N716

Review of IF SRs for use in applying N716

Code case N716 is a streamlined version of traditional risk-informed inservice inspection (RI-ISI) methodologies. N716 was developed by EPRI based upon lessons learned from a large number of traditional RI-ISI applications as well as insights from other risk-informed applications. N716 replaces the existing Class 1 and 2 piping inspection requirements with alternative Class 1, 2 and potentially Class 3 and NNS inspection requirements. N716, during pilot studies, was shown to reduce the cost of implementation and maintenance as well as provide a more stable ISI program.

One of the key attributes of N716 is its use of the plant-specific PRA and, in particular, the use of the results of the internal flooding study. This document describes how the plant-specific PRA is used to support a N716 application and describes the necessary level of PRA technical adequacy. This is accomplished by understanding how the plant-specific PRA is used in a N716 application as well as conducting a review of the supporting requirements of the ASME PRA standard for internal flooding.

The first use of the plant specific PRA is to determine if any piping beyond that define in section 2(a)(1) through 2(a)(4) of the code case should be added to the scope of high safety significant (HSS) piping. Section 2(a)(5) requires that any piping segment that has a core damage frequency (CDF) contribution of greater than 1E-06 be added to the HSS scope. Thus, the internal flooding needs to be of sufficient technical adequacy to identify this piping. It should be noted that for this step in the process, if the PRA is overly conservative, it will only result in additional inspections for Class 3 or NSS piping which currently do not have inspection requirements.

Table 1 provides a review of the supporting requirements of the ASME PRA standard for internal flooding and it includes RG 1.200 Rev 1 comments. This review identifies what capability category (per SR) is necessary to support the N716 application.

The second use of the plant-specific PRA is to support the delta risk analysis contained in section 5 of the code case. In order to conduct the delta risk analysis, conditional core damage probabilities (CCDPs) and conditional large early release probabilities (CLERPs) for HSS and low safety significant (LSS) piping need to be determined. These CCDPs/CLERPs will then be combined with applicable failure rates (see section 5(a)) and, as applicable, PODs to determine the change in risk from transitioning from the existing ISI program to that defined by the N716 application. This CCDP/CLERP determination is made by using three types of inputs as follows:

a For Class 1 piping that result in a LOCA, the highest CCDP/CLERP for LOCAs is used (SLOCA, MLOCA, LLOCA). This is conservative because N716 results in a reduction in the number of inspections required for Class 1 piping. Thus, using a conservative or upper bound CCDP/CLERP will result in a conservative estimate for the impact on risk. Therefore, because the CCDP/CLERP values taken from the plant-specific PRA need to

be realistic and/or conservative, the technical adequacy of the PRA should be reflective of this.

b Class 1 piping between the first and second isolation valve is evaluated as to its consequence impact. That is, does the postulated piping failure result in an isolable LOCA (e.g. ILOCA), potential LOCA (e.g. PLOCA) or a LOCA outside containment (e.g. LOCA-OC). CCDPs/CLERPs for these scenarios are determined by multiplying the applicable CCDP/CLERP from (a) above or the plant PRA CCDPs/CLERPS for breaks outside containment, with the applicable valve failure probability. For example, a motor operated valve that fails to close on demand (e.g. MOV-FTC), air-operated valve that fails to close on demand (e.g. AOV-FTC), or normally closed check valve that fails to remain closed (e.g. CV-FTRC). As above, because the valve failure rates/probabilities taken from the plant-specific PRA need to be realistic and/or conservative, the technical adequacy of the PRA should be reflective of this. Additionally, if the break is outside containment, the CCDP for breaks outside from the plant-specific PRA need to be realistic and/or conservative; the technical adequacy of the PRA should be reflective of this.

c For LSS Class 2 piping (note: this piping is comprised of a subset of Class 2 piping only, that is, no Class 3 or NNS piping is involved). For this Class 2 piping, the internal flooding analysis is used to confirm that the applicable CCDP (and CLERP) values for this piping is conservative. It is recommended that upper bound values of 1E-04 (CCDP) and 1E-05 (CLERP) be used. These values are consistent with the medium consequence threshold values of EPRI TR-112657. Using these upper bound values streamlines the risk impact analysis and reduces maintenance costs. Table 1 provides a review of the supporting requirements of the ASME PRA standard for internal flooding. This review identifies what capability category (per SR) is necessary to support the N716 application.

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-A1	DEFINE flood areas by dividing the plant into physically separate areas where a flood area is viewed as generally independent of other areas in terms of the potential for internal flooding effects and flood propagation.			Fundamental to all capability categories
IF-A1a	DEFINE flood areas at the level of **buildings or portions thereof from which there would be no propagation to other modeled buildings or portions thereof.**	DEFINE flood areas at the level of **individual rooms or combined rooms/halls for which plant design features exist to restrict flooding.**		Cat I - The higher capability categories require further resolution of plants areas/rooms. By not requiring higher resolution, a conservative CCDP would be developed which would only result in an increase in HSS scope (per section 2(a)(5) or conservative CCDP/CLERPs for the delta risk evaluation).
IF-A1b	For multi-unit sites with shared systems or structures, INCLUDE multi-unit areas, if applicable.			Fundamental to all capability categories
IF-A2	DELETED (moved to IF-C2c)			--
IF-A3	USE plant information sources that reflects the as-built as-operated plant to support development of flood areas.			Fundamental to all capability categories
IF-A4	CONDUCT a plant walkdown(s) to verify the accuracy of information obtained from plant information sources and to obtain or verify: (a) spatial information needed for the development of flood areas, and (b) plant design features credited in defining flood areas. Note: Walkdown(s) may be done in conjunction with the requirements of IF-B3a, IF-C9 and IF-E8.			Fundamental to all capability categories
IF-B1	For each flood area, IDENTIFY the potential sources of flooding [Note 1]. INCLUDE: *(a)* equipment (e.g., piping, valves, pumps) located in the area that are connected to fluid systems (e.g., circulating water system, service water system, component cooling water system, feedwater system, condensate and steam systems) *(b)* plant internal sources of flooding (e.g., tanks or pools) located in the flood area *(c)* plant external sources of flooding (e.g., reservoirs or rivers) that are connected to the area through some system or structure *(d)* in-leakage from other flood areas (e.g., back flow through drains, doorways, etc.)			Fundamental to all capability categories
	NRC Issue: The list of fluid systems should be expanded to include fire protection systems.			
	NRC Resolution: For each flood area…INCLUDE (a) equipment (e.g., piping, valves, pumps) located in the area that are connected to fluid systems (e.g., circulating water system, service water systems, …fire protection system…			

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-B1a	For multi-unit sites with shared systems or structures, INCLUDE any potential sources with multi-unit or cross-unit impacts.			fundamental to all capability categories
IF-B1b	SCREEN OUT flood areas with none of the potential sources of flooding listed in IF-B1and IF-B1a.			fundamental to all capability categories
IF-B2	For each potential source of flooding, IDENTIFY the flooding mechanisms that would result in a fluid release. INCLUDE: (a) failure modes of components such as pipes, tanks, gaskets, expansion joints, fittings, seals, etc. (b) human-induced mechanisms that could lead to overfilling tanks, diversion of flow through openings created to perform maintenance; inadvertent actuation of fire suppression system (c) other events resulting in a release into the flood area			fundamental to all capability categories Note: N716 only applies to piping and RI-ISI applications, therefore this SR is only partially applicable (i.e. human induced mechanisms for overfilling tanks is not applicable)
IF-B3	For each source and its identified failure mechanism, IDENTIFY the characteristic of release and the capacity of the source. INCLUDE: (a) a characterization of the breach, including type (e.g., leak, rupture, spray) (b) flow rate (c) capacity of source (e.g., gallons of water) (d) the pressure and temperature of the source			fundamental to all capability categories
	NRC Issue: It is necessary to consider a range of flow rates for identified flooding sources, each having a unique frequency of occurrence. For example, small leaks that only cause spray are more likely than large leaks that may cause equipment submergence.			
	NRC Resolution: (b) range of flow rates			
IF-B3a	CONDUCT plant walkdown(s) to verify the accuracy of information obtained from plant information sources and to determine or verify the location of flood sources and in-leakage pathways Note: Walkdown(s) may be done in conjunction with the requirements of IF-A4, IF-C9 and IF-E8.			fundamental to all capability categories
IF-C1	For each defined flood area and each flood source, IDENTIFY the propagation path from the flood source area to its area of accumulation.			fundamental to all capability categories
	NRC Issue: For a given flood source, there may be multiple propagation paths and areas of accumulation.			
	NRC Resolution: For each defined flood area and each flood source, IDENTIFY the propagation paths from the flood source area to the areas of accumulation.			

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-C2	For each defined flood area and each flood source, IDENTIFY plant design features that have the ability to terminate or contain the flood propagation. INCLUDE the presence of : (a) flood alarms, (b) flood dikes, curbs, sumps (i.e., physical structures that allow for the accumulation and retention of water), (c) drains (i.e., physical structures that can function as drains), (d) sump pumps, spray shields, water-tight doors, and (e) blowout panels or dampers with automatic or manual operation capability.			fundamental to all capability categories
IF-C2a	For each defined flood area and each flood source, IDENTIFY those automatic or operator responses that have the ability to terminate or contain the flood propagation.			fundamental to all capability categories
IF-C2b	ESTIMATE the capacity of the drains and the amount of water retained by sumps, berms, dikes and curbs. ACCOUNT for these factors in estimating flood volumes and SSC impacts from flooding.			fundamental to all capability categories
IF-C2c	For each flood area not screened out using the requirements under other Internal Flooding supporting requirements (e.g., IF-B1b and IF-C5), IDENTIFY the SSCs located in each defined flood area and along flood propagation paths that are modeled in the internal events PRA model as being required to respond to an initiating event or whose failure would challenge normal plant operation, and are susceptible to flood. For each identified SSC, IDENTIFY, for the purpose of determining its susceptibly per IF-C3, its spatial location in the area and any flooding mitigative features (e.g., shielding, flood or spray capability ratings). **NRC Issue:** There is circular logic between this SR and IF-C5. This SR requires identifying SSCs for flood areas not screened out in IF-C5. A listed reason for screening a flood area in IF-C5 is that it does not contain SSCs. **NRC Resolution:** For each flood area not screened out using the requirements under IF-B1b…			fundamental to all capability categories
IF-C3	For the SSCs identified in IF-C2c, IDENTIFY the susceptibility of each SSC in a flood area to flood-induced failure mechanisms. **INCLUDE failure by submergence and spray** in the identification process. EITHER: (a) ASSESS qualitatively the impact of flood-induced mechanisms that are not formally addressed (e.g., using the mechanisms listed under Capability Category III of this requirement), by using conservative assumptions; OR (b) NOTE that these mechanisms are not included in the scope of the evaluation.	For the SSCs identified in IF-C2c, IDENTIFY the susceptibility of each SSC in a flood area to flood-induced failure mechanisms. **INCLUDE failure by submergence, spray, jet impingement, pipe whip, humidity, condensation, temperature concerns, and any other identified failure modes** in the identification process.		Cat II - Capability category II and plant must also be designed to NUREG-0800 sections 3.6.1 and 3.6.2 or equivalent (e.g. EPRI TR-1006837 for RI-BER). If not, capability category III is required.
	NRC Issue: For Cat II, it is not acceptable to just note that a flood-induced failure mechanism is not included in the scope of the internal flooding analysis. Some level of assessment is required.			

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

<table>
<tr><th>Supporting Requirement (SR)</th><th>Capability Category I</th><th>Capability Category II</th><th>Capability Category III</th><th>Assessment</th></tr>
<tr><td></td><td colspan="3">NRC Resolution: Cat I: INCLUDE failure of submergence and spray in the identification process. EITHER:

(a) ASSESS… by using conservative assumptions; OR

(b) NOTE that these mechanisms are not included in the scope of the evaluation.

Cat II: INCLUDE failure by submergence and spray in the identification process.

ASSESS qualitatively the impact of flood-induced mechanisms that are not formally addressed (e.g., using the mechanisms listed under Capability Category III of this requirement), by using conservative assumptions.</td><td></td></tr>
<tr><td>IF-C3a</td><td colspan="3">In applying SR IF-C3 to determine susceptibility of SSCs to flood-induced failure mechanisms, TAKE CREDIT for the operability of SSCs identified in IF-C2c with respect to internal flooding impacts only if supported by an appropriate combination of:
(a) test or operational data
(b) engineering analysis
(c) expert judgment.</td><td>fundamental to all capability categories</td></tr>
<tr><td rowspan="3">IF-C3b</td><td>No requirement for inter-area propagation given that flood areas are independent (see SR IF-A1a).</td><td>IDENTIFY inter-area propagation through the normal flow path from one area to another via drain lines; and areas connected via back flow through drain lines involving failed check valves, pipe and cable penetrations (including cable trays), doors, stairwells, hatchways, and HVAC ducts.

INCLUDE potential for structural failure (e.g., of doors or walls) due to flooding loads.</td><td>IDENTIFY inter-area propagation through the normal flow path from one area to another via drain lines; and areas connected via back flow through drain lines involving failed check valves, pipe and cable penetrations (including cable trays), doors, stairwells, hatchways, and HVAC ducts.

INCLUDE potential for structural failure (e.g., of doors or walls) due to flooding loads, and the potential for barrier unavailability, including maintenance activities.</td><td rowspan="3">Cat I – higher capability categories are not required as the flood areas are defined as independent per SR IF-A1a. N716 applies to piping and RI-ISI applications. ISI has limited ability to impact maintenance induced unavailability of barriers and vice versa.</td></tr>
<tr><td colspan="3">NRC Issue: Both a Capability Category II and III PRA should include the potential for maintenance-induced unavailability of barriers.</td></tr>
<tr><td colspan="3">NRC Resolution: Cat II, III: IDENTIFY inter-area…

INCLUDE potential for structural failure (e.g., of doors or walls) due to flooding loads and the potential for barrier unavailability, including maintenance activities.</td></tr>
<tr><td>IF-C3c</td><td colspan="3">PERFORM any necessary engineering calculations for flood rate, time to reach susceptible equipment, and the structural capacity of SSCs in accordance with the applicable requirements described in Table 4.5.3-2(b).</td><td>fundamental to all capability categories</td></tr>
</table>

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-C4	DEVELOP flood scenarios (i.e., the set of information regarding the flood area, source, flood rate and source capacity, operator actions, and SSC damage that together form the boundary conditions for the interface with the internal events PRA) by examining the equipment and relevant plant features in the flood area and areas in potential propagation paths, giving credit for appropriate flood mitigation systems or operator actions, and identifying susceptible SSCs.			fundamental to all capability categories
IF-C4a	For multi-unit sites with shared systems or structures, INCLUDE multi-unit scenarios.			fundamental to all capability categories
IF-C5	SCREEN OUT ***flood areas*** where flooding of the area does not cause an initiating event or a need for immediate plant shutdown, AND either of the following applies: *(a)* the flood area (including adjacent areas where flood sources can propagate) contains no mitigating equipment modeled in the PRA; OR *(b)* the flood area has no flood sources sufficient (e.g., through spray, immersion, or other applicable mechanism) to cause failure of the equipment identified in IF-C2c. DO NOT USE failure of a barrier against inter-area propagation to justify screening (i.e., for the purposes of screening, do not credit such failures as a means of beneficially draining the area) JUSTIFY any other qualitative screening criteria.			fundamental to all capability categories
IF-C5a	SCREEN OUT ***flood areas*** where flooding of the area does not cause an initiating event or a need for immediate plant shutdown, AND the following applies: The flood area contains flooding mitigation systems (e.g., drains or sump pumps) capable of preventing unacceptable flood levels, and the nature of the flood does not cause equipment failure (e.g., through spray, immersion, or other applicable failure mechanisms). DO NOT CREDIT mitigation systems for screening out flood areas unless there is a definitive basis for crediting the capability and reliability of the flood mitigation system(s).			fundamental to all capability categories
IF-C6	USE potential human mitigative actions as additional criteria for screening out ***flood areas*** if all the following can be shown: *(a)* flood indication is available in the control room *(b)* the flood sources in the area can be isolated ***(c)* the time to the damage of safe shutdown equipment is significantly greater than the expected time for human mitigative actions to be**	USE potential human mitigative actions as additional criteria for screening out ***flood areas*** if all the following can be shown: *(a)* flood indication is available in the control room (b) the flood sources in the area can be isolated **(c) the mitigative action can be performed with high reliability for the worst flooding initiator. High reliability is established by**	**DO NOT SCREEN OUT *flood areas* based on reliance on operator action to prevent challenges to normal plant operations.**	Cat I – higher capability category are not required as the CAT I requirements to have "significantly longer time prior to damage of equipment" provides adequate analysis margin. EPRI TR-112657, Rev B-A provides additional guidance.

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
	performed, for the worst flooding initiator	**demonstrating, for example, that the actions are procedurally directed, that adequate time is available for response, that the area is accessible, and that there is sufficient manpower available to perform the actions.**		
IF-C7	SCREEN OUT ***flood sources*** if it can be shown that: (a) the flood source is insufficient (e.g., through spray, immersion, or other applicable mechanism) to cause failure of equipment identified in IF-C2c; OR (b) the area flooding mitigation systems (e.g., drains or sump pumps) are capable of preventing unacceptable flood levels and nature of the flood does not cause failure of equipment identified in IF- C2c (e.g., through spray, immersion, or other applicable failure mechanism); OR (c) the flood only affects the system that is the flood source and the systems analysis addresses this per SY-A13 and SY-A14 and need not be treated as a separate internal flooding initiating event.			fundamental to all capability categories
IF-C8	USE potential human mitigative actions as additional criteria for screening out ***flood sources*** if all the following can be shown: *(a)* flood indication is available in the control room, *(b)* the flood source can be isolated, and ***(c)* the time to the damage of safe shutdown equipment is significantly greater than the expected time for human mitigative actions to be performed, for the worst flood from that source.**	USE potential human mitigative actions as additional criteria for screening out ***flood sources*** if all the following can be shown: *(a)* flood indication is available in the control room, *(b)* the flood source can be isolated, and ***(c)* the mitigative action can be performed with high reliability for the worst flood from that source. High reliability is established by demonstrating, for example, that the actions are procedurally directed, that adequate time is available for response, that the area is accessible, and that there is sufficient manpower available to perform the actions.**	**DO NOT SCREEN OUT *flood sources* based on reliance on operator action to prevent challenges to normal plant operations.**	Cat I – higher capability category are not required as the CAT I requirements to have "significantly longer time prior to damage of equipment" provides adequate analysis margin. EPRI TR-112657, Rev B-A provides additional guidance.

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-C9	CONDUCT plant walkdown(s) to verify the accuracy of information obtained from plant information sources and to obtain or verify: (a) SSCs located within each defined flood area (b) flood / spray / other applicable mitigative features of the SSCs located within each defined flood area (e.g., drains, shields, etc.) (c) pathways that could lead to transport to the flood area Note: Walkdown(s) may be done in conjunction with the requirements of IF-A4, IF-B3a and IF-E8.			fundamental to all capability categories
IF-D1	For each flood scenario, IDENTIFY the corresponding plant initiating event group identified per Table 4.5.7-1 and the scenario-induced failures of SSCs required to respond to the plant initiating event. INCLUDE the potential for a flooding-induced transient or LOCA. If an appropriate plant initiating event group does not exist, CREATE a new plant initiating event group in accordance with the applicable requirements of Table 4.5.1-2(b). **NRC Issue:** IF-D1 incorrectly references Table 4.5.7-1 when it should cite Table 4.5.1-2(b). Note that IF-D2 was deleted in Addendum B. **NRC Resolution:** …IDENTIFY the corresponding plant initiating event group identified per Table 4.5.1-2(b)…			fundamental to all capability categories
IF-D2	DELETED			--
IF-D3	GROUP flooding scenarios identified in IF-C4 only when the following is true: *(a)* scenarios can be considered similar in terms of plant response, success criteria, timing, and the effect on the operability and performance of operators and relevant	GROUP flooding scenarios identified in IF-C4 only when the following is true: *(a)* scenarios can be considered similar in terms of plant response, success criteria, timing, and the effect on the operability and performance of operators and relevant mitigating systems; or	GROUP flooding scenarios identified in IF-C4 only when the following is true: *(a)* scenarios can be considered similar in terms of plant response, success criteria, timing, and the effect on the operability and performance of operators and relevant mitigating systems; or	Cat I - The higher capability categories require further resolution. By not requiring higher resolution, a conservative CCDP would be developed which would only result in an increase in HSS scope per section 2(a)(5) or conservative CCDP/CLERPs for the delta risk evaluation.

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
	mitigating systems; or *(b)* scenarios can be subsumed into a group and bounded by the worst-case impacts within the "new" group.	*(b)* scenarios can be subsumed into a group and bounded by the worst case impacts within the "new" group. **AVOID subsuming scenarios into a group unless:** **(i) the impacts are comparable to or less than those of the remaining scenarios in that group,** **AND** **(ii) it is demonstrated that such grouping does not impact significant accident sequences.**	*(b)* scenarios can be subsumed into a group and bounded by the worst case impacts within the "new" group. **DO NOT ADD scenarios to a group and DO NOT SUBSUME scenarios into a group unless the impacts are comparable to those of the remaining scenarios in that group.**	
	NRC Issue: The action verb AVOID is ambiguous.			
	NRC Resolution: Cat II: DO NOT SUBSUME scenarios into a group…			
IF-D3a	GROUP OR SUBSUME the flood initiating scenarios with an existing plant initiating event group, if the impact of the flood (i.e., plant response and mitigating system capability) is the same as a plant initiating event group already considered in the PRA in accordance with the applicable requirements of Table 4.5.1-2(b).		DO NOT GROUP AND DO NOT SUBSUME flood initiating scenarios with other plant initiating event groups.	Cat I / II – subsuming these scenarios into existing plant initiating events will not impact the N716 application or results
IF-D4	For multi-unit sites with shared systems or structures, INCLUDE multi-unit impacts on SSCs and plant initiating events caused by internal flood scenario groups.			fundamental to all capability categories
IF-D5	DETERMINE the flood initiating event frequency for each flood scenario group by using the applicable requirements in Table 4.5.1-2(c).			fundamental to all capability categories

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-D5a	In determining the flood initiating event frequencies for flood scenario groups, USE **one of the following**: *(a)* generic operating experience *(b)* pipe, component, and tank rupture failure rates from generic data sources *(c)* **a combination of (a) or (b) above with** engineering judgment.	**GATHER plant-specific information on plant design, operating practices and conditions that may impact flood likelihood (i.e., material condition of fluid systems, experience with water hammer, and maintenance induced floods).** In determining the flood initiating event frequencies for flood scenario groups, USE **a combination of** *(a)* generic **and plant-specific** operating experience, *(b)* pipe, component, and tank rupture failure rates from generic data sources **and plant-specific** experience, **and** *(c)* engineering judgment **for consideration of the plant-specific information collected**,		Cat I - The higher capability categories require further use of plant-specific information/ engineering judgment. N716 already requires that material and fluid conditions be assessed as part of the degradation mechanism evaluation (or conservatively assume a higher failure potential as did GGNS/CNP). Water hammer and maintenance induced floods are not amenable to periodic ISI. Additionally, the CCDP values used in the delta risk evaluation would not be impacted. On the off chance that the HSS scope per section 2(a)(5) would be impacted, the delta risk evaluation of N716 would confirm any impact would be negligible or additional inspections would be required.
IF-D6	INCLUDE consideration of human-induced floods during maintenance through application of generic data.		EVALUATE plant-specific maintenance activities for potential human-induced floods using human reliability analysis techniques. NOTE: This would require consideration of errors of commission. Table 4.5.5 does not at this time provide specific requirements related to errors of commission.	Need not be met – The purpose of N716 is to develop an alternative ISI program (i.e. periodic NDE on piping). Implementation of a periodic NDE will not impact (negatively or positively) maintenance activities.

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-D7	SCREEN OUT flood scenario groups if (a) the quantitative screening criteria in IE-C4, as applied to the flood scenario groups, are met, OR (b) the internal flooding initiating event affects only components in a single system, AND it can be shown that the product of: • the frequency of the flood and • the probability of SSC failure given the flood is two orders of magnitude lower than: • the product of the non-flooding frequency for the corresponding initiating event in the PRA and • the random (non-flood-induced) failure probability of the same SSCs that are assumed failed by the flood. If the flood impacts multiple systems, DO NOT screen on this basis.			fundamental to all capability categories
IF-E1	For each flood scenario, REVIEW the accident sequences for the associated plant initiating event group to confirm applicability of the accident sequence model. If appropriate accident sequences do not exist, MODIFY sequences as necessary to account for any unique flood-induced scenarios and/or phenomena in accordance with the applicable requirements described in para. 4.5.2.			fundamental to all capability categories
IF-E2	DELETED (moved to IF-C3c)			--
IF-E3	MODIFY the systems analysis results obtained by following the applicable requirements described in para 4.5.4 to include flood-induced failures identified by IF-C3.			fundamental to all capability categories
IF-E3a	SCREEN OUT a flood area if the product of the sum of the frequencies of the flood scenarios for the area and the bounding conditional core damage probability (CCDP)is less than 10^{-9}/reactor yr. The bounding CCDP is the highest of the CCDP values for the flood scenarios in an area.		LIMIT THE USE OF quantitative screening of flood areas.	Need not be met - For purposes of N716 applications, only need to know if > 1E-06 (CDF) and >1E-07 (LERF).
IF-E4	If additional analysis of SSC data is required to support quantification of flood scenarios, PERFORM the analysis in accordance with the applicable requirements described in para. 4.5.6.			fundamental to all capability categories
IF-E5	If additional human failure events are required to support quantification of flood scenarios, PERFORM any human reliability analysis in accordance with the applicable requirements described in Tables 4.5.5-2(e) through Table 4.5.5-2(h).			fundamental to all capability categories
IF-E5a	For all human failure events in the internal flood scenarios, INCLUDE the following scenario-specific impacts on PSFs for control room and ex-control room actions as appropriate to the HRA methodology being used: *(a)* additional workload and stress (above that for similar sequences not caused by internal floods) *(b)* cue availability *(c)* effect of flood on mitigation, required response, timing, and recovery activities (e.g., accessibility restrictions, possibility of physical harm) *(d)* flooding-specific job aids and training (e.g., procedures, training exercises)			fundamental to all capability categories
IF-E6	PERFORM internal flood sequence quantification in accordance with the applicable requirements described in para. 4.5.8.			fundamental to all capability categories

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-E6a	INCLUDE, in the quantification, the combined effects of failures caused by flooding and those coincident with the flooding due to independent causes including equipment failures, unavailability due to maintenance, and other credible causes.			fundamental to all capability categories
	NRC Issue: This supporting requirement should indicate the need to adjust the definition of common-cause failure groups while doing the internal flooding analysis.			
	NRC Resolution: INCLUDE, in the quantification,… due to causes independent of the flooding including unavailability due to maintenance, common-cause failures and other credible causes.			
IF-E6b	INCLUDE, in the quantification, both the direct effects of the flood (e.g., loss of cooling from a service water train due to an associated pipe rupture) and indirect effects such as submergence, jet impingement, and pipe whip, as applicable.			fundamental to all capability categories
IF-E7	For each flood scenario, REVIEW the LERF analysis to confirm applicability of the LERF sequences. If appropriate LERF sequences do not exist, MODIFY the LERF analysis as necessary to account for any unique flood-induced scenarios or phenomena in accordance with the applicable requirements described in para. 4.5.9.			fundamental to all capability categories
IF-E8	CONDUCT walkdown(s) to verify the accuracy of information obtained from plant information sources and to obtain or verify inputs to: (a) engineering analyses (b) human reliability analyses (c) spray or other applicable impact assessments (d) screening decisions Note: Walkdown(s) may be done in conjunction with the requirements of IF-A4, IF-B3a, and IF-C9.			fundamental to all capability categories
IF-F1	DOCUMENT the internal flooding analysis in a manner that facilitates PRA applications, upgrades, and peer review.			fundamental to all capability categories

TABLE 1
ASME PRA Supporting Requirements
Internal Flooding

Supporting Requirement (SR)	Capability Category I	Capability Category II	Capability Category III	Assessment
IF-F2	DOCUMENT the process used to identify flood sources, flood areas, flood pathways, flood scenarios, and their screening, and internal flood model development and quantification. For example, this documentation typically includes: *(a)* flood sources identified in the analysis, rules used to screen out these sources, and the resulting list of sources to be further examined *(b)* flood areas used in the analysis and the reason for eliminating areas from further analysis *(c)* propagation pathways between flood areas and key assumptions, calculations, or other bases for eliminating or justifying propagation pathways *(d)* accident mitigating features and barriers credited in the analysis, the extent to which they were credited, and associated justification *(e)* key assumptions or calculations used in the determination of the impacts of submergence, spray, temperature, or other flood-induced effects on equipment operability *(f)* screening criteria used in the analysis *(g)* flooding scenarios considered, screened, and retained *(h)* description of how the internal event analysis models were modified to model these remaining internal flooding scenarios *(i)* flood frequencies, component unreliabilities/unavailabilities, and HEPs used in the analysis (i.e., the data values unique to the flooding analysis) *(j)* calculations or other analyses used to support or refine the flooding evaluation *(k)* results of the internal flooding analysis, consistent with the quantification requirements provided in HLR QU-D			fundamental to all capability categories
IF-F3	Document the key assumptions and key sources of uncertainty associated with the internal flooding analysis.			fundamental to all capability categories
	NRC Issue: All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.			
	NRC Resolution: DOCUMENT the assumptions and sources of uncertainty associated…			