

ER COVER SHEET

ER #: ER-RB-2001-0843-000

Revision #: 0

Grade: R.-99.N.71

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Title: Clarification For the Use of the Normal Service Water system for Post-fire Safe Shutdown in Fire Area PT-1

ORIGINATING DEPARTMENT

Originator: Kerar, Rudolph J

Date: 12/18/2001

Ext: 2253813766

Dept:

System ID:

Date Required:

Component ID:

Sugg. Milestone: _____

Problem/Proposed Solution/Justification: (Attach additional sheets as required)

Revision 2 of the Post-fire Safe Shutdown Analysis (Criterion 240.201A) established the precedent of the Normal Service Water system as a redundant train to the Standby Service Water system in the event of a fire in Fire Area PT-1 (E, F & G Tunnels). The detailed analysis upon which this determination was established is documented in calculation G13.18.3.6*012. Since this analysis was very involved and is based on several regulatory fire protection documents, the full ramifications of using Normal Service Water as an Appendix R system is not always clear to persons not intimately involved with the fire protection program at RBS. Therefore, the purpose of this Engineering Request is; 1) provide clarification of the regulatory basis for the conclusion of the calculation; 2) clearly identify which procedures were impacted by the decision to use Normal Service Water as an Appendix R system; 3) perform USAR review to assure that all licensing basis documents properly reflect the use of Normal Service Water as a redundant train for post-fire safe shutdown purposes; and 4) identify any additional training that would improve Operations/Engineering personnel's understanding of the post-fire safe shutdown methodology used in Fire Area PT-1.

CLASSIFICATION AND ENGINEERING RESPONSE

Quality Classification:

Implementation:

Response Type:

Problem Resolution: (Attach additional sheets as required)

See Attached

LBD Impacted YES NO

REVIEW

Technical Reviewer

Date:

Design Verifier

Date:

APPROVAL

Supervisor

Date:

Engineering Manager

Date:

PSRC Required PSRC Meeting Number:

Date:

GMPO

Date:

Handwritten signature/initials



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1.0 Description

1.1 SSC Description

The Service Water System (SWP) provides clean, chemically controlled cooling water to remove heat from plant components. The Service Water System (SWP) is comprised of two interconnected subsystems: the Normal Service Water (NSW) subsystem and the Standby Service Water (SSW) subsystem. The Normal Service Water pumps are capable of supplying cooling water to both safety and non-safety related loads via a closed loop which is cooled by the Service Water Cooling System. The SWP system is designed to provide cooling water to the secondary side of the plant component cooling water systems and the plant chilled water systems during normal plant operation. The system is also designed to supply cooling water to the Residual Heat Removal heat exchangers to dissipate reactor decay heat when the Standby Service Water system is not in use. Therefore with respect to compliance with Appendix R, to providing cooling water to the RHR heat exchangers during a fire in Fire Area PT-1, Normal Service water can be considered a redundant train to the Standby Service Water system. The Normal Service Water pumps and heat exchangers are located outside of the protected area. Power to the Normal Service Water pumps is supplied via offsite power.

1.2 Reason for Change

In order to reduce RBS dependence on Thermo-Lag as an Appendix R fire barrier in Fire Area PT-1, Revision 2 of the RBS Post-fire Safe Shutdown Analysis (Criterion 240.201A) choose to evaluate and credit the Normal Service Water system as a safe shutdown system that would remain free from fire damage during a fire in Fire Area PT-1. The evaluation that was completed in order to credit Normal Service Water as a redundant train to Standby Service Water and to document that Normal Service Water would remain free from fire damage during a fire in Fire Area PT-1 was very involved. Since the evaluation was very detailed, the full ramifications and implications of using Normal Service Water as an Appendix R system is not always clear to persons not intimately involved with the fire protection program at RBS. The purpose of this evaluation is to provide clarification for the original analysis and to verify that adequate transfer of knowledge has been provided to personnel outside of the Engineering Department.

1.3 Design Objective to Resolve Problem

Upon completion of this evaluation this Engineering Request will: 1) provide an explanation of the regulatory basis for the acceptability of using Normal Service Water (a non-safety related system) as a post-fire safe shutdown system during a fire in Fire Area PT-1; 2) identify and review the procedures that were impacted by the decision to use Normal Service Water as a post-fire safe shutdown system and verify that the affected procedures properly incorporated the change; 3) perform a SAR review to assure that all licensing basis documents properly reflect the use of Normal Service Water as a redundant train for post-fire safe shutdown purposes and 4) identify any additional training that would improve Operations / Engineering personnel's understanding of the post-fire safe shutdown methodology used in Fire Area PT-1.

1.4 Component List

Since this ER is an evaluation only, no components are being added or deleted by this document.



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2.0 Affected Documents

2.1 List Documents (Drawings, VTI, DCDs, Calculations, etc.) modified, related or voided by the ER per phase if applicable. Note: DCDs are always "Related/References" unless it's a new drawing.

RELATIONSHIP	DOCUMENT NUMBER	REV	RELATIONSHIP STATUS	PHASE
<input type="checkbox"/> Modifies <input type="checkbox"/> Related <input type="checkbox"/> Voids	None		<input type="checkbox"/> Pending <input type="checkbox"/> Reference <input type="checkbox"/> As-Built <input type="checkbox"/> Other	
<input type="checkbox"/> Modifies <input type="checkbox"/> Related <input type="checkbox"/> Voids			<input type="checkbox"/> Pending <input type="checkbox"/> Reference <input type="checkbox"/> As-Built <input type="checkbox"/> Other	
<input type="checkbox"/> Modifies <input type="checkbox"/> Related <input type="checkbox"/> Voids			<input type="checkbox"/> Pending <input type="checkbox"/> Reference <input type="checkbox"/> As-Built <input type="checkbox"/> Other	
<input type="checkbox"/> Modifies <input type="checkbox"/> Related <input type="checkbox"/> Voids			<input type="checkbox"/> Pending <input type="checkbox"/> Reference <input type="checkbox"/> As-Built <input type="checkbox"/> Other	

2.2. List other DCAs which require a revision to their Relationship Status (change, add, or cancel):

DCA NUMBER	RELATIONSHIP	DOCUMENT NUMBER	Rev	RELATIONSHIP STATUS
	None			<input type="checkbox"/> Pending <input type="checkbox"/> Cancelled <input type="checkbox"/> As-Built <input type="checkbox"/>
				<input type="checkbox"/> Pending <input type="checkbox"/> Cancelled <input type="checkbox"/> As-Built <input type="checkbox"/>

2.3 List Cross References which do not require linking to other site documents or are not RBS site documents (i.e. ASME Standards, Books, etc.).

DOCUMENT NUMBER	Rev	DOCUMENT NUMBER	Rev

2.4 Other changes as determined by the RE.



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3.0 Evaluation / Design Summary

3.1 Evaluation Resolution

Regulatory Bases for Crediting Normal Service Water in Fire Area PT-1

The RBS construction permit application was docketed on September 24, 1973. As a result the applicable regulatory guidance for fire protection at RBS is Appendix A to Branch Technical Position (BTP) APCS 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976." RBS compliance with Appendix A to BTP APCS 9.5-1 is documented in Appendix 9A, Section 9A.3 to the RBS SAR. Appendix R was published on November 19, 1980 and applies to plants licensed to operate before January, 1979. RBS received its operating license on August 29, 1985. A letter from the NRC to RBS dated October 20, 1981 requested a comparison of the RBS fire protection program to the Appendix R requirements. This comparison is documented in Appendix 9B to the RBS SAR. During a special announced NRC inspection on April 1 – 4, 1985, implementation of the fire protection program and compliance with the requirements of 10CFR50 Appendix R (post-fire safe shutdown) per SAR commitments and the SER evaluation were reviewed at RBS. The results are summarized in NRC SSER 3 dated August 1985:

"On the basis of its evaluation the staff finds that the applicant's fire protection program with approved deviations is in conformance with the guidelines of BTP CMEB 9.5-1, section III.G, IIIJ, and IIIO of Appendix R to 10CFR50 and GDC 3, and is therefore, acceptable"

Generic Letter (GL) 86-10, "Implementation of Fire Protection Requirements" was issued on April 24, 1986. The generic letter gave direction to include the fire protection program in the SAR and provided a standard license condition. RBS had already included the fire protection program in the SAR and the necessary license condition (Attachment 4, "Fire Protection Program Requirements" in operating license NPF-47). Item 3 of Attachment 4 states :

GSU may make changes to features of the approved fire protection program which do not significantly decrease the level of fire protection without prior commission approval provided (a) such changes do not otherwise involve a change in a license condition or technical specification or result in an unreviewed safety question (see 10CFR50.59), and (b) such changes do not result in failure to complete the fire protection program approved by the commission prior to license issuance. GSU shall maintain, in an auditable form, a current record of all such changes, including an analysis of the effects of the change on the fire protection program and shall make such records available to NRC inspectors upon request. All changes to the approved program shall be reported to the Director of the Office of Nuclear Reactor Regulation, along with the FSAR revisions required by 10CFR50.71(e)."

The purpose of Appendix R, Section III.G is to provide assurance that one train of systems necessary to achieve and maintain safe shutdown conditions remains free from fire damage. Appendix R Section III.G continues by providing three (3) means of ensuring that one the redundant trains remains free from fire damage. One of the means is a 3-hour rated fire barrier. For Fire Area PT-1, Thermo-Lag was originally installed around the Division I cable trays with the intent of serving as a 3-hour rated fire barrier. When NRC Generic Letter 92-08 advised the industry that Thermo-Lag may not comply with the NRC's fire barrier requirements, RBS implemented a Thermo-Lag reduction plan to significantly reduce the plants reliance on the material. For Fire Area PT-1, the Fire Protection Engineer identified that the components



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that were being "protected" by Thermo-Lag were associated with Division I of the Standby Service Water System. Since Standby Service Water is a subsystem of the Service Water system, an effort was then put forward to evaluate if Normal Service Water and its supporting systems would remain free from fire damage during a fire in Fire Area PT-1.

According to Section C.1.b of BTP CMEB 9.5-1, a fire event need not be postulated to occur simultaneously with non-fire related failures in safety systems, plant accidents or severe natural phenomena. Generic Letter 81-12, Enclosure 1, Item 3.8 states "These [safe shutdown] systems need not be designed to (1) seismic category 1 criteria; (2) single failure criteria; or (3) cope with other plant accidents such as pipe breaks or stuck valves, except those portions of these systems which interface with or impact existing safety systems." Additional justification for the use of a non-safety related system for post-fire safe shutdown can be found in Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants", Section B, Fire Protection Performance Goals – Safety-Related Structures, Systems and Components. The Reg Guide states, "Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents." As reaffirmed in SECY 99-140, fires are not considered as design basis accidents. Unlike systems provided to mitigate design basis accidents, the NRC fire protection regulations do not require structures, systems and components used for achieving and maintaining post-fire safe shutdown to be safety related, protected against a single failure or covered by technical specifications. Therefore, RBS began investigating Normal Service Water as a system that could be used in order to achieve post-fire safe shutdown for a fire in a specific area (Fire Area PT-1).

The NRC stated in their response to Question 3.8.3, Redundant Trains / Alternate Shutdown, in Generic Letter 86-10, that "If the system is being used to provide its design function, it generally is considered redundant." Since Normal Service Water is a subsystem of the Service Water System, it performs the same design function. All post-fire safe shutdown actions associated with a fire in Fire Area PT-1 could be performed in the Main Control Room. Therefore, the safe shutdown capability for Fire Area PT-1 using Normal Service Water meets the requirements of Appendix R III.G.2 and is not an alternate shutdown area.

Appendix R Section III.L, "Alternative and dedicated shutdown capability", is the only fire protection regulation that requires licensees to assume a loss of off-site power concurrent with a fire. Since Standby Service Water is the primary system impacted by a fire in Fire Area PT-1, neither alternate nor dedicated shutdown capability would be necessary. Subsequently, the post-fire safe shutdown analysis was not required to assume a loss of off-site power. Since Normal Service Water was going to be credited in only one fire area (Fire Area PT-1), an exclusionary methodology was used to verify that Normal Service Water and its support systems would remain free from fire damage in this one fire area. The evaluation could limit its scope of investigation to verifying that a fire in Fire Area PT-1 would not induce a loss of off-site power. The evaluation is documented in calculation G13.18.3.6*012.



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In the NRC response to Question 3.8.4, Control Room Fire Considerations, in Generic Letter 86-10, the regulator ties the assumption of loss of off-site power with a control room fire. Again in the response to Question 5.3.6, On-Site Power, the NRC states that alternate shutdown capability should be powered from an on-site power system. Since the use of Normal Service Water in Fire Area PT-1 is part of the redundant safe shutdown capability for that area and that Fire Area PT-1 does not use alternate shutdown capability, the assumption that off-site power remains available, unless damaged by the fire, is within regulatory guidance.

Components required to ensure the capability of Normal Service Water during post-fire safe shutdown are located outside of Fire Area PT-1. Fire Area PT-1 is bounded by 3-hour rated fire barriers on all sides. A fire that initiates in Fire Area PT-1 would be contained within that fire area. The use of 3-hour rated fire barriers to separate redundant trains of safe shutdown components complies with the requirement of Appendix R Section III.G.1 in that one train of systems necessary to achieve and maintain shutdown conditions from the main control room remains free from fire damage. Thus for Fire Area PT-1, Normal Service Water and its support systems (including off-site power) remain free from any fire damage that occurs in PT-1.

a) Correspondence
RBC-49650, RBF1-01-0240 Letter from NRC Project Branch Chief William D. Johnson, to RBS Vice-President Randel Edington, "NRC Integrated Inspection Report 50-458/01-03.

b) Calculations
G13.18.3.6*012, Rev 0, "10CFR50 Appendix R Analysis of Fire Area PT-1.

G13.18.4.6-011, Rev 0, "NSW System One Pump Capacity Verification for Supporting Components Required Following a Postulated Fire in Fire Area PT-1".

3.2 Design Bases Discussion

The proposed use of Normal Service Water (NSW) as the credited system for providing cooling water for components required to achieve post-fire safe shutdown is based on NSW performing in accordance with its design. Under normal conditions, NSW provides cooling water flow to all Service Water components. The NSW pumps take suction from a common header. NSW flow is from the pumps, through their discharge valves, through the non-safety and safety related components, back to a common return header, through the Service Water Heat Exchangers and back to the suction of the NSW pumps. During the normal shutdown cooling process, SOP-0031, "Residual Heat Removal", NSW and its support systems provide the heat rejection function to the RHR heat exchangers. NSW will also supply cooling water for support of HVAC systems. During a fire event in Fire Area PT-1, NSW and its support systems remain free from fire damage and are able to achieve safe shutdown. Their use during post-fire safe shutdown is consistent with their design bases.

3.3 Design Input Considerations

The Normal Service Water system operates as a closed loop cooling system, providing cooling water to all required normal and vital components. Normal system flow, with two pumps running is approximately 54,000 gpm at a pressure of approximately 133 psig. It is cooled by the Service Water Cooling System and powered by Preferred Station Service Transformers. Flow rates and pressures vary depending upon system configuration which will be determined by plant parameters and demands. The NSW pumps are 50% capacity, horizontal, double suction, double volute, centrifugal pumps. Normally two of the three pumps will be running with



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the third in standby. Based on calculation G13.18.4.6*011, Rev 0, one NSW pump can provide sufficient flow through the required components so as to successfully achieve post-fire safe shutdown during a fire in Fire Area PT-1.

3.4 Relationship with other Modifications

MR 96-0020, "Revise Criterion 240.201A to Incorporate Thermo-Lag Reduction Changes"

4.0 Impact on current Operational Basis

In order to improve the operators understanding of the requirements of Normal Service Water with respect to post-fire safe shutdown, the following information will be incorporated into the Normal Service Water / Standby Service Water training module.

In order to reduce RBS dependence on Thermo-Lag as an Appendix R fire barrier in Fire Area PT-1, Revision 2 of the RBS Post-fire Safe Shutdown Analysis (Criterion 240.201A) performed an evaluation to assure that Normal Service Water and its support systems would remain free from fire damage during a fire in PT-1. Since Normal Service Water has the capability to supply sufficient cooling water to all of the components required for post-fire safe shutdown, it can be used in the event of a fire in Fire Area PT-1. AOP-0052, "Fire Outside the Main Control Room in Areas Containing Safety Related Equipment" Attachment 1, identifies Normal Service Water as the only available train of service water during a fire in PT-1. In addition, AOP-009, "Loss of Normal Service Water", Step 5.2 (Subsequent Operator Actions) states "Within one hour upon the loss of Normal Service Water when in Modes 1, 2 or 3, establish a fire watch in Fire Area PT-1 (E, F and G Tunnels) in accordance with Section 3.7.9.6 of the Technical Requirements Manual." Further, note that any condition representing degradation (trending toward but not loss) of the NSM system would be documented on a Condition Report, in accordance with RBNØ-0078.

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3.7.9.6

An upgrade is anticipated to the RBS Technical Requirements Manual to add Normal Service Water operability requirements. This upgrade will assist Operations personnel in determining if compensatory actions are required due to a degradation of the Normal Service Water system.

5.0 Engineering Instructions

There are no changes to any engineering design bases documents as a result of the evaluation provided in this ER. The Engineering Design bases contained in the Post-fire Safe Shutdown Analysis (Criterion 240.201A) and its supporting documents is consistent with the use of Normal Service Water as a system able to support post-fire safe shutdown during a fire in Fire Area PT-1.

6.0 Engineered Materials List and Vendor Technical Information

This ER is an evaluation only. There is no field work associated with this evaluation and therefore, no material is required.

7.0 Special Process Requirements

There is no field work associated with this evaluation and therefore no special process requirements.

8.0 Tests & Inspections

There is no field work associated with this evaluation and therefore no test or inspections are required.