

August 01, 2001

MEMORANDUM TO: Cynthia A. Carpenter, Chief  
Generic Issues, Environmental, Financial  
and Rulemaking Branch  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

FROM: Stewart L. Magruder, Senior Project Manager/**RA**  
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SUBJECT: TRIP REPORT - OBSERVATION OF PRA PEER REVIEW AT  
SOUTHERN NUCLEAR OPERATING COMPANY'S OFFICES

During the week of December 4, 2000, NRC staff observed a peer review of the Hatch Unit 1 PRA. The review was conducted at the Southern Nuclear Operating Company (SNOC) offices in Birmingham, AL, and was coordinated by NEI. The purpose of the onsite observation was to gain additional insight into the process, and to gauge the objectivity and repeatability of the NEI 00-02 "Probabilistic Risk Assessment Peer Review Process Guideline." NEI has proposed that the peer review process is adequate to show that a PRA is of sufficient quality for the categorization of SSCs as part of the risk-informing of special treatment requirements (risk-informing of 10 CFR Part 50, Option 2).

The NRC onsite observation process was discussed in a letter from David Matthews, Director, Division of Regulatory Improvement Programs, Office of Nuclear Reactor Regulation, NRC, to Stephen Floyd, Senior Director, Regulatory Reform, NEI, dated November 15, 2000. In addition, the staff provided comments on NEI 00-02 in a letter from Mr. Matthews to Mr. Floyd dated September 19, 2000 and in a letter from D. Matthews to A.R. Pietrangelo of NEI dated April 4, 2001.

The peer review team consisted of a team leader/system expert from General Electric, three PRA practitioners from other BWR plants, and two PRA experts from a consulting firm. The peer review team followed the NEI 00-02 guidance closely, providing the NRC staff with a good opportunity to evaluate the effectiveness of the proposed process. The assessment of the adequacy of the technical criteria in NEI 00-02 was not within the scope of this site visit. Also, the NRC staff made clear to the licensee that the intent of the visit was to assess how well the process works and not to assess the adequacy of the Hatch Unit 1 PRA.

As discussed in the November 15, 2000, letter, the staff anticipated that the final peer review report would be sent to the NRC for review. SNOC management subsequently decided not to submit the final report to the staff because they did not want the entire draft report to be on the

public docket. Therefore, to complete its observation of the peer review process, the staff reviewed a draft version of the peer review report at NEI's offices on June 13, 2001.

The staff's comments on the NEI 00-02 process are included in the attachment to this memorandum. In general, the staff concludes that the peer review process is a useful and beneficial process for the identification of the strengths and weaknesses of a PRA. The review team members displayed a genuine desire to do a good job and worked hard to give fair grades. The setup facilitated easy exchange of information between the reviewers and licensee and the process fosters cooperation between the reviewers and licensee.

The staff also concluded that the peer review process, as documented in NEI 00-02, (1) is difficult to implement consistently, (2) the assigned grades are not particularly helpful, and (3) the report summary (by itself) would not provide sufficient information for the staff to conclude that the PRA is acceptable for an Option 2 application. A more useful report would also contain the Fact and Observation (F&O) sheets and the licensee's disposition of the F&O's which are relevant to the Option 2 categorization process. Finally, because many of the subtier criteria in NEI 00-02 are somewhat subjective (allowing for broad interpretation by peer reviewers), the review process relies heavily on the experience of the peer reviewers. Therefore, in many cases, unless F&O's are provided for the sub-element, the basis for the interpretation may not be readily apparent to a third party not present at the review.

Based on staff observations of the NEI 00-02 PRA peer review process, and on staff comments on the technical adequacy of NEI 00-02, the staff is reconsidering its position that the Option 2 rule should be fashioned such that plant specific implementation of Option 2 would not entail any prior staff review. If the staff concludes that some level of prior review is warranted, it will develop review guidance for Option 2 submittals which utilize NEI 00-02. Any staff review guidance would also account for (and be integrated with) staff comments on Draft Revision B to NEI 00-04, "Option 2 Implementation Guide."

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**\*see previous concurrence**

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## **Staff Observations and Comments on Peer Review Process and Draft Report**

### **General**

1. The peer review process benefits the host licensee. The reviewers provided an independent view of the strengths and weaknesses of the PRA (as well as potential resolutions to the weaknesses).
2. The less experienced members of the peer review team learned a lot from the more experienced members and from the host utility.
3. The peer review process fosters cooperation between the reviewers and licensee and the setup facilitated easy exchange of information between the reviewers and licensee.
4. The potential applications of the PRA were considered during the review. There was a genuine intent to provide feedback to the licensee so that the PRA will be appropriate for licensing applications.

### **Implementation of the guidance in NEI 00-02 (and subtier criteria)**

1. Training materials sent to the peer review team prior to the onsite review should be incorporated into NEI 00-02. Specifically, the example certification documentation, process overview material and updates to the subtier criteria would improve NEI 00-02.
2. It appeared that some of the reviewers were not sufficiently familiar with the Hatch PRA information and the training material which were sent out prior to the week of the onsite peer review. As a result, for these reviewers, the review effort (including familiarization with the NEI 00-02 process and familiarization of the Hatch plant features) was compressed into one week. It was our observation that the review is less effective when a pre-review of the plant and PRA information is not performed. As a matter of fact, NEI 00-02 suggests this pre-review.
3. The NEI 00-02 review elements and the subtier criteria focus on the evaluation methodology and on the level of detail of the PRA. The staff agrees that the focus of the peer reviewers should be on the checking of the process, models, and assumptions of the PRA and not so much on the accuracy of the results. The staff therefore agrees with NEI 00-02 that review by an internal (licensee) QA team will also be necessary to show that the input, process and models have been used and applied correctly.
4. The definitions of may/should/shall in NEI-00-02 are confusing to the peer reviewers. In many cases, grading was instead based on the level or degree of implementation of a requirement. In these cases, it would have been very beneficial to a third party reviewer if the basis for the grade was documented. This is especially true for cases where the “may” and “should” were interpreted as not requiring compliance with the suggested criteria (in such cases, the alternative basis for the assigned grade would be important to third party reviewers). It is our observation that such documentation (especially for elements assigned a grade 3) is generally not performed.
5. Several reviewers commented that it was difficult to assign a grade for some subtier criteria because the wording was the same (or very similar) for all 3 grades (e.g., MU-10, MU-14, and

DA-11). In addition, some subtier criteria are not consistent with the checklist (e.g., L2-13 and L2-18). Again, proper documentation on the basis of the assigned grades for these elements would facilitate understanding by third party reviewers.

6. When there was disagreement among team members concerning the grade for a particular sub-element, the team generally referred back to the subtier criteria. This proved to be helpful in the cases where the subtier criteria provided a clear distinction between grades.

7. There was some confusion among some reviewers regarding the documentation of results and process used versus the documentation provided by guidance documents. In several cases, there appeared to be a tendency to give credit for documentation in lieu of guidance and vice versa.

8. In several cases the reviewers appeared to have interpreted the subtier criteria incorrectly. For example, F&O ID: 1 on AS-19, is a comment on human error probabilities, not on the identification of human failure events; and F&O ID: 4 on AS-17 should be related to AS-13. This could be taken to be evidence of either inexperience on the part of the reviewer, or the fact that the subtier criteria are not really used.

### **Grading process**

1. It appears that a grade of 3 may be the default grade and that members of the team from other plants tend to give a grade of 3 when the PRA is consistent with their plant's PRA. For example, a grade of 3 was assigned for sub-element SY-8 although everyone on the team agreed that false instrument signals that can cause failure of the system was not modeled. It appeared to the staff that a grade of 3 was assigned because most other PRAs had also not modeled this failure mode. The better way to disposition this would have been to determine that, for the Hatch plant, the failure mode would not have been significant when compared to other failure modes.

2. The headings for the subtier criteria in NEI 00-02 (risk ranking prioritization, risk informed decisions, risk based decisions) may not be relevant and may be considered presumptive. Our observation indicates that the reviewers assume that a grade of 3 is roughly equal to their perception of the industry average. A grade of 4 would be considered to be significantly better than industry average and a grade of 2 would be somewhat worse than the average. A grade of 1 appears to be reserved for elements that are significantly worse than the average or are technically incorrect and impact the PRA result. A grade of 1 still implies that the PRA sub-element is acceptable and it is not clear how a non-acceptable sub-element is graded.

3. The peer review team appeared to be reluctant to give the highest or lowest grades (i.e., grades 4 or 1). For example, in the system analysis review, sub-element SY-5 was given a grade of 2 even though the peer reviewers made comments such as: (i) the models and analyses were not consistent with as-built plant, including EOPs and AOPs, (ii) the licensee did not model such things such as return to power, containment flooding, RHR crosstie, external injection sources, venting, 2½ hour battery life, or low pressure permissive completely or correctly. It should be noted that SY-5 had six level "B" (important and necessary to address) F&Os and four level "C" (considered desirable) F&Os. This is a good example of why knowledge of the assigned grade is not as important as the knowledge of the contents (and licensee dispositions) of the F&Os.

4. It appears that, even when weaknesses were identified, there was a tendency to assign a grade 3. For example, during the discussion on the quality of data used in the PRA, some reviewers had a hard time reconciling the fact that outdated data (IPE data) were used. (In fact the licensee admitted that this was a weakness of its PRA.) Yet this weakness was not reflected clearly in the grading, for example, a grade 3 was given for sub-element DA-8 (which deals with use of current data sources for common cause failures) even though the licensee did not use current data as required in the criteria. The rationale used for assigning a grade 3 was that a systematic approach was used to identify CCFs, an issue addressed in DA-12 which was given a grade of 4.

5. Several sub-elements were given a grade of "N/A", however, it is not always clear what this meant (e.g., SY-18, MU-5, QU-5, L2-2, and L2-18). Since N/A grades are not further explained, it may be difficult for the licensee or a third party to understand this grade. We believe that an N/A could have at least three meanings: (i) that the criterion does not apply to the PRA (e.g., AS-12 and L2-17); (ii) that the criterion does not apply for that grade/application (e.g., HR-20, AS-1,-2,-3 guidance, and AS-7; and (iii) that the grade should have been a 0 but the reviewers could not assign such a grade (e.g., L2-9 and L2-11).

6. It appears that there are some inconsistencies between the grades assigned for sub-elements and the number and types of F&O's associated with that sub-element. For example, sub-element TH-8 had several level B (significant) F&Os but was given a grade of 3. In addition, sub-element SY-12 was given a grade of 4 with one level B and one level C F&O, whereas sub-element SY-13, also with one level B and one level C F&O, was given a grade of 2.

7. The assignment of an overall grade for a PRA element was done by group consensus and was loosely tied to the grading of the individual sub-elements. This overall grade will not be particularly useful to the staff since little additional insight is provided (above that already provided by the F&Os and individual sub-element grading), and as a matter of fact, important information may be obscured by giving attention to these overall grades.

### **Experience of the peer review team**

1. Although each member of the team met the minimum experience requirements of Section 2 of NEI 00-02, some of the reviewers did not appear to have sufficient PRA experience to provide meaningful input to the majority of the review.

2. It was clear that the experience of the reviewers is a very important element in the peer review process. It is our opinion that, even if the subtier criteria are made more detailed, the quality of the peer review will still depend largely on the experience of the reviewers. When all the reviewers in a session had sufficient experience in the performance of PRAs, the sessions ran more effectively. When a subconsensus group did not have experienced reviewers, the grades tended to be generous (more grades 3 and 4). It was also our observation that these grades were often changed (downgraded) during the main consensus group discussions. (For example, reviewers mentioned several times in subgroup sessions that the senior PRA expert would probably assign a lower grade to several sub-elements, but nonetheless, a grade of 3 was assigned by the subgroup. This particular expert downgraded at least five sub-elements in the data consensus session. We are unsure as to what would happen if this particular expert was not a part of the peer review team or if, for some reason, he did not pay enough attention to these particular elements.)

3. The wording of the subtier criteria is more important to the less-experienced reviewers. It also appears that the subtier criteria did not restrict the more experienced reviewers.

## **Documentation of results**

1. It appears that the general practice is to not write a fact and observation sheet if a grade 3 is assigned. If an F&O sheet is not done, there is no documentation to support or explain why a grade of 3 is assigned. Documentation is important when the subtier criteria are not clearly distinct or when minimum requirements are not provided in the subtier criteria. As an illustration, during the full group discussion of Human Reliability issues, some team members could not remember why they assigned a grade of 3 during a subgroup session just several hours earlier.

2. In our review of the draft report summary, we observed that the summary did not reflect some of the findings of the peer review. The reviewers had identified some important weaknesses in the Hatch PRA. Examples include: the use of ten-year-old (IPE) data; lack of treatment of human dependencies; and incorrect treatment of common cause data. Although these weaknesses could potentially impact the Hatch PRA results, they were not documented in the summary report. (In the case of human dependencies, the summary actually contradicts some of the findings. For example, the summary states that dependency is well done, whereas the related sub-elements were graded at 1 or 2.) Therefore, we found the summary report to be misleading and inaccurate for some elements. As a result we conclude that submitting just the summary report by itself would not be sufficient for Option 2 applications. A more useful report to the staff would also contain the F&O sheets and the licensee's disposition of the F&O's which are relevant to the Option 2 categorization process.

3. Footnotes are sometimes provided during the grading of sub-elements. These footnotes document actions that must be performed by the licensee before the sub-element can achieve the assigned grade. For example, sub-element IE-5 was assigned a grade of 3 conditional on a footnote that states that the "loss of instrument air" initiating event has to be included. There were several other footnotes that stated that the licensee had to "consider adding or document why you do not have to add" initiating events for RPV rupture, manual shutdown, reference leg break, and excessive LOCA. It is not clear to the staff how the NEI 00-04 process will utilize the footnotes (e.g., in IDP deliberations, submittal to the NRC, etc.)

4. Similar to the above, it is not clear to the staff how significance level B F&Os will be dispositioned during the Option 2 categorization process. The definition of a Level B finding is that it is "important and necessary to address, but may be deferred to the next PRA update." Whether or not this finding has to be addressed prior to an Option 2 submittal is unclear. As an example, sub-element TH-7 was assigned a grade of 3. A significance level B F&O was included with this sub-element which stated that "MAAP cannot be used in the evaluation of early over pressure failure of the primary system. Codes such as .... are capable of providing this deterministic input." The suggested possible resolution was "Formulate the success criteria for Hatch based on qualified T&H codes or clearly understand and document the limitation of the codes as applied to specific accident sequences." The questions here are whether the licensee has to resolve this comment prior to an Option 2 application or if the licensee's resolution will be available to the Option 2 IDP or the NRC reviewers.