Passive Categorization Guidance for PWROG Topical Report WCAP-16308-NP

-1000 SCOPE AND RESPONSIBILITY

-1100 Scope

This Case provides a process for determining the Risk-Informed Safety Classification (RISC) for use in risk-informed repair/replacement activities. The RISC process of this Case may be applied to any of Class 1, 2, 3, or non-class[1] pressure-retaining items or their associated supports, except core supports, in accordance with the risk-informed safety classification criteria established by the regulatory authority having jurisdiction at the plant site.

-1200 Classifications

(a) The RISC process is described in Appendix I of this Case. Pressure retaining and component support items shall be classified High Safety Significant (HSS) or Low Safety Significant (LSS). However, because this classification is to be used only for repair/replacement activities, failure potential is conservatively assumed to be 1.0 in determining a consequence category in Appendix I. These classifications might not be directly related to other risk-informed applications.

(b) Class 1 items that are part of the reactor coolant pressure boundary except as provided in paragraphs (c)(2)(i) and (c)(2)(ii) of Title 10 of the U.S. Code of Federal Regulations (10 CFR), Part 50.55a shall be classified High Safety Significant (HSS). For items that are connected to the reactor coolant pressure boundary, as defined in paragraph 10 CFR 50.55a (c)(2)(i) and (c)(2)(ii), the RISC process of (a) should be applied.

-1300 OWNER'S RESPONSIBILITY

-1310 Determination of Classification

The responsibilities of the Owner shall include determination of the appropriate classification for the items identified for each risk-informed repair/replacement activity, in accordance with Appendix I of this Case. The Owner shall ensure that core damage frequency (CDF) and large early release frequency (LERF) are included as risk metrics in the RISC process.

-1320 Required Disciplines

(a) An Integrated Decisionmaking Panel (IDP) shall use the information and insights compiled in the initial categorization process and combine that with other information from design bases, defense-in-depth, and safety margins to finalize the categorization of functions/SSCs.

(b) The designated as members of the IDP shall have joint expertise in the following fields:
- Plant Operations (SRO qualified),
- Design Engineering,
- Safety analysis,
- Systems Engineering, and
- Probabilistic Risk Assessment.

(c) Requirements for ensuing adequate expertise levels and training of IDP members in the categorization process shall be established.

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[1] Non-class items are items not classified in accordance with IWA-1320.

(d) To the extent possible, the classification of pressure retaining and support items in a system should be performed by the same IDP members as the categorization of active SSCs in that system.

Deleted: Personnel with expertise in the following disciplines shall be included in the classification process. ¶
<#>probabilistic risk assessment¶
<#>plant operations¶
<#>system design¶
<#>safety or accident analysis¶
Personnel may be experts in more than one discipline, but are not required to be experts in all disciplines.¶

-1330 Adequacy of the PRA

The Owner is responsible for demonstrating adequacy of any PRA used as the basis for this process. All deficiencies identified shall be reconciled during the analysis to support the RISC process. The resolution of all PRA issues shall be documented.

-9000 GLOSSARY

conditional consequence – an estimate of an undesired consequence, such as core damage or a breach of containment, assuming failure of an item, e.g., conditional core damage probability (CCDP)

core damage – uncovery and heatup of the reactor core to the point at which prolonged oxidation and severe fuel damage is anticipated and involving enough of the core to cause a significant release

failure – an event involving leakage, rupture, or a condition that would disable the ability of an item to perform its intended safety function

failure modes and effects analysis (FMEA) – a process for identifying failure modes of specific items and evaluating their effects on other components, subsystems, and systems

high-safety-significant function – a function that has been determined to be safety significant from traditional plant risk-assessment evaluations of core damage or large early release events (e.g., evaluations performed to support the Maintenance Rule - 10 CFR 50.65 or from other relevant information (e.g., defense in depth considerations)

initiating event (IE) – any event either internal or external to the plant that perturbs the steady state operation of the plant, if operating, thereby initiating an abnormal event, such as a transient or LOCA within the plant. Initiating events trigger sequences of events that challenge plant control and safety systems whose failure could potentially lead to core damage or large early release

large early release – the rapid unmitigated release of airborne fission products from the containment to the environment occurring before the effective implementation of off-site emergency response and protective actions

piping segment – a portion of piping, components, or a combination thereof, and their supports, in which a failure at any location results in the same consequence, e.g., loss of a system, loss of a pump train

plant features – systems, structures, and components that can be used to prevent or mitigate an accident

probabilistic risk assessment (PRA) – an assessment of the risk associated with plant operation and maintenance that is measured in terms of frequency of occurrence of risk metrics, such as core damage or a radioactive material release and its effects on the health of the public (also referred to as a probabilistic safety assessment, PSA)

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recovery action – a human action performed to regain equipment or system operability from a specific failure or human error in order to mitigate or reduce the consequences of the failure

risk metrics – a determination of what activity or conditions produce the risk, and what individual, group, or property is affected by the risk

spatial effect – a failure consequence affecting other systems or components, such as failures due to pipe whip, jet impingement, jet spray, loss of inventory due to draining of a tank or flooding

success criteria – criteria for establishing the minimum number or combination of systems or components required to operate, or minimum levels of performance per component during a specific period of time (mission time), to ensure that the safety functions are satisfied

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APPENDIX I RISK-INFORMED SAFETY CLASSIFICATION (RISC) PROCESS

I-1.0 INTRODUCTION

This Appendix provides the risk-informed process used to determine Risk-Informed Safety Classification (RISC) for use in risk-informed repair/replacement activities. This RISC process is based on conditional consequence of failure. The process provides a conservative assessment of the importance of an item. This process divides each selected system into piping segments that are determined to have similar consequence of failure. These piping segments are categorized based on the conditional consequence. Once categorized, the safety significance of each piping segment is identified. Figure I-1 illustrates the RISC methodology presented in the following sections.

Scope Identification
Select system and define boundaries for evaluation

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Consequence Evaluation
Perform FMEA considering Direct & Indirect Effects
Identify Impact Groups: Initiating Event, System/Train, Combination, Containment

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Consequence Categorization
Determine Consequence Ranking from Quantitative Indices or Consequence Category Tables

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Classification Considerations
Consider other relevant information, including defense-in-depth principles, for Medium/Low/None consequence categories

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Final Classification Definitions
HSS – high-safety-significant
LSS – low-safety-significant

Figure I-1
Risk-Informed Safety Classification Process

I-2.0 SCOPE IDENTIFICATION

The Owner shall define the boundaries included in the scope of the RISC evaluation process. Items optionally classified to Class 1 and Class 1 items connected to the reactor coolant pressure boundary, as defined in paragraphs 10 CFR 50.55a (c)(2)(i) and (c)(2)(ii), are within the scope of the RISC evaluation process. All other Class 1 items shall be classified High Safety Significant (HSS) and the provisions of the RISC evaluation shall not apply.

I-3.0 EVALUATION OF RISK-INFORMED SAFETY CLASSIFICATIONS

All pressure retaining items, including supports for a piping system, shall be evaluated by defining piping segments that are grouped based on common conditional consequence (i.e., given failure of the piping segment). To accomplish this grouping, the direct effects, and indirect effects shall be assessed for each piping segment. Additionally, information considered relevant to the classification shall be collected for each piping segment (e.g., information regarding design basis accidents, at-power risk, shutdown risk,

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Deleted: that is not modeled in the PRA, but considered relevant to the classification containment isolation, flooding, fires, seismic conditions, etc.). This other relevant information is considered in conjunction with the Consequence Category to determine the Risk Informed Safety Classification. The Consequence Category is determined from the Consequence Evaluation.

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I-3.1 Consequence Evaluation

I-3.1.1 Failure Modes and Effects Analysis (FMEA). Potential failure modes for each system or piping segment shall be identified, and their effects shall be evaluated. This evaluation shall consider the following:

(a) Pressure Boundary Failure Size. The consequence analysis shall be performed assuming a large pressure boundary failure for piping segments. Alternatively, the consequence analysis can be performed assuming a smaller leak, when
  (1) a smaller leak is more conservative; or
  (2) when a small leak can be justified through a leak-before-break analysis in accordance with the criteria specified in NUREG-1061, Volume 3; 10CFR50, Appendix A, General Design Criterion 4; or
  (3) it can be documented that plant configuration precludes the possibility of a large pressure boundary failure; or
  (4) a small break with a calculated leak rate at design basis conditions for a through-wall flaw with a length six times its depth can be used when certain design and operational considerations are satisfied:
    - the pipe segment is not susceptible to any large break mechanisms or plant controls are in place to minimize the potential for occurrence of large break mechanisms,
      + a large break mechanism is one that produces significant loadings above the normal loading on the system and specifically includes water hammer for which no mitigation is provided and internal deflagrations, but excludes seismic,
    - the pipe segment is not part of a high energy system,
    - the pipe segment is greater than 4 inches in diameter.".

(b) Isolability of the Break. A break can be automatically isolated by a check valve, a closed isolation valve, or an isolation valve that closes on a given signal or by operator action.

(c) Indirect Effects. A failure consequence affecting other systems or components, such as spatial effects.

(d) Initiating Events. For systems or piping segments that are modeled either explicitly or implicitly in any existing plant-specific Probabilistic Risk Assessment (PRA), any applicable initiating event is identified using a list of initiating events from that PRA.

(e) System Impact or Recovery. The means of detecting a failure, and the Technical Specifications associated with the system and other affected systems. Possible automatic and operator actions to prevent a loss of system function.

(f) System Redundancy. The existence of redundancy for accident mitigation purposes.

Deleted: <#>Indirect Effects. These include spatial interactions such as pipe whip, jet spray, and loss-of-inventory effects (e.g., draining of a tank).¶
<#>Initiating Events. These are identified using a list of initiating events from any existing plant-specific Probabilistic Risk Assessment (PRA) or Individual Plant Examination (IPE) and the Owner's Requirements.¶

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I-3.1.2 Impact Group Assessment. The results of the FMEA evaluation for each piping system, or portion thereof, shall be classified into one of three impact groups: initiating event, system, or combination. Each piping system, or portion thereof, shall be partitioned into postulated piping failures that cause an initiating event, disable a system without causing an initiating event, or cause an initiating event and disable a system. The consequence category assignment (high, medium, low, or none) for each piping segment within each impact group shall be selected in accordance with (a) through (d) below. In assessing the appropriate consequence category, risk information for all initiating events, including fire and seismic, should be considered.

(a) Initiating Event (IE) Impact Group Assessment. When the postulated failure results in only an initiating event (e.g., loss of feedwater, reactor trip), the consequence shall be classified into one of four categories: high, medium, low, or none. The initiating event category shall be assigned according to the following:

(1) The initiating event shall be placed in one of the Design Basis Event Categories in Table I-1. All applicable design basis events previously analyzed in the Owner's updated final safety analysis report or PRA shall be included.

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(2) Breaks that cause an initiating event classified as Category I (routine operation) need not be considered in this analysis.

(3) For piping segment breaks that result in Category II (Anticipated Event), Category III (Infrequent Event), or Category IV (Limiting Fault or Accident), the consequence category shall be assigned to the initiating event according to the conditional core damage probability (CCDP) criteria specified in Table I-5. The quantitative index for the initiating event impact group (CCDP) is the ratio of the core damage frequency due to the initiating event to the initiating event frequency.

(b) System Impact Group Assessment. The consequence category of a failure:

- modeled in a PRA that degrades or fails a high-safety-significant function but does not cause an initiating event, or
- not modeled explicitly or implicitly in a PRA, or
- that results in failure of another high-safety-significant piping segment, e.g. through indirect effects, or
- that will prevent or adversely affect the plant's capability to reach or maintain safe shutdown conditions,

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shall be based on the following:

(1) Frequency of challenge that determines how often the affected function of the system is called upon. This corresponds to the frequency of events that require the system operation.

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(2) Number of backup systems (portions of systems, trains, or portions of trains) available, which determines how many unaffected systems (portions of systems, trains, or portions of trains) are available to perform the same mitigating function as the degraded or failed systems.

(3) Exposure time, which determines the time the system would be unavailable before the plant is changed to a different mode in which the failed system's function is no longer required, the failure is recovered, or other compensatory action is taken. Exposure time is a function of the detection time and Allowed Outage Time, as defined in the plant Technical Specification. Consequence categories shall be assigned in accordance with Table I-2 as High, Medium, or Low. Frequency of challenge is grouped into design basis event categories II, III, and IV. The Owner or his designee shall ensure that the quantitative basis of Table I-2 (e.g., one full train unavailability approximately 10^{-2}) is consistent with the failure scenario being evaluated.

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For failures modeled in a PRA, quantitative indices may be used to assign consequence categories in accordance with Table I-5 in lieu of Table I-2. The quantitative index for the system impact group is the product of the change in conditional core damage frequency (CDF) and the exposure time.

(c) Combination Impact Group Assessment. The consequence category for a piping segment whose failure results in both an initiating event and the degradation or loss of a system shall be determined using Table I-3. The Owner or his designee shall ensure that the quantitative basis of Table I-3 (e.g., one full train unavailability approximately 10^{-2}) is consistent with the pipe failure scenario being evaluated. The consequence category is a function of two factors:

(1) Use of the system to mitigate the induced initiating event;

(2) Number of unaffected backup systems or trains available to perform the same function.

For failures modeled in a PRA, quantitative indices may be used to assign consequence categories in accordance with Table I-5 in lieu of Table I-3. The quantitative index for the combination impact group is the product of the change in conditional core damage frequency (CDF) and the exposure time.

(d) Containment Performance. The above evaluations determine failure importance relative to core damage or the plant's capability to reach or maintain safe shutdown conditions. Failure shall also be evaluated for its effect on containment performance. This shall be accomplished by addressing two issues, both of which are based on an approximate conditional probability value of not greater than 0.1 between the CCDP and the likelihood of large early release from containment. If there is no margin, i.e., conditional probability of a large early release due to core damage is greater than 0.1, the assigned consequence category shall be increased one level. The two issues are described as follows:

(1) CCDP values for initiating events and safety functions are evaluated to determine if the potential for large early release due to containment failure requires the consequence category to be increased.

(2) The effect on containment isolation is evaluated. If there is a containment barrier available, the consequence category from the core damage assessment is retained. If there is no containment barrier or the barrier failed in determining the consequence category from the core damage assessment, some margin in the core damage consequence category assignment must be present for it to be retained. For example, if the CCDP for core damage is less than 10^{-5}, i.e., a Medium consequence assignment, and there is no containment barrier, the Medium consequence assignment is retained, because there is 0.1 margin to the High consequence category threshold, i.e., 10^{-4}. However, if the CCDP for core damage is $5x10^{-5}$, i.e., a Medium consequence assignment, and there is no containment barrier, the consequence category is increased to High, because the margin to the High consequence category threshold, i.e., 10^{-4}, is less than 0.1. Table I-4 shall be used to assign consequence categories for those piping failures that can lead to a LOCA outside containment. In lieu of using Table I-4, quantitative indices may be used to assign consequence categories in accordance with Table I-5 with each range lowered one order of magnitude, e.g., not less than 10^{-5} is High.

I-3.2 Classification

Risk Informed Safety Classification is determined by considering the Consequence Category in conjunction with other relevant information.

I-3.2.1 Final Risk-Informed Safety Classification. Piping segments may be grouped together within a system, if the consequence evaluation (I-3.1) determines the

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<#>For piping segments, functions, and design, operational, or risk considerations that are not explicitly modeled in the PRA, the effects of the following shall be evaluated.¶
<#>Failure of the piping segment will significantly increase the frequency of an initiating event, including those initiating events originally screened out in the PRA, such that the CDF or large early release frequency (LERF) would be estimated to increase by more than 10^{-6}/yr or 10^{-7}/yr, respectively.¶
<#>Failure of the piping segment will compromise the integrity of the reactor coolant pressure boundary as defined in –1200(b).¶
<#>Even when considering operator actions used to mitigate an accident, failure of the piping segment will fail a high safety significant function.¶
<#>Failure of the piping segment will result in failure of other safety-significant piping segments, e.g., through indirect effects.¶
<#>Failure of the piping segment will prevent or adversely affect the plant's capability to reach or maintain safe shutdown conditions.¶
<#>In addition to being HSS in terms of their contribution to CDF or LERF, piping segments might also be HSS in terms of other risk metrics or conditions. Therefore, the following conditions shall be evaluated.¶
<#>The piping segment is a part of a system that acts as a barrier to fission product release during severe acci ... [1]

Deleted: I-3.1.5 Maintenance of Adequate Safety Margins. When categorizing piping segments LSS, the RISC process shall verify that there are sufficient safety margins to account for uncertainty in the engineering analysis and in the supporting data. Safety margin shall be incorporated when determining performance characteristics and parameters, e.g., piping segment, system, and plant capability or success criteria. The amount of margin should depend on the uncertainty associated with the performance parameters in question, the availability of alternatives to compensate for adverse performance, and the consequences of failure to meet the performance goals. Sufficient safety margins are maintained by ensuring that safety analysis acceptance criteria in the plant licensing basis are met, or proposed revisions account for analysis and ... [2]

effect of the postulated failures to be the same. The Risk-Informed Safety Classification shall be as follows:

Passive Categorization Guidance for PWROG Topical Report WCAP-16308-NP

Classification Definitions

HSS – Piping segment considered high-safety-significant
LSS – Piping segment considered low-safety-significant

I-3.2.2 Classification Considerations.

(a) Piping segments determined to be a High consequence category in any table by the consequence evaluation (I-3.1.1 and I-3.1.2) shall be considered HSS. The Owner may further refine the classification ranking by more extensive application of the process defined in these requirements. These analyses shall be documented.

(b) Piping segments determined to be a Medium, Low or None (no change to base case) consequence category in any table by the consequence evaluation in Section I-3.1 shall be determined HSS or LSS by considering the other relevant information for determining classification. The following conditions shall be evaluated and answered true or not true:

(1) Even when taking credit for plant features and operator actions[2], failure of the piping segment will not directly fail another high-safety-significant function.

(2) Failure of the piping segment will not result in failure of another high safety-significant piping segment, e.g., through indirect effects.

(3) Even when taking credit for plant features and operator actions, failure of the piping segment will not prevent or adversely affect the plant's capability to reach or maintain safe shutdown conditions.

(4) The piping segment does not individually support a significant mitigating or diagnosis function addressed in the Emergency Operating Procedures or the Severe Accident Management Guidelines, with no redundancy or alternate means of support.

(5) The plant condition monitoring program would identify any known active degradation mechanisms in the pipe segment prior to its failure in test or an actual demand event (e.g., flow accelerated corrosion program).

(6) Even when taking credit for plant features and operator actions, failure of the piping segment will not result in releases of radioactive material that would result in the implementation of off-site emergency response and protective actions.

The RISC process shall demonstrate that the defense-in-depth philosophy is maintained. Defense-in-depth may be demonstrated by following the guidelines of U.S.N.R.C. Regulatory Guide 1.174, Revision 1, "An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis," dated November 2002. Defense-in-depth is maintained if:

(7) A reasonable balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation.

(8) Over-reliance on programmatic activities to compensate for weaknesses in plant design is avoided.

[2] To credit operator actions, the following criteria must be met:

- There must be an alarm or clear indication of the failure.
- A procedure must direct the response to the alarm or indication.
- Equipment activated to alleviate the condition must not be affected by the failure.
- There must be sufficient time to perform the compensatory action

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Deleted: Any piping segment initially determined to be a Medium consequence category and that is subject to a known active degradation mechanism

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Piping segments and their associated supports determined to be consequence category Low or None (no change to base case) by the consequence evaluation (I-3.1.1 and I-3.1.2) and

Deleted: meeting (a) or (b) above in any table, or

Deleted: modeled, shall be determined HSS or LSS using

Deleted: the other relevant information (I-3.1.3, I-3.1.4 and I-3.1.5)

(9) System redundancy, independence, and diversity are preserved commensurate with the expected frequency, consequences of challenges to the system, and uncertainties (e.g., no risk outliers).

(10) Defenses against potential common cause failures are preserved, and the potential for the introduction of new common cause failure mechanisms is assessed.

(11) Independence of fission-product barriers is not degraded.

If any of the above eleven (11) conditions are not true, HSS should be assigned.

(c) If LSS has been assigned from I-3.2.2(b), then the RISC process shall verify that there are sufficient safety margins to account for uncertainty in the engineering analysis and in the supporting data. Safety margin shall be incorporated when determining performance characteristics and parameters, e.g., piping segment, system, and plant capability or success criteria. The amount of margin should depend on the uncertainty associated with the performance parameters in question, the availability of alternatives to compensate for adverse performance, and the consequences of failure to meet the performance goals. Sufficient safety margins are maintained by:

(1) Ensuring that safety analysis acceptance criteria in the plant licensing basis are met, or

(2) Ensuring that proposed revisions account for analysis and data uncertainty.

If LSS has been assigned from I-3.2.2(b) and at least one of the above safety margin conditions are true, then LSS should be assigned; if both of the above safety margin conditions are not true, then HSS shall be assigned.

(d) A component support or snubber shall have the same classification as the highest-ranked piping segment within the piping analytical model in which the support is included. The Owner may further refine the classification ranking by more extensive application of the process defined in these requirements. These analyses shall be documented.

I-4.0 Reevaluation of Risk-Informed Safety Classifications

New information may become available that alters the RISC for a piping segment. Such information may result from changes to the PRA, plant operation, or design of items. The Owner shall identify and verify the effect of the new information on the RISC assigned to the piping segment.

When it is determined that the new information affects the RISC, the Owner shall reevaluate the classification, using the same approach originally used to establish the RISC.

Passive Categorization Guidance for PWROG Topical Report WCAP-16308-NP

TABLE I-1

CONSEQUENCE CATEGORIES FOR INITIATING EVENT IMPACT GROUP

Design Basis Event Category	Initiating Event Type	Representative Initiating Event Frequency Range (1/yr)	Example Initiating Events	Consequence Category (Note 1)
I	Routine Operation	>1		None
II	Anticipated Event	$\geq 10^{-1}$	Reactor Trip, Turbine Trip, Partial Loss of Feedwater	Low/ Medium
III	Infrequent Event	10^{-1} to 10^{-2}	Excessive Feedwater or Steam Removal	Low/Medium
			Loss of Off Site Power	Medium/High
IV	Limiting Fault or Accident	$<10^{-2}$	Small LOCA, Steam Line Break, Feedwater Line Break, Large LOCA	Medium/ High

Note 1: Refer to I-3.1.2(a)(3)

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TABLE I-2

GUIDELINES FOR ASSIGNING CONSEQUENCE CATEGORIES TO FAILURES RESULTING IN SYSTEM OR TRAIN LOSS

Affected Systems		Number of Unaffected Backup Trains							
Frequency of Challenge	**Exposure Time to Challenge**	**0.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**≥ 3.5**
Anticipated (DB Cat II)	All Year	HIGH	HIGH	HIGH	HIGH	MEDIUM	MEDIUM	LOW*	LOW
	Between tests (1-3 months)	HIGH	HIGH	HIGH	MEDIUM*	MEDIUM	LOW*	LOW	LOW
	Long AOT (≤ 1 week)	HIGH	HIGH	MEDIUM*	MEDIUM	LOW*	LOW	LOW	LOW
	Short AOT (≤ 1 day)	HIGH	MEDIUM*	MEDIUM	LOW*	LOW	LOW	LOW	LOW
Infrequent (DB Cat. III)	All Year	HIGH	HIGH	HIGH	MEDIUM	MEDIUM	LOW*	LOW	LOW
	Between tests (1-3 months)	HIGH	HIGH	MEDIUM*	MEDIUM	LOW*	LOW	LOW	LOW
	Long AOT (≤ 1 week)	HIGH	MEDIUM*	MEDIUM	LOW*	LOW	LOW	LOW	LOW
	Short AOT (≤ 1 day)	HIGH	MEDIUM	LOW*	LOW	LOW	LOW	LOW	LOW
Unexpected (DB Cat. IV)	All Year	HIGH	HIGH	MEDIUM	MEDIUM	LOW*	LOW	LOW	LOW
	Between tests (1-3 months)	HIGH	MEDIUM	MEDIUM	LOW*	LOW	LOW	LOW	LOW
	Long AOT (≤ 1 week)	HIGH	MEDIUM	LOW*	LOW	LOW	LOW	LOW	LOW
	Short AOT (≤ 1 day)	HIGH	LOW*	LOW	LOW	LOW	LOW	LOW	LOW

Note: If there is no containment barrier and the consequence category is marked by an *, the consequence category should be increased (medium to high or low to medium).

TABLE I-3
CONSEQUENCE CATEGORIES FOR COMBINATION IMPACT GROUP

Event	Consequence Category
Initiating Event and 1 Unaffected Train of Mitigating System Available	High
Initiating Event and 2 Unaffected Trains of Mitigating Systems Available	Medium[1] (or IE Consequence Category from Table I-1)
Initiating Event and More Than 2 Unaffected Trains of Mitigating Systems Available	Low[1] (or IE Consequence Category from Table I-1)
Initiating Event and No Mitigating System Affected	N/A

Note 1: The higher classification of this table or Table I-1 shall be used.

TABLE I-4
CONSEQUENCE CATEGORIES FOR FAILURES
RESULTING IN INCREASED POTENTIAL FOR AN UNISOLATED LOCA
OUTSIDE OF CONTAINMENT

Protection Against LOCA Outside Containment	Consequence Category
One Active[1]	HIGH
One Passive[2]	HIGH
Two Active	MEDIUM
One Active, One Passive	MEDIUM
Two Passive	LOW
More than Two	NONE

Note 1: An example of Active Protection is a valve that needs to close on demand.
Note 2: An example of Passive Protection is a valve that needs to remain closed.

TABLE I-5
QUANTITATIVE INDICES FOR CONSEQUENCE CATEGORIES

CCDP or Quantitative Index, no units	Consequence Category
$\geq 10^{-4}$	High
$10^{-6} \leq$ value $< 10^{-4}$	Medium
$<10^{-6}$	Low
No change to base case	None

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I-3.1.3 Piping segments, Functions, and Design, Operational, or Risk Considerations Not Modeled in PRA. If any of the conditions in (a) or (b) below are true, the piping shall be classified HSS.

For piping segments, functions, and design, operational, or risk considerations that are not explicitly modeled in the PRA, the effects of the following shall be evaluated.

Failure of the piping segment will significantly increase the frequency of an initiating event, including those initiating events originally screened out in the PRA, such that the CDF or large early release frequency (LERF) would be estimated to increase by more than 10^{-6}/yr or 10^{-7}/yr, respectively.

Failure of the piping segment will compromise the integrity of the reactor coolant pressure boundary as defined in –1200(b).

Even when considering operator actions used to mitigate an accident, failure of the piping segment will fail a high safety significant function.

Failure of the piping segment will result in failure of other safety-significant piping segments, e.g., through indirect effects.

Failure of the piping segment will prevent or adversely affect the plant's capability to reach or maintain safe shutdown conditions.

In addition to being HSS in terms of their contribution to CDF or LERF, piping segments might also be HSS in terms of other risk metrics or conditions. Therefore, the following conditions shall be evaluated.

The piping segment is a part of a system that acts as a barrier to fission product release during severe accidents.

The piping segment supports a significant mitigating or diagnosis function addressed in the Emergency Operating Procedures or the Severe Accident Management Guidelines.

Failure of the piping segment will result in unintentional releases of radioactive material in excess of plant offsite dose limits specified in 10 CFR Part 100.

I-3.1.4 Maintain Defense-in-Depth. When categorizing piping segments LSS, the RISC process shall demonstrate that the defense-in-depth philosophy is maintained. Defense-in-depth may be demonstrated by following the guidelines of U.S.N.R.C. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis," dated July 1998.

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I-3.1.5 Maintenance of Adequate Safety Margins. When categorizing piping segments LSS, the RISC process shall verify that there are sufficient safety margins to account for uncertainty in the engineering analysis and in the supporting data. Safety margin shall be incorporated when determining performance characteristics and parameters, e.g., piping segment, system, and plant capability or success criteria. The amount of margin should depend on the uncertainty associated with the performance parameters in question, the availability of alternatives to compensate for adverse performance, and the consequences of failure to meet the performance goals. Sufficient safety margins are maintained by ensuring that safety analysis acceptance criteria in the plant licensing basis are met, or proposed revisions account for analysis and data uncertainty.

I-3.2 Classification