NEI 05-04

Process for Performing Follow-on PRA Peer Reviews Using the ASME PRA Standard

NUCLEAR
ENERGY
INSTITUTE

Prepared for
Nuclear Energy Institute (NEI)
Risk Application Task Force (RATF)

Prepared by
BWROG/General Electric Nuclear Energy
B&WOG/Framatome ANP, Inc.
WOG/Westinghouse Electric Co.

Based on material originally provided by
CEOG/WOG/Westinghouse Electric Co.

January 2005

SUITE 400 1776 I STREET, NW WASHINGTON, DC 20006-3708 202.739.8000 www.nei.org

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This report was prepared using information in a draft guidance document obtained through the Nuclear Energy Institute (NEI) Risk Applications Task Force (RATF). In particular, the CE Owners Group (CEOG) (now part of the Westinghouse Owners' Group (WOG)) developed an initial follow-on peer review process, documented in Westinghouse WCAP-16091, upon which the NEI draft document is based and has made this information available to the other Owners Groups, through the auspices of NEI's RATF.

WCAP-16091 was prepared by David Finnicum of Westinghouse. The transformation of the original work into a draft industry document was accomplished by Barry Sloane (then with Westinghouse), Greg Krueger (ERIN Engineering, formerly of Exelon), David Miskiewicz (Progress Energy – Florida), David Finnicum (Westinghouse), and Stanley Levinson (Framatome ANP). Additional review and input was provided by the RATF and other interested utility and industry personnel.

The draft NEI document, which envisioned a broader scope peer review with several options, was modified and simplified by Barry Sloane as WCAP-16181-NP, Revision 0, a draft document that was never officially released. Sloane's version was intended to be used for follow-on peer review of individual PRA technical elements, and included less detailed supporting material and process guidance. This simplification matched the guidance provided by NEI's RATF and is the impetus to create this NEI document. This document was reviewed by the B&W Owners Group (B&WOG) Risk-Informed Applications Committee, NEI's RATF, and the original team of Sloane (Dominion Energy), Krueger, Miskiewicz, Finnicum, and Levinson. The comments provided by Earl Page are specifically acknowledged.

EXECUTIVE SUMMARY

This document provides guidance material for conducting and documenting a follow-on peer review for Probabilistic Risk Assessments (PRAs) using the ASME PRA Standard RA-S-2002.

Peer review has proven to be a valuable process for establishing technical adequacy of nuclear power plant probabilistic risk assessments (PRAs). All US plants have performed a peer review of their base PRA internal events, t-power model. Recently, PRA consensus standards have been developed, and endorsed through NRC Regulatory Guide 1.200. Plants using this Regulatory Guide may, in some cases, need to perform follow-on peer reviews of their PRA, or portions thereof. The need for these follow-on reviews is generally driven by significant changes or upgrades to a portion (e.g., a single PRA technical element) or all of the previously peer-reviewed PRA. This document provides a methodology for performance of follow-on peer reviews.

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ACRONYMS

AOT	Allowed Outage Time
AS	Accident Sequence Analysis
ASME	American Society of Mechanical Engineers
B&WOG	Babcock & Wilcox Owners Group
BWR	Boiling Water Reactor
BWROG	BWR Owners Group
CE	Combustion Engineering
CEOG	CE Owners Group
CNRM	Committee on Nuclear Risk Management
DA	Data Analysis
DE	Dependency Analysis
EPRI	Electric Power Research Institute
F&O	Fact & Observation (form)
GL	Generic Letter
HFE	Human Failure Event
HLR	High Level Requirement
HR	Human Reliability
HRA	Human Reliability Analysis
IE	Initiating Event, Initiating Event Analysis
IF	Internal Flood, Internal Flood Analysis
ISI	In-service Inspection
IST	In-service Testing
LE	Level 2 (LERF) Analysis
LERF	Large Early Release Frequency
MOV	Motor Operated Valve
MU	Maintenance and Update
N/A	Not Applicable
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
PRA	Probabilistic Risk Assessment
PSA	Probabilistic Safety Analysis
QA	Quality Assurance
QU	Quantification and Results Interpretation
R&R	Risk & Reliability (Workstation)
SC	Success Criteria
SR	Supporting Requirement
SSC	System, Structure, and Component
SY	System Analysis
TH	Thermal Hydraulic Analysis
TS	Technical Specification
WOG	Westinghouse Owners Group

1.0 INTRODUCTION

1.1 Purpose

Over the last several years, the nuclear utilities have undertaken a voluntary program of performing peer reviews of their plant-specific Probabilistic Risk Assessments (PRAs)[a] using the process defined in NEI 00-02 (Reference 1). The purpose of this report is to provide a process for performing a follow-on peer review of individual technical elements of a PRA for utilities that have upgraded or significantly revised their PRAs.

In general, a follow-on peer review implies that an NEI 00-02 review has already been conducted, and at least the level A and B Fact & Observations (F&Os) from that review have been addressed. A follow-on peer review would be needed (actually required by the ASME PRA Standard, Reference 2) as a result of a PRA upgrade, performed either in response to the original peer review or as a result of the normal evolution of the PRA model. A change that constitutes a PRA upgrade is defined in Section 2 of the ASME PRA Standard (see Section 1.2 of this document). In some cases, a follow-on peer review may be requested for the entire PRA model because of changes made to the methodology throughout the PRA model. Thus, a follow-on peer review's scope can be as narrow as a single PRA technical element, or as expansive as a peer review of the entire PRA.

1.2 Background

In 1997, the Boiling Water Reactor Owners Group (BWROG) developed a process for performing a peer review of a plant's Level 1 at-power PRA models that would assess the capability of the PRA for various risk-informed applications and also assess whether a process was in place to provide a means for the long-term maintenance of that level of capability. The key features of the BWROG process were a highly structured schedule for a focused review of the PRA and a set of 11 checklists to be used to review ten technical elements of a PRA plus the program in place for maintenance of the PRA models, and a four-level grading scheme for the eleven technical areas.

The Combustion Engineering Owners Group (CEOG) adopted the BWROG peer review process with some slight modifications. In parallel, the Nuclear Energy Institute (NEI), working with the Westinghouse Owners Group (WOG) and the Babcock & Wilcox Owners Group (B&WOG), adopted the BWROG peer review process and revised the checklists to incorporate Pressurized Water Reactor (PWR) specific items as needed. NEI issued NEI-00-02 as the industry standard for performing PRA peer reviews. The industry peer review process presented in NEI 00-02 was intended to cover a single peer review of a utility's PRA with on-going maintenance of the capability of the PRA covered by reviewing the utility's PRA maintenance and update process to ensure that it was sufficient to maintain the PRA at the appropriate capability level.

[a] Some referenced documents may use the term Probabilistic Safety Assessment (PSA) instead of PRA. These terms are considered equivalent terms in the context of this document.

In April 2002, the American Society of Mechanical Engineers (ASME) issued ASME RA-S-2002, the PRA Standard; this was updated with Addendum A in December 2003 (Reference 2). Section 5.4 of the standard requires a peer review for PRA upgrades[b]. (Note: The ASME PRA Standard defines PRA upgrade as "the incorporation into a PRA model of a new methodology or significant changes in scope or capability. This could include items such as new human reliability analysis methodology; new data update methods, new approach to quantification or truncation, or new treatment of common cause failure.")

The overall scope and set of detailed requirements in the ASME PRA Standard are somewhat different than that of NEI 00-02. Thus, peer reviews conducted in accordance with NEI 00-02 do not cover the full scope of the ASME PRA standard. In Appendix B of Regulatory Guide 1.200 (RG 1.200) (Reference 3), the Nuclear Regulatory Commission (NRC) recognized the validity of the peer reviews conducted in accordance with NEI 00-02 as partially covering the scope of the ASME PRA Standard and they endorsed the concept of performing a self-assessment to show compliance with ASME PRA Standard requirements, including those not covered by the NEI 00-02 peer reviews. Appendix B of RG 1.200 explicitly identifies which ASME PRA Standard requirements are either not covered by the NEI peer review checklists or are only partially covered and thus specifies the scope of an incremental self-assessment (i.e., gap analysis) to bring the NEI review to adequate equivalence with the ASME PRA Standard, given that an NEI peer review has been previously performed.

The process defined in this document is derived from prior Westinghouse and (draft) industry processes (References 5, 6, and 7).

1.3 Scope

The scope of this document is to provide a process for performing a follow-on PRA peer review for nuclear plants that have already had an NEI 00-02 peer review. This document addresses follow-on peer reviews to address changes made to a technical element of the PRA that result in significant changes to the methodology or which have otherwise been determined to result in an upgrade of the technical element. The scope of this follow-on peer review is the entire scope of the ASME PRA Standard that is applicable to the particular technical element being subject to the follow-on peer review. The process described in this document is applicable to a PRA peer review for whatever reason the utility has for performing the review, e.g., PRA upgrades per the definition in the ASME PRA Standard, methodology changes, etc.

[b] The BWROG is working on a white paper to distinguish between a PRA update and upgrade, thus helping to clarify when a follow-on peer review would be necessary (to satisfy the ASME PRA Standard).

2.0 GENERAL OVERVIEW OF PEER REVIEW PROCESS

The purpose of the PRA peer review process is to provide a method for establishing the technical capability and adequacy of a PRA relative to expectations of knowledgeable practitioners, using a set of guidance that establishes a set of minimum requirements. Follow-on peer reviews that cover the scope of the ASME PRA Standard will use the supporting requirements (SRs) in Section 4 of the ASME PRA Standard, supplemented, as appropriate, by the results of the original NEI 00-02 peer review.

The PRA peer review process is a tiered review process in which the reviewer begins with a relatively high level examination of the PRA technical element(s) against the requirements, and progresses successively to additional levels of detail as necessary to ensure the robustness of the model until all of the requirements are adequately reviewed.

Implementing the review involves essentially a combination of a broad scope examination of the PRA element(s) within the scope of the review and a deeper examination of portions of the PRA element(s) based on what is found during the review. The SRs provide a structure, which in combination with the peer reviewers' PRA experience provides the basis for examining the various PRA technical elements. The supporting requirements help to ensure completeness in the review. If a reviewer discovers a question or discrepancy, it is expected that a more thorough, detailed search will be conducted.

In general, it is essential to focus the review on the relevant application-specific results of the PRA to ensure that the review directly addresses intended plant applications of the PRA. For example, if the results of a PRA indicated relatively low importance of a diesel generator(s), then a risk-informed submittal to increase the allowed outage time (AOT) of the diesel generator(s) would be supported by the PRA, assuming the peer review showed an adequate and technically sound PRA model.

3.0 GRADING PROCESS

One of the outcomes of the peer review process is the assignment of "grades." These grades are used to indicate the relative capability level of each technical element based on the SRs as defined in the ASME PRA Standard. For follow-on PRA peer reviews against the ASME PRA Standard scope, the grade for each SR will be the ASME PRA Capability Category that the utility PRA meets for that SR. This section provides a simplified grading process for peer reviews against the ASME PRA Standard.

In general, it is essential to focus the review on the specific conclusions of the PRA to ensure that the review directly addresses intended plant applications of the PRA. It is important to note that the PRA does not receive one overall grade. Each SR is graded.

The major benefits of the review process, however, *are not the SR grades*, but rather the recommendations for improvements and the acknowledgments of the strengths of the PRA. Additional beneficial outcomes of the review process are the exchange of information regarding PRA techniques, experiences, and applications among the host utility and utility reviewer personnel, and an anticipated evolving level of consistency from review to review.

3.1 Grading Process for Peer Reviews Against ASME PRA Standard

Section 4 of the ASME PRA Standard presents the risk assessment technical SRs. These requirements are specified in terms of capability category requirements with increasing scope and level of detail, increasing plant-specificity, and increasing realism as SRs satisfy Capability Category I through Capability Category III. See Table 1.3-1 of the ASME PRA Standard (Reference 2).

For a peer review against the ASME PRA Standard, the applicable portions of a host utility's PRA will be reviewed against the applicable ASME PRA Standard SRs in Sections 4.5 and 5 of the ASME PRA Standard, following the guidance of Section 6 of the ASME PRA Standard. For each SR reviewed, the host utility's PRA will be graded based on the Capability Category requirements that the host utility's PRA meets for that SR.

For each Capability Category, the SRs define the minimum requirements necessary to meet that Capability Category. Some of the SR action statements apply to only one Capability Category, while others extend across two or three Capability Categories. When an action statement spans multiple categories, it applies equally to each Capability Category. When necessary, the differentiation between Capability Categories is made in other associated SRs. The interpretation of a SR whose action statement spans multiple categories is stated in Table 1.[c] It is

[c] This logic and supporting table have been proposed for the ASME PRA Standard in Addendum B, which, at the time of issuance of this report, has not been balloted by the Committee on Nuclear Risk Management (CNRM), nor released to the public for comment. There may be some modification of the proposed language in the final, accepted version that will appear in the next officially-released version of the Standard.

intended that, by meeting all the SRs under a given High Level Requirement (HLR), a PRA will meet that HLR.

Table 1 -- Interpretation of Supporting Requirements

Action Statement Spans	Peer Review Finding	Interpretation of the Supporting Requirement
All Three Capability Categories (I/II/III)	Meets SR	Capable of supporting applications in all Capability Categories
	Does not meet SR	Does not meet minimum standard
Single Capability Category (I or II or III)	Meets Individual SR	Capable of supporting applications requiring that Capability Category or lower
	Does not meet any SR	Does not meet minimum standard
Lower Two Capability Categories (I/II)	Meets SR for CC I/II	Capable of supporting applications requiring Capability Category I or II
	Meets SR for CC III	Capable of supporting applications in all Capability Categories
	Does not meet SR	Does not meet minimum standard
Upper Two Capability Categories (II/III)	Meets SR for CC II/III	Capable of supporting applications in all Capability Categories
	Meets SR for CC I	Capable of supporting applications requiring Capability Category I
	Does not meet SR	Does not meet minimum standard

If there are instances where it appears that this approach leads the reviewer(s) to question the adequacy of the requirement for the higher capability categories, the reviewer(s) will document the interpretation of the SR that has been applied, and the host utility may submit an inquiry to the ASME CNRM requesting a clarification.

When the peer review consists of a team of reviewers (i.e., more than one reviewer; see Section 4.4), the determination of the grade for each SR will be based on the consensus of the review team. No grades will be assigned to HLRs, but a qualitative assessment of the HLRs will be made based on the associated SR grades.

The applicable portions of the PRA and associated documentation will also be reviewed for conformance to the requirements of Sections 4.2 and 4.3 of the ASME PRA Standard as part of the overall review.

3.2 Comparison Against Grading Process for NEI 00-02

For the sake of comparison between the Capability Categories of the ASME PRA Standard and the grades assigned during the NEI 00-02 Peer Reviews, a brief discussion of what the NEI 00-02 grades mean is warranted. This will facilitate any "conversion," when appropriate and applicable from the original peer review to the follow-on peer review.

Under the NEI 00-02 grading process, the grade is meant to convey the ability of the PRA sub-element to support particular types of applications. The implementation of the PRA peer review process uses checklists that include the criteria to be used to grade each of the elements of the PRA. These checklists are contained in Appendix B of NEI 00-02.

The distinctions in grade level are assigned based on example applications. These distinctions were more explicitly defined in subtier criteria that were developed subsequent to the original checklists and used in some of the later industry peer reviews. However, it is important to note that all the PRA applications will likely be a blend of probabilistic and deterministic assessments. Therefore, the grades also implicitly define the required level of deterministic assessments that are needed in conjunction with the PRA.

<u>Grade 1</u>

This grade corresponds to the attributes needed for identification of plant vulnerabilities, i.e., responding to NRC Generic Letter (GL) 88-20. Most PRAs are expected to be capable of meeting these requirements.

There may be substantial conservatisms included in the modeling, analysis, and data for PRA Grade 1. These conservatisms may still allow the identification of outliers and vulnerabilities, and prioritization of certain issues, but they limit the ability to use a PRA with Grade 1 grades for its sub-element for most other applications.

A PRA with mostly Grade 1 elements is considered acceptable for:

- Satisfying the GL 88-20 requirement
- Assessing severe accident vulnerabilities
- Resolving selected generic issues (e.g., A-45)
- Prioritizing licensing issues

<u>Grade 2</u>

Grade 2 corresponds to the attributes needed for risk ranking of systems, structures, and components (SSCs). A PRA with elements certified at this grade would provide assurance that, on a relative basis, the PRA methods and models yield meaningful rankings for the assessment of SSCs, when combined with deterministic insights (i.e., a blended approach). Grade 2 is thus acceptable for Grade 1 applications and for applications that involve the risk ranking. Examples of such applications include the following:

- Motor-operated valve (MOV) ranking for GL 89-10
- NRC inspection activities

- Maintenance Rule support

Grade 3

This review grade extends the requirements to ensure that risk significance determinations made by the PRA are adequate to support regulatory applications, when combined with deterministic insights. Therefore, a PRA with elements certified at Grade 3 can support physical plant changes when it is used in conjunction with other deterministic approaches that ensure that defense-in-depth is preserved.

Grade 3 is acceptable for Grades 1 and 2 applications, and also for assessing safety significance of equipment and operator actions. This assessment can be used in licensing submittals to the NRC to support positions regarding absolute levels of safety significance if supported by deterministic evaluations. Examples may include the following:

- Graded Quality Assurance (QA)
- In-service Testing (IST)
- In-service Inspection (ISI)
- Backfit calculations (see also Grade 4)
- Reduce or eliminate licensing commitments
- On-line maintenance evaluations
- Single Technical Specification (TS) changes

Grade 4

This review grade requires a comprehensive, intensively reviewed study that has the scope, level of detail, and documentation to ensure the highest capability of PRA analyses and the robustness of the results. Routine reliance on the PRA as the basis for certain changes is expected as a result of this grade. It is expected that few PRAs would currently have many elements eligible for this grade.

Grade 4 is acceptable for Grades 1, 2, and 3 applications, and also usable as a primary basis for developing licensing positions that may change hardware, procedures, requirements, or methods (inside or outside the licensing basis). Examples may include the following:

- Reduce or eliminate licensing commitments (sole basis)
- Modify TSs (sole basis)
- Replace relevant TSs with an on-line risk monitor
- Backfit calculations
- Reclassification of the quality category of some equipment

In general, the following correspondence exists between the two "grading" systems:

NEI 00-02	ASME PRA Standard
Grade 1	No equivalent "grade"
Grade 2	Capability Category I
Grade 3	Capability Category II
Grade 4	Capability Category III

4.0 FOLLOW-ON PEER REVIEW: ASME PRA STANDARD SCOPE

This section describes the process that will be used to perform a follow-on peer review within the scope of the ASME PRA Standard (Reference 2).

4.1 Scope

The follow-on peer review will cover the set of HLRs and SRs for the applicable PRA technical elements in Section 4 of the ASME PRA Standard. Further, the scope may be limited within a PRA technical element to only the SRs that are germane to a specific PRA upgrade (e.g., re-evaluation of pre-initiator human error probabilities). The follow-on peer review may be limited to a single PRA technical element, or may include multiple (or all) technical elements. This process should also be applicable for the utility conducting a follow-on peer review simply to validate their self-assessment (as per NEI 00-02), since the self-assessment is against the requirements in the ASME PRA Standard.

It is expected that, in addition to the original NEI 00-02 peer review, the host utility will have performed a self-assessment of their PRA against that portion of the ASME PRA Standard not covered by the NEI peer review scope as defined in Table B-4 of RG 1.200 (i.e., gap analysis). The results of this self-assessment will be used to help focus the follow-on peer review of the PRA for compliance with those ASME SRs not covered by the NEI peer review scope.

4.2 Host Utility Requirements

It is expected that, prior to requesting a follow-on peer review, the host utility will address the technical issues identified during the original NEI 00-02 peer review that apply to the technical elements to be covered by the follow-on peer review. This includes updating and reviewing the associated documentation. It is also recommended that, when the host utility is satisfied that the applicable PRA peer review issues have been resolved, they perform a self-assessment of the compliance of their PRA, as related to the peer review issues, with the applicable requirements in the ASME PRA Standard.

It is expected that a gap analysis will be performed prior to the scheduling of a peer review, and the results of the gap analysis will be available to the peer review team. Otherwise, the host (requesting) utility should recognize that the peer review is likely to be more difficult and require more time.

The host utility should provide the peer review team with a package of relevant information in advance of the follow-on peer review, to allow adequate review by the team. This package should contain at least the following items:

a. A detailed description of the scope of the intended follow-on peer review. This should be sent early enough to permit feedback from the peer reviewers to resolve

any issues prior to performing the review. (Scope may have been discussed during the planning stages, but the actually review personnel should be very clear on the scope details.

b. A copy of the host utility self-assessment of their PRA's compliance with the ASME PRA Standard. This should include the basis for their assessment of compliance for each ASME SR with references to those portions of their PRA documentation that demonstrates the appropriate degree of compliance.

c. A copy of the NEI 00-02 peer review or those portions associated with the scope of the follow-on peer review, to the extent that this information is still pertinent.

d. A summary of the changes made to the applicable portions of the PRA since the original NEI 00-02 peer review. This should include explicit identification of what was done to resolve each relevant F&O with a significance level of "A" or "B."

e. Copies of any PRA documents that were revised as a result of the changes to the PRA. If the changes affect a large number of the PRA documents, examples can be provided. If only example documents are provided, a list of all revised documents should also be provided. These documents should then be available for the review team when the follow-on peer review is conducted.

f. A copy of the latest PRA Quantification Report, if this is based on results obtained using the upgraded technical elements being reviewed. The report should include a summary of CDF and LERF results, and discussion of the results and insights.

4.3 Self-Assessment

The detailed self-assessment of compliance with the ASME PRA Standard, if performed, should identify, for each SR to be reviewed, the Capability Category that the PRA supports. For each SR to be reviewed, the documentation should include a statement of the Capability Category that is met, the basis for the assessment, and references to the specific PRA documents, and appropriate sections, which support the assessment. It is understood that for those SRs (i.e., applicable NEI subelements) receiving a Grade 3 or 4 by a NEI 00-02 review and for which no self-assessment is required by Appendix B of Regulatory Guide 1.200, a Capability Category II will be assumed unless the SR compliance has been altered by a PRA update and/or a specific self-assessment supports a different Capability Category.

The ASME has granted the Electric Power Research Institute (EPRI) a number of licenses for the use of an electronic version of the ASME PRA Standard. EPRI has expanded the ePSA module of the Risk and Reliability (R&R) Workstation to incorporate an ACCESS™ database that includes the ASME PRA Standard SRs, as well as provisions for documenting a self-assessment of a PRA against the ASME PRA Standards and for documenting a peer review of the self-assessment (Reference 4). This database also includes provisions for documenting the results of the NEI 00-02 peer review and the actions taken to correct any identified deficiencies. The

ePSA module is available to all EPRI members and it, or an equivalent process, may be used to document the self-assessment.

4.4 Peer Review Team

Section 6 of the ASME PRA Standard provides guidance for PRA peer reviews. Section 6.2 of the ASME PRA Standard provides specific peer review team requirements that must be met. Specifically, Section 6.2.3 allows a single expert to perform the peer review of a single technical PRA element, given that the expert has appropriate knowledge and experience. It is assumed that with regard to the independence requirement of Section 6.2.2.2 that reasonable and practicable interpretation will be made allowing, as needed, use of non-involved utility personnel from other sites for multi-site utilities, use of current contractors (on-site or otherwise) involved in other work, etc. A requirement of absolute independence coupled with the need for adequate technical expertise can be difficult to achieve in some situations.

When multiple PRA technical elements are included in the follow-on peer review, a Lead Reviewer may be assigned for each of the PRA technical elements (e.g., System Analysis) to be reviewed, from among the members of the review team, based on member qualifications. The responsibilities of the Lead Reviewer are to coordinate the general review for the technical element, conduct the final consensus session, and to prepare the summary for the technical element at the end of the review. In addition to Lead Reviewers, there will also be a Technical Lead, responsible for the overall technical scope and content of the review, and a Team Lead (or facilitator), responsible for ensuring the review is conducted on schedule and provide an interface with the host utility. Depending on the size of the review team, these two functions may be performed by the same individual.

The number of members of the peer review team and their specific expertise (and qualifications) is a function of the number of PRA technical elements that are being reviewed. Such decisions should be recommended to the host utility by the designated Technical Lead.

4.5 Peer Review Schedule

Adequate time should be allocated for the peer review process. The amount of time required, and the associated logistics, will depend on the scope of the review, the number of reviewers examining each technical element, and the availability of supporting documentation. Prior to the peer review, the lead reviewer for the technical element being reviewed should review all host utility-supplied information to confirm the ability of the review team to complete the peer review in the scheduled time. Should the schedule be determined to be inadequate, either the schedule should be modified or additional information requested of the host utility to facilitate the review in the available time.

4.6 Peer Review Process

The review team will focus on reviewing, for the technical elements to be reviewed, the host utility's self-assessment of the applicable elements against the corresponding scope in RG 1.200, Appendix B, and the degree to which the PRA meets the applicable requirements in the ASME PRA Standard SRs.

Depending on the size of the peer review team and the scope of the follow-on peer review, the team may be sub-divided into sub-teams to review the various aspects of the PRA within the scope of the review. The composition of the sub-teams may vary from day-to-day to meet the review needs for each day. Such an approach was used for the original NEI 00-02 peer review, and example schedules are available from those reviews. As the peer review process is very intense and focused because of the amount of material to cover in a limited period of time, schedules and element assignments should be considered flexible, though the Team Lead needs to ensure that all the material is adequately reviewed.

Prior to the start of the review, the review team members will perform a "refresher" review of the applicable portions of the ASME PRA Standard, with emphasis on section 6.0, and establish a common perspective regarding the general grading philosophy consistent with the ASME PRA Standard. The applicable HLRs in Section 4.5 will also be briefly reviewed to ensure the team is familiar with the high level scope of the review.

At the beginning of review for each technical element, the reviewer(s) should review the HLRs for the element and preview the individual SRs. In Appendix A of RG 1.200, the NRC has provided a Regulatory Position relative to some of the specific SRs in the ASME PRA Standard. The peer reviewer(s) should consider these NRC clarifications and qualifications, where applicable, during the review, and note the extent to which the PRA element(s) being reviewed address these positions. However, a reviewer's assessment that the PRA meets or does not meet a particular SR should be derived from what is in the Standard (and not based on the NRC's clarification and qualifications). If so desired by the host utility, the reviewer(s) may also provide an assessment relative to the NRC's clarifications and qualifications.

The starting point for the review of each SR is typically the host utility's self-assessment when available. This will provide the utility's assessment of the Capability Category that they think their PRA meets for that SR and the basis for this assessment. The self-assessment should also provide pointers to the associated PRA documentation. The reviewers look at the basis statement and review the associated documentation to a sufficient level of detail to make their own assessment. The reviewers are not limited to the referenced documents. The reviewers may request that they be allowed to review any pertinent documentation they believe is needed to make their assessment. Assessment of the SRs can be recorded in tables such as Tables B-10 through B-18 in Appendix B of this document.[d]

[d] The SR tables in Appendix B do not necessarily reflect the latest version of the ASME PRA Standard. Users should confirm that the structure of Tables B-10 through B-18 conforms to the version being applied, and make changes (e.g., indicating appropriate SR numbering and Capability Categories for the SRs) as needed.

During the review of an SR (whether covered by the NEI 00-02 checklist or not), if the reviewers identify any issues/problems that impact the capability of the PRA, they will document these problems using an F&O form equivalent to that presented in Appendix A of this report. The F&Os specify the PRA element and SR of concern, and describe the PRA level of compliance with the criteria. The issue documented may be a weakness, a strength, or a simple observation. The F&O includes an assessment of the importance of the observation on the level of capability of the SR, and, for weaknesses, a proposed resolution for the weakness. The importance of each observation is classified as follows:

A/B[e] Important and necessary to address to ensure the technical adequacy of the PRA, the capability of the PRA, or the robustness of the PRA update process.

C Technical suggestion considered desirable to maintain maximum flexibility in PRA applications and consistency with the industry practices, or simply to enhance the PRA's technical capability as time and resources permit, at the discretion of the host utility.

D Editorial or minor technical item left to the discretion of the host utility.

Each technical element has an HLR and a number of associated SRs with respect to documentation. In general, the documentation HLRs require that the documentation be sufficient to facilitate peer reviews by describing the processes used, providing the assumptions used and their bases, and providing the associated SRs specific details for each technical element. Assessing the Capability Category for the documentation SRs does not require a separate review for each SR. At the start of the review for a given technical element, the review team may review the documentation HLR and SRs for that element to identify any unique documentation aspects for that technical element. At the completion of the review of the technical element, the reviewers for that element may assess the PRA compliance with the documentation SRs based on availability, scope and completeness of the documentation that they used to review the technical SRs for the technical element.

At the end of the review for each technical element being reviewed, the team members will conduct consensus discussions to assign grades (Capability Categories) to the SRs. The consensus session for a particular technical element will be led by the Lead Reviewer.

As stated in Section 6.1 of the ASME PRA Standard, "The peer review need not assess all aspects of the PRA against all Section 4 requirements; however, enough aspects of the PRA shall be reviewed for the reviewers to achieve consensus on the adequacy of methodologies and their implementation for each PRA element." The set of key review areas identified in Section 6.3 of the ASME PRA Standard for the technical element(s) being peer reviewed must be addressed.

[e] While the original NEI 00-02 peer review process used separate levels of A and B for assessing the important of an F&O, based on the experience of that process and the difficulty sometimes in distinguishing between the two levels, it was decided to combine these levels for the follow-on peer reviews. The host utility is probably in the best position to decide the urgency with which the F&Os need to be addressed based on the impact to their PRA results. Reviewers, when writing an F&O, can also state their position concerning the urgency of the F&O's resolution).

In performing the review of a given technical element, the Lead Reviewer may elect to skip the review of selected SRs if the other reviewers determine that they can achieve consensus on the adequacy of the PRA with respect to the HLR associated with the SRs that are not reviewed. Before electing to skip any SRs, the Lead Reviewer should consult the appropriate portion of section 6.3 to ensure that the review will be consistent with the appropriate requirements in Section 6.3. The review sub-team must document their basis for skipping the given SR.

The reviewers should specifically address key assumptions and key sources of uncertainty in the elements being reviewed. Such assumptions and uncertainties, their potential impact on the baseline PRA results and PRA applications, and the manner in which the host utility's quantification process addresses them, should be reviewed. The reviewers' opinions and suggestions regarding these key assumptions and uncertainty sources should be documented.

Section 5 of the ASME PRA Standard provides the requirements for a PRA configuration control program. The follow-on peer review team should provide a summary assessment of how well the PRA maintenance program satisfies ASME PRA Standard Section 5 requirements relative to the technical element(s) being reviewed. The requirements defined by the Maintenance and Update (MU) checklist in NEI 00-02 may be used as guidance for this summary assessment for the specific technical element(s). The Maintenance and Update (MU) checklist from the NEI 00-02 process is provided in Appendix C of this document.

As noted in Section 4.3, EPRI's ePSA tool can be used to review the results of the original NEI 00-02 peer review, status of F&Os, and results of the host utility's self-assessment. The ePSA tool can also be used by the follow-on peer review team, at the direction and discretion of the host utility, to record their finding, e.g., new F&Os as a result of the follow-on review. The tables in Appendix B can also be used to record peer review results. Regardless of the tool used, all grades, comments, observations, and recommendations should be made available in an electronic form to the Technical Lead (to prepare the final report) and the host utility (for review).

In the peer review process, the grades for the individual SRs are established by a consensus process that requires that all reviewers agree with the final assigned grades. If a condition arises where a minority of reviewers (one or more) cannot come to consensus, then, at the request of any peer reviewer, differences or dissenting views among peer reviewers should be documented with any recommended alternatives for resolution of these differences. Note that, from the perspective of the host utility, this is a highly undesirable situation. Therefore, the review team should strive to achieve a consensus position on all review elements.

4.7 Follow-on Peer Review Report

The output of the peer review is a written report documenting both the details and the summary findings of the review. The report should address the following:

- Clear definition of the scope of the peer review
- Summary of the results of the review for each technical element within the scope of the review, organized at the HLR level. The result summaries should focus on the general results of the reviews of the SRs.
- Summary of any "A" or "B" level F&Os from the original NEI 00-02 peer review that the follow-on reviewers do not believe have been resolved.

- The rationale for not accepting the resolution of the F&Os from the original NEI 00-02 peer review, as well as any F&Os generated as a result of the follow-on peer review.
- Summary of any new "A/B" F&Os generated during the follow-on peer review.
- Summary of identification of key assumptions and key sources of uncertainty, their impacts, and the reviewers' opinion regarding their treatment.
- Identification of the assessed Capability Category for each SR within the scope of the review.

The principal results, conclusions, and recommendations of the Peer Review Team should be communicated to the host utility at the completion of the onsite review, and included in the report. The resumes of the peer review team members should also be included.

The peer review report should be made part of the host utility's PRA documentation file for future internal and external reference.

5.0 REFERENCES

1. "Probabilistic Risk Assessment (PRA) Peer Review Process Guidance," NEI 00-02, Revision A3, Nuclear Energy Institute, October 2000.

2. "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications, Addendum a," ASME RA-Sa-2003, American Society of Mechanical Engineers, December 2003.

3. Regulatory Guide 1.200 for Trial Use, "An Approach For Determining the Technical Adequacy of Probabilistic Risk Assessment Results For Risk-Informed Activities," U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, February 2004.

4. ePSA PRA Documentation Module, Beta Version 2, The Electric Power Research Institute, May 2003.

5. "Process for Performing PRA Peer Review Follow-on Reviews and for Performing PRA Peer Reviews Using the ASME PRA Standard," WCAP-16091, Westinghouse Electric Company, LLC, June 2003.

6. "Process for Performing Follow-on PRA Peer Reviews Using the ASME PRA Standard," Rev. 0 (Draft, Not Issued), NEI-03-xx, September 2003.

7. "Process for Performing Follow-on PRA Peer Reviews of Individual PRA Technical Elements Using the ASME PRA Standard," WCAP-16181-NP, Rev. 0 (Draft, Not Issued), Westinghouse Electric Company, LLC, November 2003.

APPENDIX A

SAMPLE
FACT AND OBSERVATION FORM

FACT/OBSERVATION REGARDING PRA TECHNICAL ELEMENTS
OBSERVATION (ID:)[f] / Technical Element ___ / Supporting Requirement ____
LEVEL OF SIGNIFICANCE:
BASIS FOR SIGNIFICANCE
POSSIBLE RESOLUTION
PLANT RESPONSE OR RESOLUTION

LEVELS OF SIGNIFICANCE FOR FACTS AND OBSERVATIONS

A/B	Important and necessary to address to ensure the technical adequacy of the PRA, the capability of the PRA, or the robustness of the PRA update process.
C	Technical suggestion considered desirable to maintain maximum flexibility in PRA applications and consistency with Industry practices, or simply to enhance the PRA's technical capability as time and resources permit, at the discretion of the host utility.
D	Editorial or minor technical item left to the discretion of the host utility.
S	Superior treatment exceeding requirements and exceeding what would be found in most PRAs.

[f] Suggested format for F&O ID number is *ee-sr-##,* where *ee* is the 2 letter code for the Technical Element (e.g., HR for Human Reliability Analysis), *sr* is the identifier for the specific supporting requirement (e.g., A3), and ## is a sequential number for F&Os for the given SR. For example, *HR-A3-02* would be the second F&O referring to supporting requirement HR-A3.

APPENDIX B

SAMPLE SUMMARY TABLES

Note: The supporting requirement level tables in this Appendix do not necessarily reflect the latest version of the ASME PRA Standard. Users should confirm that the structure of Tables B-10 through B-18 conforms to the version being applied, and make changes (e.g., indicating appropriate SR numbering and Capability Categories for the SRs) as needed.

Table B-1 Sample Summary Table for Initiating Event Analysis		
High Level Requirement Number	**Summary of High Level Requirement**	**Summary of Assessed Capability fo**
HLR-IE-A	Reasonably complete identification of Initiating Events	
HLR-IE-B	Appropriate grouping of Initiating Events	
HLR-IE-C	Estimation of frequency of Initiating Events	
HLR-IE-D	Documentation	

Table B-2 Sample Summary Table for Accident Sequence Analysis		
High Level Requirement Number	**Summary of High Level Requirement**	**Summary of Assessed Capability fo**
HLR-AS-A	Accident sequence analyses define plant-specific sequences for each initiating event.	
HLR-AS-B	Accident sequence analyses address sequence level dependencies.	
HLR-AS-C	Documentation	

Table B-3
Sample Summary Table for Success Criteria

High Level Requirement Number	Summary of High Level Requirement	Summary of Assessed Capability for PRA
HLR-SC-A	Overall success criteria are defined and are based on the as-built, as-operated plant.	
HLR-SC-B	Thermal/hydraulic and other supporting analyses capable of providing the success criteria and event timing used in the analyses.	
HLR-SC-C	Documentation	

Table B-4
Sample Summary Table for Systems Analysis

High Level Requirement Number	Summary of High Level Requirement	Summary of Assessed Capability for PRA
HLR-SY-A	Reasonably complete treatment of causes of system, failure/unavailability	
HLR-SY-B	Reasonably complete treatment of common cause failures.	
HLR-SY-C	Documentation	

Table B-5
Sample Summary Table for Human Reliability Analysis

High Level Requirement Number	Summary of High Level Requirement	Summary of Assessed Capability for PRA
HLR-HR-A	Systematic process used to identify routine actions which may impact equipment availability	
HLR-HR-B	Screening of events based on plant-specific operational practices.	
HLR-HR-C	Impact of failure of activities characterized as Human Failure Events (HFEs)	
HLR-HR-D	Assessment of probabilities use systematic process	
HLR-HR-E	Set of operator responses established using systematic review of relevant procedures	
HLR-HR-F	Failure to perform required actions represented by HFEs	
HLR-HR-G	Assessment of probabilities uses well-defined and self-consistent process.	
HLR-HR-H	Recovery actions modeled only if plausible and feasible.	
HLR-HR-I	Documentation	

Table B-6
Sample Summary Table for Data Analysis

High Level Requirement Number	Summary of High Level Requirement	Summary of Assessed Capability for PRA
HLR-DA-A	Parameters clearly defined	
HLR-DA-B	Components grouped into homogenous groups based on common design, environmental and service conditions	
HLR-DA-C	Generic parameter estimates and plant-specific data collection consistent with parameter definitions.	
HLR-DA-D	Parameter estimates based on relevant generic and plant-specific data.	
HLR-DA-E	Documentation	

Table B-7
Sample Summary Table for Internal Flooding

High Level Requirement Number	Summary of High Level Requirement	Summary of Assessed Capability for PRA
HLR-IF-A	Flood areas identified	
HLR-IF-B	Flood sources and mechanisms identified	
HLR-IF-C	Flooding scenarios developed for each flood source	
HLR-IF-D	Flood-induced initiating events identified and frequency quantified.	
HLR-IF-E	Flood-induced accident sequences quantified.	
HLR-IF-F	Documentation	

Table B-8
Sample Summary Table for Accident Sequence Quantification and Results Interpretation

High Level Requirement Number	Summary of High Level Requirement	Summary of Assessed Capability for PRA
HLR-QU-A	Level 1 quantification quantifies core damage frequency	
HLR-QU-B	Quantification uses appropriate models and codes and accounts for limitations.	
HLR-QU-C	Quantification determines that identified dependencies are appropriately addressed.	
HLR-QU-D	Quantification results reviewed and important contributors identified.	
HLR-QU-E	Uncertainties in PRA results are characterized.	
HLR-QU-F	Documentation	

Table B-9
Sample Summary Table for LERF Analysis

High Level Requirement Number	Summary of High Level Requirement	Summary of Assessed Capability for PRA
HLR-LE-A	Core damage sequences appropriately grouped into plant damage states.	
HLR-LE-B	LERF evaluations include credible severe accident phenomena	
HLR-LE-C	LERF evaluations include analysis of containment system performance.	
HLR-LE-D	LERF evaluations include analysis of containment structural performance.	
HLR-LE-E	Frequency of containment failure modes leading to LERF quantified and aggregated.	
HLR-LE-F	Quantification of LERF addresses important risk factors and sources of uncertainty.	
HLR-LE-G	Documentation	

Table B-10
Assessment of Supporting Requirement Capability Categories

For Initiating Events

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-IE-A	IE-A1					
	IE-A2					
	IE-A3					
	IE-A4					
	IE-A5					
	IE-A6	N/A				
	IE-A7	N/A				
	IE-A8	N/A				
	IE-A9	N/A				
	IE-A10					
HLR-IE-B	IE-B1					
	IE-B2					
	IE-B3					
	IE-B4					
HLR-IE-C	IE-C1					
	IE-C2					
	IE-C3					
	IE-C4					
	IE-C5	N/A	N/A			
	IE-C6					
	IE-C7					
	IE-C8					
	IE-C9	N/A				
	IE-C10					
	IE-C11					

Table B-10
Assessment of Supporting Requirement Capability Categories

For Initiating Events

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
	IE-C12					
HLR-IE-D	IE-D1					
	IE-D2					
	IE-D3					
	IE-D4					

Table B-11
Assessment of Supporting Requirement Capability Categories
For Accident Sequence Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-AS-A	AS-A1					
	AS-A2					
	AS-A3					
	AS-A4					
	AS-A5					
	AS-A6					
	AS-A7					
	AS-A8					
	AS-A9					
	AS-A10					
	AS-A11					
HLR-AS-B	AS-B1					
	AS-B2					
	AS-B3					
	AS-B4					
	AS-B5					
	AS-B6					
HLR-AS-C	AS-C1					
	AS-C2					
	AS-C3					
	AS-C4					

Table B-12
Assessment of Supporting Requirement Capability Categories
For Success Criteria

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-SC-A	SC-A1					
	SC-A2					
	SC-A3					
	SC-A4					
	SC-A5					
	SC-A6					
HLR-SC-B	SC-B1					
	SC-B2	N/A				
	SC-B3					
	SC-B4					
	SC-B5					
	SC-B6					
HLR-SC-C	SC-C1					
	SC-C2					
	SC-C3					
	SC-C4					

Table B-13
Assessment of Supporting Requirement Capability Categories
For Systems Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-SY-A	SY-A1					
	SY-A2					
	SY-A3					
	SY-A4	N/A				
	SY-A5					
	SY-A6					
	SY-A7					
	SY-A8					
	SY-A9					
	SY-A10					
	SY-A11					
	SY-A12					
	SY-A13					
	SY-A14					
	SY-A15					
	SY-A16					
	SY-A17					
	SY-A18					
	SY-A19					
	SY-A20					
	SY-A21					
	SY-A22					
	SY-A23					

Table B-13
Assessment of Supporting Requirement Capability Categories
For Systems Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-SY-B	SY-B1					
	SY-B2	N/A	N/A			
	SY-B3					
	SY-B4					
	SY-B5					
	SY-B6					
	SY-B7					
	SY-B8					
	SY-B9					
	SY-B10					
	SY-B11					
	SY-B12					
	SY-B13					
	SY-B14					
	SY-B15					
	SY-B16					
HLR-SY-C	SY-C1					
	SY-C2					
	SY-C3					

Table B-14
Assessment of Supporting Requirement Capability Categories
For Human Reliability Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-HR-A	HR-A1					
	HR-A2					
	HR-A3					
HLR-HR-B	HR-B1					
	HR-B2					
HLR-HR-C	HR-C1					
	HR-C2					
	HR-C3					
HLR-HR-D	HR-D1					
	HR-D2					
	HR-D3	N/A				
	HR-D4					
	HR-D5					
	HR-D6					
	HR-D7					
HLR-HR-E	HR-E1					
	HR-E2					
	HR-E3					
	HR-E4	N/A				
HLR-HR-F	HR-F1					
	HR-F2					

Table B-14
Assessment of Supporting Requirement Capability Categories
For Human Reliability Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-HR-G	HR-G1					
	HR-G2					
	HR-G3					
	HR-G4					
	HR-G5					
	HR-G6					
	HR-G7					
	HR-G8					
	HR-G9					
HLR-HR-H	HR-H1					
	HR-H2					
	HR-H3					
HLR-HR-I	HR-I1					

Table B-15
Assessment of Supporting Requirement Capability Categories
For Data Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-DA-A	DA-A1					
	DA-A2					
	DA-A3					
HLR-DA-B	DA-B1					
	DA-B2					
HLR-DA-C	DA-C1					
	DA-C2					
	DA-C3					
	DA-C4					
	DA-C5					
	DA-C6					
	DA-C7					
	DA-C8					
	DA-C9					
	DA-C10					
	DA-C11					
	DA-C12					
	DA-C13					
	DA-C14					
	DA-C15					
HLR-DA-D	DA-D1					
	DA-D2					
	DA-D3					
	DA-D4	N/A				

Table B-15
Assessment of Supporting Requirement Capability Categories
For Data Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
	DA-D5					
	DA-D6					
	DA-D7					
HLR-DA-E	DA-E1					

Table B-16
Assessment of Supporting Requirement Capability Categories
For Internal Flooding Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-IF-A	IF-A1					
	IF-A2					
	IF-A3					
	IF-A4					
HLR-IF-B	IF-B1					
	IF-B2					
	IF-B3					
	IF-B4					
HLR-IF-C	IF-C1					
	IF-C2					
	IF-C3					
	IF-C4					
	IF-C5					
	IF-C6					
HLR-IF-D	IF-D1					
	IF-D2					
	IF-D3					
	IF-D4					
	IF-D5					
HLR-IF-E	IF-E1					
	IF-E2					
	IF-E3					
	IF-E4					
	IF-E5					

Table B-16
Assessment of Supporting Requirement Capability Categories
For Internal Flooding Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
	IF-E6					
	IF-E7					
HLR-IF-F	IF-F1					
	IF-F2					

Table B-17
Assessment of Supporting Requirement Capability Categories
For Accident Sequence quantification and Results Interpretation

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-QU-A	QU-A1					
	QU-A2					
	QU-A3					
	QU-A4					
HLR-QU-B	QU-B1					
	QU-B2					
	QU-B3					
	QU-B4					
	QU-B5					
	QU-B6					
	QU-B7					
	QU-B8					
	QU-B9					
HLR-QU-C	QU-C1					
	QU-C2					
	QU-C3					
HLR-QU-D	QU-D1					
	QU-D2					
	QU-D3	N/A				
	QU-D4					
	QU-D5					
HLR-QU-E	QU-E1					
	QU-E2					
	QU-E3					
	QU-E4					

Table B-17
Assessment of Supporting Requirement Capability Categories
For Accident Sequence quantification and Results Interpretation

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-QU-F	QU-F1					
	QU-F2					
	QU-F3	N/A				
	QU-F4					
	QU-F5					
	QU-F6					

Table B-18
Assessment of Supporting Requirement Capability Categories
For LERF Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-LE-A	LE-A1					
	LE-A2					
	LE-A3					
	LE-A4					
	LE-A5					
HLR-LE-B	LE-B1					
	LE-B2					
	LE-B3					
HLR-LE-C	LE-C1					
	LE-C2					
	LE-C3					
	LE-C4					
	LE-C5					
	LE-C6					
	LE-C7					
	LE-C8					
	LE-C9					
	LE-C10					
HLR-LE-D	LE-D1					
	LE-D2					
	LE-D3					
	LE-D4					
	LE-D5					
	LE-D6					

Table B-18
Assessment of Supporting Requirement Capability Categories
For LERF Analysis

HLR	SR	Capability Category I	Capability Category II	Capability Category III	Not Reviewed	Associated Facts and Observations
HLR-LE-E	LE-E1					
	LE-E2					
	LE-E3					
HLR-LE-F	LE-F1					
	LE-F2					
HLR-LE-G	LE-G1					
	LE-G2					
	LE-G3					
	LE-G4					
	LE-G5					
	LE-G6					
	LE-G7					
	LE-G8					

APPENDIX C

MAINTENANCE AND UPDATE PROCESS REVIEW CHECKLIST

Table MU
PRA Configuration Control Process[1]

DESIGNATOR	CRITERIA	COMPLIANCE
GUIDANCE		
MU-1	• Describes the process used	
MU-2	• Consistent with industry practices	
MU-3	• Sufficient detail provided to update the evaluation	
INPUT -- MONITORING AND COLLECTING NEW INFORMATION[2]		
MU-4	• Each of the following information sources is part of the PSA update process for monitoring new information associated with the following:	
	- Operational Experience	
	- Plant Design	
	- New Maintenance Policies	
	- Operator Training Program	
	- Technical Specification	
	- Revised Engineering Calculations	
	- Emergency and Abnormal Operating Procedures	
	- Operating Procedures	
	- Emergency Plan	
	- Accident Management Programs	
	- Industry Studies	
MU-5	• Plant specific data is included for quantitative reevaluation.	
MODEL CONTROL		
MU-6	• The computer models of the PRA are stored in a controlled manner. This also applies to sensitivity cases that may be performed to support a specific application.	
SOFTWARE CONTROL		
MU-7	• Computer code controls are formalized to ensure that the effect on the PRA of changes to these codes are understood and addressed if appropriate	
UPDATE/MAINTENANCE		
MU-8	• A process is in place to maintain the PRA. The PRA update model process consists of the elements identified and the steps in the process. The model update process consists of the following:	
	- Identification of Affected Model Elements	
	- Modification of PRA Models	
	- Requantification of PRA Models	
	- Evaluation of Results	
	- Re-Evaluation of Past PRA Applications	
MU-9	• The plant has defined a fixed update schedule and criteria upon which to base the need for an update .	
MU-10	• The PRA results are evaluated by knowledgeable personnel before the results are used. [3]	
RE-EVALUATION OF PAST PSA APPLICATIONS		
MU-11	• Past PRA Applications are evaluated qualitatively to assure that the conclusions remain valid. [4]	

Table MU PRA Configuration Control Process(1)		
DESIGNATOR	**CRITERIA**	**COMPLIANCE**
MU-12	• Past PRA Applications that may be affected by the latest information and update are re-performed.	
DOCUMENTATION		
MU-13	• Documentation reflects the process used	
MU-14	• Includes an independent review for the documented results	
MU-15	• Provides the basis of the update process and the results are traceable to specific changes in design, procedures, training, or operating experience.	

Notes to Table MU

1) PRA maintenance encompasses the identification and evaluation of new information, and the incorporation of this information into the PRA on an as-needed basis. PRA maintenance typically refers to minor model modifications and effort. More extensive maintenance may be performed if a specific application requires refinement of certain parts of the model. The on-going maintenance of the PRA can be performed on a resource-available basis when not driven by specific application needs. PRA maintenance should serve to keep the PRA reasonably current between PRA updates.

   A PRA update is a comprehensive revision to the PRA models and associated documentation. PRA updates are scheduled to be performed periodically. In addition, they may also be performed on an as needed basis as determined by the PRA Group leader. It is recommended that the update frequency should be no greater than once per year and no less than once per every three years (or every other fuel cycle).

   The need for an update prior to a specific application is dependent upon the needs of the specific application (e.g., greater detail in specified areas) and the effect of new information on the assessment of the fidelity of the model to the current plant and procedures.

2) The purpose of the monitoring and data collection process is to identify information which could impact the PRA models. Monitoring implies a vigilant attitude towards industry and plant experiences, information, and data with the purpose of identifying inputs pertinent to the PRA. Collection refers to the process of logging the information and collecting explanatory information to evaluate its importance to the PRA.

3) An evaluation of the results of the PRA update need to be performed to ensure that the plant design and procedural changes have been accurately reflected and that biases have not been introduced into the accident sequence quantification.

4) The update of the PRA may result in a dramatically changed risk profile. Changes to the risk profile can in turn affect the results of past PRA applications. Possible examples are the safety significance determination in the Maintenance Rule, the in-service test interval for IST evaluations, or the on-line safety matrix to support on-line maintenance safety evaluations. PRA Application re-evaluations can be performed in a rigid fashion that involves a complete re-analysis. However, in general, a qualitative review of the applications would appear to be sufficient for many applications. A complete reanalysis may be needed only on a selected basis.