Log # TXX-92447
File # 908.3
Ref. # 10CFR50.63

TU ELECTRIC

October 1, 1992

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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
RESPONSE TO STATION BLACKOUT (SBO) RULE

REF: (1) TU Electric Letter logged TXX-901008 from William J. Cahill, Jr. to NRC dated November 5, 1990
(2) NRC Letter from Thomas A. Bergman to William J. Cahill, Jr. dated February 27, 1992

Gentlemen:

Pursuant to 10CFR50.63, "Loss of All Alternating Current Power," attached is TU Electric's assessment of CPSES's ability to withstand and recover from an SBO for Units 1 and 2. CPSES meets the criteria of a four hour AC Independent Plant. With the availability of an emergency diesel generator in the non-blacked-out unit, credit is taken for the operation of selected systems which service both Units 1 and 2.

Note that the provisions of the SBO report, Attachment 1, apply to each unit individually unless otherwise indicated. If the provisions are different for each unit, then the unit differences are identified in the text of the report. Those portions of the report that have changed from the original Unit 1 report, reference 1, have been indicated by **boldface** type. The **boldface** changes reflect the addition of Unit 2 to the report as well as clarifications for both units as a result of NRC review and comments.

In addition, Attachment 2 has been provided to summarize TU Electric's actions with respect to the NRC recommendations contained in the NRC staff's preliminary safety evaluation, reference 2.

TU Electric plans to finalize the operating procedures and equipment list associated with dual unit operation following NRC review and approval of the enclosed report. Full implementation, including training, will be completed as soon as practical and well within the mandatory two year period.

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If additional information is required, please contact David Bize at (214) 812-8879.

Sincerely,

William J. Cahill, Jr.

DNB/dnb
Attachments

c - Mr. J. L. Milhoan, Region IV
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# RESPONSE TO STATION BLACKOUT RULE FOR COMANCHE PEAK STEAM ELECTRIC STATION

On July 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations in 10 CFR Part 50. A new section, 50.63, was added which requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout (SBO) of a specified duration. Utilities are expected to have the baseline assumptions, analyses, and related information used in their coping evaluation available for NRC review. It also identifies the factors that must be considered in specifying the station blackout duration. Section 50.63 requires that, for the station blackout duration, the plant be capable of maintaining core cooling and appropriate containment integrity. Section 50.63 further requires that each licensee submit the following information:

1. A proposed station blackout duration including a justification for the selection based on the redundancy and reliability of the onsite emergency AC power sources, the expected frequency of loss of offsite power, and the probable time needed to restore offsite power;

2. A description of the procedures that will be implemented for station blackout events for the duration (as determined in 1 above) and for recovery therefrom; and

3. A list and proposed schedule for any needed modifications to equipment and associated procedures necessary for the specified SBO duration.

The NRC has issued Regulatory Guide 1.155, "Station Blackout," which describes a means acceptable to the NRC Staff for meeting the requirements of 10 CFR 50.63. Regulatory Guide (RG) 1.155 states that the NRC staff has determined that NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," also provides guidance that is in large part identical to the RG 1.155 guidance and is acceptable to the NRC Staff for meeting these requirements.

Table 1 to RG 1.155 provides a cross-reference between RG 1.155 and NUMARC 87-00, and notes where the RG takes precedence.

TU Electric has evaluated Comanche Peak Steam Electric Station Units 1 and 2 against the requirements of the SBO rule using guidance from NUMARC 87-00, except where RG 1.155 takes precedence. The results of this evaluation are detailed below.

A. Applicability of the NUMARC 87-00 Methodology

The applicability to Comanche Peak Units 1 and 2, of the assumptions upon which the NUMARC 87-00 methodology is based, has been verified as described below:

1. General Criteria

Following the guidance in NUMARC 87-00 to determine the required station blackout coping duration and to assess the coping capability of the units provide a high level of assurance that the systems necessary for decay heat removal and containment isolation will function as required during a station blackout. Furthermore, verifying the applicability of NUMARC 87-00 assumptions provides assurance that the reactor coolant inventory during the station blackout is adequate to maintain the reactor core covered.

2. Initial Plant Conditions

As assumed in NUMARC 87-00, the potential for core damage from a station blackout at Comanche Peak is bounded by design-basis events that are initiated from conditions that exist when the reactor is operating at a power level of 100%.

3. Initiating Event

3.1. The initiating event for a station blackout at Comanche Peak is assumed to be a loss of all offsite power (LOOP) resulting from a switchyard-related event due to random faults, an external event such as a grid disturbance, or a weather-related event that affects the offsite power systems either throughout the grid or at the plant.

3.2. The LOOP at Comanche Peak is assumed to affect all offsite power lines on the site.

3.3. No emergency AC power sources are assumed to be available at Comanche Peak as alternate AC power sources.

3.4. No design-basis accidents are assumed to occur at Comanche Peak immediately prior to or during a station blackout.

4. Station Blackout Transient

4.1. As assumed in NUMARC 87-00, following the loss of all offsite power at Comanche Peak, the reactor automatically trips with sufficient shutdown margin to maintain the reactor subcritical at hot standby. However, the possibility exists that the reactor may return briefly to critical conditions during the cooldown, because procedures at Comanche Peak direct control room operators to cooldown the reactor coolant system (RCS) at the maximum cooldown rate to preserve RCS inventory by reducing the rate of any leakage from the RCS. These procedures direct the operators to monitor reactor subcriticality, and to terminate the cooldown if a positive startup rate is achieved. Analysis has shown that any power excursion that may result from momentary returns to criticality during such a cooldown remain well below the point of adding heat, and so are insignificant with respect to heat generation.

4.2. As assumed in NUMARC 87-00, the main steam system safety valves that are necessary to maintain decay heat removal functions at Comanche Peak will operate properly during a station blackout.

- The Main Steam Isolation Valves (MSIVs) close to isolate the steam generators to prevent excessive blowdown and allow for a controlled cooldown of the reactor coolant system. The MSIVs at Comanche Peak are Y-pattern globe valves that require hydraulic pressure to open, gas (nitrogen) pressure to close, and fail closed on a loss of hydraulic pressure. Valve closure is accomplished by energizing either of two redundant solenoids on the hydraulic fluid discharge manifold to allow valve hydraulic fluid to drain to the oil reservoir, thereby enabling the stored nitrogen pressure above an actuating piston to close the valve. The solenoids for venting the hydraulic pressure are powered from safety-related batteries. Calculations show that the safety-related batteries have sufficient capacity to supply all of their loads (including these solenoids) throughout the station blackout event.

- The steam generator atmospheric relief valves (ARVs) provide automatic steam pressure relief capability and manual steam line depressurization for controlling the cooldown of the reactor coolant system. These valves are safety-related and air-operated, and have dedicated safety-related air accumulators to enable valve operability following a loss of compressed air. These accumulators are sized to provide enough air for four hours of valve operation during a cooldown.

- **The AFW Turbine steam isolation valves for Units 1 and 2 are safety-related air operated, normally closed valves which are designed to fail open upon loss of AC power or instrument air supply. Fail open is the safe position in order to permit uninterrupted steam supply to the AFW Turbine in the event of a loss of offsite power. Although the valves are not required to be cycled during the SBO event, the valves are provided with safety grade air accumulators for remote operation in the event the valves must be closed for the purpose of containment isolation during the SBO event. The accumulators are sized with sufficient air capacity for the duration of the SBO event.**

- The turbine stop valves are required to close quickly following a reactor trip, to prevent excessive reactor cooldown. Closure is accomplished by activating either of two remote trip solenoids which allow the auxiliary trip fluid circuit to depressurize. This activates devices which allow the trip fluid circuit to depressurize and isolate the control fluid supply, which in turn allows compressed springs to close the valves. Instrumentation and controls required to close the valves are powered from a non-safety-related batteries.

- Steam Generator Blowdown **and Process Sampling** isolation valves are required to close to prevent excessive blowdown. These valves are air-powered and fail closed on loss of instrument air. In addition, remote manual closure of each valve may be accomplished by activating solenoids that are powered from a safety-related battery.

- The Main Steam Safety Valves (MSSVs) provide overpressure protection for the Main Steam lines. These valves are safety-related, self-contained, spring-actuated valves that require neither AC power nor manual action to actuate.

4.3. As assumed in NUMARC 87-00, the safety/relief valves and power-operated relief valves at Comanche Peak will operate properly during a station blackout.

- o The pressurizer Power-Operated Relief Valves (PORVs) are normally closed, gas-operated (nitrogen), and have reverse-acting fail-closed gas actuators. Nitrogen is supplied to each valve from a dedicated accumulator that is sized to enable the valve to cycle 100 times in a 10-minute period. Valve control circuits are powered from safety-related batteries. The valves are environmentally qualified for an environment that is more harsh than that associated with a station blackout.

- o The pressurizer safety valves are safety-related, self-contained, spring-actuated valves that require neither AC power nor manual action to actuate.

4.4. As assumed in NUMARC 87-00, no independent failures, other than those causing the station blackout event, are assumed to occur at Comanche Peak during the course of the transient.

4.5. As assumed in NUMARC 87-00, AC power is available to necessary shutdown equipment at Comanche Peak within four hours.

5. Reactor Coolant Inventory Loss

An CPSES-specific calculation shows that expected rates of reactor coolant inventory loss under station blackout conditions at Comanche Peak do not result in core uncovering in the four hour period. This calculation assumes that the reactor coolant pump leakage is initially 25 gpm/pump, and that it decreases with decreasing RCS pressure.

6. Operator Action

As assumed in NUMARC 87-00, operator action at Comanche Peak is assumed to follow the Plant Operating Procedures for the underlying symptoms or identified event scenarios associated with a station blackout. At Comanche Peak, the primary procedures that operators follow during a station blackout **are** ECA-0.0A **and ECA-0.0B, Unit 1 and Unit 2, respectively, hereafter referred to as ECA-0.0,** "Loss of All AC Power."

7. Effects of Loss of Ventilation

7.1. Equipment Operability Inside Containment

A Westinghouse calculation of the temperature response of a large dry containment like Comanche Peak's indicates that temperatures inside containment, resulting from the loss of ventilation during a station blackout, are enveloped by the loss-of-coolant accident and **main steam** line break temperature profiles.

7.2. Equipment Operability Outside Containment

(a) According to NUMARC 87-00, areas containing equipment required to cope with a station blackout need be evaluated only if the area is a dominant area of concern and the dominant area of concern has not been previously evaluated as a harsh environment due to a high- or moderate-energy line break. However, at Comanche Peak, all of the equipment has been evaluated for operability.

(b) **The battery sizing calculations were performed in accordance with the methodology and assumptions in IEEE 485.** A CPSES specific calculation shows that the loss of heating in the battery room results in a minimum battery room temperature of 67°F. A CPSES specific battery sizing calculation that assumed an electrolyte temperature of 65°F shows that, even without load shedding, the heaviest loaded battery has sufficient capacity to not only carry its loads for a four hour period, but also provide sufficient DC power for Diesel Generator field flashing. **Other assumptions included:**

1. **Aging factor of 1.25.**
2. **Temperature correction factor of 1.08, and**
3. **Design margins of 25 and 35 percent for Class 1E batteries.**

7.3. Control Room Temperature

**The control rooms for Units 1 and 2 are in a common area and are serviced by a common ventilation system. The common ventilation system has four 50% capacity air conditioning units, two of which are normally operating. At least one of these air conditioning units will be available during a station blackout. With only one air conditioning unit in operation, the control room temperature will increase by a small amount, which will not prevent the operators from performing necessary actions nor affect the operability of control room equipment and instrumentation.**

8. <u>System Cross-Tie Capability</u>

**The capability exists to cross-tie fluid systems that supply cooling to the control room and uninterruptible power supply ventilation systems. No credit has been taken for this capability with respect to CPSES ability to cope with a station blackout. However, as defense-in-depth, these systems may be used to provide additional ventilation.**

9. <u>Instrumentation and Controls</u>

**The availability of instrumentation and controls required for a station blackout has been evaluated. The required control room indications are enveloped by accident monitoring or Chapter 15 accident analyses requirements. The indications are routinely surveilled to ensure operability.** As assumed in NUMARC 87-00, operators are trained to take appropriate actions in the event of erratic performance or failure of shutdown equipment and/or instrumentation.

10. <u>Containment Isolation Valves</u>

As assumed in NUMARC 87-00, containment isolation valves either fail in the safe condition, in accordance with the design bases, or the penetration can be manually isolated. Step 1 in Section 7.2.5 of NUMARC 87-00 requires the identification of the following containment isolation valves. **These valves are identical in each unit.**

| TAG NUMBER(S) | DESCRIPTION |
|---|---|
| HV-2333, HV-2334, HV-2335, HV-2336 | Main Steam Isolation Valves |
| HV-2452-1, HV-2452-2 | Steam Isolation Valves for Turbine Driven AFW Pump |
| HV-2134, HV-2135, HV-2136, HV-2137 | Main Feedwater Isolation Valves (FWIVs) |
| HV-2491A, HV-2491B HV-2492A, HV-2492B HV-2493A, HV-2493B HV-2494A, HV-2494B | AFW Pump Discharge Isolation Valves |
| 8809A, 8809B | Isolation Valves between the Residual Heat Removal System and Reactor Coolant System Cold Leg Piping |

| | |
|---|---|
| 8835 | Isolation Valve between the Safety Injection System and Reactor Coolant System Cold Leg Piping |
| 8105 | Isolation Valve in the Charging Line from the Chemical and Volume Control System |

Of these valves, the AFW steam supply valves HV-2452-1 and HV-2452-2, are designed to fail open upon loss of AC or air supply. The valves are required to remain open during the station blackout so that a steam supply to the turbine driven AFW Pump is ensured. Although these valves are not required to be cycled during the SBO event, they have been evaluated for remote containment isolation capability in case the valves must be closed for containment isolation during the SBO event. The valves are provided with dedicated accumulators which have enough stored capacity for a full stroke and an appropriate leakage allowance to maintain them in the closed position for the entire station blackout duration.

The FWIVs are safety related motor operated valves which fail as is upon loss of AC power. The FWIVs are provided with two DC powered solenoids to close the FWIVs, if needed, and have DC operated open/closed position indication switches in the control room. However, for containment isolation, the FWIVs are backed up by the non-safety related feedwater control and bypass valves. These non-safety valves are surveilled once every 18 months in accordance with slave relay testing.

All of the other valves in the above table fail open on loss of power, but they all either must remain open, or are in series with other containment isolation valves that were not identified as "containment isolation valves of concern" by Step 1 of Section 7.2.5 of NUMARC 87-00.

11. Hurricane Preparations

NUMARC 87-00 assumes that procedural actions taken in anticipation of the effects of a hurricane provide significant safety benefits and reduce the risk of a station blackout. However, because Comanche Peak is so far inland, the site is not susceptible to the effects of hurricanes. Comanche Peak does have procedures that direct actions taken in anticipation of the effects of severe weather, including tornadoes. These actions provide significant safety benefits and reduce the risk of a station blackout due to severe weather.

B. Deviations from the NUMARC 87-00 Methodology

The analyses performed to evaluate Comanche Peak Units **1 and 2** against the requirements of 10CFR50.63 were consistent with the methodology described in NUMARC 87-00, except as noted in Table B.1.

C. Proposed Station Blackout Duration

Section 3 of NUMARC 87-00 was used to determine a proposed station blackout duration of four hours. No modifications were required to attain this coping duration category.

The following plant factors were identified in determining the proposed station blackout duration:

1. The AC Power Design Characteristic Group is P1 [illegible] **each Unit** based on:

   a. The expected frequency of grid-related losses of offsite power (LOOPs) does not exceed once per 20 years.

   b. According to Table 3-2 of NUMARC 87-00, the estimated frequency of LOOPs at Comanche Peak due to extremely severe weather is 0.0001/year. This frequency places the plant in ESW Group 1.

   c. Using Table 3-3 of NUMARC 87-00 and the formula from Part 1c of Section 3.2.1, the estimated frequency of LOOPs at Comanche Peak due to severe weather is 0.00248/year. This frequency places the plant in SW Group 1.

   d. The offsite power system at Comanche Peak is in the I1/2 Group because all of the offsite power sources are connected to the site through electrically independent and physically separated switchyards. (FSAR Figure 8.2-2 shows the configuration of the offsite AC power sources for CPSES.)

2. The emergency AC power configuration group is C **per unit** based on:

   a. Two emergency AC power supplies, **per unit,** are not credited as alternate AC power sources.

   b. One emergency AC power supply, **per unit,** is necessary to operate safe shutdown equipment following a loss of offsite power.

Table B.1: Deviations from the NUMARC 87-00 Assumptions at Comanche Peak

| NUMARC 87-00 Reference | NUMARC 87-00 Assumption | Comanche Peak Unit 1 Assumption |
|---|---|---|
| Assumption 2.3.1(3) | Emergency AC power sources are assumed to be available as alternate AC power sources to cope with a station blackout under certain conditions. | No emergency AC power sources are assumed to be available as alternate AC power sources to cope with a station blackout. |
| Assumption 2.5.1 | Reactor coolant pump leakage is assumed to be a constant 25 gpm/pump. | Reactor coolant pump leakage is assumed to be 25 gpm/pump at RCS operating pressure, but the rate decreases as RCS pressure decreases. |
| Assumption 2.8 | Multi-unit sites will be able to achieve and maintain safe shutdown in the affected unit by procedurally utilizing the unaffected unit's cross-tied systems. | No credit is taken for electrical or fluid system cross-ties. |
| Assumption 2.11 | Procedural actions taken in anticipation of the effects of a hurricane provide significant safety benefits and reduce the risk of a station blackout. | Procedural actions taken in anticipation the effects of severe weather (including tornadoes) provide significant safety benefits and reduce the risk of a station blackout. |
| Assumption 7.2.4 | NUMARC 87-00 provides a procedure which can be used to determine the average steady-state temperature in dominant areas of concern containing equipment necessary to achieve and maintain safe shutdown during a station blackout. | Site-specific calculations were performed to determine the time-dependent temperatures in dominant areas of concern, except UPS rooms where NUMARC-87-00, Rev. 1 Appendix H methodology was used. |

3. The target emergency diesel generator (EDG) reliability **per unit** is 0.95. This target reliability was selected based on:

   a. Having a nuclear unit average EDG reliability for the last **100** demands greater than 0.95 **for Unit 1.**

   b. **Currently, data is not available for Unit 2.**

   For Comanche Peak, TU Electric is committed to Safety Guide 9 (3/10/71) and the TransAmerica DeLaval, Inc., EDG Reliability Program. TU Electric will reevaluate this program upon resolution of Generic Issue B-56, "Emergency Diesel Generator Reliability," and issuance of Regulatory Guide 1.9, Revision 3, "Selection, Design, Qualification, Testing, and Reliability of Diesel Generator Units Used as Onsite Electrical Power Systems at Nuclear Power Plants," consistent with the reporting requirements of Regulatory Guide 1.9.

D. Procedure Description

Plant procedures have been reviewed to meet the guidelines in NUMARC 87-00, Section 4 in the following areas. **The following procedures are applicable to both Units, except for ECA 0.0 which is Unit specific.**

1. AC Power Restoration

The TU Electric Blackstart Plan provides guidelines for total or near-total grid blackout events. This Plan supports the Electric Reliability Council of Texas (ERCOT) Operating Guide Number 16, which was written for partial or complete collapse of the ERCOT system. The ERCOT guide places high priority on restoring power to nuclear units, and Page 3 of the TU Electric Blackstart Plan states that:

"Highest priority will be given to providing offsite power to Comanche Peak. This includes priority routing of the first available offsite power to Comanche Peak station service and the first priority allocation of materials and manpower to restore one transmission line into Comanche Peak should all lines be damaged and out of service."

ECA-0.0, "Loss of All AC Power," is the procedure used by CPSES operators to respond to a station blackout. ECA-0.0 directs the operators to attempt to restore power to an AC safeguards bus by starting the emergency diesel generators per ABN-601, "Response to a 138/345kV System Malfunction." If the emergency diesel generators fail to start, this procedure directs the operator to ABN-601. ABN-601 provides additional instructions to restore power from any remaining offsite power source. Thus, no procedure modifications are necessary to ensure that power would be restored from the first available power source.

2. Severe Weather

Because Comanche Peak is located so far inland, hurricane procedures are not applicable to CPSES. However, a tornado is a design-basis event for CPSES. CPSES procedure, ABN-907, "Acts of Nature," includes actions to be taken during tornado activity in the vicinity of the unit. These actions include:

- o Visual observations of weather conditions by Security officers and Emergency Response and Rescue personnel, and reporting of those conditions to the Control Room via radio or telephone;

- o Opening dampers in the Control Room to protect the Control Room air-conditioning units from damage; and

- o Visual inspections of plant buildings and structures following high winds and/or tornado activity at the site.

In addition, this procedure requires Emergency Response and Rescue personnel on duty in the First Aid Station to periodically monitor National Weather Service radio broadcasts for information about severe thunderstorms and tornado watches and warning, and to keep the Control Room informed of all watches or warnings issued or cancelled by the National Weather Service. Thus, no procedure modifications are necessary to provide guidance for operators to determine the proper course of action due to the onset of severe weather.

3. Station Blackout Response Guidelines

Section 4.2.1 of NUMARC 87-00 provides guidance for operator actions to be taken during a station blackout event. This guidance is in the form of 13 guidelines that assume a single path to achieve and maintain a safe shutdown condition during a station blackout event. In addition to repeated attempts at restoring AC power to a shutdown bus, the path consists of performing operations intended to stabilize the plant using available equipment.

ECA-0.0, "Loss of All AC Power," is the procedure used by CPSES operators to respond to a station blackout event. For various steps, ECA-0.0 refers the operator to other operating procedures. With respect to the 13 guidelines in NUMARC 87-00, the CPSES procedures and any necessary modifications to these procedures are described below:

3.1. ECA-0.0 directs the operators to attempt to restore power to an AC safeguards bus by starting the emergency diesel generators per ABN-601. If the diesel generators fail to

start, this procedure directs the operator to restore power from any remaining offsite power source.

3.2. ECA-0.0 provides specific actions for coping with a station blackout. These actions are consistent with the coping assessment described below.

3.3. ECA-0.0 requires the operator to verify auxiliary feedwater (AFW) flow. If flow can not be verified, the procedure directs the operator to manually align the AFW valves. ECA-0.0 verifies that potential feedwater flowpaths out of the steam generators are isolated, and monitors steam generator levels to ensure that AFW flow is adequate throughout the station blackout event.

3.4. ECA-0.0 directs the operator to isolate the reactor coolant system (RCS) to minimize RCS inventory losses by isolating major flowpaths out of the RCS, **and** directs operators to rapidly depressurize the intact steam generators, thereby reducing RCS temperature and pressure to reduce reactor coolant pump seal leakage and further reducing RCS inventory losses.

3.5. ECA-0.0 requires the operator to verify auxiliary feedwater (AFW) flow, **and to** isolate the condensate storage tank (CST) to preserve inventory of AFW by locally closing valves that isolate the CST from the condenser hotwell. Calculations have confirmed that the volume of water in the CST when the CST level is at the minimum level required by Technical Specifications is adequate to cooldown the RCS and maintain the RCS temperature while removing the decay heat that is generated during the station blackout duration. Thus, alignment of an alternate water source is not required during a station blackout.

3.6. Calculations have been performed to verify that the Class 1E batteries at Comanche Peak have enough capacity to supply SBO loads for the station blackout duration.

3.7. ECA-0.0 direct operators to verify containment isolation if and after a safety injection signal is received. Attachments to this procedure identify the valves and dampers that should automatically close in response to the safety injection signal. Examination has confirmed that all of the air-operated valves and dampers which are required to be closed for containment isolation are designed to fail closed on loss of AC power. ECA-0.0 also directs the operator to manually close or isolate any valves or dampers which should be closed but are not.

ECA-0.0 will be revised **for Unit 2** to acknowledge the inability of operators to verify valve closure during a station blackout for containment isolation valves whose position indication is powered from AC power only. **This action has been completed for Unit 1.**

3.8. Lighting for access into and egress out of a majority of areas in the unit is provided by emergency DC-powered lighting. In addition, portable lighting which may be required to perform some local actions is provided to the operators in tool kits that are distributed throughout the plant and marked for "Emergency Use Only." A sufficient number of these tool kits are located in areas illuminated by emergency DC-powered lighting. Additional batteries for the portable lighting are also provided in the tool kits.

Procedure OWI-[illegible], "Operations Department Management Periodic Review," will be revised to administratively control the availability of batteries for portable lighting in the emergency tool kits **in Unit 2. This action has been completed for Unit 1.**

3.9. According to the CPSES Physical Security Plan, one-hour uninterruptible battery capacity is furnished to the card readers, electrical locks, and balanced magnetic switches. In the event of a card reader failure due to loss of power, doors may be opened using hard keys. On-shift auxiliary operators carry hard keys with them to enable emergency access to required equipment, and policies direct them to open doors with their hard keys if a door card reader fails during emergency conditions. Emergency hard keys are also available in the Control Room and in the Key Control Facility inside the Protected Area.

ECA-0.0 will be revised to caution operators about the loss of normal plant lighting, the possible loss of security door card readers, and possible increases in area temperatures due to the loss of ventilation systems **in Unit 2** during a station blackout. This procedure will refer operators to procedure STA-674, "Heat Stress Management," for guidance in performing local operations in areas with high temperatures. **These actions have been completed for Unit 1.**

Procedure STA-674, "Heat Stress Management," identifies the symptoms of heat stress, provides administrative controls and establishes methods to reduce heat stress in high-temperature areas of the plant.

3.10. **ABN-601, "Response to a 138/345kV System Malfunction," will be revised to direct operators to open the UPS distribution**

**room doors within 30 minutes of a station blackout if the UPS air conditioning units are not operating to equalize the temperature in the area.**

3.11. ECA-0.0 **will be revised to** alert operators to radiation areas in **Unit 2.** The procedure **will** direct Radiation Protection personnel to monitor radiation levels to minimize the release of radioactivity and to alert operators of changes in radiological conditions. **This action has been completed for Unit 1.**

3.12. The turbine stop valves**, feedwater con.rol and bypass valves** and their associated power and control components are non-1E components which must be relied upon to cope with the station blackout event. Operability of these valves and components is assured through surveillance testing in accordance with the CPSES Technical Specifications **and slave relay testing, respectively.**

3.13. ECA-0.0 **will be revised for Unit 2 to** direct operators to monitor the temperature of the fluid in the Boric Acid Tank (BAT), and to add water to the BAT to reduce boron concentration if the fluid temperature falls below **the crystallization temperature. This action has been completed for Unit 1.**

4. Procedure Changes Associated with Required Modifications

**No hardware modifications are requi. d to cope with a station blackout.**

E. Proposed Modifications and Schedule

**No hardware modifications are required to cope with a station blackout.**

1. Condensate Inventory for Decay Heat Removal

A site-specific calculation determined that 187,200 gallons of water **per unit** are required to cooldown the reactor coolant system, remove decay heat for four hours, and restore steam generator levels. The minimum permissible condensate storage tank level per Technical Specifications provides **262,000** gallons of water **per unit**, which exceeds the quantity required for coping with a four hour station blackout. Thus, no modification is necessary to assure adequate condensate inventory for the station blackout event.

2. Class 1E Battery Capacity

A battery capacity calculation has been performed pursuant to Section 7.2.2 of NUMARC 87-00 to verify that the Class 1E batteries have sufficient capacity to supply the connected loads continuously for a period of four hours following a station blackout event. This calculation took no credit for load shedding, assumed an electrolyte temperature below the minimum calculated temperature for the battery room during a station blackout, and was performed in accordance with IEEE 485. Thus, no modification is necessary to assure adequate Class 1E battery capacity for the station blackout duration.

3. Compressed Air

Air-operated valves relied upon to cope with a station blackout for four hours can either be manually operated or have sufficient backup sources of compressed air independent of the preferred and blacked-out unit's Class 1E power supplies. Thus, no modification is necessary to assure operation of air-operated valves during a station blackout.

A review of ECA-0.0 identified the following air-operated valves **in each unit** that must be cycled during a station blackout:

| Tag Number(s) | Description |
|---|---|
| HV-2459, HV-2460, HV-2461, HV-2462 | AFW Throttling to Steam Generators |
| PV-2325, PV-2326, PV-2327, PV-2328 | Atmospheric Relief Valves (ARVs) on Steam Generators |

These valves have air accumulators to provide backup air supply upon loss of instrument air.

- o The AFW throttling valves have accumulators which are sized for 30 minutes of operation. ECA-0.0 specifically cautions operators about this limitation, and identifies valves which operators must locally operate to throttle AFW flow after the air accumulators are depleted. These valves are located in the turbine-driven AFW pump room, which is calculated to reach a maximum temperature of 131.1°F during the station blackout period. In addition, the AFW throttling valves may themselves be locally operated.

- o The ARVs have accumulators which are of sufficient size to enable a controlled cooldown of the RCS from hot standby to hot shutdown over the four hour station blackout period.

4. Effects of Loss of Ventilation

CPSES-specific calculations identified the following areas as dominant areas of concern:

| Area/Room Number | Description | Peak Temperature During SBO |
|---|---|---|
| 119 | UPS & Distribution Room Train B | **121.8**°F |
| 121 | UPS & Distribution Room Train A | **121.8**°F |
| 74 | Turbine-driven AFW Pump Room | 131.1°F |
| 83 | Electrical Equipment Area | 120.7°F |

The operability of the equipment required during the station blackout located in these areas has been assessed in accordance with **vendor data or** NUMARC 87-00 guidelines. No modifications or associated procedure changes are required to provide reasonable assurance for equipment operability for any of the equipment.

5. Containment Isolation

The list of containment isolation valves **for both units** has been reviewed to verify that valves which must be closed or capable of being operated (cycled) under station blackout conditions can be positioned (with indication) independent of the preferred and blacked-out unit's Class 1E power supplies. No plant modifications or procedure changes are required to ensure that appropriate containment integrity can be provided under station blackout conditions.

6. Reactor Coolant Inventory

**Unit 1 and Unit 2** plant-specific analys**e**s of reactor coolant system inventory assumed that reactor coolant pump leakage is initially 25 gpm/pump and decreases with decreasing RCS pressure. The analys**e**s show that the expected rates of reactor coolant inventory loss under station blackout conditions do not result in core uncovery during four hours. Therefore, makeup systems, in addition to those currently available under station blackout conditions, are not required to maintain core cooling under natural circulation (including reflux boiling).

f. <u>Availability of Common Systems</u>

Selected safety-related systems at CPSES are common systems (i.e., provide service to both Units 1 and 2). Power is supplied to these systems by electrical distribution equipment which can be supplied by an EDG from either Unit 1 or 2. In the event of a station blackout, at least one EDG will be available in the non-blacked-out unit to power these systems. The common electrical distribution equipment is designed to automatically switchover, if necessary, to the functional EDG. It should be noted that this inter-tie between units is for the same safety division (e.g., Unit 1 Train A inter-tied with Unit 2 Train A). Redundant safety divisions are <u>not</u> interconnected.

The following common systems will be available following a blackout at one Unit and a single EDG operating in the non-blacked-out unit. The operations of these systems are discussed below:

a. Control Room Lighting

Both the Units 1 and 2 Control Rooms are located in a common area. The control rooms are provided with EDG powered Essential Lighting which is supplied from common electrical distribution equipment. Therefore, AC powered lighting sufficient to produce approximately 16 foot-candles will be available during a station blackout. The control room lighting will be interrupted for a brief period between the onset of the loss of offsite power (LOOP) until the start sequence of the EDG is complete. During this brief period, DC lighting powered by dedicated non-safety related batteries is available.

b. Control Room Ventilation

This system contains four 50% capacity air conditioning units (2 per Train per unit), each of which is powered by common electrical distribution equipment. During normal operations, each of these four air conditioning units receive condenser cooling water from a different train of safety grade Component Cooling Water. If a station blackout were to occur, at least one 50% capacity air conditioning unit of the Control Room Ventilation System will be available. Because of the greatly reduced heat load following a station blackout one air conditioning unit is sufficient to prevent a significant rise in room temperature.

c. UPS Room Ventilation

This system contains two 100% capacity air conditioning units each of which is powered by common electrical distribution equipment. Each Unit is supplied with condenser cooling water from either the Unit 1 or Unit 2 train of Component Cooling Water (CCW). During normal operation, only one condenser cooling water path per unit is open. During an SBO, the condenser cooling water to the operating UPS room cooler may be lost. However, fans on the cooler will continuously circulate air throughout the UPS rooms with or without condenser cooling water.

To assess the effects of loss of cooling to the UPS Rooms, the maximum steady state temperatures was calculated using the methodology defined in Appendix H of NUMARC 87-00. A starting temperature of 95°F was assumed in this calculation based on one year of operating experience in Unit 1. This data indicated that the assumed starting temperature would reasonably bound the anticipated Unit 2 temperatures. The calculation indicates that the maximum steady state temperature reached will be no greater than 121.8°F provided that the UPS room doors are opened within 30 minutes after a station blackout.

The bulk air temperatures are monitored in the UPS rooms on a per shift basis. Administrative controls will be provided to ensure that the area temperature remains below the SBO initial starting temperature assumption.

d. Communications

The communication system consists of a Gaitronics Page Party and a Radio system, each powered by common safety-related distribution equipment. In the event of a station blackout, the systems will be powered by the available EDG. Although these systems are non-safety related, they will not be shed from the class 1E power supply. Therefore, both systems will be available during the station blackout.

# TU ELECTRIC RESPONSES TO NRC STAFF RECOMMENDATIONS IN PRELIMINARY SAFETY EVALUATION

| NRC RECOMMENDATION | TU RESPONSE |
|---|---|
| The Licensee is expected to verify the accuracy of the results and maintain documentation that support the stated results. (Section 1.0) | The accuracy of the SBO results has been verified as part of the dual Unit 1 and Unit 2 SBO analysis. |
| Include the EDG reliability calculations for the last 100 demands, provided the EDGs have experienced 100 demands. This documentation should retained in support of the SBO submittal. (Section 2.1) | The Unit 1 EDG reliabilities calculated using the NSAC-108 methodology are:<br><br>Train A - 1.0<br>Train B - 0.99<br>Unit Average - 0.995.<br><br>Unit 2 EDG reliabilities are not available. |
| Provide input parameters and justifications for the control room analysis. The input parameters and justification for other rooms should be included with the documentation that is maintained to support the SBO submittal. (Section 2.2.4.1) | The input parameters and justifications which were provided to the NRC in TXX-92157, dated March 31, 1992, have been superceded by dual unit operation. Sufficient control room ventilation is available during an SBO to keep the control room temperature near normal conditions. |
| Document all of the input parameters (i.e., equipment heat loads, personnel heat loads, thermal conductivity for structures, room free air volumes, initial temperatures, etc.) and provide justification for each of these input parameters used in the temperature transient analyses. (electrical equipment areas, containment ground floor, Valves rooms, Pressurizer compartment, Main Steam Penetration Platform, and turbine driven AFW pump room. (Section 2.2.4.1) | Rooms inside containment are bounded by EQ-harsh LOCA evaluations.<br><br>Rooms in the main steam areas are bounded by EQ-harsh MSLB superheat evaluations.<br><br>The UPS rooms are 121.8°F<br><br>The TDAFWP room is 131.1°F<br><br>The electrical equipment room is 120.7°F |

| NRC RECOMMENDATION | TU RESPONSE |
|---|---|
| Reevaluate the temperature rise calculations for the UPS and distribution rooms taking into account the installation of the DC powered ventilation fans and verify that the maximum temperatures expected during a 4-hour SBO event are lower than the temperature limit for the operability of the inverters. (Section 2.2.4.2) | The temperature rises in the UPS and distribution rooms have been recalculated using the NUMARC methodology. The maximum expected temperatures are low enough that inverter operability is reasonably assured. Therefore, additional ventilation fans are not required. |
| Procedure changes associated with the proposed design modification in the UPS inverter rooms will be identified, developed, and implemented coincident with the installation of the modification. Implement and maintain these procedures required to ensure an appropriate response to an SBO event. (Section 2.3) | The temperature rises in the UPS and distribution rooms have been recalculated using the NUMARC methodology. The maximum expected temperatures are low enough that inverter operability is reasonably assured. Therefore, additional ventilation fans and their associated procedure changes are not required. |
| Implement the appropriate training to ensure an effective response to an SBO event, in accordance with RG 1.155, Position 3.4. (Section 2.3) | Credit is taken for the existing training program. Unit 2 specific training will be performed after the Unit 2 operating procedures and equipment list are finalized. |
| Install dc powered fans to supply sufficient capacity of outside air to the UPS rooms to maintain the room temperatures below the temperature at which inverter operability can be assured. (Section 2.4) | The temperature rises in the UPS and distribution rooms have been recalculated using the NUMARC methodology. The maximum expected temperatures are low enough that inverter operability is reasonably assured. Therefore, additional ventilation fans are not required. |

| NRC RECOMMENDATION | TU RESPONSE |
|---|---|
| Include a full descript'on, including the nature anj objectives of the proposed modifications identified above in documentation that is to be maintained in support of the SBO submittal. (Section 2.4) | The temperature rises in the UPS and distribution rooms have been recalculated using the NUMARC methodology. The maximum expected temperatures are low enough that inverter operability is reasonably assured. Therefore, additional ventilation fans are not required. |
| Plant procedures should reflect the appropriate testing and surveillance requirements for equipment and components required to cope with an SBO to ensure the operability. (Section 2.5) | Equipment required to cope with an SBO is safety-related and included in the CPSES QA program, pursuant 10CFR50, Appendix B, except for the equipment described in Sections A.9 and D.3.12 of Enclosure 1. |
| Verify and confirm that the ventilation fans and the additional batteries, if required, are covered by a QA program consistent with the guidance of Appendix A, RG 1.155. (Section 2.5) | The temperature rises in the UPS and distribution rooms have been recalculated using the NUMARC methodology. The maximum expected temperatures are low enough that inverter operability is reasonably assured. Therefore, additional ventilation fans and batteries are not required. |
| Provide confirmation and include in the documentation supporting the SBO submittal, an EDG reliability program that meets the minimum guidance of RG 1.155, Position 1.2. (Section 2.6) | The CPSES EDG reliability program meets the minimum guidance of RG 1.155, Position 1.2. |