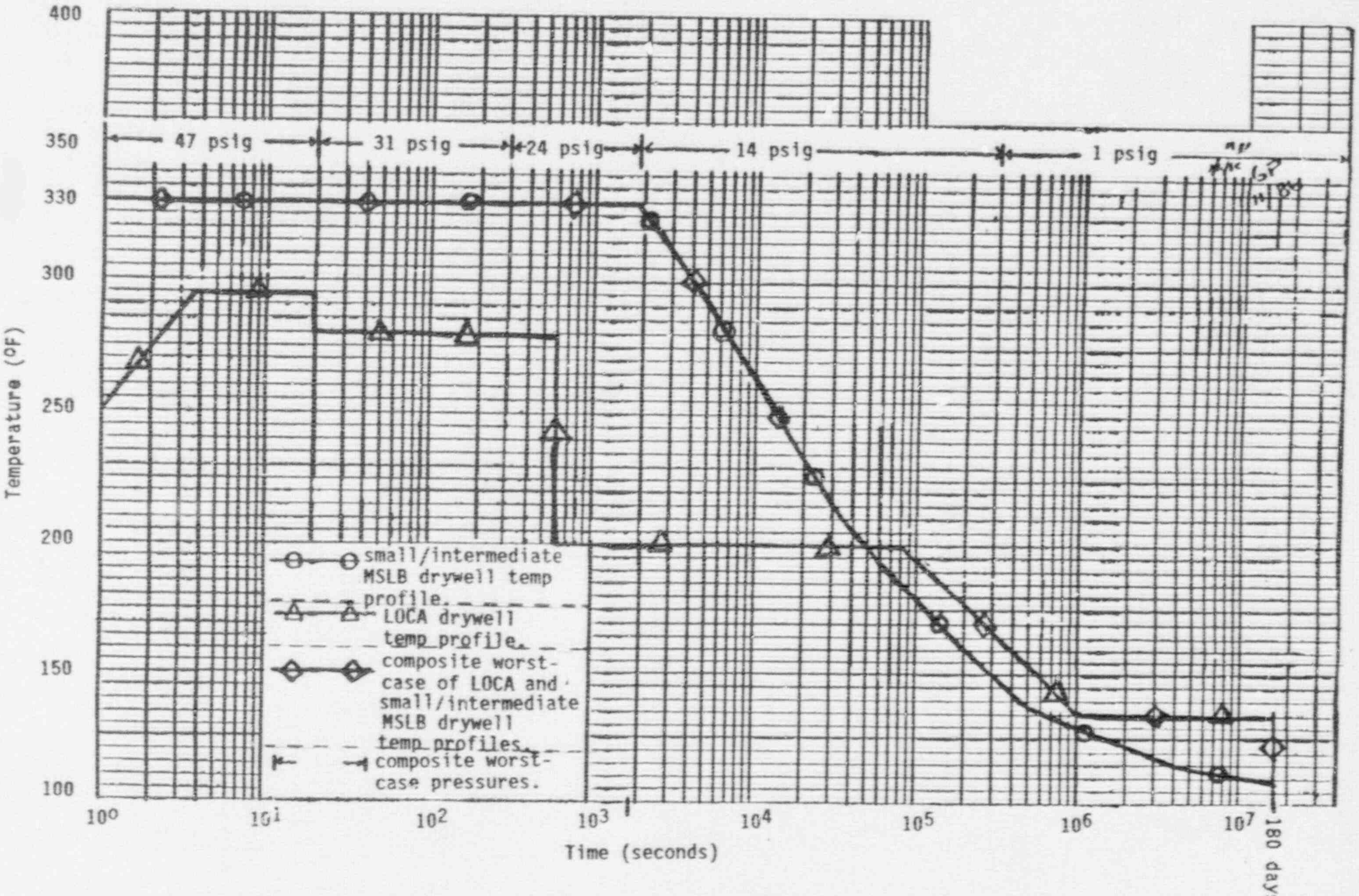
ATTACHMENT 1

SAFETY EVALUATION OF STATION BLACKOUT - RESPONSE



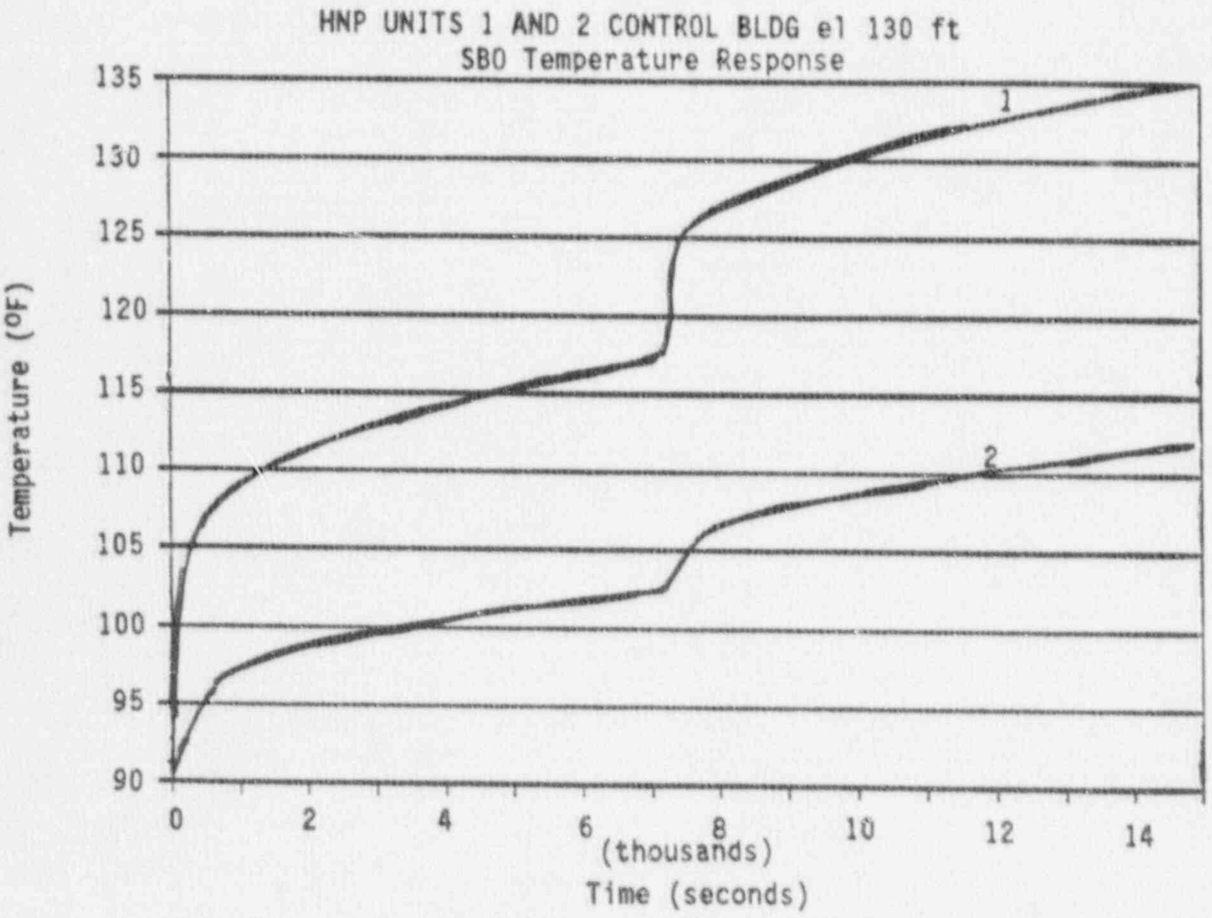
ATTACHMENT 2

SAFETY EVALUATION OF STATION BLACKOUT - RESPONSE



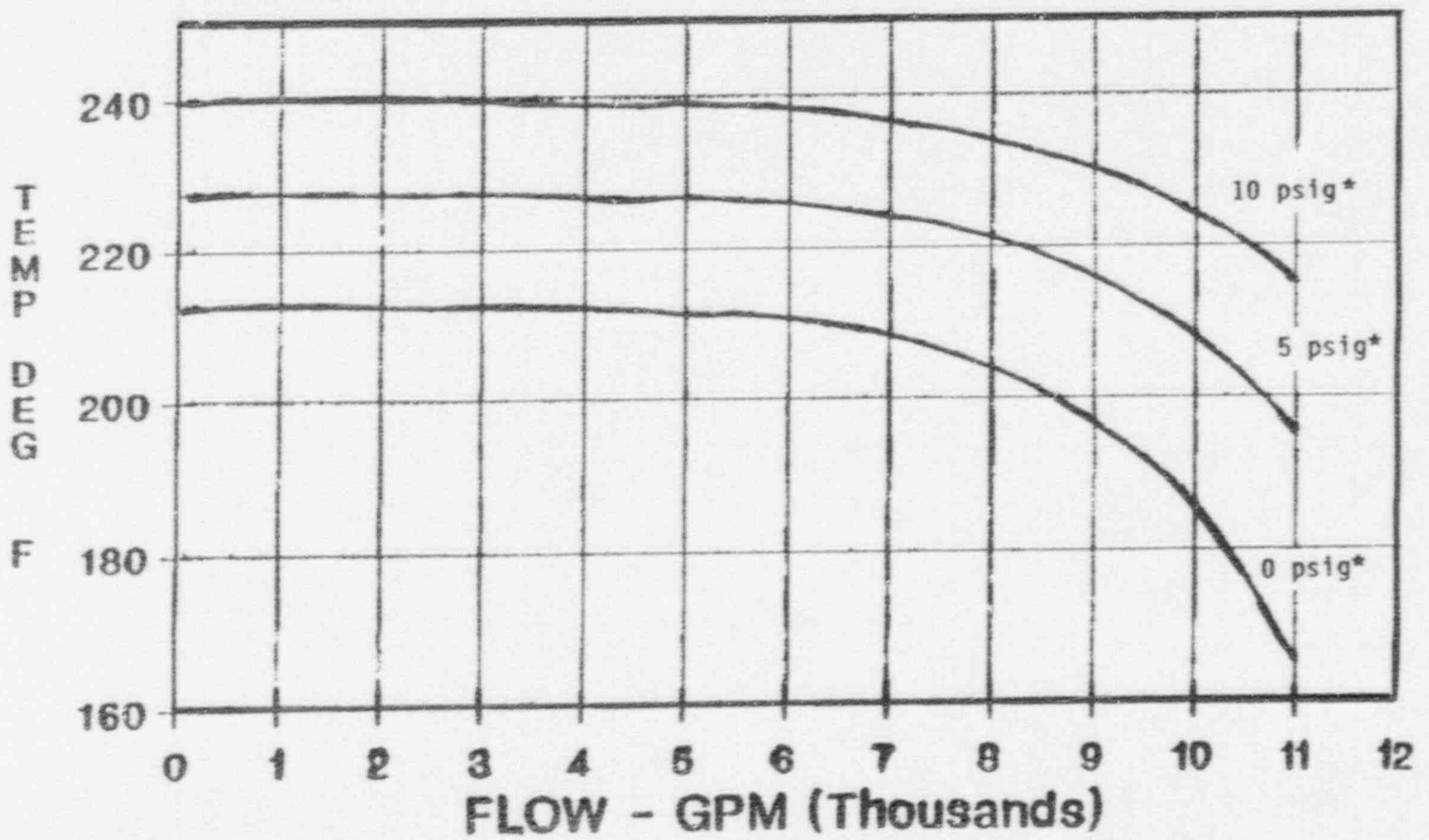
ATTACHMENT 3

SAFETY EVALUATION OF STATION BLACKOUT - RESPONSE



HATCH 2 RHR

RHR Pump NPSH Limit



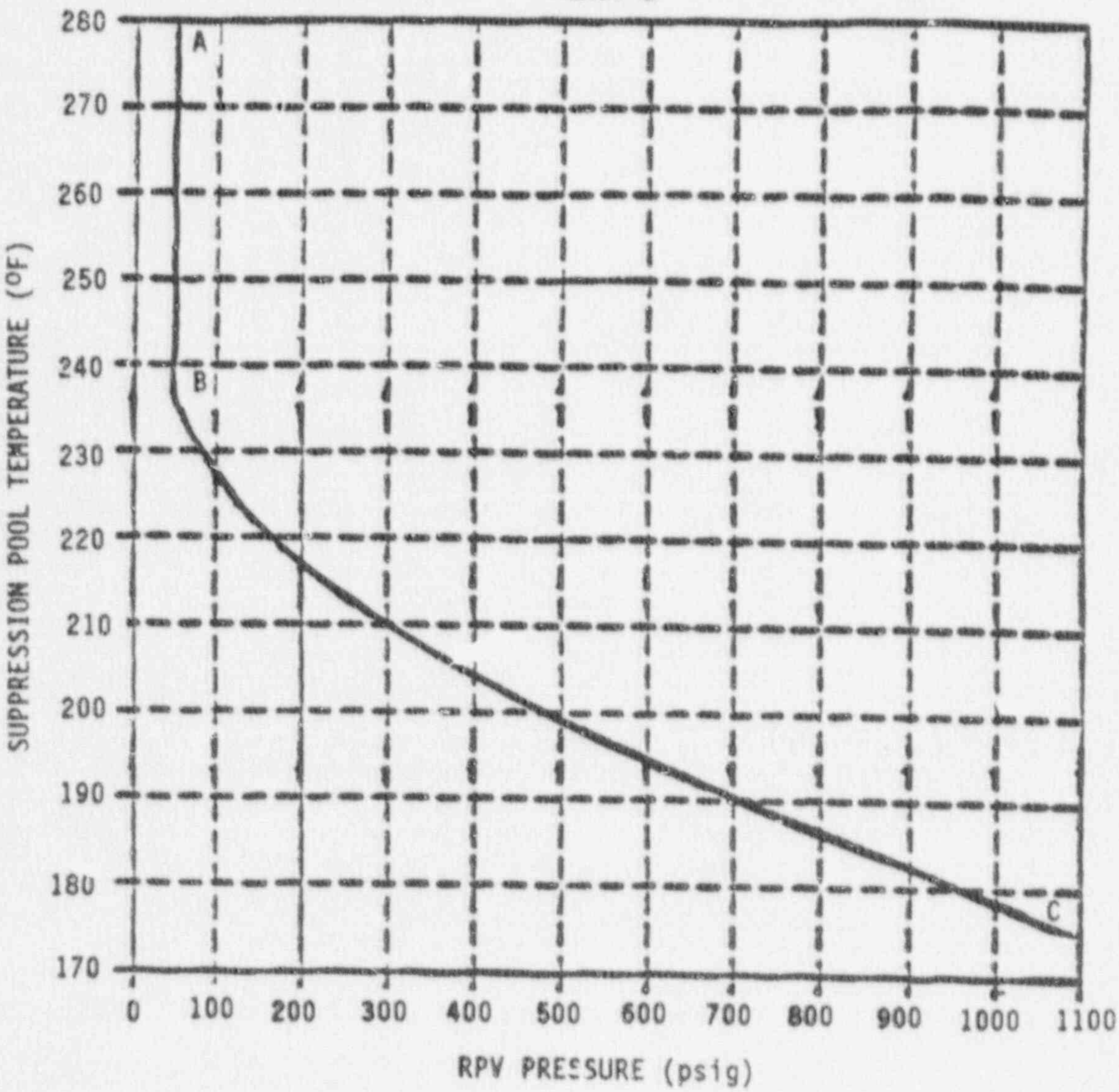
*TORUS FREE SPACE PRESSURE.

ATTACHMENT 5

SAFETY EVALUATION OF STATION BLACKOUT - RESPONSE

HEAT CAPACITY TEMPERATURE LIMIT

UNIT 2



ATTACHMENT 6

SAFETY EVALUATION OF STATION BLACKOUT - RESPONSE