

February 8, 2002

Mr. Anthony R. Pietrangelo, Director
Risk and Performance-Based Regulation
Nuclear Energy Institute
Suite 400
1776 I Street, NW
Washington, DC 20006-3708

SUBJECT: NRC STAFF REVIEW OF DRAFT REVISION B OF NEI 00-04, "OPTION 2
IMPLEMENTATION GUIDELINE" (TAC NO. MA8584)

Dear Mr. Pietrangelo:

This letter forwards the enclosed comments on revision B of your draft guideline; NEI 00-04, "Option 2 Implementation Guideline," submitted to the staff by letter dated June 15, 2001 in response to comments provided by the staff in a letter dated April 4, 2001.

Most of the comments in the enclosure relate to the categorization process. Pilot plant reviews have noted areas where clarifications or enhancements to the guidance may be useful; some of our comments reflect these matters. In addition, as you know, a subcommittee meeting of the Advisory Committee on Reactor Safeguards (ACRS) is planned for February 22, 2002 to discuss the guidance in NEI 00-04 on categorization. Questions from individual committee members concerning the categorization process were documented in a memorandum dated January 28, 2002 (available in ADAMS as ML02028019). We may provide additional comments in the future as a result of our ongoing assessment of pilot plant activities or our interactions with the ACRS.

In the area of treatment, as discussed during the meeting of January 9, 2002, NRC does not plan to review and endorse regulatory guidance. Section D of the enclosure contains some additional comments about other sections of NEI 00-04 for your consideration. The staff notes that some of the comments are linked to decisions about the rule language, as for example, the set of rules being removed for Risk-Informed Safety Class (RISC)-3 structures, systems and components and the submittal and documentation process.

As noted during the meeting on January 9, we hope to post revised rule language shortly to facilitate making conforming changes to guidance to reflect the staff's planned rule language. Please inform us of your expected schedule for revising and resubmitting NEI 00-04. Questions concerning this letter should be directed to either Tim Reed (301-415-1462) or Eileen McKenna (301-415-2189).

Sincerely,

/RA/

Cynthia A. Carpenter, Program Director
Policy and Rulemaking Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Enclosure: As stated

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Comments on Categorization Guidance Contained in NEI 00-04 "Option 2
Implementation Guidance"

A. Comments on the categorization process as described in NEI 00-04

1. NEI 00-04 does not provide guidance concerning the categorization of those structures, systems and components (SSCs) that can play a role in ensuring long-term containment integrity. This issue was discussed during a conference call on May 17, 2001 (ML011490303) where it was suggested that this could be accommodated within the context of defense-in-depth.
2. The argument in NEI-00-04 as to why common-cause failure (CCF) should not be taken into account when evaluating risk achievement worth (RAW) of an SSC is based on the consideration of the conditional probability of common cause failure, given the failure of a single component from the group. The additional argument that it does not make sense to take the total CCF probability to 1 in calculating RAW could equally be applied for any other failure mode. However, the staff believes that it is appropriate to calculate the RAW of the complete common cause basic event, i.e., that event whose probability is the random failure probability multiplied by the conditional common cause failure probability, since it represents a distinct contributor to the total SSC failure, just as does the random failure probability of the SSC.
3. The guidance in Reg Guide 1.174 states that for very small risk increases ($<10^{-6}$ core damage frequency (CDF) and $<10^{-7}$ large early event frequency (LERF)) the change will be considered regardless of whether there is a calculation of the total CDF/LERF. However if CDF is considerably over 1×10^{-4} per year or if LERF is considerably over 1×10^{-5} per year, the focus should be on finding ways to decrease rather than increase the risk. It is not clear to the staff how this Reg Guide 1.174 guidance will be used for plants with high overall CDF/LERF (i.e., CDF considerably over 1×10^{-4} per year or LERF considerably over 1×10^{-5} per year).

On the subject of selective implementation, the staff is interested in what guidance would be provided on assessing the change in risk if implemented for selected systems; for instance, if the showing of a small change in risk for a subset of systems "uses up all of the delta CDF," how would a licensee assess recategorization of additional systems if that were to occur?

4. The staff seeks a better understanding of the decision criteria to be used by the integrated decision-making panel (IDP) in issues such as defense-in-depth, determination of safety significance of SSCs implicitly modeled in the probabilistic risk assessment (PRA) and those not modeled in the PRA, and use of results of sensitivity studies. This comment has arisen during the pilot reviews and during ACRS discussions.
5. Statements are made in the guidance (e.g., the penultimate paragraph on page 15) that since functionality is being maintained, there would be little if any change in risk. However, maintaining functionality does not in and of itself mean that there is no change in reliability. Absent an understanding about what changes in treatment might result, it

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is hard to judge how the reliability of the equipment might be impacted. In section 4.4 of NEI-00-04, the possibility of a change in reliability is in fact recognized, and sensitivity studies are proposed to assess the potential impact on CDF and LERF. The staff considers this to be an important step in the categorization process. However, the justification for the factor to be used as the sensitivity factor on unreliability (for change in treatment) needs an engineering basis to support it. Relating the factor to the difference from mean value to upper bound for typical distributions is not valid as the probability distribution represents uncertainty about the value to use to characterize the current performance of the population of components.

6. The sensitivity studies identified in Table 2.4-1 seem reasonable, although it might be easier to decrease the CCF and human error probability (HEP) values to zero rather than their 5th percentiles. The purpose of these studies is to identify whether any SSCs were masked by potentially high values. In the case of the 95th percentiles, it might be more appropriate to use values indicative of the higher ranges seen in industry PRAs; the methodology used by a particular licensee may be one that provides very optimistic results. As a point of clarification, with respect to the CCF sensitivity studies, is the intent to recommend using the 5th and 95th percentiles of the CCF basic event probability or the conditional CCF probability (see comment 2)?
7. The discussion on implicitly modeled SSCs in Section 2.4.2.1 is unclear. It is important to know where implicit credit has been taken for an SSC, or where a particular SSC failure mode has been truncated. However, unless it is explicitly modeled, the RAW and Fussell-Vesely importance (FV) of an SSC cannot be determined.
8. In the first paragraph on page 7, it is implied that systems that have “regulatory requirements that have bases other than protection of public health and safety from potential reactor accidents (e.g., the radwaste processing system)” are not within the scope of the Option 2 process. Is this the correct interpretation? If so, the first decision box in Figure 2.4-2 (“prevents or mitigates core damage?”) should be clarified so that systems such as the radwaste system are excluded.
9. Section 2.2 lists four functional attributes that are to be identified for each SSC. These are: SSC function, performance attributes, environmental factors, and actuation requirements. It is not clear how and when these attributes are factored into the decision-making process.
10. Comment 18 in our April 4 letter concerned the figure on Risk Importance assessment process for components addressed in the PRA (now numbered Figure 2.4-4). Further discussion is needed on this figure as it is still not clear to us how the “complicated initiating event” portion is used together with the guidance on significant severe accident mitigation functions to provide the appropriate candidate RISC category for these SSCs. (See also Figure 3.4-1.) For example, it appears as if a candidate safety significant SSC, if it does not directly cause a complicated initiating event (IE), will only remain candidate safety significant if “sensitivity studies indicate a higher importance.”
11. There needs to be more linkage between NEI 00-02 and the guidance in NEI 00-04. The staff is preparing draft review guidance for the focused review of the PRA to support Option 2 application as a means of dealing with areas in NEI 00-02 in which we

have concerns about adequacy of the review of the PRA. We anticipate that the licensee submittal for Option 2 will likely need to contain more than just the summary findings and the Facts and Observations from implementation of the NEI 00-02 peer review process. For example, characterizing key assumptions that drive the results (so that sensitivity studies can test the significance of assumptions for the categorization) is appropriate.

12. Section 2.4.1.2 of NEI-00-04 is silent on the use of the American Society of Mechanical Engineers (ASME) Standard in assuring that the categorization is supported by the PRA. The guidance in this section is specifically for the use of NEI 00-02. Since the issuance of the Standard is imminent, does NEI propose to provide such guidance?
13. The second to last paragraph in Section 4.4 discusses the monitoring of SSCs. The discussion links monitoring strategies to the results of the sensitivity studies. It states that "... if the sensitivity studies indicate that, even with bounding SSC performance assumptions, the risk will remain within acceptance guidelines, and the bounding performance assumptions are supported by monitoring programs, then no changes would be necessary." Also, on page 15, it is stated that "For those cases where some degradation in performance may be possible, sensitivity studies will be performed using available PRA information. Any identified monitoring will also be evaluated to ensure that degradations will be identified appropriately." Please clarify what these statements mean in terms of monitoring of Risk-Informed Safety Class (RISC)-3 SSCs.
14. Absent consensus standards and industry peer review processes, what quality process will be used for fire, seismic and shutdown PRAs or for the screening/margins analyses for these initiators. The last paragraph on page 19 (Section 2.4.1.3) addresses this issue to a limited extent, but a more robust process may be needed for Option 2 categorization. The alternative could be to demonstrate that the SSC categorization with respect to these initiators is conservative.
15. How is SSC function with regard to security and non-proliferation accounted for? The addressing of safeguards features has been raised by the ACRS and during the public comment period.
16. In Section 2.4.2, it is stated that "The first question in the safety significance process involves the role the system/structure plays in the prevention and mitigation of severe accidents." The term "prevention of severe accidents" can be interpreted broadly, for example, it could be taken to include safeguards systems (see comment 15), or to include SSCs like spray shields (to prevent an internal flooding initiator). How does NEI 00-04 define "prevention"?
17. Section 3.1 provides guidelines for performing the fire assessment.

In the third paragraph, it is stated that "Fire barriers would not be considered, unless the fire risk analysis supports consideration of the impacts of the failure of the barrier." Does this imply that fire barriers (doors, walls, dampers, etc.) can only be considered as low safety significant if it is modeled explicitly and that the quantitative analysis shows that it is not risk significant? Does this also imply that fire barriers that are credited in the screening of fire areas will be categorized as safety significant?

In fire PRAs, how are fire suppression systems categorized? (In many cases, automatic and manual fire suppression is used as one input to help define fire damage states. In these cases, the success/failure of the fire suppression systems is used to determine the split fractions in the fire damage state trees, and the event itself will not propagate to the accident sequence event tree (and therefore, the event will not be in the CDF or LERF cutset equation). How then are the importances of these fire suppression systems/events evaluated?)

18. Section 3.2 provides guidelines for performing the seismic assessment.

In the seismic margins analysis, in addition to SSCs that support the safe shutdown paths, what considerations are given to findings obtained during the seismic walkdowns in the areas of seismic ruggedness screening (relays, anchorage, etc.) and spatial interactions. That is, what process is used to preserve "seismic ruggedness" for SSCs where this credit is taken during the seismic analysis and walkdowns. What credit is taken for seismic "2 over 1" spatial interactions? This comment also applies to the seismic PRA.

In regard to the seismic PRA method, is it the intent to develop new component fragilities to assess the impact changes for RISC-3 components in the PRA (as part of the sensitivity analyses).

B. Comments on the categorization process based on observations of the pilots

1. In conduct of the IDP, it was important to keep clear in the discussions the distinction between "safety" functions that arise from the design basis (with the corollary that only treatment would be changed, and there is a need to "maintain function" consistent with licensing assumptions and safety analyses) and the risk-significant functions (deriving from analyses like PRA). These can lead to different characterizations about what the function is, and what SSCs are necessary to achieve them. The guidance may need to be clarified on this point. Also, having a master list of components with all of their potential functions identified would be helpful in developing confidence that SSCs are associated with the appropriate safety functions and that the most limiting category is assigned to each SSC.
2. There should be an identification of all the functions in the design bases and in the PRA for each SSC to be categorized. Having such a list would be helpful in developing confidence that SSCs are associated with the appropriate functions during the categorization process.

It was noted that, although a "flood prevention" function was identified as an item of discussion for the IDP, a fire prevention function was not identified. SSCs that could limit fire initiation, fire growth, or the spread of fire to other fire areas may in some cases be as important as SSCs identified as being important in the prevention of flood initiation and/or mitigation.

3. The IDPs need to consider potential changes in treatment as part of their deliberations on safety significance. This will be helpful from the perspective of what is important to

preserve and what might be changed. It is also unclear, absent an understanding about the changes in treatment, how the reliability of equipment will change (if at all) when treatment is relaxed.

4. The defense-in-depth matrix in NEI 00-04 does not appear to do an adequate job of identifying defense-in-depth issues for IDP consideration. Panel members appeared not to know how to apply guidance in this matrix.
5. There is a need for more guidance in NEI 00-04 regarding the categorization of SSCs that do not affect CDF and LERF. For example, the IDP discussion regarding the standby gas treatment system would have been more focused, and the basis for decision-making would have been clearer, if such guidance existed in NEI 00-04. This would also apply to other systems such as post accident sampling system, and containment systems. The guidance should help licensees develop a process that systematically looks at the importance these SSCs have with respect to severe accidents, taking into account the need for maintaining defense-in-depth for such things as long-term containment integrity and accident management roles.
6. There should be a distinction between the use of quantitative risk approaches versus the use of qualitative risk approaches. When more simplified models are used (this applies to the use of screening methodologies for shutdown conditions, fires, seismic and other external events), the results of the categorization should be more conservative (i.e., tend to categorize more SSCs as safety significant) when compared to when a PRA is used. One way to accomplish this could be to apply more conservative guidance during the deliberations for defense-in-depth and/or safety margins.
7. There is a need to provide guidance about what authority the IDP has for making a determination that an SSC is low safety significant when the PRA indicates the SSC is safety significant.

C. Editorial comments

1. In the fourth paragraph of Section 2.4.1.2 there is a statement that the licensee “should justify why the PRA is adequate for this application in terms of scope and quality”. Perhaps a better way to phrase it would be that the licensee “should demonstrate that the PRA results have been used appropriately in the categorization process, taking into account the strengths and weaknesses of the PRA”. There is no requirement to change the PRA as the last sentence suggests. This would only be necessary if it were thought that a more detailed PRA would provide a necessary basis for categorizing SSCs as low safety significant.
2. Section 2.4.2: change “safety significance process” to “SSC categorization process” to accord with the new title of Figure 2.4.2.
3. Section 5.3 appears to be a repeat of Section 4.4 - clarify what is different about these two steps; is one done by the preparers and one by the IDP?

D. Other Comments

1. On p.3, note reference to “standard commercial controls” (similar references in many other locations)
2. See p. 6 which has discussion about use of Appendix T
3. On p.9, the scope of rules is not consistent with current NRC proposal
4. On p. 52 middle of page - should the reference be “4.4” instead of “2.4.4?”
5. On p. 59 top, should first sentence be revised to “...to determine whether or not these SSC are implicitly depended upon in the PRA”?
6. On p. 61, Figure 5.1-1 1st rectangle refers only to design bases and core damage - what about LERF?
7. On p.64, revise title in footnote to be “Implementation”
8. On p. 75 top paragraph, there is a dangling phrase “An existing evaluation had concluded that”
9. On pp. 77 and 85, the text notes that NEI 99-04 has been revised - has it been submitted for NRC endorsement?
10. On p. 77, last sentence reads “Yet, a full 50.59 evaluation may not be required” - clarify meaning.
11. On p. 81, the statement is made that “Those commitments solely associated with RISC-3 SSC were deleted” - clarify the meaning, are they no longer commitments, or no longer implemented? If the latter, were they reviewed to determine if needed for functionality?
12. On p. 83 in the last sentence, clarify “circumstances”
13. On p. 85, at the top of the page there is a statement that if a (design) change results in a change of RISC categorization, the NRC is notified - does this refer to first paragraph under 7.4 that licensee makes a commitment to notify of “changes in the categorization of SSCs.” Does this mean changes from one RISC category to another after first being categorized (as compared to the categorization into the categories from implementation of §50.69?). (Note that the Title of section 7.4 is “Changes to SSC Categorization Process”).
14. On p. 85 should the reference to “UFSAR guideline” be “commitment management guideline”?

15. On p. 85, is the sentence about “changes in PRA that result in changes in SSC categorization should be reported...intervals...FSAR update” a different commitment from that in first paragraph or just one means by which SSC categorization could change?
16. On p. A-1 - Does “original licensing basis” refer to the “pre 50.69 implementation” licensing basis?