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10 CFR 50.90
10 CFR 50.59

SEP 06 2007

LR-N07-0233

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

SALEM GENERATING STATION – UNIT 1 AND UNIT 2
FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR 75
NRC DOCKET NOS. 50-272 AND 50-311

Subject: **RESPONSE TO RAI ON LAR S07-05 (TAC NOs.MD6353 & 6354) REVISION TO LICENSING BASIS – NPSH METHODOLOGY FOR ECCS PUMPS**

References: (1) Letter from PSEG to NRC: "License Amendment Request LAR S07-05, Revision to Licensing Basis – NPSH methodology for ECCS Pumps, Salem Nuclear Generating Station, Units 1 and 2, Facility Operating Licenses DPR-70 and DPR-75, Docket Nos. 50-272 and 50-311," dated August 15, 2007

In Reference 1, PSEG Nuclear LLC (PSEG) submitted License Amendment Request (LAR) S07-05. LAR S07-05 requested revision to the licensing basis for the Net Positive Suction Head available (NPSHa) for Emergency Core Cooling System (ECCS) and Containment Heat Removal System Pumps, as described in Appendix 3A of the Salem Updated Final Safety Analysis Report (UFSAR). As a result of the required Generic Safety Issue (GSI)-191 (Generic Letter (GL) 2004-02) evaluations, a change in methodology is required for calculating the NPSHa.

The NRC provided PSEG a Request for Additional Information (RAI) on LAR S07-05. On August 30th, 2007, PSEG and the NRC discussed the RAI to provide additional clarification. The response to the RAI is provided as an attachment to this submittal. Additional proposed changes to the UFSAR are also provided as an attachment to this submittal.

In accordance with 10CFR50.91(b)(1), a copy of this letter has been sent to the State of New Jersey.

PSEG has evaluated the additional information provided in Attachment 1 in accordance with 10CFR50.91(a)(1), using the criteria in 10CFR50.92(c), and has determined there is no impact to the no significant hazards consideration provided in Reference 1. There is also no impact to the 10 CFR 51.22(c)(9) environmental assessment provided in Reference 1.

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If you have any questions or require additional information, please do not hesitate to contact Mr. Steve Mannon at (856) 339-1129.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 9/06/07
(Date)

Sincerely,

Robert C. Braun
Site Vice President
Salem Generating Station

Attachments (2)

CC Mr. S. Collins, Administrator - Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
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Mr. R. Ennis, Licensing Project Manager - Salem
U. S. Nuclear Regulatory Commission
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USNRC Senior Resident Inspector – (Salem X24)

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REQUEST FOR ADDITIONAL INFORMATION

REGARDING PROPOSED LICENSE AMENDMENT

REVISION TO LICENSING BASIS - NET POSTIVE SUCTION HEAD METHODOLGY

FOR EMERGENCY CORE COOLING SYSTEM PUMPS

SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2

DOCKET NOS. 50-272 AND 50-311

By letter dated August 15, 2007, PSEG Nuclear LLC (PSEG or the licensee) submitted an amendment request for Salem Nuclear Generating Station (Salem), Unit Nos. 1 and 2. The proposed amendment would revise the licensing basis, as described in Appendix 3A of the Salem Updated Final Safety Analysis Report (UFSAR), regarding the method of calculating the net positive suction head (NPSH) available for the emergency core cooling system and containment heat removal system pumps. The proposed change relates to issues associated with Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors."

The NRC staff has reviewed the information the licensee provided that supports the proposed amendment and would like to discuss the following issues to clarify the submittal.

1. Please confirm that the pressure to be credited in determining the available NPSH of the residual heat removal pumps during a loss-of-coolant accident is the pre-accident partial air pressure in containment.

Response

PSEG confirms that the pressure to be credited in determining NPSHa is the pre-accident partial air pressure in containment. The proposed UFSAR markup (Attachment 1, page 1 of the 8/15/07 submittal) states:

"*The containment pressure value will be equal to the initial air pressure in containment prior to the LOCA*."

This "initial air pressure in containment prior to the LOCA" is the same as "pre-accident partial air pressure in containment." Either terminology is acceptable for the proposed change to the UFSAR; the proposed UFSAR terminology has been clarified in Attachment 2 to this submittal.

2. The August 15, 2007, letter proposes to delete a statement from the UFSAR (Appendix 3A) which states:

> Added conservatism is introduced into the NPSH calculation by calculating the static head from the elevation of the top of the sump instead of the available water level above the sump.

The reason for the deletion appears to be that the water level is determined, since 1997[1], as a minimum calculated value rather than the top of the sump. However, this is not clarified by the proposed change to the UFSAR. Please propose wording to add to the UFSAR that will describe how the water level is determined (such as that on page 9 of Attachment 1 of the August 15, 2007, letter).

Response

The proposed change to the water level (static head) value will be described in the UFSAR as follows:

"The static head term in the NPSHa is calculated using the minimum available water inventory in the containment for recirculation operation. This minimum water inventory ensures that the containment sump strainers are fully submerged prior to initiation of recirculation phase."

This proposed UFSAR change is provided in Attachment 2 to this submittal.

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1 Letter from E. C. Simpson, Public Service Electric and Gas Company, to NRC, 90 Day Response to Generic Letter 97-04, January 5, 1998

LICENSE BASIS PAGES WITH PROPOSED CHANGES

The following License basis for Salem Unit 1 (Facility Operating License DPR-70) and Salem Unit 2 (Facility Operating License DPR-75) are affected by this amendment request:

UFSAR	Page
Appendix 3A	3A-2

rates. The recirculation mode of operation gives the limiting NPSH requirement for the residual heat removal pumps, and the minimum NPSH available is determined from the following calculation:

$$NPSH_{available} = (h)_{\substack{containment \\ pressure}} - (h)_{\substack{vapor \\ pressure}} + (h)_{\substack{static \\ head}} - (h)_{loss}$$

~~It is assumed that the vapor pressure of the liquid in the sump (corresponding to the temperature of the liquid at the onset of recirculation) is equal to the containment pressure. This assumption assures that the actual available NPSH is always greater than the calculated value determined from the reduced equation:~~

~~$$NPSH_{available} = (h)_{static\ head} - (h)_{loss}$$~~

The containment pressure value will be equal to the initial air pressure in containment prior to the LOCA (i.e., the pre-accident partial air pressure in containment). However, when the containment sump vapor pressure exceeds the containment initial pressure then the following will be assumed

$$(h)_{containment\ pressure} = (h)_{vapor\ pressure}$$

The containment air pressure value used in the NPSHa calculation is based on the containment conditions prior to the accident only and does not include any credit for accident pressure conditions, is conservatively determined based on minimum containment initial pressure, and maximum temperature and relative humidity conditions. The calculation also accounts for further reduction of this initial air pressure based on possible maximum cooldown of the containment environment post-LOCA.

The vapor pressure term used in the NPSHa for the sump water being pumped, is based on the highest temperature of the sump fluid for the condition being evaluated.

~~Added conservatism is introduced into the NPSH calculation by calculating the static head from the elevation of the top of the sump instead of the available water level above the sump.~~

The static head term in the NPSHa is calculated using the minimum available water inventory in the containment for recirculation operation. This minimum water inventory ensures that the containment sump strainers are fully submerged prior to initiation of recirculation phase

It is believed that the methods utilized in calculating NPSH meet the intent of the Regulatory Guide, of ensuring adequate NPSH with adequate margin for the centrifugal charging, safety injection, residual heat removal, and containment spray pumps.

Regulatory Guide 1.2 - <u>THERMAL SHOCK TO REACTOR PRESSURE VESSELS</u>

Although NRC Regulatory Guide 1.2 was withdrawn by the NRC on July 31, 1991, SGS commitments, as stated below, are not affected by this withdrawal.

Current Westinghouse research programs and pressure vessel design conform with the intent of the Regulatory Guide.

Westinghouse is continuing to obtain fracture toughness data through participation in the HSST Program at the Oak Ridge National Laboratory. The fracture toughness data recently obtained include