PRESSURIZED WATER REACTOR OWNERS GROUP

PWROG
PWR Owners Group

PWROG-20015-NP
Revision 1

WESTINGHOUSE NON-PROPRIETARY CLASS 3

Alternate 10 CFR 50.69 Defense-in-Depth Categorization Process

Risk Management Committee

PA-RMSC-1769, Revision 1

March 2021

Westinghouse

PWROG-20015-NP
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Alternate 10 CFR 50.69 Defense-in-Depth Categorization Process

PA-RMSC-1769, Revision 1

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March 2021

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Record of Revisions

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1	See PRIME	Removal of export control disclaimer for NRC public release.

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Utility Member	Plant Site(s)	Participant	
		Yes	No
Ameren Missouri	Callaway (W)	X	
American Electric Power	D.C. Cook 1 & 2 (W)	X	
Arizona Public Service	Palo Verde Unit 1, 2, & 3 (CE)	X	
Dominion Energy	Millstone 2 (CE)	X	
	Millstone 3 (W)	X	
	North Anna 1 & 2 (W)	X	
	Surry 1 & 2 (W)	X	
	V.C. Summer (W)	X	
Duke Energy Carolinas	Catawba 1 & 2 (W)	X	
	McGuire 1 & 2 (W)	X	
	Oconee 1, 2, & 3 (B&W)	X	
Duke Energy Progress	Robinson 2 (W)	X	
	Shearon Harris (W)	X	
Energy Harbor	Beaver Valley 1 & 2 (W)	X	
	Davis-Besse (B&W)	X	
Entergy Palisades	Palisades (CE)		X
Entergy Operations South	Arkansas 1 (B&W)	X	
	Arkansas 2 (CE)	X	
	Waterford 3 (CE)	X	
Evergy	Wolf Creek (W)	X	
Exelon Generation Co. LLC	Braidwood 1 & 2 (W)	X	
	Calvert Cliffs 1 & 2 (CE)	X	
	Ginna (W)	X	
Florida Power & Light \ NextEra	St. Lucie 1 & 2 (CE)	X	
	Turkey Point 3 & 4 (W)	X	
	Seabrook (W)	X	
	Pt. Beach 1 & 2 (W)	X	
Luminant Power	Comanche Peak 1 & 2 (W)	X	
Pacific Gas & Electric	Diablo Canyon 1 & 2 (W)		X

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		Yes	No
PSEG – Nuclear	Salem 1 & 2 (W)	X	
So. Texas Project Nuclear Operating Co.	South Texas Project 1 & 2 (W)		X
Southern Nuclear Operating Co.	Farley 1 & 2 (W)	X	
	Vogtle 1 & 2 (W)	X	
	Vogtle 3 & 4 (W)	X	
Tennessee Valley Authority	Sequoyah 1 & 2 (W)	X	
	Watts Bar 1 & 2 (W)	X	
Xcel Energy	Prairie Island 1 & 2 (W)	X	

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Utility Member	Plant Site(s)	Participant	
		Yes	No
Asociación Nuclear Ascó-Vandellòs	Asco 1 & 2 (W)	X	
	Vandellos 2 (W)	X	
Centrales Nucleares Almaraz-Trillo	Almaraz 1 & 2 (W)	X	
CEZ**	Temelin		X
EDF Energy	Sizewell B (W)	X	
Electrabel	Doel 1, 2 & 4 (W)	X	
	Tihange 1 & 3 (W)	X	
Electricite de France	56 Units	X	
Elektriciteits Produktiemaatschappij Zuid-Nederland	Borssele 1 (Siemens)	X	
Eletronuclear-Eletrobras	Angra 1 (W)	X	
Emirates Nuclear Energy Corporation	Barakah 1 & 2	X	
Hokkaido	Tomari 1, 2 & 3 (MHI)	X	
Japan Atomic Power Company	Tsuruga 2 (MHI)	X	
Kansai Electric Co., LTD	Mihama 3 (W)	X	
	Ohi 3 & 4 (W & MHI)	X	
	Takahama 1, 2, 3 & 4 (W & MHI)	X	
Korea Hydro & Nuclear Power Corp.	Kori 1, 2, 3 & 4 (W)	X	
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Kyushu	Genkai 3 & 4 (MHI)	X	
	Sendai 1 & 2 (MHI)	X	
Nuklearna Electrarna KRSKO	Krsko (W)	X	
Ringhals AB	Ringhals 3 & 4 (W)	X	
Shikoku	Ikata 3 (MHI)	X	
Taiwan Power Co.	Maanshan 1 & 2 (W)	X	

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TABLE OF CONTENTS

LIST OF FIGURES

1 EXECUTIVE SUMMARY

Project authorization PA-RMSC-1769, Revision 1, “Alternate 50.69 Categorization Process” (Reference 1) developed an alternate defense-in-depth categorization process to the NEI 00-04, “10 CFR 50.69 SSC Categorization Guideline” (Reference 2). During the implementation of 10 CFR 50.69 (Reference 7) by various licensees, it was determined that several processes are overly conservative when performing the 10 CFR 50.69 categorization and are resource intensive, without providing a commensurate benefit to the health and safety of the public. For example, when evaluating core damage defense-in-depth, credit cannot be taken for multiple identical, redundant trains. To address this, an alternate approach has been developed in lieu of the current defense-in-depth categorization process. The alternate core damage defense-in-depth and alternate containment defense-in-depth categorization process (also referred to collectively in this report as the alternate defense-in-depth categorization process) are in compliance with 10 CFR 50.69; however, these processes allow additional focus on risk-informed safety class (RISC) RISC-1 and RISC-2 structures, systems and components (SSCs). The alternate defense-in-depth categorization process will reduce the 10 CFR 50.69 implementation effort, which will provide efficiency and time savings which can be used to categorize additional systems. This will result in additional RISC determination of SSCs thereby increasing the focus on additional high safety significant (HSS) SSCs in the plant.

2 ALTERNATE DEFENSE-IN-DEPTH CATEGORIZATION PROCESS OVERVIEW

Project authorization PA-RMSC-1769, Revision 1, “Alternate 50.69 Categorization Process” (Reference 1) developed an alternate defense-in-depth categorization process to the NEI 00-04, “10 CFR 50.69 SSC Categorization Guideline” (Reference 2). During the implementation of 10 CFR 50.69 (Reference 7) by various licensees, it was determined that several processes are overly conservative when performing the 10 CFR 50.69 categorization and are resource intensive, without providing a commensurate benefit to the health and safety of the public. For example, when evaluating core damage defense-in-depth, credit cannot be taken for multiple identical, redundant trains. To address this, an alternate approach has been developed in lieu of the current defense-in-depth categorization process.

A plant can choose to implement this process or use the defense-in-depth categorization process in NEI 00-04 (Reference 2).

2.1 NEI 00-04 PROCESS

The NEI 00-04 **core damage defense-in-depth** process has been identified as overly conservative and resource intensive as credit cannot be taken for multiple identical, redundant trains. As stated in NEI 00-04, Section 6.1 (Reference 2):

> *“For each design basis event, identify the region of Figure 6-1* [in NEI 00-04] *in which the plant mitigation capability lies without credit for the function/SSC that has been proposed as low safety-significant, and without credit for any identical, redundant SSCs within the system that are also classified as low safety-significant.”*

This statement causes a conservative interpretation in the examination of core damage defense-in-depth. Guidance to improve the implementation of defense-in-depth is provided in this report to determine how many measures are appropriate and how effective those measures are. Instead of merely relying on bottom-line risk estimates, defense-in-depth is invoked as a strategy to ensure public safety. To deny credit for redundant identical SSCs within the same system (e.g., multiple diesel generators in the 4kV system) is to deny existence of defense-in-depth within a system.

The NEI 00-04 **containment defense-in-depth** process uses the assumptions and documentation of the probabilistic risk assessment (PRA) model without using the quantitative results of the PRA model. Most of these considerations could be evaluated by using the Large Early Release Frequency (LERF) PRA model, with the exception being the assessment of the Long-Term Containment Integrity consideration which will continue to be evaluated using the NEI 00-04, Section 6.2 guidance.

2.2 ALTERNATE DEFENSE-IN-DEPTH CATEGORIZATION PROCESS

2.2.1 Background

When NEI 00-04 (Reference 2) was prepared in the early 2000s, PRA models varied from rather simplistic models to moderately complex models. Computer software and hardware capability at the time limited the amount of detail that could be included in PRA models. There also was no PRA standard available to ensure that the model developers used acceptable methods. Peer Reviews of PRA models were being performed with no definitive PRA standard. As a result, there were significant limitations and variability to PRA models and questions regarding the completeness and acceptability of the models.

In the last 20 years, the capability of PRA models has increased substantially as has the level of review to determine technical acceptability through the creation of ASME/ANS RA-Sa-2009 PRA standard (Reference 3), industry wide peer review processes, regulatory guidance on PRA technical adequacy[1], and Regulatory Guide 1.200 (Reference 4 or Reference 5, depending on revision used in the 10 CFR 50.69 license amendment request). The PRA standard and peer review processes ensure that in the development of the PRA model the appropriate SSCs are modeled in the correct accident sequences, including common cause considerations. There is now regulatory guidance for an approach to determine the technical adequacy of probabilistic risk assessment results for risk-informed activities, Regulatory Guide 1.174 (Reference 6). The PRA models for 10 CFR 50.69 are required to meet the ASME/ANS RA-Sa-2009 PRA Standard for all high level requirements including those for initiating events, accident sequences, system analysis, and success criteria. Using insights from the model structure can provide a more efficient way of evaluating defense-in-depth for 10 CFR 50.69.

Sites with approved license amendments to implement 10 CFR 50.69 have had their PRA model(s) evaluated against Regulatory Guide 1.200 (Reference 4 or Reference 5, depending on revision used in the 10 CFR 50.69 license amendment request) and documented in the NRC Staff Safety Evaluation Report (SER) as acceptable for implementation of 10 CFR 50.69.

2.2.2 Alternate Process

The following alternate defense-in-depth categorization process can be completed in lieu of NEI 00-04, Section 6. This alternate process is defined in several steps for the analysis of core damage and containment defense-in-depth:

[1] There are no changes to the technical adequacy requirements of the PRA between Revision 2 and Revision 3 of Regulatory Guide 1.200 (Reference 4 or Reference 5, respectively).

1. **PRA Technical Adequacy Pre-Requisites:** The alternate defense-in-depth process requires that the full power internal events (FPIE) PRA model meet the following requirements:

    a. The PRA model used for the alternate defense-in-depth evaluations is acceptable for implementing 10 CFR 50.69.

    b. Findings related to the following ASME/ANS RA-Sa-2009 PRA Standard (Reference 3) technical areas must be closed or dispositioned as not impacting the categorization process:

        1) Accident sequence analysis

        2) Success Criteria

        3) Initiating Event Frequencies

        4) Truncation

        5) Common Cause Groupings

2. The alternate defense-in-depth categorization process can be implemented for any system that was previously categorized or systems that will be categorized.

3. Any system that has been previously categorized is not required to be re-categorized with the alternate defense-in-depth categorization process.

4. A plant can implement both the alternate defense-in-depth categorization process and the process identified in the current plant license condition for 10 CFR 50.69. It is determined by the plant whether a system uses the alternate defense-in-depth categorization process.

5. No assignments of RISC are completed until a system is individually categorized since SSCs are candidate HSS / candidate LSS until they are reviewed by the Integrated Decision-making Panel (IDP).

6. Candidate HSS SSCs from the alternate defense-in-depth process are developed using the FPIE PRA model. This candidate list provides the input to the final defense-in-depth categorization for any system selected for categorization under 10 CFR 50.69. Refer to Figure 2-1 for a high-level flowchart of the 10 CFR 50.69 categorization process modified by the alternate defense-in-depth categorization process (shown in yellow).

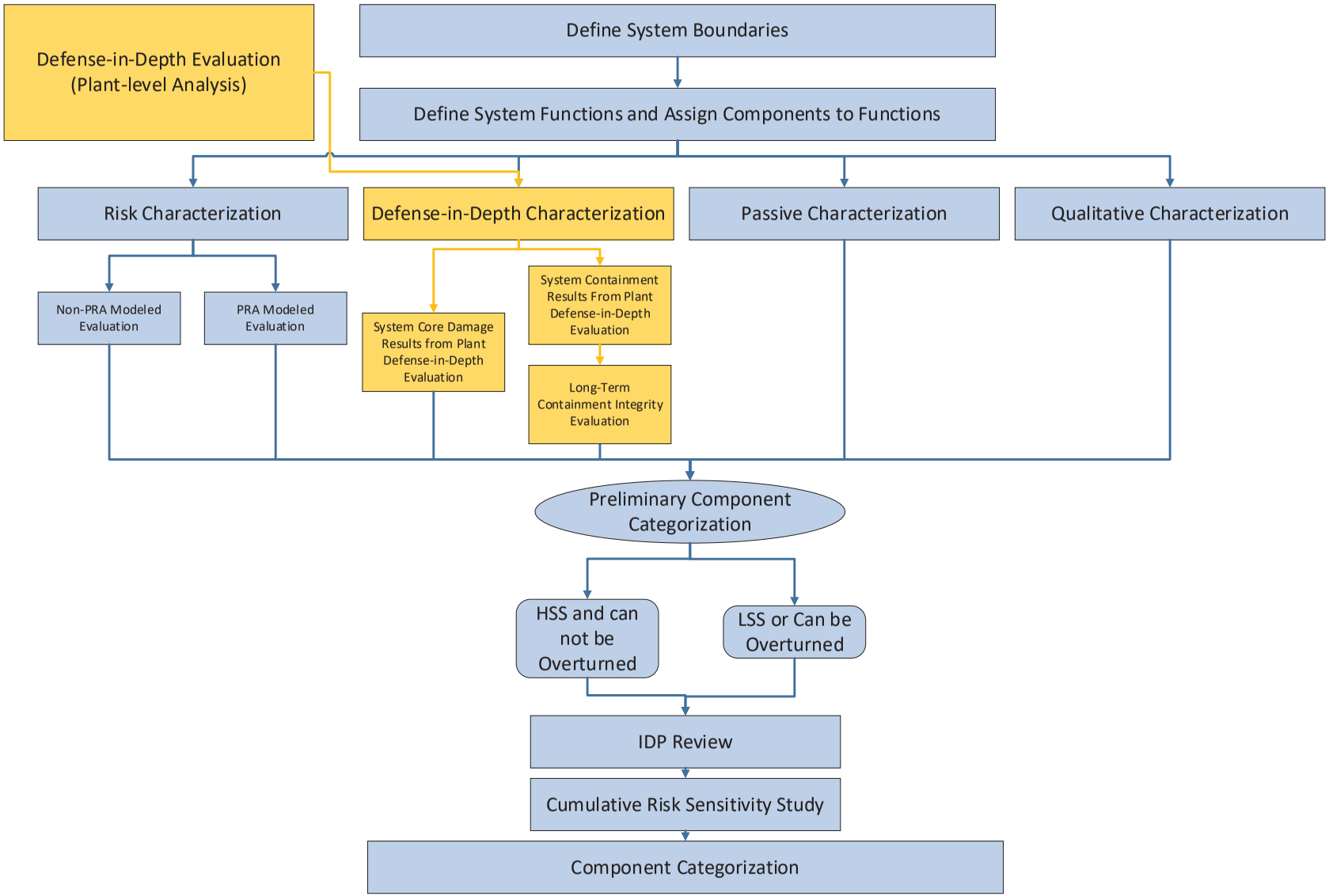

Figure 2-1: High-Level Flowchart of the 10 CFR 50.69 Categorization Process Modified by the Alternate Defense-in-Depth Categorization Process (shown in yellow)

7. **Alternate Core Damage Defense-in-Depth Categorization Process:** This analysis replaces the considerations in NEI 00-04, Section 6.1. This analysis is completed at the plant level, not the system level. The results from the FPIE Core Damage Frequency (CDF) PRA model are used.

    a. Filter to only cutsets that have an initiating event and a single basic event representing a failure of an SSC, including an independent failure, a common cause failure, or a human failure event (HFE) which leads to core damage. Ensure cutsets that include flags, split fractions, and other house or special events with an initiating event and a single basic event are not discarded.

        1) Pressure boundary failure initiating events and pressure boundary failure basic events are not addressed by the alternate core damage defense-in-depth categorization process (e.g., pipe ruptures leading to internal flooding scenarios). They are addressed in the pressure boundary categorization. The exceptions to this are pressure boundary initiating events that impact the FPIE PRA model through non-flooding scenarios, which are included in the alternate core damage defense-in-depth categorization process.

        2) Common cause failure groups that are greater than or equal to four (4) can be screened out of the filtered cutsets based on the significant redundancy of performing the function.

    b. Cutset Quantitative Screening

        1) Cutsets with initiating events with frequencies that are less than 1E-04/yr are not included in the alternate core damage defense-in-depth categorization process and can be screened out of the filtered cutsets.

    c. From the remaining filtered cutsets, identify the SSCs in the plant that are modeled by these initiating events and basic events.

        1) Review HFEs and recovery actions to ensure specific SSC failure modes (e.g., MOV fails to close) are modeled. If not, correlate the HFE/recovery action to an SSC.

    d. The SSCs in the plant identified from the filtered cutsets are considered candidate HSS for the alternate core damage defense-in-depth assessment.

    e. For SSCs that are candidate HSS, the associated functions are driven to candidate HSS following the process in NEI 00-04, Section 7.1.

    f. Consistent with the existing NEI 00-04 defense-in-depth process, SSCs and functions outside the scope of the PRA do not need to be evaluated for core

damage defense-in-depth since the level of defense-in-depth is based on the success criteria in the PRA.

8. **Alternate Containment Defense-in-Depth Categorization Process:** This analysis replaces the considerations in NEI 00-04, Section 6.2 except for the Long-Term Containment Integrity consideration which is evaluated using the NEI 00-04, Section 6.2 guidance.

    a. Address the Long-Term Containment Integrity consideration only for the systems categorized consistent with the NEI 00-04, Section 6.2 guidance:

        "Long-Term Containment Integrity"

        - *"Does the SSC support a system function that is not considered in CDF and LERF, but would be the only means for preserving long-term containment integrity post-core damage (e.g., containment heat removal)?"*

    b. The remainder of the alternate containment defense-in-depth categorization process is completed at the plant level, not the system level. The results from the FPIE LERF PRA model are used.

        1) Filter to only cutsets that have an initiating event and a single basic event representing a failure of an SSC, including an independent failure, a common cause failure, or a HFE which leads to containment failure. Ensure cutsets that include flags, split fractions, and other house or special events with an initiating event and a single basic event are not discarded.

            a) Pressure boundary failure initiating events and pressure boundary failure basic events are not addressed by the alternate containment defense-in-depth categorization process (e.g., pipe ruptures leading to internal flooding scenarios). They are addressed in the pressure boundary categorization. The exceptions to this are pressure boundary initiating events that impact the FPIE PRA model through non-flooding scenarios, which are included in the alternate containment defense-in-depth categorization process.

            b) Common cause failure groups that are greater than or equal to four (4) can be screened out of the filtered cutsets based on the significant redundancy of performing the function.

2) Cutset Quantitative Screening

   a) Cutsets with initiating events with frequencies that are less than 1E-04/yr are not included in the alternate containment defense-in-depth categorization process and can be screened out of the filtered cutsets.

3) From the remaining filtered cutsets, identify the SSCs in the plant that are modeled by these initiating events and basic events.

   a) Review HFEs and recovery actions to ensure specific SSC failure modes (e.g., MOV fails to close) are modeled. If not, correlate the HFE/recovery action to an SSC.

4) The SSCs in the plant identified from the filtered cutsets are considered candidate HSS for the alternate containment defense-in-depth categorization assessment.

5) For SSCs that are candidate HSS, the associated functions are driven to candidate HSS following the process in NEI 00-04, Section 7.1.

6) Consistent with the alternate core damage defense-in-depth categorization process, SSCs outside the scope of the PRA do not need to be evaluated for containment defense-in-depth (except for Long-Term Containment Integrity) since the level of defense-in-depth is based on the success criteria in the PRA.

9. All other SSCs that are not identified as candidate HSS in either the alternate core damage defense-in-depth analysis or the alternate containment defense-in-depth analysis are considered candidate Low Safety Significant (LSS) for the alternate defense-in-depth categorization process.

2.2.3 Basis for the Alternate Core Damage Defense-in-Depth Categorization Process

NEI 00-04, Section 6.1 is evaluated at the function level by identifying SSC functions required for design basis events. The PRA (NEI 00-04, Section 5) and containment defense-in-depth (NEI 00-04, Section 6.2) are completed at the SSC level while the Review of Risk Information (NEI 00-04, Section 9.2.2) can be categorized at the function or SSC level. The alternate core damage defense-in-depth categorization process evaluates at the SSC level instead of the function level since the analysis now examines the specific failure events leading to core damage.

The alternate core damage defense-in-depth categorization process continues to rely on the PRA success criteria in evaluating defense-in-depth. The main differences between the NEI

00-04, Section 6.1 process and the alternate core damage defense-in-depth categorization process are:

1. The alternate core damage defense-in-depth categorization process evaluation is at the SSC level and is completed for the entire plant in one analysis. Assignments of RISC are not complete until a system is individually categorized since the SSCs are candidate HSS / candidate LSS until they are reviewed by the IDP.

2. The alternate core damage defense-in-depth categorization process continues to maintain the associated functions as candidate HSS as directed in NEI 00-04, Section 7.1.

3. In the alternate core damage defense-in-depth categorization process, replacement of NEI 00-04, Figure 6-1 (Defense-in-Depth Matrix example) with identification of risk significant cutsets is based on the success criteria used in the PRA (NEI 00-04, Section 6.1 uses PRA success criteria in its approach).

4. In the alternate core damage defense-in-depth categorization process, crediting identical, redundant SSCs within the system in certain cutsets is acceptable based on the PRA technical adequacy requirements.

5. The alternate core damage defense-in-depth categorization process uses the PRA model structure and insights to enhance the core damage defense-in-depth analysis.

6. The alternate core damage defense-in-depth categorization process does not evaluate initiating events with a frequency less than 1E-04/yr since NEI 00-04, Figure 6-1 has low safety significance confirmed with a frequency less than 1E-03/yr.

NEI 00-04, Section 7.1, states:

> *"If any SSC is safety significant, from either the PRA-based component safety significance assessment (Section 5) or the defense-in-depth assessment (Section 6), then the associated system function is preliminarily safety significant."*

When a SSC is candidate HSS from the FPIE PRA, the Integral PRA, the core damage defense-in-depth, and/or the containment defense-in-depth assessments, the functions driving the candidate HSS determination are identified as "associated functions." All SSCs mapped to an "associated function" are preliminary HSS as described in NEI 00-04, Section 7.1. The detailed categorization process described in NEI 00-04, Section 10.2 provides the approach for performing additional engineering and system analyses to identify specific SSC level or piece part functions and importance for the safety-significant SSCs in order to justify and categorize as LSS.

The alternate core damage defense-in-depth categorization process uses the FPIE PRA model assumptions and success criteria consistent with the intent of NEI 00-04 to allow for defense-in-depth categorization of systems with only the PRA model assumptions and success criteria.

Consistent with the existing NEI 00-04 defense-in-depth process, SSCs and functions outside the scope of the PRA do not need to be evaluated for the alternate core damage defense-in-depth categorization process since the level of defense-in-depth is based on the success criteria in the PRA.

2.2.4 Basis for the Alternate Containment Defense-in-Depth Categorization Process

The alternate containment defense-in-depth categorization process examines PRA cutsets with the same approach as the alternate core damage defense-in-depth categorization process, except with a LERF PRA model in place of the CDF PRA model. The LERF PRA model evaluates containment integrity, containment isolation, and credits hydrogen igniters in ice condensers and Mark III containments, where applicable. Therefore, these considerations in NEI 00-04, Section 6.2 are replaced with the LERF PRA cutset review and are not qualitatively evaluated in the alternate containment defense-in-depth categorization process.

The Long-Term Containment Integrity consideration is not evaluated in a LERF PRA model. Therefore, the assessment of long-term containment integrity in NEI 00-04, Section 6.2 will continue to be used (i.e., the current guidance is retained) for alternate containment defense-in-depth and is only evaluated for categorized systems:

> *"Long-Term Containment Integrity*
>
> - *Does the SSC support a system function that is not considered in CDF and LERF, but would be the only means for preserving long-term containment integrity post-core damage (e.g., containment heat removal)?"*

The alternate containment defense-in-depth categorization process does not evaluate initiating events with a frequency less than 1E-04/yr consistent with the alternate core damage defense-in-depth categorization process.

Containment defense-in-depth is already evaluated on the SSC level in NEI 00-04, Section 6.2. The evaluation is maintained at the SSC level with the alternate containment defense-in-depth categorization process except it is performed for the entire plant in one analysis (excluding the long term containment integrity consideration). Assignments of RISC are not complete until a system is individually categorized since the SSCs are candidate HSS / candidate LSS until they are reviewed by the IDP.

NEI 00-04, Section 7.1, states:

> *"If any SSC is safety significant, from either the PRA-based component safety significance assessment (Section 5) or the defense-in-depth assessment (Section 6), then the associated system function is preliminarily safety significant."*

When a SSC is candidate HSS from the FPIE PRA, the Integral PRA, the core damage defense-in-depth, and/or the containment defense-in-depth assessments, the functions driving

the candidate HSS determination are identified as “associated functions.” All SSCs mapped to an “associated function” are preliminary HSS as described in NEI 00-04, Section 7.1. The detailed categorization process described in NEI 00-04, Section 10.2 provides the approach for performing additional engineering and system analyses to identify specific SSC level or piece part functions and importance for the safety-significant SSCs in order to justify and categorize as LSS.

The alternate containment defense-in-depth categorization process uses only the FPIE PRA model to be consistent with the alternate core damage defense-in-depth categorization process (except for the Long-Term Containment Integrity qualitative consideration which continues to be evaluated using the NEI 00-04, Section 6.2 guidance). The basis for the consistency of the alternate core damage defense-in-depth categorization process with the current NEI 00-04 process is described in Section 2.2.3 of this report.

Consistent with the alternate core damage defense-in-depth categorization process, SSCs and functions outside the scope of the PRA do not need to be evaluated for the alternate containment defense-in-depth categorization process since the level of defense-in-depth is based on the success criteria in the PRA.

2.2.5 Compliance with Regulatory Guide 1.174 Defense-in-Depth

The alternate defense-in-depth categorization process is compliant with Section 2.1.1.2 of Regulatory Guide 1.174 (Reference 6):

1. ***Preserve a reasonable balance among the layers of defense***
    a. **Preserved.** The alternate defense-in-depth categorization process does not affect the reasonable balance among the layers of defense in a plant. 10 CFR 50.69 allows for a plant to implement alternative treatments for RISC-3 and RISC-4 SSCs. Plants are required to maintain reasonable confidence that SSCs with alternative treatments remain capable of performing their safety-related functions under design basis conditions. The alternate defense-in-depth categorization process is in compliance with 10 CFR 50.69 and does not impact reasonable balance among the layers of defense.
2. ***Preserve adequate capability of design features without an overreliance on programmatic activities as compensatory measures.***
    a. **Preserved.** Plant design features are not modified by implementing 10 CFR 50.69 or the alternate defense-in-depth categorization process. SSCs with alternative treatments are required to maintain reasonable confidence of operation as described in the explanation in the first criteria. Programmatic activities to maintain reasonable confidence are consistent with the current activities and in compliance with the approved 10 CFR 50.69 process.

3. ***Preserve system redundancy, independence, and diversity commensurate with the expected frequency and consequences of challenges to the system, including consideration of uncertainty.***
    a. **Preserved.** System redundancy, independence, and diversity are preserved in the 10 CFR 50.69 process and the alternate defense-in-depth categorization process. No system design modifications are made by implementing the alternate defense-in-depth categorization process. SSCs with alternative treatments are required to maintain reasonable confidence that they will perform their design functions as described in the explanation in the first criteria. These alternative treatments preserve system redundancy, independence, and diversity.
4. ***Preserve adequate defense against potential CCF.***
    a. **Preserved.** Although the alternate defense-in-depth categorization process examines defense-in-depth using the PRA model, SSCs with alternative treatments are required to maintain reasonable confidence of operation as described in the explanation in the first criteria. These alternative treatments preserve defense against potential CCF.
5. ***Maintain multiple fission product barriers.***
    a. **Preserved.** Multiple fission product barriers are maintained and are not modified by implementing 10 CFR 50.69 or the alternate defense-in-depth categorization process. SSCs with alternative treatments are required to maintain reasonable confidence of operation as described in the explanation in the first criteria.
6. ***Preserve sufficient defense against human errors.***
    a. **Preserved.** SSCs with alternative treatments are required to maintain reasonable confidence of operation as described in the explanation in the first criteria. These alternative treatments, such as alternative testing requirements, could result in a human error but are not expected to result in increased human errors from the error rate associated with special treatment requirements. The alternate defense-in-depth categorization process does not modify the currently established process for alternative treatments in 10 CFR 50.69 so implementation of the alternate defense-in-depth categorization process does not affect this criteria.
7. ***Continue to meet the intent of the plant's design criteria.***
    a. **Preserved.** SSCs categorized using the alternate defense-in-depth categorization process that have alternative treatments applied are required to maintain reasonable confidence of operation as described in the explanation in the first criteria. Plant monitoring programs are in place under 10 CFR 50.69 to confirm continued performance. The alternate defense-in-depth categorization process does not modify the currently established process for alternative treatments in 10 CFR 50.69 so implementation of the alternate defense-in-depth categorization process does not impact the plant's design criteria. The alternate defense-in-depth categorization process has no impact on NEI 00-04, Section 9.2.2, *Review of Safety Related Low Safety-Significant Functions/SSCs*, Number 7, regarding failures of SSCs that act as a fission product barrier.

3 REFERENCES

1. PA-RMSC-1769, Revision 1, “Alternate 50.69 Categorization Process.”

2. NEI 00-04, Revision 0, “10 CFR 50.69 SSC Categorization Guideline,” July 2005.

3. ASME/ANS RA-Sa-2009, “Standard for Level l/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications,” Addendum A to RA-S-2008, The American Society of Mechanical Engineers, New York, NY, American Nuclear Society, La Grange Park, Illinois, dated February 2009.

4. NRC Regulatory Guide 1.200, Revision 2, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities,” U.S. Nuclear Regulatory Commission, March 2009.

5. NRC Regulatory Guide 1.200, Revision 3, “Acceptability of Probabilistic Risk Assessment Results for Risk-Informed Activities,” U.S. Nuclear Regulatory Commission, December 2020.

6. NRC Regulatory Guide 1.174, Revision 3, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” U.S. Nuclear Regulatory Commission, January 2018.

7. 10 CFR 50.69, Final Rule, “Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors,” November 22, 2004.