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HOPE CREEK GENERATING STATION
EVENT CLASSIFICATION GUIDE TECHNICAL BASIS
April 30, 2003

CHANGE PAGES FOR
REVISION #19

The Table of Contents forms a general guide to the current revision of each section and attachment of the Hope Creek ECG Technical Basis. The changes that are made in this TOC Revision #19 are shown below.

1. Check that your revision packet is complete.
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ADD			REMOVE		
Pages	Description	Rev.	Pages	Description	Rev.
ALL	TOC	19	All	TOC	18
All	Section 8.1	02	All	Section 8.1	01

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HOPE CREEK ECG TECHNICAL BASIS
TABLE OF CONTENTS/SIGNATURE PAGE

REVISION SUMMARY Biennial Review Performed: Yes ____ No X

8.1.3.b has a clarification made for the condition of "If Primary Containment Instrument Gas/Instrument Air (PCIG/IA) is lost due to LOCA conditions and the MSIVs are drifting shut, consider the Main Condenser capability lost (imminent <2 hours) for the purpose of this EAL." This follows the direction given in the ECG usage section.

SIGNATURE PAGE

Prepared By: F. J. Hughes 04/10/03
Date

Section/Attachments Revised: N/A
(List Non-Editorial Only - Section/Attachments) Date

Reviewed By: N/A
10CFR50.54q Effectiveness Reviewer Date

Reviewed By: N/A
Department Manager Date

Reviewed By: N/A
Manager – Licensing Date
(Reportable Action Level (Section 11) and associated Attachments marked by "L")

Reviewed By: 4/10/03
Emergency Preparedness Manager Date

Reviewed By: N/A
Manager – Quality Assessment - NBU Date
(If Applicable)

SORC Review and Station Approvals

N/A N/A
Mtg. No. Hope Creek Chairman Vice President - Nuclear Operations

Date Date

Effective Date of this Revision: 4-30-2003
Date

8.0 System Malfunctions

8.1 Loss of Heat Removal Capability

ALERT - 8.1.2

IC Inability to Maintain the Plant in Cold Shutdown

EAL

Unplanned, Complete Loss of ALL Technical Specification required systems **available to provide Decay Heat Removal functions**

AND

EITHER one of the following occur:

- RCS Temperature has risen to > **200 ^{0}F**
  (Excluding a **< 15 minute** rise > **200 ^{0}F** with a **heat removal function** restored)
- An UNCONTROLLED temperature rise is RAPIDLY approaching **200 ^{0}F**
  (with NO **heat removal function** restored)

OPERATIONAL CONDITION - 4, 5

BASIS

Loss of Decay Heat Removal capabilities necessary to maintain Cold Shutdown conditions could potentially lead to core damage if corrective actions are not implemented. Declaration of an Alert is warranted when ALL Technical Specification required systems are not available to provide Decay Heat Removal functions and cannot be restored to prevent boiling in the core.

The specification of an RCS temperature rise, rather than specific equipment failures, recognizes the potential for long heatup times providing adequate time for restoration of some form of alternate cooling.

The statement "**Unplanned, Complete Loss** of ALL Technical Specification required systems **available to provide Decay Heat Removal functions**" is intended to represent a complete loss of functions available, or an inadequate ability, to provide core cooling during the Cold Shutdown and Refueling Modes, including alternate decay heat removal methods. This EAL allows for actions taken IAW OP-AB.ZZ-0142, Loss of Shutdown Cooling (Abnormal Operating Procedure) to reestablish RHR in the Shutdown Cooling Mode or provide for an

alternate methods of decay heat removal, with the intent of maintaining RCS temperature below 200°F.

For loss of an in-service Decay Heat Removal system with other decay heat removal methods available, actions taken to provide for restoration of a decay heat removal function may require time to implement. If the event results in RCS temperature "momentarily" (for less than **15 minutes**) rising above 200°F with heat removal capability restored, Emergency Coordinator judgment will be required to determine whether heat removal systems are adequate to prevent boiling in the core and restoration of RCS temperature control. **Momentary (not to exceed 15 minutes) unplanned excursions above 200°F, when alternate decay heat removal capabilities exist, should not be classified under this EAL.**

NRC analysis has shown that specific sequences can result in core uncovery within 15 to 20 minutes and severe core damage within an hour after decay heat removal capability has been lost. **Unplanned** is defined as a condition that is not due to scheduled operations or maintenance activities, in which an RHR system is intentionally removed from service.

Barrier Analysis

N/A

ESCALATION CRITERIA

Emergency Classification will escalate to a Site Area Emergency based on inability to maintain RPV Water level above the Top of the Active Fuel, or rising Radiological Releases.

DISCUSSION

The Residual Heat Removal (RHR) system provides the normal method for decay heat removal operating in the Shutdown Cooling Mode. With RHR unavailable for shutdown cooling operation, (including the loss of SACS and/or service water which supply cooling water to the RHR heat exchangers), alternate decay heat removal system can be aligned to control decay heat. An unavailability of these systems, can result in a gradual rise in RCS temperature to the values specified in this EAL. The rate of rise in coolant temperature would be dependent on the amount of decay heat present. The threshold for this EAL is the RCS temperature transition value between Operational Conditions 4 and 3.

Procedural guidance is provided to establish an alternate method of decay heat removal. These alternate methods include: aligning Reactor Water Cleanup system (RWCU), with maximum RACS aligned to the Non-Regenerative Heat Exchanger; aligning Condensate Transfer via the ECCS injection lines; aligning RPV Head Spray with RPV Water Level established above +80"; maximizing Fuel Pool Cooling if the RPV head is removed and the reactor cavity flooded; using the "C" RHR pump crosstied to the "A" RHR loop.

If these alternate means are unavailable, or ineffective, decay heat removal must be accomplished by feed-and-bleed using ECCS systems and discharging steam to the Suppression Pool via the SRVs.

DEVIATION

None

REFERENCES

NUMARC NESP-007, SA3
NUMARC Questions and Answers, June 1993, "System Malfunction Question #6b"
HC.OP-AB.ZZ-0142 (Q), Loss of Shutdown Cooling
HC.OP-EO.ZZ-0101 (Q)-FC, Reactor Pressure Vessel (RPV) Control
HC.OP-EO.ZZ-0102 (Q)-FC, Primary Containment Control
Hope Creek Appendix A based on NEDO-2121, Supplement A to BWR Owners Group Emergency Procedure Guidelines, Revision 4
HCGS Technical Specifications Sections 3/4.3, 3/4.4.9, 3/4.7.1, 3/4.7.2

8.0 System Malfunctions

8.1 Loss of Heat Removal Capability

SITE AREA EMERGENCY - 8.1.3.a

IC Loss of Reactor Water Level that has or will Uncover Fuel in the Reactor Vessel

EAL

Reactor Water Level REACHES **-161" (Top of Active Fuel)**

OPERATIONAL CONDITION - 4, 5

BASIS

Reactor Water Level reaching **-161" (Top of Active Fuel)** indicates a loss of core submergence. Without core submergence, the integrity of the fuel clad barrier can no longer be assured, even with the reduced decay heat levels in Cold Shutdown and Refuel. This event is classified based on reaching the Reactor Water level threshold (instead of being able to restore and maintain above the threshold) due to the potentially severe consequences of a loss of core submergence.

Since the design of the normal and emergency makeup systems should preclude this condition, an extreme challenge to their ability to provide core cooling by submergence has occurred. Additionally, ECCS availability and Containment Integrity requirements may be relaxed under these Operational Conditions, thus classification at the Site Area Emergency level is warranted.

Barrier Analysis

Fuel Clad Barrier has been potentially lost
RCS Barrier has been lost.

ESCALATION CRITERIA

Emergency Classification will escalate to a General Emergency based on abnormal Radiological Releases.

DISCUSSION

Core Submergence ensures adequate core cooling. When RPV water level decreases to below Top of Active Fuel (TAF) the ability to effectively remove decay heat can no longer be guaranteed and the Fuel Cladding Barrier can no longer be considered intact. Sustained partial or total core uncovery can result in clad damage and a significant release of fission products to the reactor coolant. Sustained core uncovery can also result in a breach of the reactor vessel, or an unisolated intersystem LOCA with the RHR System.

DEVIATION

None

REFERENCES

NUMARC NESP-007, SS5
HC.OP-EO.ZZ-0101 (Q)-FC, Reactor Pressure Vessel (RPV) Control
HC.OP-EO.ZZ-0201 (Q)-FC, Alternate Level Control

8.0 System Malfunctions

8.1 Loss of Heat Removal Capability

SITE AREA EMERGENCY- 8.1.3.b

IC Complete Loss of Functions Needed to Achieve Cold Shutdown Conditions

EAL

Loss of Main Condenser capabilities, as evidenced by an inability to remove Decay Heat from the Reactor

AND

Loss of Torus capabilities as evidenced by EITHER one of the following:

- Entry into an Unsafe region of ANY of the following curves:
  - Heat Capacity Temperature Limit (HCTL) Curve
  - Heat Capacity Level Limit (HCLL) Curve
  - Pressure Suppression Pressure (PSP) Curve
  - SRV Tailpipe Level Limit Curve
- Insufficient SRV capacity to reduce RPV pressure

OPERATIONAL CONDITION - 1, 2, 3

BASIS

A Complete Loss of decay heat removal systems required to ACHIEVE Cold Shutdown conditions from a Hot Shutdown condition, represents a significant challenge to the plant due to the failure of multiple systems designed for the protection of the public. Hence, declaration of a Site Area Emergency is warranted.

This EAL specifically includes a degradation of those plant systems required to ACHIEVE a Cold Shutdown condition. It does NOT include an inability to MAINTAIN a Cold Shutdown condition. The inability to MAINTAIN Cold Shutdown Conditions is specifically addressed by EAL 8.1.2. Hence, a Loss of RHR Shutdown Cooling is not included in this EAL.

This EAL includes a loss of Service Water or SACS capabilities, based on the effect a loss of these systems has on the ability to maintain Torus capabilities with the Safe Region of the

referenced EOP curves. Loss is defined as the systems being unavailable to perform their intended design function.

If Primary Containment Instrument Gas/Instrument Air (PCIG/IA) is lost due to LOCA conditions and the MSIVs are drifting shut, consider the Main Condenser capability lost (imminent <2 hours) for the purpose of this EAL.

In the case where the Main Condenser became isolated from the Reactor due to an MSIV Isolation, but the MSIV could be reopened by procedure, or Main Steam Line drains can control pressure, then a Loss of the Main Condenser capabilities has not occurred.

Barrier Analysis

N/A

ESCALATION CRITERIA

Emergency Classification will escalate to a General Emergency based on loss of Fission Product Barriers or Radiological Releases.

DISCUSSION

In this event, a loss of both the normal heat sink for the Reactor and an impending severe degradation of alternate heat removal capability to the Torus has occurred. Loss of the heat sink for the reactor when in a Hot Shutdown condition will limit the ability to maintain that Operational Condition, or to cooldown the reactor if required.

The Main Condenser can be lost for a variety or reasons; loss of Circulating Water, loss of the Turbine Control and/or Bypass Valve functions, Main Steam Line isolation, etc. With the Main Condenser not available and without the RHR System lined up in Shutdown Cooling Mode, decay heat must be removed from the RCS by HPCI, RCIC or the SRVs and be absorbed in the Suppression Pool (SP). Loss of the pressure control ability of the SRVs as indicated by the inability to reduce RPV pressure represents a loss of control of a major RCS parameter which could result in RPV overpressure conditions, or the inability to cooldown if Cold Shutdown is required.

The HCTL curve is defined as the highest Torus temperature at which initiation of RPV depressurization will not result in exceeding either the SP design temperature or the Primary Containment pressure limit before the rate of energy transfer from the RPV to the Primary Containment is beyond the capacity of the Containment Vent.

The HCLL curve is defined as the higher of either the elevation of the Containment downcomer opening or the lowest Torus level at which initiation of RPV depressurization will not result in exceeding the HCTL.

Violation of either curve would require an immediate emergency depressurization, thus ensuring that the immediately present thermal energy in the RCS has been transferred to the Primary Containment while maintaining the Containment within design limits. This represents a serious potential threat to the Primary Containment Barrier.

DEVIATION

The NUMARC IC associated with EAL SS4 suggests that the IC should include a Complete Loss of Functions needed to achieve or maintain Hot Shutdown. The NUMARC basis includes both reactivity control and decay heat removal. At Hope Creek, as with all other BWRs, the operator action of placing the Reactor Mode Switch in the Shutdown position that results in Control Rod inserting into the core such that the Reactor will remain shutdown under all conditions without boron, places the Reactor in a Hot Shutdown condition. No additional actions are required to maintain the Reactor in this condition.

Systems are required and additional operator actions are required to achieve Cold Shutdown conditions. Based on this, Hope Creek has modified the NUMARC IC for SS4 to apply specifically to a total loss of decay heat removal, since reactivity control concerns are addressed under the ATWS Section. This IC and EAL are consistent with the requirements for declaration of a Site Area Emergency.

REFERENCES

NUMARC NESP-007, SS4
HC.OP-EO.ZZ-0100 (Q)-FC, Reactor Scram
HC.OP-EO.ZZ-0101 (Q)-FC, Reactor Pressure Vessel (RPV) Control
HC.OP-EO.ZZ-0102 (Q)-FC, Primary Containment Control
Hope Creek Appendix A based on NEDO-2121, Supplement A to BWR Owners Group Emergency Procedure Guidelines, Revision 4
HCGS Technical Specifications 3/4.1.3, 3/4.1.5