June 13, 2007

Mr. Biff Bradley, Director
Risk Assessment
Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING NUCLEAR ENERGY INSTITUTE TOPICAL REPORT (TR) WCAP-16294-NP, REV. O, "RISK-INFORMED EVALUATION OF CHANGES TO TECHNICAL SPECIFICATION REQUIRED ACTION ENDSTATES FOR WESTINGHOUSE NSSS PWRs" (MD5134)

Dear Mr. Bradley:

By letter dated September 9, 2005, (Agencywide Documents Access and Management System Accession No. ML052620374), the Nuclear Energy Institute (NEI) submitted for U.S. Nuclear Regulatory Commission (NRC) staff reviewed TR WCAP-16294-NP, Rev. 0, "Risk-Informed Evaluation of Changes to Technical Specification Required Action Endstates for Westinghouse NSSS PWRs." Upon review of the information provided, the NRC staff has determined that additional information is needed to complete the review. On June 1, 2007, you and I agreed that the NRC staff will receive your response to the enclosed Request for Additional Information (RAI) questions by July 20, 2007.

The NEI should notify the NRC, in writing, if it requires longer than 60 days to respond to this request. If the NEI does not respond in 60 days, and does not request an extension, the NRC will terminate its review of TR WCAP-16294-NP, Rev. 0. If you have any questions regarding the enclosed RAI questions, please contact me at 301-415-3610.

Sincerely,

/RA/

Tanya M. Mensah, Senior Project Manager
Special Projects Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project Nos. 689 and 700

Enclosure: RAI questions

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT (TR) WCAP-16294-NP, REV. 0, "RISK-INFORMED EVALUATION

OF CHANGES TO TECHNICAL SPECIFICATION REQUIRED ACTION

ENDSTATES FOR WESTINGHOUSE NSSS PWRs."

NUCLEAR ENERGY INSTITUTE

PROJECT NO. 689

By letter dated September 9, 2005, the NEI submitted TR WCAP-16294-NP (August 2005), "Risk Informed Evaluation of Changes to Technical Specification Required Action Endstates for Westinghouse NSSS PWRs," requesting U.S. Nuclear Regulatory Commission (NRC) staff review and approval. WCAP-16294 includes the technical justification supporting Risk Management Technical Specification (TS) Initiative 1 for Westinghouse NSSS PWRs.

The Westinghouse Owners Group (WOG) undertook this risk-informed initiative to evaluate the endstates that the TS Actions require the unit to be placed in if the Required Action and associated Completion Time are not met. The evaluation has identified the appropriate endstate for a number of TS Required Actions based on the risk of transitioning the unit from Mode 1 to the lower Modes. Mode 4 is found to be a risk-acceptable alternative to Mode 5.

The NRC staff requests responses to the following questions in order to continue the review of WCAP-16294. All section, paragraph, page, table, or figure numbers in the questions below refer to items in WCAP-16294-NP, unless specified otherwise.

Probabilistic and Risk Assessment Branch Questions

1. For the Limiting Condition For Operation (LCO) governing containment isolation functions, the proposed changes allow a Mode 4 end state when the condition represents unavailability of the containment barrier (i.e., LCO 3.6.1, or conditions with both airlock doors open (action 3.6.2.c), or a penetration open and unisolable (action 3.6.3.b)). In such conditions, it is not clear that the justification based on diversity of core cooling mechanisms is an adequate basis for the change, since core cooling is not directly relevant to the containment fission product barrier. A cold shutdown endstate is more appropriate for such conditions due to the complete unavailability of the containment barrier, which should be reflected in the TR and in the markup TS. Provide justification for a Mode 4 end state or do not apply a hot shutdown endstate to these containment LCOs (Note: CE TSTF-422, "Change in Technical Specifications End States, CE-NPSD–1186" does not apply a hot shutdown endstate in these cases).

2. The assessment of the relative risks of operation in Mode 4 compared to Mode 5 assumes that the turbine-driven auxiliary feedwater (AFW) pump is available (assures heat removal for station blackout), and that the reactor trip breakers are open (rod

withdrawal accidents not credible). These assumptions are not TS requirements, and tier 2 restrictions have not been identified for any of the LCOs. The TR should justify these assumptions on equipment availability and propose appropriate requirements or other controls for those LCOs for which these assumptions support the changed end state. Similarly, there appear to be assumptions made in the risk analyses with regards to the unavailability of equipment in Mode 5 which are then factored into the qualitative and quantitative risk analyses conclusions, but no specific basis could be identified to justify these assumptions:

- Unavailability of the AFW start signal.
- Unavailability of one Emergency Core Cooling System (ECCS) train.
- Unavailability of safety injection (SI) pumps (note that quantitative analysis uses combined charging/SI pumps, so at least one SI pump should be available in Mode 5).
- Unavailability of alternating current (AC) sources.
- Unavailability of containment isolation and cooling systems.

Although these systems and functions may not be required by TS, the report states that equipment is assumed available unless operating procedures direct isolation or lockout. It is not apparent that the isolation or lockout of the above functions is so directed at all plants. For example, plants with high pressure charging SI pumps would not be required to lock out all SI pumps, and there is no requirement to remove sources of AC power in Mode 5. The report should clarify differences in assumed equipment availability to mitigate initiating events between Modes 4 and 5, and provide a specific basis as to why equipment is not credited in Mode 5 for both the qualitative and quantitative risk analyses.

3. LCO 3.0.4.a of the Standard TSs would allow entry into Mode 4 from Mode 5 for each of the TS within the scope of the proposed changes, due to the change in action requirements which would now allow indefinite operations in Mode 4. This is based on TSTF-422 implementation guidance of WCAP-16364-NP (Section 2.5). However, the TR has not justified such operations, and therefore the proposed TS changes should include a restriction on applicability of 3.0.4.a.

4. A review of the plant operating state (POS) 4 cutsets identified seven apparent issues which may be causing a bias in the overall risk analyses results which favor POS 3 over POS 4. These issues need to be investigated and resolved, and if appropriate explored via sensitivity analyses to demonstrate their impact on the overall conclusions of the TR. Address the following seven issues in the justifications and conclusions of the TR.

    a. Several cutsets contain events for failure to start emergency feedwater (EFW) or to align component cooling water (CCW) to the residual heat removal (RHR) heat exchangers. However, these actions should not be required due to the timing of events (i.e., RHR cooling not yet established so EFW would still be running, or RHR cooling established and CCW need not be realigned.) See for example cutsets #1, #11.

    b. The offsite power nonrecovery factor of 0.5 over two hours seems overly conservative.

c. The assessment of dependencies between human interactions does not account for sequences which have an intervening successful operator action (which breaks dependency), or involve very long times between events.

d. The loss of RHR cooling event involving multiple failures (i.e., independent failure of RHR pumps) does not consider the time available to repair and restore the first failure nor reduce the mission time of the second component based on the average time of failure of the first component.

e. The loss of RHR cooling event mitigation requires high pressure recirculation for some sequences. The failure of the RHR would seem to preclude the availability of RHR cooling for recirculation. Therefore, it is not clear how the initiating event interacts with this mitigation event. If there is an assumption or a recovery of RHR included in high pressure recirculation then the option to restore RHR cooling could also be credited.

f. The loss of RHR cooling event mitigation assumes that the unavailability of high pressure recirculation following successful feed-and-bleed cooling results in core damage. This is overly pessimistic, given that the reactor coolant system (RCS) would be completely filled and subcooled, and there would be substantial time available to restore the RHR system.

g. The loss of inventory event mitigation assumes that if the operator fails to terminate high pressure safety injection flow, then the only core cooling option available is high pressure recirculation (i.e., returning to RHR cooling or secondary cooling is not credited). This is overly pessimistic, given that the RCS would be completely filled and subcooled with the leak isolated, and there would be substantial time available to recognize that the RHR system was available and could be operated.

5. Section 6.3.1 of the report identifies the system configuration assumptions employed in the quantitative model and in some cases provides information on how plant-specific designs vary. However, there is no basis provided to justify that plant-specific designs are bounded by this analysis. For example:

- Separate low pressure SI pumps and RHR pumps would result in the availability of low pressure SI in Mode 5 to mitigate inventory losses, making the Mode 5 risk lower.

- Designs with a common non-redundant CCW safety-related supply header increase potential for loss of CCW and RHR cooling in Mode 5

- Service water (SW) configurations less robust than assumed (common headers, etc.) similarly would increase loss of RHR cooling in Mode 5, while more robust designs may reduce Mode 5 risk.

- Separate high pressure SI pumps are typically required to be disabled in Mode 5, while combined charging/SI pumps would assure availability of one pump in Mode 5.

- Additional redundancy in emergency diesel generators (EDGs) would enhance mitigation of loss of offsite power, which would improve the risk of Mode 5 preferentially to Mode 4.

- Ability of containment spray or coolers to provide backup cooling during recirculation for core damage mitigation would improve the risk of Mode 5 preferentially to Mode 4.

- A more complete discussion of design variations and assessment of their impact on the quantitative risk analysis, possibly using sensitivity studies, is needed to assure applicability to all Westinghouse plants; otherwise, plant-specific justifications will be required.

6. In Section 6.3.1.1 for POS 3 plant response model, the bulleted items state that the event mitigation of loss of coolant accidents (LOCAs) is identical to the at-power PRA model "except for the availability of accumulators." This is not explained in the TR and is not understood as to the meaning. Explain and justify this statement.

7. Table 6-9 provides core damage probability (CDP) results for POS 3 and POS 4. A per-hour frequency is also provided by dividing the total probability by the time assumed. It is not stated whether the time-independent contribution of transition risk has been deleted from the results in order to obtain a time-dependent CDP. The first bullet after the table states the time-adjusted CDP is 4x higher in Mode 5 compared to Mode 4, consistent with Table 6-9. Similarly, the results of Table 6-10 do not identify if transition risk for loss of shutdown cooling and loss of inventory include the transition risks. Please clarify the basis for the CDPs in this table.

8. Section 6.3.2 fourth bullet states that loss of offsite power is a larger risk contributor in Mode 5 than in Mode 4, but Table 6-10 shows these contributions as 10.1 pecent in Mode 5, and 12.7 percent in Mode 4. Explain this apparent inconsistency.

9. In Section 6.4 for the individual LCO assessments, each individual evaluation includes statements regarding the availability of equipment which is also in the scope of the application. However, there are not constraints in the TS, nor tier 2 restrictions recommended, to assure availability of this equipment. It is not stated directly whether any of the risk analyses to support the individual LCOs are sensitive to the availability of this equipment identified in each individual LCO evaluation, and if so, what measures are appropriate to assure the plant configuration remains bounded by the assessment. Where assessments include statements regarding availability of equipment, include tier 2 restrictions or justify not doing so.

Containment and Ventilation Branch Questions

1. WCAP-16294-NP, Page 6-57/58, Section 6.4.9, TS 3.6.1 B Containment (Atmospheric, Subatmospheric, Ice Condenser, and Dual).

   At the top of Page 6-58, first paragraph, the fourth line states “due to the limited time in the shutdown modes”. This does not appear to add much to the basis for changing the required action endstate for an inoperable containment from Mode 5 to Mode 4. This TS change would allow for an extended stay in Mode 4 and not necessarily ensure a limited time (defined in Section 6.3.1.2 as a normal or average time from historical data). Inoperability of the containment ranges from a condition where leakage after an accident at full power probably would be slightly higher than that assumed in the accident/dose analysis up to gross leakage potential or containment structural integrity not being reasonably assured even for an accident in Mode 4. The rationale for similarly changing the endstate required in the other TSs appears to rely in part on containment being operable. Although passive, the containment structure is not redundant and allowing an extended stay in Mode 4 for the entire range of containment inoperability vice proceeding to Mode 5 in an orderly fashion as is currently required does not appear to afford the defense-in-depth that would make avoiding a transition to Mode 5 risk/safety beneficial.

   Justify the change in required endstate from Mode 5 to Mode 4. It appears to be in a different category than similar changes to the other TSs.

2. WCAP-16294-NP Page 6-99/100 Section 6.4.35, TS 3.7.10, Control Room Emergency Filtration System (CREFS).

   At the top of Page 6-100, first paragraph, second sentence states, “If two CREFS trains are inoperable due to an inoperable control room boundary, an independent initiating event must occur along with core damage and containment isolation failure for filtration to be required.” The assertion that containment isolation failure would also have to occur for CREFS to be required to maintain Control Room occupant doses less than required limits may not be accurate for many plants.

   This qualitative evaluation contains an assertion in its basis rationale that would not appear accurate for many plants. Explain this assertion and its general applicability would be needed for this TS change to be acceptable.

Reactor Systems Branch Questions:

1. Pages 5-1, Section 5.1, first bullet states, “A reasonable balance among prevention of core damage, prevention of containment failure, and consequences mitigation is preserved.”

   Section 2.2.1 of Regulatory Guide 1.177, “An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications,” states that, “A reasonable balance among prevention of core damage, prevention of containment failure, and consequence mitigation is preserved, i.e., the proposed change in a TS has not significantly changed the balance among these principles of prevention and mitigation, to the extent that such balance is needed to meet the acceptance criteria of the specific design basis accidents and transients, consistent with 10 CFR 50.36. TS change requests should consider whether the anticipated operational changes associated with a TS change could introduce new accidents or transients or could increase the likelihood of an accident or transient (as is required by 10 CFR 50.92)."

Consistent with 10 CFR 50.36, "Technical Specifications" and as required by 10 CFR 50.92, "Issuance of Amendment," please include the TS change (TSTF) required section on "No Significant Hazards Consideration" as listed in 10 CFR 50.92(c)(1), (2), and (3).

2. There are missing pages in the TS markups (both in hardcopy and in ADAMS) for TS 3.8.1, AC Sources Operating (Page 3.8.1-4). Please provide the missing page.

3. Page 6-107, Section 6.4.40, TS 3.8.1 – AC Sources - Operating. In 'Condition A and Condition C,' a transformer and a transformer common cause basic event were respectively selected to model the respective conditions. Please state the reason for selecting transformers (and not other components such as breakers, etc.) in the risk models.

4. Page 6-109, Table 6-18, states "The total CDP decreases by greater than a factor of 6 when the unit cooled down to Mode 4 (POS 3) instead of Mode 5 (POS 4)," and it should refer instead to a "factor of 60." It is an apparent editorial error.

cc:

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