

### 1-1.8 GENERAL SCREENING GUIDANCE

Section 1-8 states the criteria used in the Standard for screening out hazard groups and mechanisms, initiating events, accident sequences/ cutsets/ sequences and other specific plant areas, SSCs etc. from inclusion in the baseline PRA model. The overall screening criteria are stated in Table 1-1.8-1. Supporting Requirements (SR) specifying screening criteria reference this Table. Some SRs specify more or less stringent criteria. The screening process involves a combination of qualitative and quantitative processes. Qualitative screening relies on physical features of the item to be screened. For example, qualitative processes may lead to screening out blizzards in the arid/ desert environments or removal of initiating events that are not credible based on plant design. Quantitative screening is applied when a hazard is possible and consequential but its likelihood is remote or its consequences on the plant have a very low likelihood of proceeding to core damage.

Screening is a practical tool to simplify PRA models while retaining a clear focus on important contributors to risk. As such, the underlying intent of the screening criteria is to ensure that items that are screened do not impact the integrity and insights provided by a PRA model.

The quantitative screening criteria stated in Table 1-1.8-1, include an absolute screen based on either of the criteria in columns (a) or (b), a relative screening of risk significance (column (c)) and a confirmatory check on the cumulative impact of the screened hazards /scenarios, etc. criteria (column (d)). Relative screens at the individual level of a single hazard mechanism or type or a given accident scenario are intended to ensure that risk-significant contributors and their resulting insights are not lost. Use of individual absolute risk measures allows rare, but possible, events to be screened out based on frequency of the hazard or event or the risk-significance of a screened component or area on CDF and/or LERF. Screening criteria vary from estimated CDF and LERF contributions in the range of  $10^{-7}$  to  $10^{-9}$  per year for CDF and  $10^{-8}$  to  $10^{-10}$  per year for LERF.

Table 1-1.8-1 allows quantitative screens to be applied on a direct assessment of hazard frequency and CDF and LERF on an event frequency basis with

demonstrably conservative assessments. Quantitative screening also requires a cumulative assessment to ensure that the screening process does not significantly impact quantification of plant risks, or cause loss of significant insights. Specifically, for each screened category, the user must show that the items screened out from the PRA will contribute less than 5% of the CDF or LERF of the larger hazard category. Note the 5% value is treated as a goal and allows modification with justification, by the analysis team. For specific hazard groups, screening criteria may be supplemented by additional conditions that may be necessary on a hazard or PRA supporting requirement specific basis to ensure that the screening is robust and addresses hazard-specific considerations.

Qualitative screening, where it applies, is governed by Table 1-1.8-1 column (e). Features screened out via the qualitative screening process are not subjected to quantitative screening criteria. Note that supplemental hazard specific conditions may be applied to both quantitative and qualitative screens.

Table 1-1.8-1 General Screening Requirements

Item Being Screened	Individual screening criteria should meet one of the following categories <sup>1,2</sup>		Relative screening criteria (c)	Cumulative screening criteria (d)	Qualitative screening criteria <sup>4</sup> (e)
	Screening criteria (CDF/LERF) <sup>4</sup> (a)	Screening criteria (Hazard Freq) (b)			
Hazard Group (HG) <sup>8</sup>	<p>Demonstrably conservative contribution of HG CDF &lt;10<sup>-7</sup>/yr regardless of total CDF</p> <p>AND</p> <p>Demonstrably conservative contribution of HG LERF &lt;10<sup>-8</sup>/yr regardless of total LERF</p> <p>Hazard specific requirements may also be applied</p>	<p>Realistic estimate of mean hazard frequency<sup>10</sup> &lt;10<sup>-7</sup>/yr with CCDP &lt;0.1 and CLERP &lt;0.1<sup>7</sup></p> <p>OR</p> <p>Demonstrably conservative estimate of hazard frequency<sup>10</sup> &lt;10<sup>-6</sup>/yr with CCDP &lt;0.1 and CLERP &lt;0.10<sup>7</sup></p> <p>Hazard specific requirements may also be applied<sup>6</sup></p>	The screened out hazard mechanism does not represent a risk-significant contributor.	<p>&lt;5% of total plant CDF and LERF unless otherwise justified</p> <p>AND</p> <p>Aggregate contribution of CDF (LERF) quantitatively screened mechanisms/types less than 10<sup>-6</sup>/yr (10<sup>-7</sup>/yr)</p>	<p>Physically not possible or will not lead to core damage, as assessed by a demonstrably conservative deterministic analysis/assessment.</p> <p>OR</p> <p>Event subsumed into a larger event category</p>

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	Screening criteria (CDF/LERF) <sup>4</sup> (a)	Screening criteria (Hazard Freq) (b)			
Initiating Event (IE)	<p>Mean contribution of IE to CDF &lt;10-8/yr regardless of total CDF</p> <p>Mean contribution of IE to LERF &lt;10-9/yr regardless of total LERF</p> <p>[Bounding values may be used to justify an upper limit on the mean contribution]</p> <p>Hazard specific requirements may also be applied see for example IFEV-A8.</p>	<p>Mean Frequency of the IE is &lt;10-7/yr, and event does not involve either an ISLOCA, containment bypass, or reactor pressure vessel rupture.</p> <p>OR</p> <p>The mean frequency of the IE is &lt;10-6/yr, and core damage could not occur unless at least two trains of mitigating systems are failed independent of the initiator.</p> <p>[Bounding values may be used to justify an upper limit on the mean contribution]</p> <p>Hazard specific requirements may also be applied see for example IFEV-A8</p>	<p>The screened out hazard mechanism does not represent a risk-significant contributor to hazard group.</p> <p>Hazard specific requirements may also be applied, see example FSS-G22 for multi-compartment fires</p>	<p>&lt;5% of CDF or LERF contribution for those IEs included in hazard group risk metric, unless otherwise justified</p>	<p>Event can be screened if the resulting reactor shutdown is not an immediate occurrence<sup>5</sup>.</p> <p>For fire hazard follow HLR-QLS-A</p>

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	Screening criteria (CDF/LERF) <sup>4</sup> (a)	Screening criteria (Hazard Freq) (b)			
Accident Sequence (AS)	<p>Mean contribution of AS to CDF &lt;10-8/yr regardless of CDF for IE</p> <p>Mean contribution of AS to LERF &lt;10-9/yr regardless of LERF for IE</p>	Not Applicable	<p>The screened out hazard mechanism does not represent a risk-significant contributor CDF or LERF</p> <p>DO NOT SCREEN OUT individual sequences if the frequency of a group of sequences with similar characteristics (e.g., similar flood scenario, initiating event, and accident sequence) exceeds this screening criterion.</p>	<5% of risk metric associated with the AS contribution unless otherwise justified	Not Applicable
HRA Screening	<p>Screening rules to be justified in accordance with HLR-HR-B</p> <p>For HRA use bounding value to determine need to retain action. See HR-D2 for process for selecting those values.</p>				DO NOT SCREEN OUT activities that could simultaneously have an impact on multiple trains of a redundant system or diverse systems.

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	Screening criteria (CDF/LERF) <sup>4</sup> (a)	Screening criteria (Hazard Freq) (b)			
Data	Not applicable				<p>JUSTIFY the rationale for screening out or disregarding plant-specific, data (e.g., plant design modifications, changes in operating practices).</p> <p>When screening out generic event data, ENSURE that screening is performed on both the CCF events and the independent failure events in the database used to generate the CCF parameters.</p>
Cutset	Truncate accident sequences and associated system models at a sufficiently low cutoff value that dependencies associated with risk-significant cutsets or accident sequences are not eliminated <sup>9</sup>		Not Applicable	<5% of risk metric (e.g. hazard specific CDF/LERF) associated with the IE contribution unless otherwise justified	Not Applicable
Component, Failure Rate and Fragility	<p>Component estimated contribution to total failure &lt; 2 orders of magnitude of other components in same train and has same effect on system.</p> <p>A failure mode may be excluded when total failure rate or probability is less than 1% of the total failure rate or probability for that component, when their effects on system</p> <p>Supplemental hazard specific criteria may also apply</p>		Not Applicable	Not Applicable	Not Applicable

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	Screening criteria (CDF/LERF) <sup>4</sup> (a)	Screening criteria (Hazard Freq) (b)			
Room/Plant Areas	Mean estimated contribution of area to CDF <10-8/yr regardless of total CDF  Mean estimated contribution of area to LERF <10-9/yr regardless of total LERF  Supplemental hazard specific criteria may be apply		<1% of hazard group risk metric <sup>10</sup>	Cumulative criteria for screening out rooms /plant areas will vary among the hazards.	Hazard specific criteria may be applied.

NOTES:

- (1) For quantitative screening analyst must meet (a) or (b) and (c) and (d), .For qualitative screening use (e).
- (2) Do not screen out individual sequences, if the frequency of hazard groups, initiating events or accident sequences with similar characteristics (subsumed in the same mechanism, resulting in a similar flood scenario etc.) exceeds the screening criteria. Intent is to ensure hazard groups/initiating events are artificially parsed into multiple smaller sequences with similar initiating conditions and impacts.
- (3) Risk metrics include CDF and LERF. 1% is used for realistic evaluations and 10% may be used when screening methods uses demonstrably conservative evaluations of risk (e.g., use of 90% confidence limits on hazard mechanism frequency, or conservatively assuming a CCDF of unity when there is a high likelihood of event mitigation).
- (4) Demonstrably conservative bounding values may be used to justify an upper limit on the mean contribution
- (5) The event does not require the plant to go to shutdown conditions until sufficient time has expired during which the initiating-event conditions, with a high degree of certainty (based on supporting calculations), are detected and corrected before normal plant operation is curtailed (either administratively or automatically).
- (6) SR specific conditions for application may apply: For example, SR may include requirements for:
- (7) 1-No Cliff edge effect
- (8) 2-Confirm key assumptions via walkdown
- (9) No cliff edge effect
- (10) Hazard mechanisms (external flood) or hazard types (high winds) are to be screened using hazard group criteria
- (11) Truncation of cutsets/sequences will have to be done at a value significantly below 1% of the risk metric because the sum of the screened cutsets/sequences will be the dominant screening criteria. Truncation limits established such that no risk-significant accident sequences are inadvertently eliminated
- (12) Risk metrics include CDF and LERF. 1% is used for realistic evaluations and 10% may be used when screening methods uses demonstrably conservative evaluations of risk (e.g, use of 90% confidence limits on hazard mechanism frequency, or conservatively assuming a CCDF of unity when there is a high likelihood of event mitigation).
- (13) Do not screen out individual sequences, if the frequency of hazard groups, initiating events or accident sequences with similar characteristics (subsumed in the same mechanism, resulting in a similar flood scenario ,etc.) exceeds the screening criteria. Intent is to ensure hazard groups/initiating events are artificially parsed into multiple smaller sequences with similar initiating conditions and impacts.

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(14) For external floods the applicable parameter for screening is the mean exceedance frequency associated with consequential hazard challenges

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