Meeting Between NRC and India's Atomic Energy Regulatory Board

Regulatory Inspection and Methods Significance Determination Process

Russell Gibbs

Office of Nuclear Reactor Regulation

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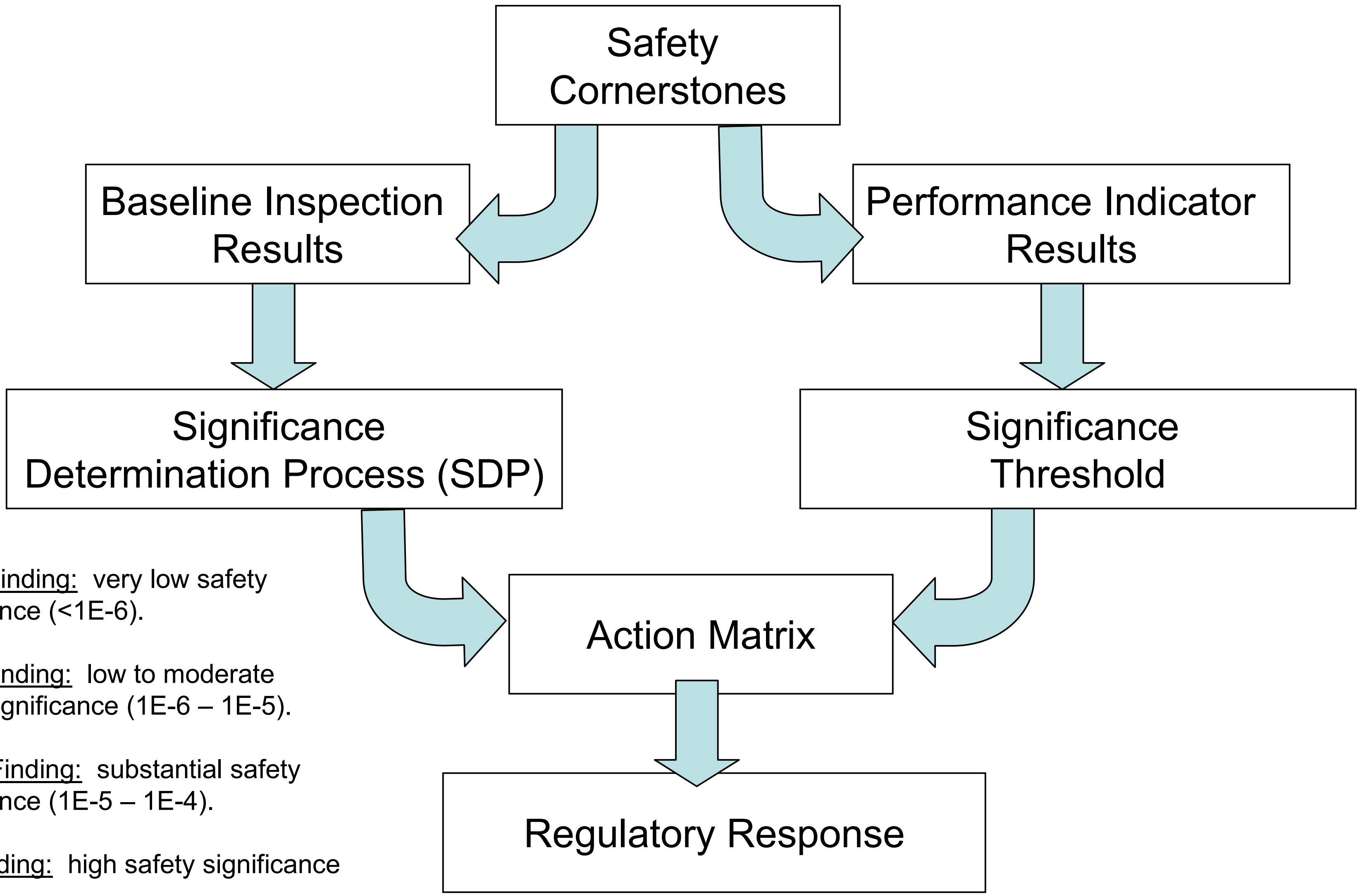
Reactor Oversight Process

Strategic Performance Areas



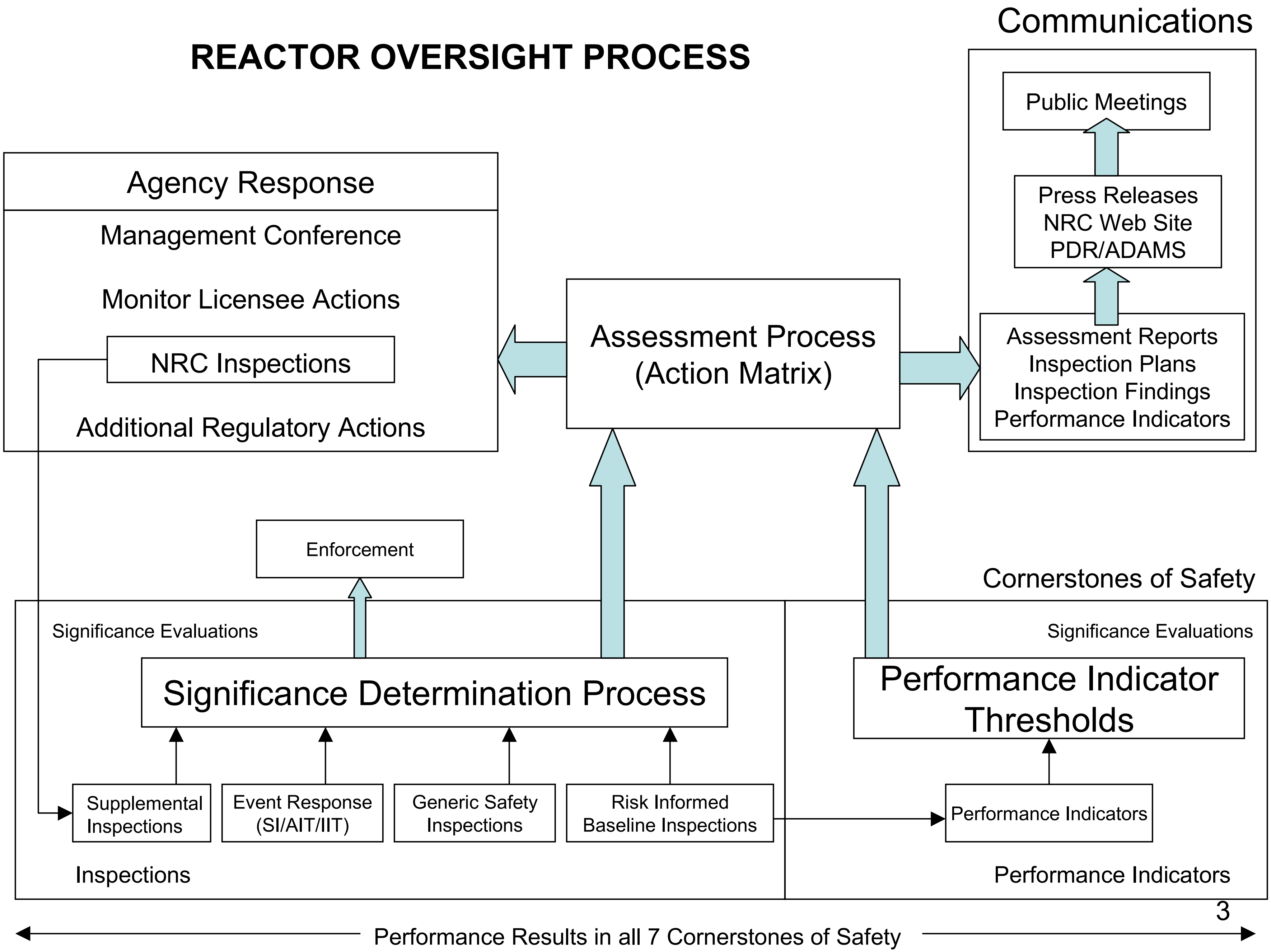
Green Finding: very low safety significance (<1E-6).

White Finding: low to moderate safety significance (1E-6 – 1E-5).

Yellow Finding: substantial safety significance (1E-5 – 1E-4).

Red Finding: high safety significance (>1E-4).

REACTOR OVERSIGHT PROCESS



Objectives of the Significance Determination Process

- Characterize the significance of inspection findings in support of the Reactor Oversight Process
- Provide a basis for assessment and enforcement actions associated with inspection findings thereby reducing subjectivity
- Provide stakeholders an objective and common framework for communicating the safety significance of inspection findings
- Provide the staff with plant specific risk information for use in risk-informing the inspection program

Significance Determination Process Overview

- Reactor Safety SDPs (mostly risk-informed)
  - At-power and shutdown findings
  - Special SDPs for emergency preparedness, fire protection, containment integrity, licensed operator requalification, steam generator tube integrity, and plant configuration control
  - Spent fuel pool/dry cask storage SDP scheduled to be issued in 2004

- Radiation Safety (deterministic)
  - Occupational Radiation Safety
  - Public Radiation Safety

- Safeguards (risk-informed)
  - Physical Protection

Significance Determination Process Risk-Informed Inspectors

- Initial and Ongoing Risk Training
- Knowledge of Facility Operations and “Healthy” Questioning Attitude
- Integration of Plant Specific Information to Risk Significance of Structure, Systems, and Components
- Knowledge of the Significance Determination Process
- Efficient Use of Risk Tools Such as Licensee Risk Information and SDP Plant Specific Risk Inspection Notebooks

Reactor Safety Significance Determination Process

- Three phase process
  - Phase 1 screens issues to Green, Phase 2, and/or Phase 3
  - Phase 2 evaluates issues using plant specific risk-informed inspection notebooks that are typically conservative yet representative of licensee PRA model
  - Phase 3 is a more detailed review using independent risk tools (e.g., SPAR models)
- Phases 1 and 2 are generally performed by inspection staff, with assistance of a Senior Reactor Analyst (SRA), where necessary.
- Phase 3 is performed by a SRA or other risk analyst.

Phase 1 SDP for At-Power Inspection Findings

- Prior to conducting a Phase 1 Screening, the performance deficiency must be of greater than minor significance.

- The Phase 1 Screening Worksheet contains decision logic to determine if the deficiency can be characterized as Green without further analysis.

- Deficiencies generally screen to Green if initiating event frequencies and total function of mitigating and containment systems are not lost.

- Some deficiencies immediately screen to Green based on their low impact to overall plant risk (e.g., radiological barrier systems such as building ventilation).

Phase 2 SDP for At-Power Inspection Findings

- Step 1- Select Initiating Event Scenarios
- Step 2 - Estimate the Initiating Event Likelihood
- Step 3 – Determine the Remaining Mitigation Capability
- Step 4 - Estimate Risk Significance of Inspection Finding
- Step 5 – Screen for External Event Contribution
- Step 6 – Screen for Large Early Release Frequency (LERF) significance

Phase 2 SDP for At-Power Inspection Findings

Step 1 - Select Initiating Event Scenarios

- Enter Table 2, with the equipment or safety function that was assumed to be impacted by the inspection finding. Finding is loss of one high head safety injection pump.

- Determine the initiating event worksheets that must be evaluated.

Table 2 Initiators and System Dependency for Generic PWR Nuclear Power Plant

Affected Systems	Major Components	Support Systems	Initiating Event Scenarios
Engineered Safeguards Features Actuation System (ESFAS)	Three actuation trains, each with a load sequencer	120V vital AC, DC	All
Essential Cooling Water System (ECWS)	Three trains, each with one pump	4.16-kV, 480V (for MOVs), DC, ESFAS	All
High Head Safety Injection (HHSI) System	Two pumps (800 gpm @1275 psi, shutoff head = 1650 psid)	4.16-kV, 480V, DC, ESFAS, SI pump room cooling(8)	**All except LLOCA, ATWS, LODC**
Instrument Air (IA)	Two IA compressors (per unit). Back up is two station air compressors	Offsite power, BOP diesel(5)	LOIA
Low Head Safety Injection (LHSI) System	Three pumps	4.16-kV, 480V, DC, ESFAS, SI pump room cooling(8)	All except ATWS, LCCW, LODC
Main Steam Isolation System	For each steam generator: one MSIV [FW isolation and Control Valves (10)]	Offsite power and IA, DC, ESFAS	SGTR, MSLB
	For each steam generator: one PORV	480V, DC, 120V vital AC	All except LLOCA, and MLOCA
	For each steam generator: five safety relief valves	None	TPCS, LOOP, ATWS, LEAC

Phase 2 SDP for At-Power Inspection Findings

Step 2 - Estimate the Initiating Event Likelihood

- Enter Table 1 with exposure time associated with the finding. Assume > 30 days.

- Determine the initiating event likelihood (IEL) for each initiating event identified in Step 1.

- If the finding increases the likelihood of an initiating event, increase the IEL value in accordance with the SDP usage rules.

Table 1 - Categories of Initiating Events for Generic PWR Nuclear Power Plant

Row	Approximate Frequency	Example Event Type	Initiating Event Likelihood (IEL)		
I	> 1 per 1-10 yr	Loss of Power Conversion System (TPCS)	1	2	3
II	1 per 10-10^2 yr	Loss of offsite power (LOOP), Loss of Class 1E 125V DC Bus A or B (LODC)	2	3	4
III	1 per 10^2 - 10^3 yr	Steam Generator Tube Rupture (SGTR), Stuck open PORV/SRV (SORV), Small LOCA including RCP seal failures (SLOCA), Main Steam Line Break Outside Containment (MSLB)	3	4	5
IV	1 per 10^3 - 10^4 yr	Medium LOCA (MLOCA), LOOP with Loss of One Class 1E 4.16-kV Bus (LEAC)	4	5	6
V	1 per 10^4 - 10^5 yr	Large LOCA (LLOCA), Loss of Component Cooling Water (LCCW)	5	6	7
VI	less than 1 per 10^5 yr	ATWS[1)]	6	7	8
			>30 days	3-30 days	<3 days
			Exposure Time for Degraded Condition		

Phase 2 SDP for At-Power Inspection Findings

Step 3 - Estimate the Remaining Mitigation Capability

- For each inspection notebook worksheet identified in Step 1, determine which safety functions impacted by inspection finding.

- Circle affected functions within associated sequences on each worksheet that contain one or more of affected safety functions

- If the inspection finding increases the likelihood of an initiating event, circle all sequences on the worksheet for that particular event.

Table 3.1 SDP Worksheet for Generic PWR Nuclear Power Plant — Transients with Loss of PCS (TPCS) (1)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) with (1/1 SG PORV or 1/5 safety relief valves) per SG that is fed by AFW
High Pressure Injection for FB (EIHP)	**1/2 HHSI pumps (1 multi-train system)**
Primary Heat Removal, Feed/Bleed (FB)	2/2 pressurizer PORVs open for Feed/Bleed (operator action = 2) (2)
High Pressure Recirculation (LPR)	1/3 LHSI trains and with associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow aligned to CCW (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 TPCS - AFW - LPR (3) 1 + 4 + 3	8				
2 TPCS - AFW - FB (4) 1 + 4 + 2	7				
3 TPCS - AFW - **EIHP** (5) 1 + 4 + 3	8	1	4 + 2(indicates single train credit)	1	8

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve.

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Phase 2 SDP for At-Power Inspection Findings

Step 3 – Estimate Remaining Mitigation Capability (Cont.)

– Enter Table 5, “Remaining Mitigation Capability Credit,” and determine the remaining mitigation capability credit for each of the functions affected.

-Determine if an operator could recover the affected function in time to mitigate the assumed initiating event. If the criteria for recovery credit are met, enter a recovery credit of 1.

Type of Remaining Mitigation Capability	Remaining Mitigation Capability Credit X = - $\log_{10}$(failure prob)
Recovery of Failed Train Operator action to recover failed equipment that is capable of being recovered after an initiating event occurs. Action may take place either in the control room or outside the control room and is assumed to have a failure probability of approximately 0.1 when credited as “Remaining Mitigation Capability.” Credit should be given only if the following criteria are satisfied: (1) sufficient time is available; (2) environmental conditions allow access, where needed; (3) procedures describing the appropriate operator actions exist; (4) training is conducted on the existing procedures under similar conditions; and (5) any equipment needed to perform these actions is available and ready for use.	1
1 Automatic Steam-Driven (ASD) Train A collection of associated equipment that includes a single turbine-driven component to provide 100% of a specified safety function. The probability of such a train being unavailable due to failure, test, or maintenance is assumed to be approximately 0.1 when credited as “Remaining Mitigation Capability.”	1
1 Train A collection of associated equipment (e.g., pumps, valves, breakers, etc.) that together can provide 100% of a specified safety function. The probability of this equipment being unavailable due to failure, test, or maintenance is approximately 1E-2 when credited as “Remaining Mitigation Capability.”	2
1 Multi-Train System A system comprised of two or more trains (as defined above) that are considered susceptible to common cause failure modes. The probability of this equipment being unavailable due to failure, test, or maintenance is approximately 1E-3 when credited as “Remaining Mitigation Capability,” regardless of how many trains comprise the system.	3
2 Diverse Trains A system comprised of two trains (as defined above) that are not considered to be susceptible to common cause failure modes. The probability of this equipment being unavailable due to failure, test, or maintenance is approximately 1E-4 when credited as “Remaining Mitigation Capability.”	4 (=2+2)
Operator Action Credit Major actions performed by operators during accident scenarios (e.g., primary heat removal using bleed and feed, etc.). These actions are credited using three categories of human error probabilities (HEPs). These categories are Operator Action = 1 which represents a failure probability between 5E-2 and 0.5, Operator Action = 2 which represents a failure probability between 5E-3 and 5E-2, and Operator Action = 3 which represents a failure probability between 5E-4 and 5E-3.	1, 2, or 3

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Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) with (1/1 SG PORV or 1/5 safety relief valves) per SG that is fed by AFW
High Pressure Injection for FB (EIHP)	**1/2 HHSI pumps (1 multi-train system)**
Primary Heat Removal, Feed/Bleed (FB)	2/2 pressurizer PORVs open for Feed/Bleed (operator action = 2) (2)
High Pressure Recirculation (LPR)	1/3 LHSI trains and with associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow aligned to CCW (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 TPCS - AFW - LPR (3) 1 + 4 + 3	8				
2 TPCS - AFW - FB (4) 1 + 4 + 2	7				
3 TPCS - AFW - **EIHP** (5) 1 + 4 + 3	8	**1**	**4 + 2(indicates single train credit)**	**1**	**8**

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve.

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Phase 2 SDP for At-Power Inspection Findings

- **Step 4 – Estimate Risk Significance of the Inspection Finding**
  - Determine the sequence risk significance for each of the sequences circled in Step 3.
  - Complete "Counting Rule Worksheet." The result is the risk significance of the inspection finding based on the internal initiating events that lead to core damage.

Counting Rule Worksheet

Counting Rule Worksheet

Step	Instructions		
(1)	Enter the number of sequences with a risk significance equal to 9.	(1)	5
(2)	Divide the result of Step (1) by 3 and round down.	(2)	1
(3)	Enter the number of sequences with a risk significance equal to 8.	(3)	7
(4)	Add the result of Step (3) to the result of Step (2).	(4)	8
(5)	Divide the result of Step (4) by 3 and round down.	(5)	2
(6)	Enter the number of sequences with a risk significance equal to 7.	(6)	1
(7)	Add the result of Step (6) to the result of Step (5).	(7)	3
(8)	Divide the result of Step (7) by 3 and round down.	(8)	1
(9)	Enter the number of sequences with a risk significance equal to 6.	(9)	1
(10)	Add the result of Step (9) to the result of Step (8).	(10)	2
(11)	Divide the result of Step (10) by 3 and round down.	(11)	0
(12)	Enter the number of sequences with a risk significance equal to 5.	(12)	1
(13)	Add the result of Step (12) to the result of Step (11).	(13)	1
(14)	Divide the result of Step (13) by 3 and round down.	(14)	0
(15)	Enter the number of sequences with a risk significance equal to 4.	(15)	0
(16)	Add the result of Step (15) to the result of Step (14).	(16)	0

- If the result of Step 16 is greater than zero, then the risk significance of the inspection finding is of high safety significance (RED).
- If the result of Step 13 is greater than zero, then the risk significance of the inspection finding is at least of substantial safety significance (YELLOW).
- If the result of Step 10 is greater than zero, then the risk significance of the inspection finding is at least of low to moderate safety significance (WHITE).
- If the result of Steps 10, 13, and 16 are zero, then the risk significance of the inspection finding is of very low safety significance (GREEN).

Phase 2 Result: ☐ GREEN ☐ WHITE ■ YELLOW ☐ RED

- Adding all affected sequences from all affected initiating events is five 9's, seven 8's, one 7, one 6, and one 5. Total risk is 1E-5 (Yellow).

Phase 2 SDP for At-Power Inspection Findings

Step 5 – Screen for Potential Risk Contribution due to External Initiating Events

- The plant-specific SDP Phase 2 worksheets do not currently include external initiating events contribution (e.g., fire, seismic).

- If the phase 2 SDP result for an inspection finding represents an increase in risk of greater or equal to 1E-7 per year, then an SRA or other NRC risk analyst performs an analysis to estimate the increase in risk due to external initiators.

Phase 2 SDP for At-Power Inspection Findings

- **Step 6 – Screen for Potential Risk Contribution due to Large Early Release Frequency (LERF)**
  - If any of the sequence results are greater than or equal to 1E-7 per year <u>and</u> involve any of the sequence types listed below, then the finding is screened for LERF contribution using IMC 0609, Appendix H.
    - ISLOCA, transients (includes SBO scenarios), or small LOCAs for all reactor containment types
    - ATWS for BWR Mark I and II reactor containment types
    - SGTRs for all PWR reactor containment types

Phase 3 SDP

- **Risk Significance Estimation Using Risk Basis That Departs from the Phase 1 or 2 Process**

  -If necessary, Phase 3 will refine or modify, with sufficient justification, the earlier screening results from Phases 1 and 2.

  -In addition, Phase 3 will address findings that cannot be evaluated using the Phase 2 process (e.g., external event contributors).

  -Phase 3 analysis will use appropriate PRA techniques and rely on the expertise of NRC risk analysts.

Phase 3 SDP

A Phase 3 analysis includes the following:

- Phase 1 and 2 results
- PRA tools used for the Phase 3 assessment
- Affected accident sequences
- Influential assumptions
- Sensitivity of results to each assumption
- Contributions of greatest uncertainty factors

Risk effects of Large Early Release Frequency, internal flooding and external events are also evaluated.

Phase 3 analysis is documented in a Significance and Enforcement Review Panel (SERP) package and presented to SERP members for a preliminary decision.

SERP Process

Preliminary SERP decision presented to licensee in a "Choice" letter

-Licensee has choice to respond by letter or attend a Regulatory Conference

-Licensee may accept preliminary result

If preliminary result is changed due to new information or insights, SERP reconvenes and determines final significance of finding

- final significance letter sent to licensee describing finding and regulatory significance

SDP Challenges

- Improve SDP timeliness goal of < 90 days – use of <u>best available information</u> for decision-making
- Complete the Phase 2 notebook benchmarking efforts
- Level of risk knowledge needed for risk-informed inspectors
- Improve the Phase 3 SDP risk analysis tools and guidance – Risk Assessment Standardization Program (RASP)

Significance Determination Process for At-Power Inspection Findings

Three Example Exercises

Phase 2 Exercise #1

- While performing a complete system walkdown of the high head safety injection (HHSI) system, an inspector identified that a normally locked open manual valve in the discharge flow path of one train was closed.
- The valve position for this valve was not indicated in the control room. This valve was also not in the flow path during quarterly surveillance testing of the system.

Phase 2 Exercise #1 Cont.

- It was subsequently determined that the valve had been out of position since maintenance was last performed on the system ten months prior.
- The inspectors determined that the criteria for crediting operator recovery of the HHSI train were satisfied and that credit for recovery of the train was appropriate.
- The generic PWR risk-informed inspection notebook will be used for this exercise.

Table 2 Initiators and System Dependency for Generic PWR Nuclear Power Plant

Affected Systems	Major Components	Support Systems	Initiating Event Scenarios
Engineered Safeguards Features Actuation System (ESFAS)	Three actuation trains, each with a load sequencer	120V vital AC, DC	All
Essential Cooling Water System (ECWS)	Three trains, each with one pump	4.16-kV, 480V (for MOVs), DC, ESFAS	All
High Head Safety Injection (HHSI) System	Two pumps (800 gpm @1275 psi, shutoff head = 1650 psid)	4.16-kV, 480V, DC, ESFAS, SI pump room cooling (8)	**All except LLOCA, ATWS, LODC**
Instrument Air (IA)	Two IA compressors (per unit). Back up is two station air compressors	Offsite power, BOP diesel (5)	LOIA
Low Head Safety Injection (LHSI) System	Three pumps	4.16-kV, 480V, DC, ESFAS, SI pump room cooling (8)	All except ATWS, LCCW, LODC
Main Steam Isolation System	For each steam generator: one MSIV [FW isolation and Control Valves (10)]	Offsite power and IA, DC, ESFAS	SGTR, MSLB
	For each steam generator: one PORV	480V, DC, 120V vital AC	All except LLOCA, and MLOCA
	For each steam generator: five safety relief valves	None	TPCS, LOOP, ATWS, LEAC

Table 1 - Categories of Initiating Events for Generic PWR Nuclear Power Plant

Row	Approximate Frequency	Example Event Type	Initiating Event Likelihood (IEL)		
I	> 1 per 1-10 yr	Loss of Power Conversion System (TPCS)	1	2	3
II	1 per 10-10^2 yr	Loss of offsite power (LOOP), Loss of Class 1E 125V DC Bus A or B (LODC)	2	3	4
III	1 per 10^2 - 10^3 yr	Steam Generator Tube Rupture (SGTR), Stuck open PORV/SRV (SORV), Small LOCA including RCP seal failures (SLOCA), Main Steam Line Break Outside Containment (MSLB)	3	4	5
IV	1 per 10^3 - 10^4 yr	Medium LOCA (MLOCA), LOOP with Loss of One Class 1E 4.16-kV Bus (LEAC)	4	5	6
V	1 per 10^4 - 10^5 yr	Large LOCA (LLOCA), Loss of Component Cooling Water (LCCW)	5	6	7
VI	less than 1 per 10^5 yr	ATWS[1)]	6	7	8
			> 30 days	3-30 days	< 3 days
			Exposure Time for Degraded Condition		

Table 3.1 SDP Worksheet for Generic PWR Nuclear Power Plant — Transients with Loss of PCS (TPCS) (1)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) with (1/1 SG PORV or 1/5 safety relief valves) per SG that is fed by AFW
High Pressure Injection for FB (EIHP)	**1/2 HHSI pumps (1 multi-train system)**
Primary Heat Removal, Feed/Bleed (FB)	2/2 pressurizer PORVs open for Feed/Bleed (operator action = 2) (2)
High Pressure Recirculation (LPR)	1/3 LHSI trains and with associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow aligned to CCW (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 TPCS - AFW - LPR (3) 1 + 4 + 3	8				
2 TPCS - AFW - FB (4) 1 + 4 + 2	7				
3 TPCS - AFW - **EIHP** (5) 1 + 4 + 3	8	**1**	**4 + 2(indicates single train credit)**	**1**	**8**

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve.

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Table 3.2 SDP Worksheet for Generic PWR Nuclear Power Plant — Small LOCA (SLOCA)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Early Inventory, HP Injection (EIHP)	**1/2 HHSI pumps (1 multi-train system)**
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train)
Primary Heat Removal, Feed/Bleed (FB)	2/2 PORVs open for Feed/Bleed (operator action = 2)
Low Pressure Injection (LPI)	1/3 LHSI pumps (1 multi-train system)
Low Pressure Recirculation (LPR)	1/3 LHSI pumps with associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow from CCW (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 SLOCA - LPR (2,4,7) 3 + 3	6				
2 SLOCA - AFW - FB (5) 3 + 4 + 2	9				
3 SLOCA - **EIHP** (8) 3 + 3	6	3	2	1	6

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Table 3.3 SDP Worksheet for Generic PWR Nuclear Power Plant — Stuck Open PORV (SORV)[1]

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Isolation of Small LOCA (BLK)	The closure of the block valve associated with stuck open PORV (operator action = 2) [2]
Early Inventory, HP Injection (EIHP)	**1/2 HHSI pumps (1 multi-train system)**
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train)
Primary Heat Removal, Feed/Bleed (FB)	1/1 remaining PORVs open for Feed/Bleed (operator action = 2)
Low Pressure Injection (LPI)	1/3 LHSI pumps (1 multi-train system)
Low Pressure Recirculation (LPR)	1/3 LHSI pumps with associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow from CCW (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 SORV - BLK - LPR (2, 4, 7) 3 + 2 + 3	8				
2 SORV - BLK - AFW - FB (5) 3 + 2 + 4 + 2	11				
3 SORV - BLK - **EIHP** (8) 3 + 2 + 3	8	3	2 + 2	1	8

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Table 3.4 SDP Worksheet for Generic PWR Nuclear Power Plant — Medium LOCA (MLOCA)

Safety Functions Needed:		Full Creditable Mitigation Capability for Each Safety Function:			
Early Inventory, HP Injection (EIHP) Low Pressure Injection (LPI) Low Pressure Recirculation (LPR)		**1 remaining HHSI train (1 single train system)** ½ remaining LHSI trains (1 multi-train system) ½ remaining LHSI trains with associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow from CCW (1 multi-train system)			
Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 MLOCA - LPR (2) 4 + 3	7				
2 MLOCA - LPI (3) 4 + 3	7				
3 MLOCA - **EIHP** (4) 4 + 2	6	4	0	1	5

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Table 3.6 SDP Worksheet for Generic PWR Nuclear Power Plant — Loss of Offsite Power (LOOP)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Emergency AC Power (EAC)	1/3 Standby Diesel Generators (1 multi-train system)
Secondary Heat Removal (TDAFW)	1/1 TDAFW pump (1 ASD train) with 1/ 5 safety relief valves per SG that is fed by AFW
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train)
Recovery of AC Power in < 2 hrs (REC2)	Recovery of AC power (operator action = 1) [1]
Recovery of AC power in < 5 hrs (REC5)	Recovery of AC power (operator action = 2) [3,4]
Early Inventory, HP Injection (EIHP)	**1/2 HHSI pumps (1 multi-train system)**
Primary Heat Removal, Feed/Bleed (FB)	2/2 pressurizer PORVs open for Feed/Bleed (operator action = 2)
Low Pressure Recirculation (LPR)	1/3 LHSI trains and with the associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow aligned to CCW (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 LOOP - AFW - LPR (3) 2 + 4 + 3	9				
2 LOOP - AFW - FB (4) 2 + 4 + 2	8				
3 LOOP - AFW - **EIHP** (5) 2 + 4 + 3	9	2	4 + 2	1	9
4 LOOP - EAC - LPR (7, 11) 2 + 3 + 3 (AC Recovered)	8				
5 LOOP - EAC - **EIHP** (8, 13) 2 + 3 + 3	8	2	3 + 2	1	8
6 LOOP - EAC - REC5 (9) 2 + 3 + 2	7				
7 LOOP - EAC - TDAFW - FB (12) 2 + 3 + 1 + 2 (AC Recovered)	8				
8 LOOP - EAC - TDAFW - REC2 (14) 2 + 3 + 1 + 1	7				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Table 3.7 SDP Worksheet for Generic PWR Nuclear Power Plant — Steam Generator Tube Rupture (SGTR) (1)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system) (2)
Early Inventory, HP Injection (EIHP)	**1/2 HHSI pumps (1 multi-train system)**
Primary Heat Removal, Feed/Bleed (FB)	2/2 pressurizer PORVs open for Feed/Bleed (operator action = 2)
Pressure Equalization (EQ)	Operator depressurizes RCS to less than setpoint of relief valve of SG using 1/3 pressurizer spray valves or 2/2 pressurizer PORVs (operator action = 2)
Isolation of Faulted SG (ISOL)	Operator isolates the faulted SG by closing 1/1 MSIV and associated Feedwater Isolation Valve (operator action = 2)
Cooldown and depressurization (DEPR)	Operator cools down and depressurizes the RCS using 1/4 SG PORVs or ½ pressurizer PORVs (operator action = 2)
Low Pressure Recirculation (LPR)	1/3 LHSI trains and with the associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow aligned to CCW (1 multi-train system)
Low Pressure Injection (SDC)	1/3 RHR trains (pumps & HXs) and ½ charging pumps (operator action = 3) (3)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 SGTR - EQ - ISOL (3) 3 + 2 + 2	7				
2 SGTR - **EIHP** - SDC (5) 3 + 3 + 3	9	3	2 + 3	1	9
3 SGTR - **EIHP** - DEPR (6) 3 + 3 + 2	8	3	2 + 2	1	8
4 SGTR - **EIHP** - EQ (7) 3 + 3 + 2	8	3	2 + 2	1	8
5 SGTR - AFW - LPR (9) 3 + 3 + 3	9				
6 SGTR - AFW - ISOL (10) 3 + 3 + 2	8				
7 SGTR - AFW - FB (11) 3 + 3 + 2	8				
8 SGTR - AFW - **EIHP** (12) 3 + 3 + 3	9	3	3 + 2	1	9

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Table 3.9 SDP Worksheet for Generic PWR Nuclear Power Plant — Main Steam Line Break Outside Containment (MSLB)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
MSLB Isolated (MSIV)(1)	3/4 MSIVs close [failure means at least 2 MSIVs failed] (1 multi-train)
High Pressure Injection (EIHP)	**1/2 HHSI pumps (1 multi-train system)**
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system)
Feedwater valves close (FWVC)	Isolation of the feed to the SG whose MSIV did not close by auto trip of MFW pumps or isolation of MFW line, and operators close the valves feeding the SG from AFW, or trip of the AFW pump (operator action =2) (2)
Stop Injection (STIN)	Operators stop high pressure injection (operator action = 1) (3)
Primary Heat Removal, Feed/Bleed (FB)	2/2 pressurizer PORVs open for Feed/Bleed (operator action = 2)
High Pressure Recirculation (LPR)	1/3 LHSI pumps and with the associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow aligned to CCW (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 MSLB - FWVC - STIN (3) 3 + 2 + 1	6				
2 MSLB - AFW - LPR (5) 3 + 3 + 3	9				
3 MSLB - AFW - FB (6) 3 + 3 + 2	8				
4 MSLB - **EIHP** - FWVC (8) 3 + 3 + 2	8	**3**	**2 + 2**	**1**	**8**
5 MSLB - **EIHP** - AFW (9) 3 + 3 + 3	9	**3**	**2 + 3**	**1**	**9**
6 MSLB - MSIV (10) 3 + 3	6				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Table 3.10 SDP Worksheet for Generic PWR Nuclear Power Plant — Loss of Component Cooling Water (LCCW) (1)

Safety Functions Needed:		Full Creditable Mitigation Capability for Each Safety Function:			
RCP Trip (RCP) Seal Injection using PDP (PDP) **High Pressure Injection (EIHP)** Secondary Heat Removal (AFW)		Operator trips the RCPs to prevent a seal LOCA (operator action = 2) (2) Operator starts PDP for seal injection (operator action = 2) (2) **1/2 HHSI trains (1 multi-train system)** 1/3 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train)			
Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 LCCW - AFW (2) 5 + 4	9				
2 LCCW – **EIHP** (3) 5 + 3	8	5	2	1	8
3 LCCW - RCP (4) 5 + 2	7				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Table 3.12 SDP Worksheet for Generic PWR Nuclear Power Plant — LOOP and Loss of One Class 1E 4.16-kV Bus (LEAC)(1)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
PORV Recloses (PORV)	2/2 Pressurizer PORVs reclose after opening during transient (1 train)
Secondary Heat Removal (AFW)	½ MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) with 1/5 safety relief valve per SG that is fed by AFW
High Pressure Injection for FB (EIHP)	1 HHSI pump (1 train)
Primary Heat Removal, Feed/Bleed (FB)	2/2 pressurizer PORVs open for Feed/Bleed (operator action = 2)
Low Pressure Recirculation (LPR)	½ LHSI pumps with (associated ½ RHR heat exchangers or 2/4 RCFCs with cooling flow aligned to CCW) (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 LEAC - AFW - LPR (3) 4 + 4 + 3	11				
2 LEAC - AFW - FB (4) 4 + 4 + 2	10				
3 LEAC - AFW - EIHP (5) 4 + 4 + 2	10	4	4 + 0	1	9
4 LEAC - PORV - LPR (7) 4 + 2 + 3	9				
5 LEAC - PORV - EIHP (8) 4 + 2 + 2	8	4	2 +0	1	7
6 LEAC - PORV - AFW (9) 4 + 2 + 4	10				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

Operator open manual valve

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Counting Rule Worksheet			
Step	**Instructions**		
(1)	Enter the number of sequences with a risk significance equal to 9.	(1)	5
(2)	Divide the result of Step (1) by 3 and round down.	(2)	1
(3)	Enter the number of sequences with a risk significance equal to 8.	(3)	7
(4)	Add the result of Step (3) to the result of Step (2).	(4)	8
(5)	Divide the result of Step (4) by 3 and round down.	(5)	2
(6)	Enter the number of sequences with a risk significance equal to 7.	(6)	1
(7)	Add the result of Step (6) to the result of Step (5).	(7)	3
(8)	Divide the result of Step (7) by 3 and round down.	(8)	1
(9)	Enter the number of sequences with a risk significance equal to 6.	(9)	1
(10)	Add the result of Step (9) to the result of Step (8).	(10)	2
(11)	Divide the result of Step (10) by 3 and round down.	(11)	0
(12)	Enter the number of sequences with a risk significance equal to 5.	(12)	1
(13)	Add the result of Step (12) to the result of Step (11).	(13)	1
(14)	Divide the result of Step (13) by 3 and round down.	(14)	0
(15)	Enter the number of sequences with a risk significance equal to 4.	(15)	0
(16)	Add the result of Step (15) to the result of Step (14).	(16)	0

- If the result of Step 16 is greater than zero, then the risk significance of the inspection finding is of high safety significance (RED).
- If the result of Step 13 is greater than zero, then the risk significance of the inspection finding is at least of substantial safety significance (YELLOW).
- If the result of Step 10 is greater than zero, then the risk significance of the inspection finding is at least of low to moderate safety significance (WHITE).
- If the result of Steps 10, 13, and 16 are zero, then the risk significance of the inspection finding is of very low safety significance (GREEN).

Phase 2 Result: ☐ **GREEN** ☐ **WHITE** ■ **YELLOW** ☐ **RED**

Phase 2 Exercise #2

- Consider a hypothetical inspection finding that involves the failure of the licensee to identify a 180 degree circumferential crack on a weld on a 2 inch line connected to the reactor coolant system.
- Evidence of the crack remained unidentified for four months.
- The inspectors determined that a small loss of coolant accident would result if this weld failed.

Phase 2 Exercise #2 Cont.

- Assume that recovery credit is <u>not</u> appropriate for the circumstances surrounding this hypothetical finding.
- The generic PWR risk-informed inspection notebook will be used for this exercise.

Notebook Usage Rule

Finding (Not Involving a Support System) that Increases the Likelihood of an IE

If the amount of increase in the frequency of the initiating event due to the inspection finding is not known, increase the IEL for the applicable initiating event by one order of magnitude. If specific information exists that indicates the IEL should be increased by more than one order of magnitude, consult with the regional SRA to determine the appropriate IEL.

Table 1 - Categories of Initiating Events for Generic PWR Nuclear Power Plant

Row	Approximate Frequency	Example Event Type	Initiating Event Likelihood (IEL)		
I	> 1 per 1-10 yr	Loss of Power Conversion System (TPCS)	1	2	3
II	1 per 10-10^2 yr	Loss of offsite power (LOOP), Loss of Class 1E 125V DC Bus A or B (LODC)	2	3	4
III	1 per 10^2 - 10^3 yr	Steam Generator Tube Rupture (SGTR), Stuck open PORV/SRV (SORV), Small LOCA including RCP seal failures (SLOCA), Main Steam Line Break Outside Containment (MSLB)	3	4	5
IV	1 per 10^3 - 10^4 yr	Medium LOCA (MLOCA), LOOP with Loss of One Class 1E 4.16-kV Bus (LEAC)	4	5	6
V	1 per 10^4 - 10^5 yr	Large LOCA (LLOCA), Loss of Component Cooling Water (LCCW)	5	6	7
VI	less than 1 per 10^5 yr	ATWS[(1)]	6	7	8
			> 30 days	3-30 days	< 3 days
			Exposure Time for Degraded Condition		

Notes:

Table 3.2 SDP Worksheet for Generic PWR Nuclear Power Plant — Small LOCA (SLOCA)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Early Inventory, HP Injection (EIHP)	1/3 HHSI pumps (1 multi-train system)
Secondary Heat Removal (AFW)	1/3 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train)
Primary Heat Removal, Feed/Bleed (FB)	2/2 PORVs open for Feed/Bleed (operator action = 2)
Low Pressure Injection (LPI)	1/3 LHSI pumps (1 multi-train system)
Low Pressure Recirculation (LPR)	1/3 LHSI pumps with associated 1/3 RHR heat exchangers or 2/6 RCFCs with cooling flow from CCW (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 **SLOCA - LPR** (2,4,7) **3 + 3**	**6**	**2**	**3**	**0**	**5**
2 **SLOCA - AFW - FB** (5) **3 + 4 + 2**	**9**	**2**	**4 + 2**	**0**	**8**
3 **SLOCA - EIHP** (8) **3 + 3**	**6**	**2**	**3**	**0**	**5**

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Counting Rule Worksheet

Step	Instructions		
(1)	Enter the number of sequences with a risk significance equal to 9.	(1)	0
(2)	Divide the result of Step (1) by 3 and round down.	(2)	**0**
(3)	Enter the number of sequences with a risk significance equal to 8.	(3)	**1**
(4)	Add the result of Step (3) to the result of Step (2).	(4)	**1**
(5)	Divide the result of Step (4) by 3 and round down.	(5)	**0**
(6)	Enter the number of sequences with a risk significance equal to 7.	(6)	**0**
(7)	Add the result of Step (6) to the result of Step (5).	(7)	**0**
(8)	Divide the result of Step (7) by 3 and round down.	(8)	**0**
(9)	Enter the number of sequences with a risk significance equal to 6.	(9)	0
(10)	Add the result of Step (9) to the result of Step (8).	(10)	**0**
(11)	Divide the result of Step (10) by 3 and round down.	(11)	**0**
(12)	Enter the number of sequences with a risk significance equal to 5.	(12)	**2**
(13)	Add the result of Step (12) to the result of Step (11).	(13)	**2**
(14)	Divide the result of Step (13) by 3 and round down.	(14)	**0**
(15)	Enter the number of sequences with a risk significance equal to 4.	(15)	**0**
(16)	Add the result of Step (15) to the result of Step (14).	(16)	**0**

- If the result of Step 16 is greater than zero, then the risk significance of the inspection finding is of high safety significance (RED).
- If the result of Step 13 is greater than zero, then the risk significance of the inspection finding is at least of substantial safety significance (YELLOW).
- If the result of Step 10 is greater than zero, then the risk significance of the inspection finding is at least of low to moderate safety significance (WHITE).
- If the result of Steps 10, 13, and 16 are zero, then the risk significance of the inspection finding is of very low safety significance (GREEN).

Phase 2 Result: ☐ GREEN ☐ WHITE ■ **YELLOW** ☐ **RED**

Phase 2 Exercise #3

- The “A” instrument air (IA) compressor seized shortly after it was started for periodic rotation of the operating equipment.
- It was subsequently determined that the compressor seized because of improperly performed preventive maintenance which had been conducted two days prior.
- The IA system is a normally cross-tied support system.

Phase 2 Exercise #3 Cont.

- The inspectors determined that the criteria for crediting operator recovery of the IA compressor were not satisfied and that credit for recovery of the compressor was not appropriate.
- Use the generic BWR risk-informed inspection notebook for this exercise.

Notebook Usage Rule

Finding (Normally Cross-tied Support System) that Increases the Likelihood of an IE

For inspection findings that involve the unavailability of one train of a multi-train, normally cross-tied support system that increases the likelihood of an initiating event, increase the IEL by one order of magnitude for the associated special initiator.

Table 2 Initiators and System Dependency for Generic BWR Nuclear Power Plant

Affected System		Major Components	Support Systems	Initiating Event Scenarios
Code	Name			
DGCW	Diesel generator Cooling Water	Pumps	480 V-AC	All
SW	Service water	5 pumps in Unit 1/ 2 Crib house; shared system supplying a common header	4160 V-AC, 125 V-DC, IA	LOSW
TBCCW	Turbine Building Closed Cooling Water System	2 pumps, 2 HXs, an expansion tank	SW, IA, 4160 V-AC	TRAN, TPCS, SLOCA, IORV, LOOP, ATWS
HPCI	High Pressure Coolant Injection	1 TDP, MOV	125 V-DC, 250 V-DC, Room HVAC	All except LLOCA, LOSW
LPCS	Low Pressure Core Spray	2 Trains or Loops; 1 LPCS pump per train	4160 V-AC, 480 V-AC, 125 V-DC, SW, Pump Room HVAC	All except LOSW
RCIC	Reactor Core Isolation Cooling	1 TDP, MOV	125 V-DC, Room HVAC	All except LLOCA, MLOCA
FPS	Fire Protection System	2 diesel fire pumps, MOV	120V AC, SW, 24V Nickel-cadmium batteries	LOSW, LOIA
CRD	Control Rod Drive Hydraulic System	2 MDP, MOV	Non-emergency ESF AC Buses, TBCCW	TRAN, TPCS, SLOCA, IORV, LOOP, ATWS
IA	**Instrument Air**	2 compressors for each unit plus a shared compressor supplying both units	SW, 480V AC	**LOIA**
SLC	Standby Liquid Control	2 MDP, 2 explosive valves	480 V-AC, 125 V-DC	ATWS
Room HVAC			DGCW	All

Table 1 - Categories of Initiating Events for Generic BWR Nuclear Power Plant

Row	Approximate Frequency	Example Event Type	Initiating Event Likelihood (IEL)		
I	> 1 per 1-10 yr	Transient (Reactor Trip) (TRAN), Loss of Power Conversion System (Loss of condenser, Closure of MSIVs, Loss of feedwater) (TPCS)	1	2	3
II	1 per 10-10^2 yr	Loss of offsite power (LOOP), Inadvertent or stuck open SRVs (IORV), Loss of Instrument Air **(LOIA)**	2	3	4
III	1 per 10^2 - 10^3 yr	Loss of Service Water (LOSW), Loss of an AC Bus (LOAC)	3	4	5
IV	1 per 10^3 - 10^4 yr	Small LOCA (RCS rupture) (SLOCA), Medium LOCA (RCS rupture) (MLOCA)	4	5	6
V	1 per 10^4 - 10^5 yr	Large LOCA (RCS rupture) (LLOCA), ATWS	5	6	7
VI	less than 1 per 10^5 yr	ISLOCA, Vessel rupture	6	7	8
			> 30 days	3-30 days	< 3 days
			Exposure Time for Degraded Condition		

Table 3.4 SDP Worksheet for Generic BWR — Loss of Instrument Air (LOIA)[1,2]

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	1/5 ADS valves (RVs) manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/2 LPCS trains (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps in 1/2 trains with heat exchangers and 1/4 RHRSW pumps in SPC (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery of Failed Train	Results
1 LOIA - CHR (2,4) 2 + 3	5	3	3	0	6
2 LOIA - HPI - LPI (5) 2 + 2 + 6	10	3	2 + 6	0	11
3 LOIA - HPI - DEP (6) 2 + 2 + 2	6	3	2 + 2	0	7

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

None

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and available and ready for use.

Counting Rule Worksheet

Step	Instructions		
(1)	Enter the number of sequences with a risk significance equal to 9.	(1)	0
(2)	Divide the result of Step (1) by 3 and round down.	(2)	**0**
(3)	Enter the number of sequences with a risk significance equal to 8.	(3)	**0**
(4)	Add the result of Step (3) to the result of Step (2).	(4)	**0**
(5)	Divide the result of Step (4) by 3 and round down.	(5)	**0**
(6)	Enter the number of sequences with a risk significance equal to 7.	(6)	**1**
(7)	Add the result of Step (6) to the result of Step (5).	(7)	**1**
(8)	Divide the result of Step (7) by 3 and round down.	(8)	**0**
(9)	Enter the number of sequences with a risk significance equal to 6.	(9)	1
(10)	Add the result of Step (9) to the result of Step (8).	(10)	**1**
(11)	Divide the result of Step (10) by 3 and round down.	(11)	**0**
(12)	Enter the number of sequences with a risk significance equal to 5.	(12)	**0**
(13)	Add the result of Step (12) to the result of Step (11).	(13)	**0**
(14)	Divide the result of Step (13) by 3 and round down.	(14)	**0**
(15)	Enter the number of sequences with a risk significance equal to 4.	(15)	**0**
(16)	Add the result of Step (15) to the result of Step (14).	(16)	**0**

- If the result of Step 16 is greater than zero, then the risk significance of the inspection finding is of high safety significance (RED).
- If the result of Step 13 is greater than zero, then the risk significance of the inspection finding is at least of substantial safety significance (YELLOW).
- If the result of Step 10 is greater than zero, then the risk significance of the inspection finding is at least of low to moderate safety significance (WHITE).
- If the result of Steps 10, 13, and 16 are zero, then the risk significance of the inspection finding is of very low safety significance (GREEN).

Phase 2 Result: ☐ GREEN ■ **WHITE** ☐ YELLOW ☐ **RED**