SDP Handouts 110106 /
LP_SDP0306.ppt

Significance Determination Process

Technical Training Center
Chattanooga, Tennessee

e-19

Learning Objectives

- After studying the SDP material, you should be able to:
  - State the purpose(s) of the SDP.
  - Explain how inspection findings are used in licensee performance assessment.

Learning Objectives

- Given a scenario, IMC-0609, IMC-0612, and Risk Informed Notebook, you should be able to determine the result of each applicable sequence.
- Given the counting rule worksheet, you should be able to determine the Phase 2 color of the simulated inspection finding.

Purpose of SDP

- The Significance Determination Process (SDP) uses risk insights, where appropriate, to help NRC inspectors and staff determine the safety significance of inspection findings.

SDP Objectives

- To characterize the safety significance of inspection findings for the NRC Reactor Oversight Process (ROP), using best available risk insights as appropriate.

  The SDP assigns a color to the inspection finding.

Exhibit 2: REACTOR OVERSIGHT PROCESS

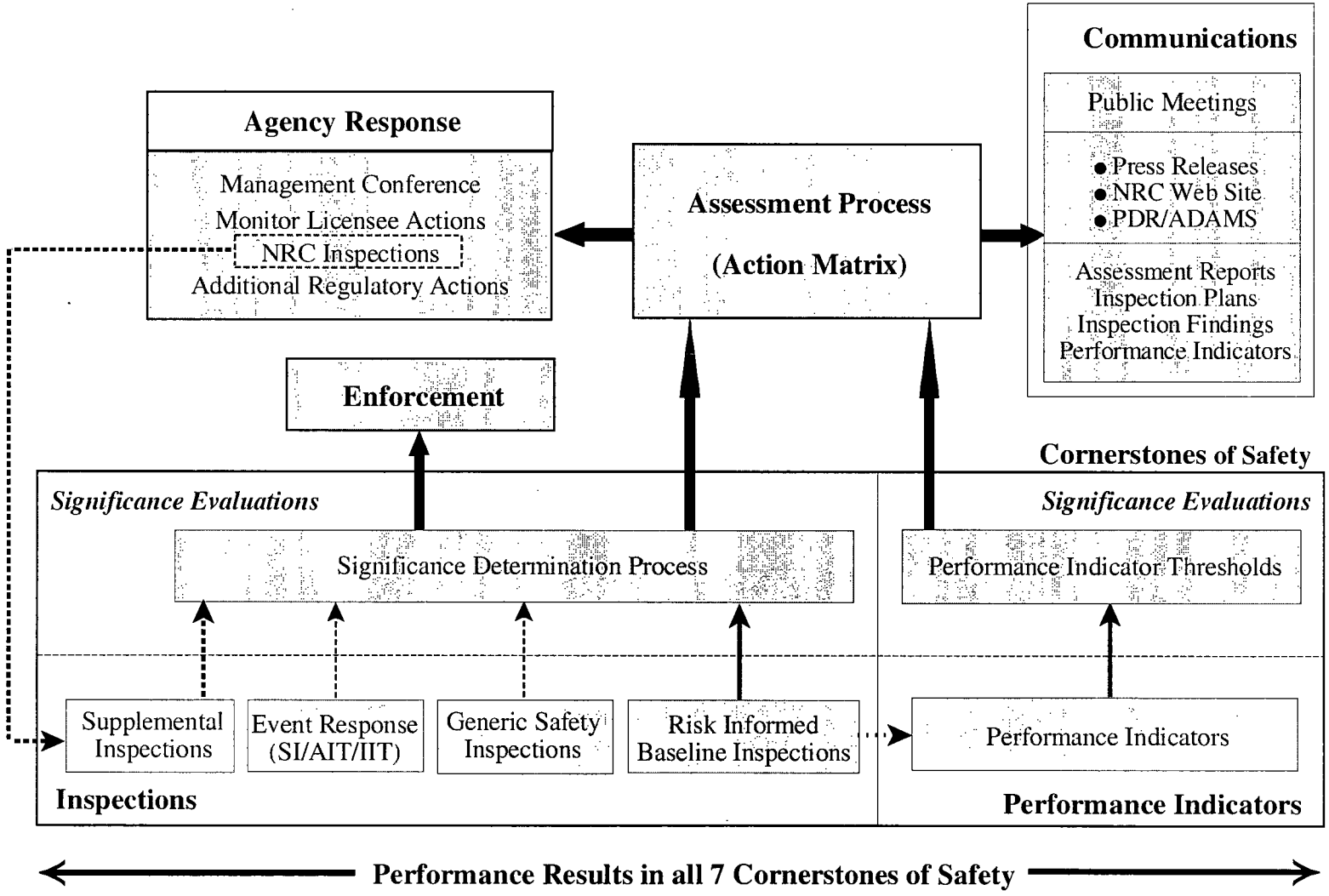


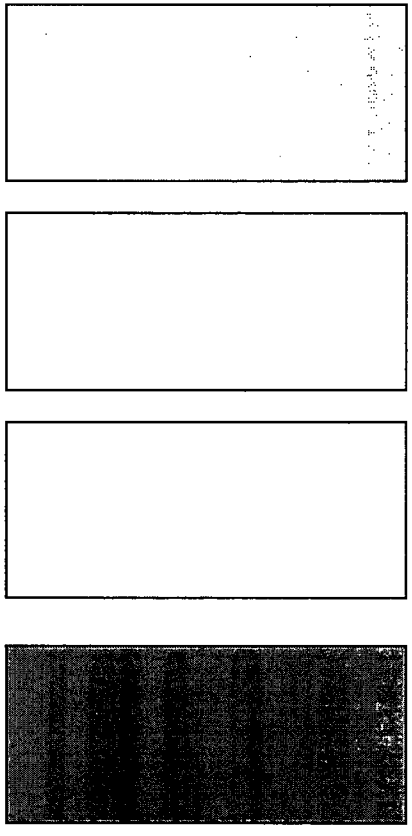
Exhibit 4 - ACTION MATRIX

		Licensee Response column	Regulatory Response column	Degraded Cornerstone column	Multiple/ Repetitive Degraded Cornerstone column	Unacceptable Performance column	IMC 0350 Process
RESULTS		All Assessment Inputs (Performance Indicators (PIs) and Inspection Findings) Green; Cornerstone Objectives Fully Met	One or Two White Inputs (in different cornerstones) in a Strategic Performance Area; Cornerstone Objectives Fully Met	One Degraded Cornerstone (2 White Inputs or 1 Yellow Input) or any 3 White Inputs in a Strategic Performance Area; Cornerstone Objectives Met with Moderate Degradation in Safety Performance	Repetitive Degraded Cornerstone; Multiple Degraded Cornerstones; Multiple Yellow Inputs; or 1 Red Input; Cornerstone Objectives Met with Longstanding Issues or Significant Degradation in Safety Performance	Overall Unacceptable Performance; Plants Not Permitted to Operate Within this Band, Unacceptable Margin to Safety	Plants in a shutdown condition with performance problems placed under the IMC 0350 process
RESPONSE	Regulatory Performance Meeting	None	Branch Chief (BC) or Division Director (DD) Meet with Licensee	DD or Regional Administrator (RA) Meet with Licensee	RA (or EDO) Meet with Senior Licensee Management	Commission meeting with Senior Licensee Management	RA (or EDO) Meet with Senior Licensee Management
	Licensee Action	Licensee Corrective Action	Licensee root cause evaluation and corrective action with NRC Oversight	Licensee cumulative root cause evaluation with NRC Oversight	Licensee Performance Improvement Plan with NRC Oversight		Licensee Performance Improvement Plan / Restart Plan with NRC Oversight
	NRC Inspection	Risk-Informed Baseline Inspection Program	Baseline and supplemental inspection procedure 95001	Baseline and supplemental inspection procedure 95002	Baseline and supplemental inspection procedure 95003		Baseline and supplemental as practicable, plus special inspections per restart checklist
	Regulatory Actions[1]	None	Supplemental inspection only	Supplemental inspection only	-10 CFR 2.204 DFI -10 CFR 50.54(f) Letter - CAL/Order	Order to Modify, Suspend, or Revoke Licensed Activities	CAL/order requiring NRC approval for restart
COMMUNICATION	Assessment Letters	BC or DD review/sign assessment report (w/ inspection plan)	DD review/sign assessment report (w/ inspection plan)	RA review/sign assessment report (w/ inspection plan)	RA review/sign assessment report (w/ inspection plan)		N/A. RA (or 0350 Panel Chairman) review/ sign 0350-related correspondence
	Annual Public Meeting	SRI or BC Meet with Licensee	BC or DD Meet with Licensee	RA (or designee) Discuss Performance with Licensee	RA or EDO Discuss Performance with Senior Licensee Management		N/A. 0350 Panel Chairman conduct public status meetings periodically
	Commission Involvement	None	None	None	Plant discussed at AARM	Commission Meeting with Senior Licensee Management	Commission meetings as requested, restart approval (single case)
	INCREASING SAFETY SIGNIFICANCE ---------->						

Note 1: Other than the CAL, the regulatory actions for plants in the Multiple/Repetitive Degraded Cornerstone column and IMC 0350 column are not mandatory agency actions. However, the regional office should consider each of these regulatory actions when significant new information regarding licensee performance becomes available.

Note 2. The IMC 0350 Process column is included for illustrative purposes only and is not necessarily representative of the worst level of licensee performance. Plants under the IMC 0350 oversight process are considered outside the auspices of the ROP Action Matrix. See IMC 0350, "Oversight of Operating Reactor Facilities in a Shutdown Condition with Performance Problems," for more detail.

SDP Colors



Green – very low safety significance. ΔCDF < 1E-6

White – low to moderate safety significance. 1E-6< ΔCDF < 1E-5

Yellow – substantial safety significance. 1E-5< ΔCDF < 1E-4

Red – high safety significance. 1E-4< ΔCDF

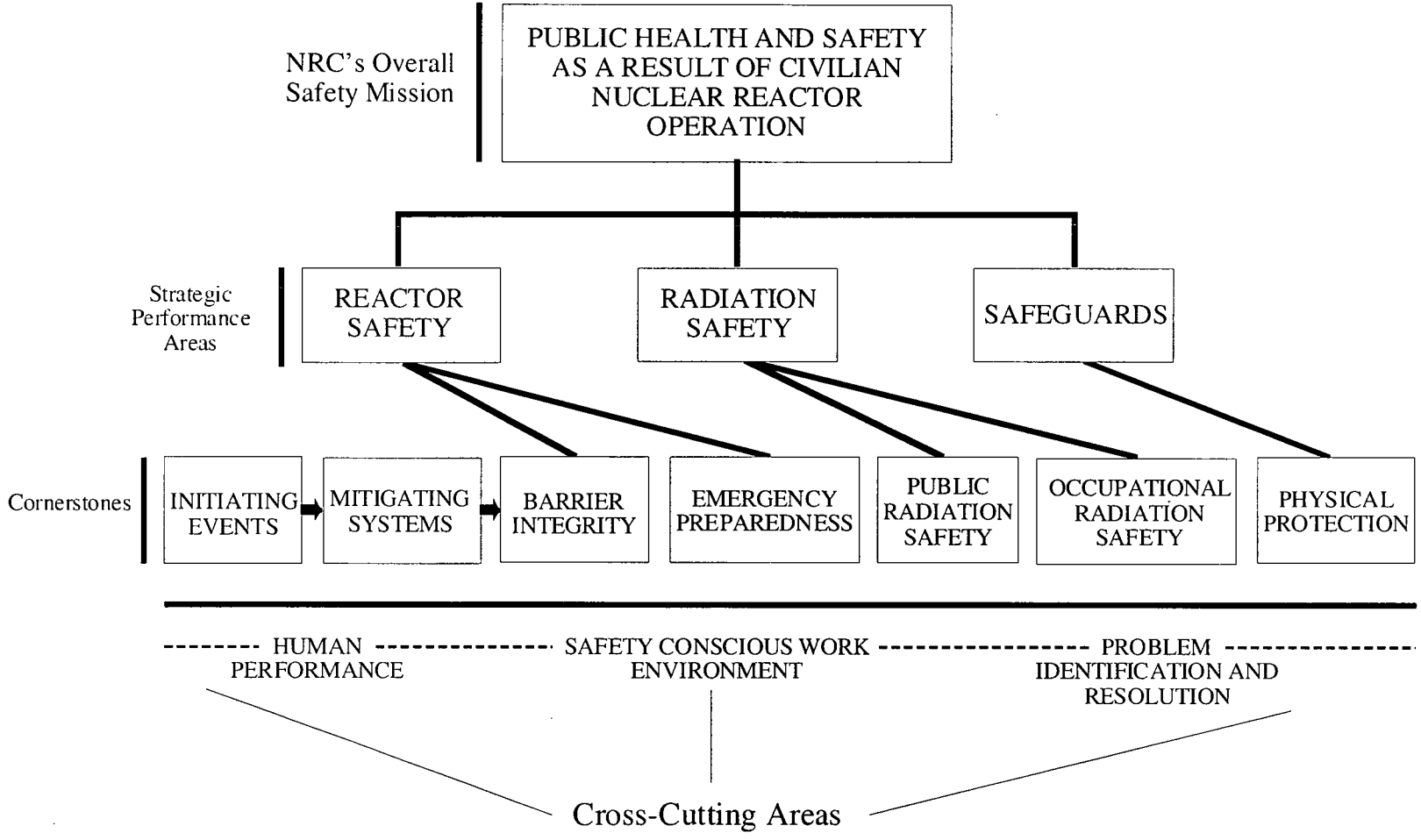
SDP Objectives (Continued)

- To provide all stakeholders an objective and common framework for communicating the potential safety significance of inspection findings.
- To provide a basis for timely assessment and/or enforcement actions associated with an inspection finding.
- To provide the inspectors with plant-specific risk information for use in risk-informing the inspection program.

Types of SDPs

- At least one SDP supports each cornerstone associated with the strategic performance areas defined in IMC 2515.
- The SDPs and related instructions are found in IMC 0609.

Exhibit 1: REGULATORY FRAMEWORK



SDP Listing

A. Significance Determination of Reactor Inspections for At-Power Situations
B. Emergency Preparedness SDP
C. Occupational Radiation Safety SDP
D. Public Radiation Safety SDP
E. Physical Protection SDP
F. Fire Protection and Post-Fire Safe Shutdown SDP
G. Shutdown Safety SDP
H. Containment Integrity SDP
I. Operator Requalification, Human Performance SDP
J. SG Tube Integrity SDP
K. Maintenance Risk Assessment and Risk Management SDP

Significance Determination of Reactor Inspections for At-Power Situations

Entry Conditions

- This SDP is designed to provide a simplified probabilistic framework for use in identifying risk-significant issues within the Initiating Events, Mitigation Systems, and Barrier cornerstones. It will estimate the increase in core damage frequency during at-power situations due to conditions which contribute to unintended risk increases caused by deficient licensee performance.

Deficient Performance

- Deficient licensee performance or performance deficiency is an issue that is the result of a licensee not meeting a requirement or standard where the cause was reasonably within the licensee's ability to foresee and correct, and that should have been prevented.

  The licensee does not have to be committed to a standard in order to determine whether there is a performance deficiency (PD). A PD is determined to exist if the licensee fails to adhere to a widely accepted industry standard. *IMC 0612.*

Examples of Deficient Performance

- Safety-related pump discharge valve remained closed following surveillance testing.
- Debris left in safety-related tank following maintenance activities.
- Failing to take proper corrective action when testing demonstrated a problem.

Entry Conditions (Continued)

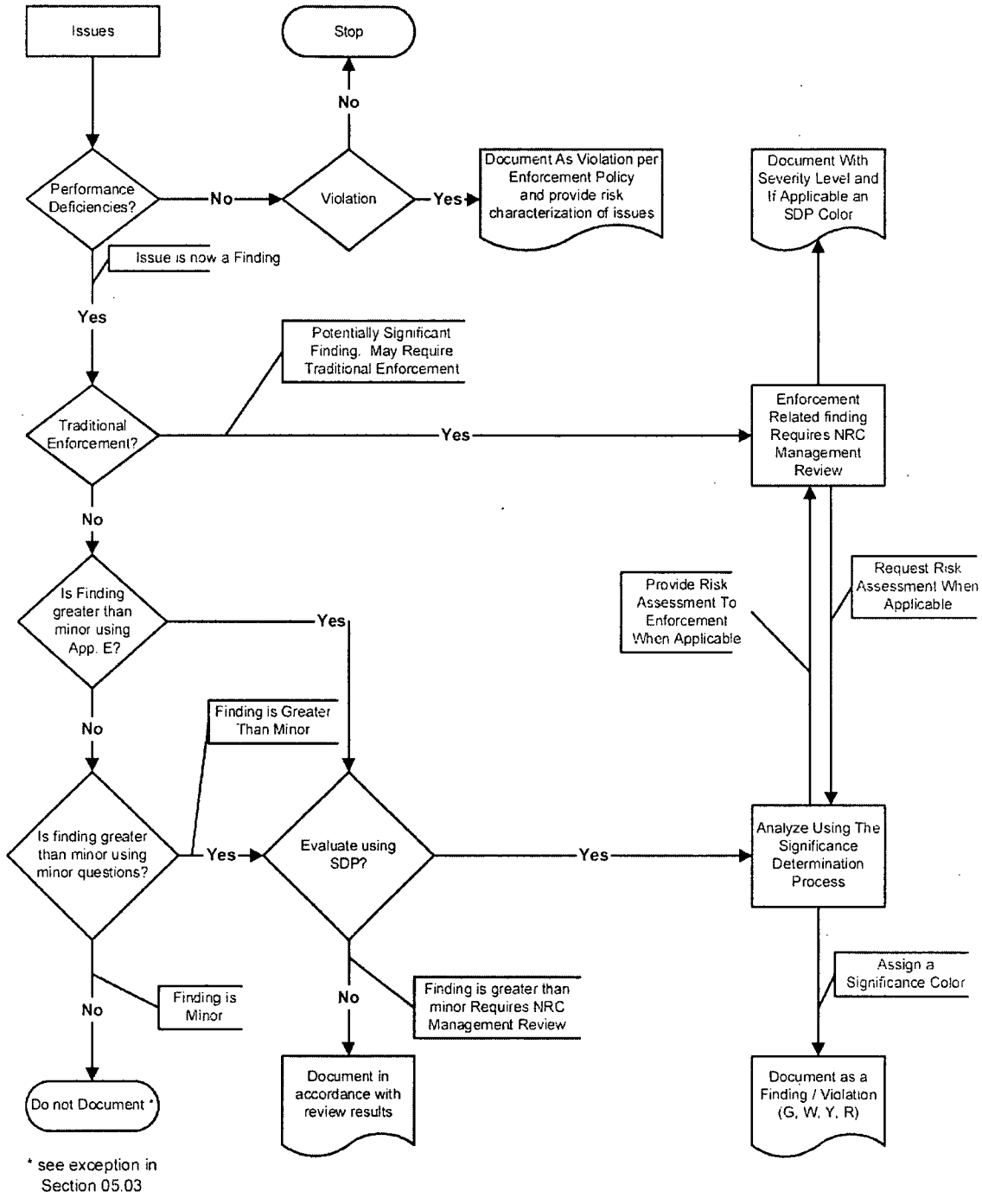
- Conditions which do not represent deficient licensee performance are considered part of the acceptable plant risk and are not candidates for SDP evaluation.
- Each issue entering the SDP process must be screened using IMC 0612, Appendix B, "Issue Screening", and as applicable Appendix E, "Examples of Minor Findings." to determine whether or not the issue is a minor issue.
- If issue is not minor, then it is a candidate for SDP evaluation.
- This SDP is not used for event evaluation.

Issue Disposition

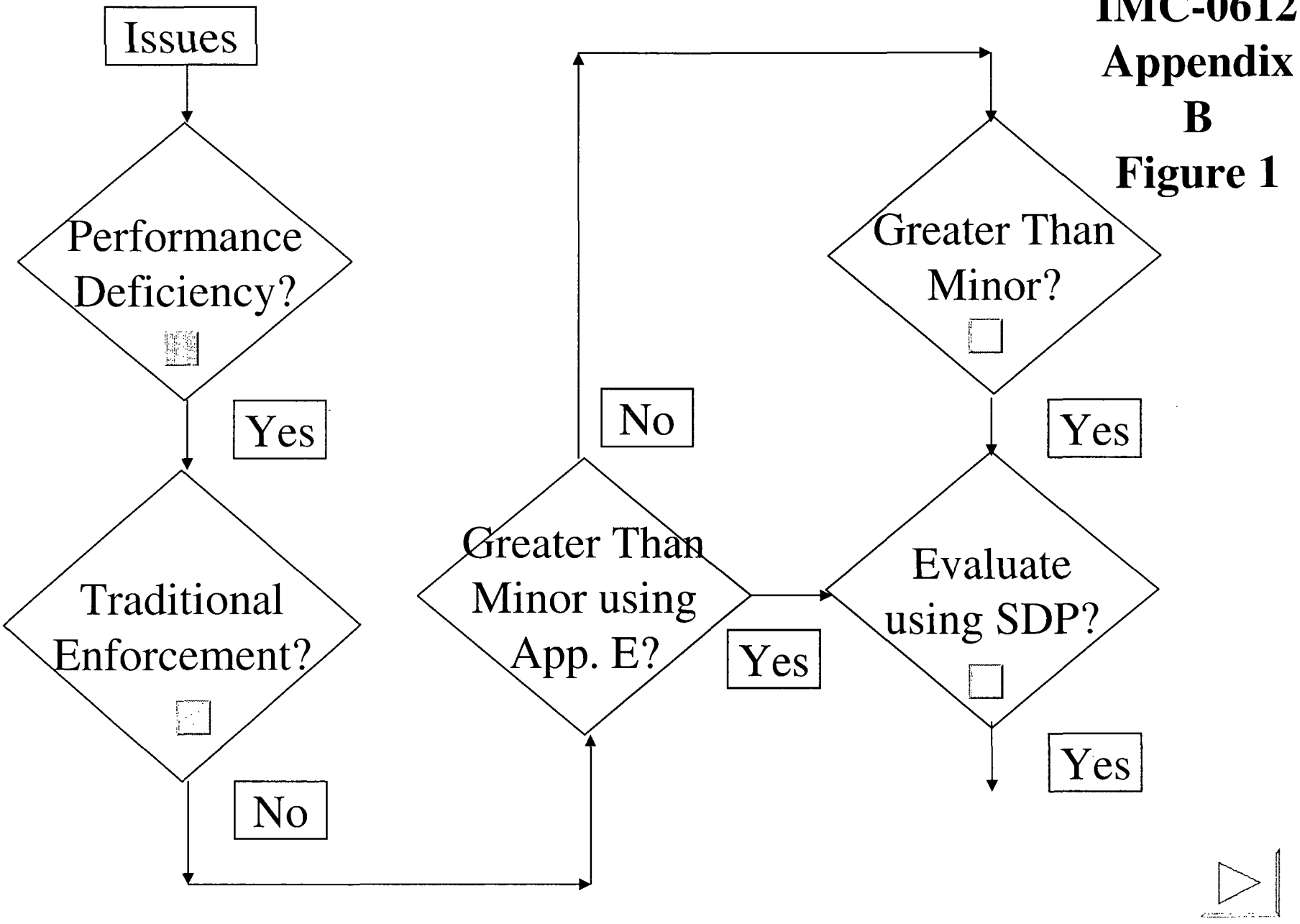
IMC-0612

Appendix B

Issue Date: 9/30/05

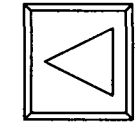


IMC-0612
Appendix
B
Figure 1



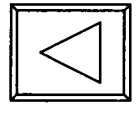
Performance Deficiency

Did the licensee fail to meet a requirement or a standard, where the cause was reasonably within the licensee's ability to foresee and correct and which should have been prevented?



Traditional Enforcement

- Does the issue have actual safety consequence?
- Does the issue have the potential for impacting the NRC's ability to perform its regulatory function?
- Are there any willful aspects of the violation?



IMC 0612 Minor Issue Questions

- Could the finding be reasonably be viewed as a precursor to a significant event?
- If left uncorrected, would the finding become a more significant safety concern?
- Does the finding relate to a performance indicator that would have caused the PI to exceed a threshold?
- Is the finding associated with one of the cornerstone attributes and does the finding affect the associated cornerstone objective?
- Does the finding relate to any maintenance risk assessment and risk management issues?

Initiating Events

- Objective – to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations.
- Attributes: design control, protection against external factors, configuration control, equipment performance, procedure quality, and human performance.

Mitigating Systems

- Objective – to ensure the availability, reliability, and capability of systems to respond to initiating events to prevent undesirable consequences (i.e., core damage).
- Attributes: design control, protection against external factors, configuration control, equipment performance, procedure quality, and human performance.

Barrier Integrity

- Objective – to provide reasonable assurance that physical design barriers (fuel cladding, RCS, and containment) protect the public from radionuclide releases caused by accidents or events.
- Attributes: design control, configuration control, procedure quality, human performance, Cladding performance, RCS equipment and barrier performance, and SSC and barrier performance.

SDP Evaluation Questions

- Is the finding associated with an increase in the likelihood of an initiating event?
- Is the finding associated with the operability, availability, reliability, or function of a system or train in a mitigating system?
- Is the finding associated with the integrity of fuel cladding, the reactor coolant system, reactor containment, control room envelope, auxiliary building (PWR), or standby gas treatment system (BWR)?
- Is the finding associated with a degraded conditions that could concurrently influence any mitigation equipment and an initiating event?
- Is the finding associated with or involve impairment or degradation of a fire protection feature?
- Is the finding associated with the spent fuel pool cooling system radiological barrier?
- Is the finding associated with inadequate 10 CFR 50.65 (a)(4) risk assessment (quantitative only) and/or risk management?

SDP Phases

The plant-specific reactor safety SDP uses a graduated three-phase process to differentiate inspection findings on the basis of their potential risk significance. The staff's final significance determination may be based on any of these three phases.

- **Phase 1 – Characterization and Initial Screening of Findings**
  - Characterization of the finding and an initial screening of low-significance findings for disposition by the licensee's corrective action program.
- **Phase 2 – Risk Significance Estimation and Justification Using the Site Specific Risk-Informed Inspection Notebook**
  - Plant-specific estimation of the risk significance of an inspection finding and development of the basis for the determination.

SDP Phases (Continued)

- Phase 3 – Risk Significance Estimation Using Any Risk Basis That Departs from the Phase 1 or Phase 2 Process
  - Phase 3 is used to address those situations that depart from the guidance provided for Phase 1 or Phase 2.

    A Phase 3 analysis need be no more detailed than an adjustment to the Phase 2.

Issue

While performing a complete system walk down of the high pressure coolant injection (HPCI) system in accordance with Inspection Procedure 71111.04, "Equipment Alignment," an inspector identified that a normally open, motor operated, injection valve in the discharge flow path was closed. The valve position for this valve indicated open in the control room. This valve was also not in the flow path during quarterly surveillance testing of the system. 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 HPCI system were satisfied and that credit for recovery was appropriate.

SDP Phase 1- Characterization and Initial Screening of Findings

1. Characterize the inspection finding and describe the assumed impact.
2. Perform an initial screening of the inspection finding.

SDP Tables

Site Specific Risk-Informed Inspection Notebook

- Table 1, Categories of Initiating Events
- Table 2, Initiators and System Dependency
- Table 3.X, SDP Worksheets
- Table 4, Remaining Mitigation Capability Credit
- Table 5, Counting Rule Worksheet

SDP Phase 2 Steps

1. Enter Table 2, "Initiators and System Dependency" with the equipment impacted by the finding. This determines the worksheets to be evaluated.
2. Enter Table 1, "Categories of Initiating Events" with the exposure time, and determine likelihood number for events determined in 1.

SDP Phase 2 Steps

3. On each affected sequence on each required worksheet:
   - **Enter likelihood number.**
   - **Determine remaining capability rating for each system in the sequence.**
   - **Apply recovery credit if applicable.**
   - **Sequence risk = (Likelihood) + (remaining mitigation capability) + (recovery credit)**

4. Complete Table 5, "Counting Rule Worksheet." The result is the Risk Significance (i.e., Green, White, Yellow, or Red) of the inspection finding based on the internal initiating events that lead to core damage.

A Little Math

- If events A and B are independent, then the Pr(A and B) is:

$$\Pr(A \text{ and } B) = \Pr(A)\Pr(B)$$

- Logarithms

$$\log AB = \log A + \log B$$

SDP Rules

IMC-0609A

Appendix A, Attachment 2

1.0 DETERMINING THE INITIATING EVENT LIKELIHOOD

1.1 Exposure Time

If the inception of the condition is unknown:

- determine last successful demonstration of functionality.
- Exposure time = (date inoperable - date of functionality demonstration)/2
- called t/2

1.2 Inspection Finding (Not Involving a Support System) that Increases the Likelihood of an Initiating Event

1.3 Inspection Finding (Normally Cross-tied Support Systems) that Increases the Likelihood of an Initiating Event

1.4 Inspection Finding (Normally Running Components of a Split Train Support System) that Increases the Likelihood of an Initiating Event and the Impact on Mitigating System Capability Can Be Explicitly Determined

1.5 Inspection Finding (Normally Standby Components of a Split Train Support System) that increases the Likelihood of an Initiating Event and the Impact on Mitigating System Capability Can Be Explicitly determined

1.6 Inspection Findings Involving Emergency Diesel Generators

1.7 Inspection Findings Involving Safety-Related Battery Chargers

2.0 DETERMINING REMAINING MITIGATION CAPABILITY

2.1 Inspection Finding that Degrades Mitigation Capability and Does Not Reduce Remaining Mitigation Capability Credit to a Value Less Than Full Mitigation Credit

2.2 Inspection Finding (Normally Split Train Support System) that Does Not Increase the Likelihood of an Initiating Event and the Impact on Mitigating System Capability Can Be Explicitly Determined

2.3 Inspection Findings Involving a Loss of Redundancy of Equipment

2.4 Inspection Findings Involving Equipment that Impact Operator Action Credit

3.0 CHARACTERIZING THE RISK SIGNIFICANCE OF INSPECTION FINDINGS

3.1 Treatment of Shared Systems Between Units

3.2 Counting Rule

Every 3 affected accident sequences that have the same order of magnitude of risk constitute one equivalent sequence which is more risk significant by one order of magnitude. This rule is applied in a cascading fashion.