NUCLEAR ENERGY INSTITUTE

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July 22, 2004

Mr. John N. Hannon
Chief, Plant Systems Branch
Office of Nuclear Reactor Regulation
Mail Stop O11-A11
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: PWR Containment Sump Evaluation Methodology, Section 6 Change Pages.

PROJECT NUMBER: 689

Dear Mr. Hannon:

Enclosed are two replacement pages for Section 6 of the PWR Containment Sump Evaluation Methodology provided in a letter dated July 13, 2004. The replacement pages reflect changes identified in a conference call with your staff on July 20, 2004.

Please contact John Butler 202-739-8108, jcb@nei.org, or me if you have any questions on this transmittal.

Sincerely,

Anthony R. Pietrangelo

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Enclosure

c: Mr. David L. Solorio, NRC
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sizes larger than the alternate break size. The conservative factors involved in the calculation of NPSH, including event timings, thermal/hydraulic conditions and plant physical configurations, may be evaluated to provide a more realistic calculation of NPSH available. This section discusses the potential impact of factors that have a positive impact on more realistic analysis of available net positive suction head (NPSH).

In applying a more realistic NPSH calculation to the Region II evaluation, which is still within the plant design basis, it is recognized that operability assessments, for example, such as those identified in Generic Letter 91-18 (Reference 11), do not need to be undertaken when nominal parameters used in the assessment are exceeded for a short period of time (e.g., less than 30 days). The NPSH margin still available, even using these more realistic analysis models, combined with the short time period of exceedance of the values used in this analysis and the low probability of a break larger than the alternate break size support continued operation without an operability assessment under these conditions.

6.4.7.1 NPSH Available

The Hydraulic Institute Standard ANSI/HI 1.1-1.5-1994 (Reference 12), defines NPSH as the total suction head in feet absolute, determined at the suction nozzle and corrected to datum, less the vapor pressure of the liquid in feet absolute. It is an analysis of energy conditions on the suction side of a pump to determine if the liquid will vaporize at the lowest pressure point in the pump. The typical equation governing the calculation of available NPSH is given as:

$$NPSH_A = H_P + H_{El} - H_{VP} - H_F$$

Where:

H_P = absolute pressure head at the pump suction pressure
$= (P_{gauge}) * 144 in^2/ft^2 / \rho$
ρ = fluid density (lbs/ft^3)
H_{El} = Elevation head
H_{VP} = Vapor pressure at prevailing water temperature converted to head
$= (P_{vapor}) * 144 in^2/ft^2 / \rho$
H_F = form and frictional head losses including through the sump screen, entrance losses and piping losses

reactor year (Region II of Figure 3 of the Regulatory Guide). The CDF of less than 1.0 E-04 bounds the population of PWRs.

A simple bounding PRA logic can be defined where the failure of ECC recirculation is dominated by the failure of the modification considered for sump blockage mitigation. This would then be dominated by the mitigation equipment reliability, or the operator action credited for mitigation.

Using a bounding generic value for LBLOCA initiating event frequency of 5.0 E-04 per year as identified in NUREG-1150 and a maximum change in CDF as a result of the modification of 1.0 E-05 per year from Regulatory Guide 1.174, yields a required unreliability of 2.0 E-02 per demand. This can be translated to a targeted reliability of 98% per demand for operator actions and or active components.

This generic risk calculation does not need to be repeated for plant specific assessments. Plant specific assessments of proposed changes would only have to assure that a target reliability of 98% per demand could reasonably be met.

Establishing a combination of extremely low probability of needing containment sump recirculation and challenging the containment sump performance will provide suitable redundancy for the regulatory intent to be met by not assuming single failures of active components. Thus, the defense in depth and safety margin considerations in Regulatory Guide 1.174 can be implicitly assured by the low probabilities of the events.

6.6 REFERENCES

1. SECY-02-0057, "Update to SECY-01-0133, 'Fourth Status Report on Study of Risk Informed Changes to the Technical Requirements of 10 CFR Part 50 (Option 3) and Recommendation on Risk-Informed Changes to 10 CFR 50.46 (ECCS Acceptance Criteria)".

2. 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors".

3. Letter from Suzanne C. Black, NRC, to Anthony Pietrangelo, NEI, "Nuclear Energy Institute's Proposals for Determining Limiting Pipe Break Size Used in