April 11, 2005

MEMORANDUM TO: James W. Andersen, Chief
Performance Assessment Section
Inspection Program Branch
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

FROM: John W. Thompson, Senior Reactor Operations Engineer ***/RA/***
Inspection Program Branch
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

SUBJECT: PUBLIC MEETING SUMMARY ON THE MITIGATING SYSTEMS PERFORMANCE INDEX AND THE REACTOR OVERSIGHT PROCESS MONTHLY MEETING HELD ON MARCH 16 AND 17, 2005

On March 16 and 17, 2005, a Mitigating Systems Performance Index (MSPI) and Reactor Oversight Process (ROP) public meeting was held at the One White Flint North Building, Rooms 12B4 and 10B4, respectively. Attachment 1 contains the attendance list for the meeting. Attachment 2 contains the agenda topics for the combined meeting.

During the March 16, 2005, MSPI meeting, industry discussed the probabilistic risk assessment (PRA) quality requirements necessary to implement MSPI by the January 2006 target implementation date. The PRA quality requirements were established by an industry-staff task group that was formed by the ROP Working Group in 2004. The MSPI PRA task group report, issued December 16, 2004, contained a list of PRA requirements deemed necessary to implement MSPI, and its conclusions and recommendations were agreed to by both the staff and industry. During the March 16, 2005, meeting, NEI stated that industry could not carry out the activities defined by the MSPI PRA Task Group by the January 2006 proposed implementation target date. Instead, the industry proposed other possible activities. The staff is reviewing industry's change of commitment regarding PRA quality and will discuss its merits and ramifications during the next MSPI Working Group meeting currently scheduled for April 27, 2005.

During the March 17, 2005, ROP meeting, meeting participants discussion Reactor Oversight Process (ROP) topics. Topics discussed included discussion of significance determination process (SDP) Appendices K and F (maintenance rule and fire protection) to Inspection Manual Chapter (IMC) 0609. The staff also provided status updates on the scrams with loss of normal heat removal and barrier integrity performance indicator (PI) improvement initiatives.

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Industry stated that Revision 3 to NEI 99-02, "Regulatory Assessment Performance Indicator Guideline" will be issued in April 2005 and will be used during the second quarter of performance indicator reporting. The remainder of the meeting was devoted to open and new frequently asked questions (FAQs). The next monthly public MSPI/ROP meeting is scheduled for April 28, 2005.

During the March 17, 2005, meeting, the staff held a 45 minute closed door, non-public discussion on ROP security issues. If future meetings require discussion of security issues, meeting notice agendas will denote times when non-public discussion of security issues will occur.

Attachments:
1. Attendance List for March 16 and 17, 2005 public MSPI/ROP meeting
2. MSPI/ROP March 16 and 17 Meeting Agendas
3. Appendix E, Examples of Minor Issues
4. Appendix B, Issue Screening
5. Appendix K, Maintenance Risk Assessment and Risk Management Significance Determination Process
6. Technical Basis Document, Maintenance Risk Assessment and Risk Management Significance Determination Process
7. Draft MSPI Workshop Questions Compilation from Workshop 1
8. ROP Working Group Action List
9. Scrams w/LONHR flow chart (draft)
10. FAQ log (Part 1), dated 3/17/05
11. FAQ log (Part 2) dated 3/17/05

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ATTENDANCE LIST
INDUSTRY/STAFF MSPI PUBLIC MEETING
OWFN 12B4
March 16, 2005

	NAME	AFFILIATION
1.	John Thompson	NRC
2.	Don Dube	NRC
3.	Kerry Landis	NRC
4.	Ann Marie Stone	NRC
5.	Sonia Burgess	NRC
6.	Jim Sumpter	NPPD
7.	James Andersen	NRC
8.	James Vail	NRC
9.	Gareth Parry	NRC
10.	Bob Youngblood	ISL
11.	Victoria Warren	Erin/Exelon
12.	Gerald Sowers	APS
13.	John Butler	NEI
14.	Tony Pietrangelo	NEI
15.	Robin Ritzman	PSEG
16.	Al Haeger	Exelon
17.	Don Olson	Dominion
18.	Duane Kanitz	APS-STARS
19.	John Giddens	Southern Nuclear
20.	Rick Thomas	Entergy
21.	Jeff Gabor	Exelon
22.	Jeff Stone	Constellation/CCNPP
23.	Justin Armstrong	Westinghouse
24.	Leonard Sueper	NMC
25.	Glen Masters	INPO
26.	David Wrona	NRC

ATTENDANCE LIST
INDUSTRY/STAFF ROP PUBLIC MEETING
OWFN 10B4
March 17, 2005

	NAME	AFFILIATION
1.	John Thompson	NRC
2.	Greg Gibson	SCE
3.	Jim Andersen	NRC
4.	Allan Haeger	Exelon
5.	Russell Gibbs	NRC
6.	John Butler	NEI
7.	Jim Sumpter	NPPD
8.	John Butler	NEI
9.	John Giddens	Southern Nuclear
10.	Robert Biggs	Entergy
11.	Joey Clark	Entergy
12.	Tony Pietrangelo	NEI
13.	Deann Raleigh	LIS, Scientech
14.	Robin Ritzman	PSEG
15.	Dave Wrona	NRC
16.	Don Olson	Dominion
17.	Rick Thomas	Entergy
18.	Duane Kanitz	APS-STARS
19.	Roy Mathew	NRC
20.	Don Hickman	NRC
21.	Peter Koltay	NRC

MSPI WORKING GROUP PUBLIC MEETING
AGENDA

January 26, 2005
9:00 - 4:00 p.m. (O7B4)

9:00 - 9:05 a.m.	Introduction and Purpose of Meeting
9:05 - 10:15 a.m.	Discussion on the draft report from the MSPI PRA Task Force
10:15 - 10:30 a.m.	Break
10:00 - 11:15 a.m.	Discussion of MSPI Draft Guidance Documents (NEI 99-02, Appendix F and G)
11:15 a.m.-12:00 p.m.	Discussion on MSPI Milestones and Schedule
12:00 - 1:00 p.m.	Lunch
1:00 - 2:30 p.m.	Discussion of MSPI Workshop
2:30 - 2:45 p.m.	Break
2:45 - 4:00 p.m.	Continue Discussion of MSPI Workshop
4:00 p.m.	Adjourn

Attachment 2

ROP MONTHLY WORKING GROUP MEETING
AGENDA

March 17, 2005
9:00 - 4:00 p.m. OWFN 10B4

9:00 a.m.	Welcome and Introduction
9:05 a.m.	Discussion of SDP Issues
10:00 a.m.	Status Update of Scrams with Loss of Normal Heat Removal PI Task Force
10:15 a.m.	Public Discussion & Break
10:30 a.m.	Status Update of RCS Leakage Performance Indicator Improvement Initiative
10:45 a.m.	Discussion and Status of New Draft Revision 3 to NEI 99-02
11:00 a.m.	Discussion of ROP Security Issues
12:00 p.m.	Break for Lunch
1:00 p.m.	Discussion of PI FAQs
2:15 p.m.	Public Discussion & Break
2:30 p.m.	Continue Discussion of PI FAQs
4:00 p.m.	Adjourn

APPENDIX E

EXAMPLES OF MINOR ISSUES

This guidance applies to thresholds for documenting findings and violations in Inspection Manual Chapter 0612. Although the following examples are all violations of requirements, ROP issues not associated with requirements should be considered minor if the issue is similar to the example guidance.

Minor issues and violations, are below the significance of that associated with green SDP findings and are not the subject of formal enforcement action or documentation. Failures to implement requirements that have insignificant safety or regulatory impact or issues that have no more than minimal risk should normally be categorized as minor. While licensees must correct minor violations, minor violations or other minor findings **do not normally warrant documentation** in inspection reports or inspection records and **do not warrant enforcement action**.

NRC Inspection Manual Chapter 0612 Appendix B, "Issue Screening," provides guidance for determining if a finding should be documented and whether the finding can be analyzed using an SDP. When determining whether identified issues can be considered minor, inspectors should compare the issue to the following examples.

In all cases, minor issues should meet the following criteria:
have no actual safety consequences,
have little to no potential to impact safety,
• have no impact on the regulatory process, and
• not involve willfulness.

The examples in this appendix describe issues and explain how to determine whether or not the issue is minor. In all cases, this determination is based on the judgement of the inspector who identified the issue and the regional management involved and will depend on the circumstances of the particular issue.

1. **Record Keeping Issues . . . . Page E-2**
2. **Licensee Administrative Requirement/Limit Issues . . . . Page E-3**
3. **Nonsignificant Dimensional, Time, Calculation, or Drawing Discrepancies . . . . Page E-7**
4. **Insignificant Procedural Errors . . . . Page E-9**
5. **Work in Progress Findings . . . . Page E-15**
6. **ALARA Planning or Work Controls Issues . . . . Page E-16**
7. **Maintenance Rule Issues . . . . Page E-16**

1. **Record Keeping Issues**

Example a. **Post-maintenance testing was performed on ten glycol air handling units during an outage of a Westinghouse ice condenser facility. All the required tests were performed, based on statements from licensee workers, but there was no record that an actual air flow test was conducted on two of the units. Based on indication in the control room, both air handling units had comparable air flow to those that had documented test results, and the ice condenser technical specification required air temperatures were all well-within specification.**

The violation:10 CFR 50, Appendix B, Criterion XI or the licensee's procedures require test results to be documented and evaluated to assure that test requirements are satisfied.

Minor because: This was a record keeping issue of low significance. There was reasonable assurance that test requirements were met as evidenced by actual air flow being satisfactory and technical specification temperatures being within limits.

Not minor if: The air flow was determined to be degraded during subsequent testing.

Example b. **In a records storage vault, the licensee observes a ceiling leak. Temporary containers were used to collect water during rainstorms. This "work around" continued for a year. However, the containers overflowed during a heavy weekend rainstorm when no one was available to monitor the containers and some safety-related records were damaged, but were still readable.**

The violation:The licensee failure to correct the water intrusion problem in a prompt manner which resulted in damage to records violated the 10 CFR 50.71 requirement to maintain certain records.

Minor because: This was a failure to implement a corrective action that had no safety impact because no records were lost.

Not minor if: Required records were irretrievably lost.

Example c. **The licensee's surveillance test records were not complete for a safety-related pump.**

The violation:The surveillance test is required by Technical Specifications.

Minor because: The surveillance test was performed, but not completely documented. The portion of the test documented and the last completed surveillance test revealed that the equipment performed its' safety function.

Not minor if: The surveillance test was not performed or a subsequent test showed that the equipment would not perform some safety-related function.

Example d. An inspector found that a licensee was missing area radiation survey records or weekly area contamination (smear) records.

The violation: Area radiation surveys and contamination surveys are required by license conditions or 10 CFR 20.2103.

Minor because: The record of the survey is missing, but the survey was actually performed. No unexpected contamination or exposure resulted from the violation.

Not minor if: An unexpected contamination or exposure resulted from the violation.

Licensee Administrative Requirement/Limit Issues

Example While performing a review of a completed surveillance test, the system engineer determines that operators performing the test had made a calculation error when determining the leak rate of a power-operated relief valve's nitrogen accumulators. When calculated correctly, the actual check valve leakage exceeded the surveillance leakage rate's acceptance criterion in the surveillance procedures (but not the Technical specifications surveillance requirement). The surveillance had been completed a week earlier and the system had been returned to service. The allowable leakage rate was below that used in the design assumptions for sizing of the accumulators and it was determined that with the identified leakage, the valves would be able to perform the required number of strokes assumed in the accident analysis.

The violation: The Technical Specification surveillance test's allowable check valve leakage rates were exceeded and the system was returned to service.

Minor because: The limit exceeded was an administrative limit. Actual check valve leakage rates, based on testing history, have always been significantly low enough to meet the required number of valve strokes.

Not minor if: Maintenance records indicated that historical check valve leakage rates were too high bringing the ability of the valves to meet the required number of valve strokes into question or Technical Specification limits were exceeded.

Example NRC inspectors identified that a high radiation door was not locked as required by plant procedures. While the licensee's procedurally controlled administrative limit for area postings was exceeded, the door to the area was conservatively classified and did not exceed regulatory radiation levels to warrant posting as a locked high radiation area.

The violation: Site procedures require activities to be accomplished in accordance with procedures.

Minor because: The requirement was a licensee administrative limit. The area was conservatively posted and no regulatory limits requiring posting were exceeded.

Not minor if: The area radiation levels exceeded the limits such that the area should have been a locked high radiation area or the radiation levels in the area were changing rapidly due to power changes or system operation such radiation levels at which the door would be required to be locked could be reached.

Example During a refueling outage, the licensee tested a charging pump at full flow conditions as required every 18 months. Vibration data taken during this test indicated vibration of 0.324 inches per second (ips), which exceeded the test procedure Alert range of 0.320 ips. The procedure required the surveillance frequency to be increased to every nine months after exceeding the Alert range. The licensee failed to identify that the test result exceeded the Alert range, so the test frequency was not increased. Subsequent vibration testing revealed no further vibration degradation. The ASME Code acceptance criterion for vibration measurements was 0.325 ips.

The violation: Criterion XI or the licensee's procedures require that test procedures shall incorporate acceptance limits established by design documents. Measured vibration data exceeded the test procedure alert levels and the additional testing was not performed.

Minor because: This limit was a licensee administrative limit. The ASME Code limit was not exceeded and there was no subsequent degradation of vibration of the pump.

Not minor if: Subsequent vibration tests revealed degradation into the action range, the same issue affected a number of pumps tested, or the issue was repetitive.

Example The licensee missed an hourly update of a state agency during a declared Unusual Event.

The violation: 10 CFR 50.54(q) requires that licensees follow their emergency plan and the plan committed the licensee to hourly updates of state agencies during declared emergencies.

Minor because: There is no regulatory requirement to make this update, there was no impact on public health and safety, and it did not detract significantly from the state agency's ability to function during the emergency.

Not minor if: There was a failure to make required initial notifications, a significant breakdown in communication functions committed to in the emergency plan, or a failure that affected the agency's ability to respond to the emergency.

Example **During an inspection of silicon foam penetration seals, an inspector noted that foam extrusion (3/8 inch) from repaired seals was less than the amount specified in the seal repair procedure (½ inch). However, the silicon foam vendor's instructions permit extrusions as little as 1/4 inch.**

The violation: The seal repair was not performed in accordance with the licensee's procedure.

Minor because: This is a violation of a licensee administrative requirement. Because the extrusions met the vendor's instruction's limits, no regulatory limit was violated.

Not minor if: Both the licensee and vendor procedures were violated such that the condition would have impacted the ability of the seal to perform its function.

Example **The licensee's procedure required that heat tracing be energized in the diesel fire pump room from September 30 to April 30. In December, an inspector observed that the heat tracing was de-energized. The room temperature was 68 degrees, maintained by the steam boiler (50 degrees was the minimum temperature for operations). The temperature of the room was monitored and annunciated in the control room. An annunciator response procedure instructs the operator to check heat tracing if the room temperature alarms were received. The inspector verified that the temperature in the room had not dropped below 50 degrees since September 30.**

The violation: A licensee procedural requirement was not met.

Minor because: This is a failure to implement a procedural requirement that had no safety impact under the given situation. The temperature had not dropped below the minimum temperature for operations.

Not minor if: The annunciator was inoperable or the room temperature fell below 50 degrees.

Example **An operating procedure requires the shift supervisor to advise the station manager prior to making any mode changes. A mode change is made without this notification.**

The violation: The licensee is required to follow their procedures per Technical Specification 6.8.1, if applicable.

Minor because: This is a minor procedural error that had no impact on safety equipment and caused no safety consequences. All requirements for the mode change were met except this notification.

Not minor if: A mode change was made without all required equipment being operable.

Example **The NRC requires licensees to maintain the total effective dose equivalent (TEDE) to five rem per year. The licensee established by procedure an**

administrative limit of 2 rem per year. Radiation protection manager or general manager approval was required for any individual to exceed the procedural limit. Contrary to the licensee's program, a technician received 2.7 rem in one year without approval from the radiation safety officer.

The violation:The licensee is required to follow their procedures per license conditions.

Minor because: This was an licensee administrative limit. The worker was within federal limits.

Not minor if: Multiple examples were identified of failures to satisfy station radiation protection procedures indicating a failure to maintain and implement programs to keep exposures as low as reasonably achievable.

Nonsignificant Dimensional, Time, Calculation, or Drawing Discrepancies

Example a. A temporary modification was installed on one of two redundant component cooling water system surge tanks to restore seismic qualification. The supporting calculations, which did not receive a second-level review, were found to contain technical errors that did not result in the train being inoperable.

The violation:10 CFR 50, Appendix B, Criterion III design control measures for verifying the adequacy of design were not implemented. Design changes are required to be subjected to design control measures commensurate with those applied to the original design.

Minor because: These are nonsignificant calculation errors. The calculation errors were minor and the installed modification restored seismic qualification of the tank.

Not minor if: The calculation errors were significant enough that the modification required revision or rework to correctly resolve seismic concerns.

Example b. A controlled design drawing shows a plug valve where a ball valve is actually installed. This deficiency occurred because of an oversight by the licensee.

The violation:The design is required to be correctly translated into drawings.

Minor because: This is a nonsignificant drawing deficiency.

Not minor if: Operation of the system was adversely affected by the difference in valves.

Example c. A licensee procedure required that all valves specified on a locked valve list be indicated as locked on the plant drawings. Inspectors identified safety-related valves on the locked valve list that were not indicated as locked on the plant drawings. All valves on the locked valve list were properly positioned and locked, as determined by field verification.

The violation:Activities were not performed in accordance with procedures.

Minor because: This is a nonsignificant drawing discrepancy. All valves required to be locked were locked and properly positioned.

Not minor if: More than one valve was in the required position, but not locked.

Example d. The technical specification required a primary sample to be taken and analyzed within two hours of a power change in excess of 20 percent. The inspector found that the chemistry sample was taken and analyzed within 2 hours and 35 minutes after a recent power increase from 60 to 85 percent. The sample was within specification requirements.

The violation:The technical specification was violated.

Minor because: This is a failure to implement a requirement that has no safety impact. The sample delay was not significant.

Not minor if: The sample had not been conducted or was delayed to the extent that the sample results were not reliable.

Example e. An inspector found that the radiological survey instruments were beyond the required calibration frequency. The instruments were actually in calibration tolerance (when later checked).

The violation:The licensee is required to calibrate radiological survey instruments at specified intervals.

Minor because: This is a failure to calibrate the survey instruments that has no safety impact because the instruments were actually in tolerance.

Not minor if: The instruments were out of calibration tolerance, resulting it a lack of reasonable assurance that the surveys performed were representative of the actual radiological conditions.

Example f. An inspector noted that the required radiation protection training for a worker was not completed as required.

The violation:The licensee is required to provide radiation protection training to workers through their radiation protection program procedures.

Minor because: The periodic training was not yet performed, but the initial training had been performed and training had been scheduled. There was no actual consequence from the radioactive material shipments.

Not minor if: An actual consequence occurred that was attributed to the lack of training.

Example g. During construction of a safety-related concrete wall, a licensee quality control inspector observed that an imbedded Richmond insert is cocked at an angle of 6 degrees. The specification required plus-or-minus 3 degrees. The licensee discovered that the worker who placed

the insert failed to use a level as required. For reasons unknown, the condition report was closed without implementing corrective actions. Subsequent to this incident, the same worker mis-oriented three other inserts. All of the inserts were later abandoned in place.

The violation:The condition adverse to quality was not corrected and it recurred.

Minor because: These mis-oriented inserts represent a failure to implement a corrective action that has no safety impact. It had no direct safety impact because the out-of-specification inserts were abandoned in place.

Not minor if: A safety-related attachment had been made to an out-of-specification insert and placed in service.

Example h. The licensee's security fence is required to be 12 feet tall. The NRC discovers that, in one section, the fence is only 11 feet 10 ½ inches tall.

The violation:A license condition requires that the licensee meet their Physical Security Plan, which states that the security fence is required to be 12 feet tall.

Minor because: This is not a significant dimensional discrepancy.

Not minor if: The fence was significantly shorter (e.g. 11 feet).

Example I. The FSAR states the volume of the refueling water storage tank is 250,000 gallons. The actual volume is 248,000 gallons.

The violation:The facility was not consistent with the FSAR.

Minor because: This is a nonsignificant dimensional discrepancy.

Not minor if: The accident analysis assumed 250,000 gallons of useable volume above the suction point and the actual volume required accident analysis calculations to be re-performed to assure the accident analysis requirements were met.

Insignificant Procedural Errors

Example a. A scaffold erected between safety-related plant service water strainers was wedged tightly between the system piping. Licensee procedures required an engineering evaluation be performed for all scaffolding located above or near safety-related equipment. No engineering evaluation was performed to assess the seismic impact of the scaffold. A later engineering evaluation determined that there is no safety concern.

The violation: 10 CFR 50, Appendix B, Criterion V requires that activities affecting quality shall be performed in accordance with procedures.

Minor because: This is a procedural error that has no safety impact.

Not minor if: The licensee routinely failed to perform engineering evaluations on similar issues, or if the later evaluation determined that safety-related equipment was adversely affected.

Example b. While performing a reactor protection procedure, an operator inadvertently operated the bypass switch which caused a single channel trip condition. The operator failed to follow the procedure and adequately self-check to ensure the right switch was manipulated.

The violation: 10 CFR 50, Appendix B, Criterion V requires that activities be accomplished in accordance with procedures.

Minor because: This was an insignificant procedural error and no there were no safety consequences.

Not minor if: The error caused a reactor trip or other transient.

Example A valve motor operator was test wired for reading operating current during testing required by Generic Letter 89-10. The valve was successfully cycled, the data recorded and determined to be within the acceptable range, and the valve was returned to service. However, the ammeter used a 0-100 amp scale instead of a 0-10 amp scale as required by the procedure. Subsequent retest with the proper meter resulted in satisfactory amperage readings.

The violation: The test procedure was not followed.

Minor because: This was a procedural error that had no impact on safety equipment. The mistake did not result in an actual equipment problem.

Not minor if: The retest revealed that the data was actually outside of the acceptable range.

Example During a review of the lighting in the safety injection pump room, an inspector-identified that the lighting was less than FSAR design levels for operator action. The licensee informed the inspector that this condition was previously identified. However, the corrective action to increase the lighting was given a low priority and was not completed in the two years since initial identification. Interviews with operators revealed that some had difficulties conducting surveillance or emergency drills without the use of flashlights in the pump room.

The violation: The licensee failed to take prompt corrective action for a condition adverse to quality.

Minor because: This is a failure to implement a corrective action that has no safety impact. Operators are procedurally required to carry flashlights and had no problems functioning in this light condition as evidenced by the lack of operational errors due to poor lighting.

Not minor if: The degraded lighting condition contributed to an operator error.

Example The inspector-identified a valve with a missing name-plate, a violation of plant procedures requiring that all equipment be labeled. Discussions with operators revealed that this condition had existed for several years, but because operators routinely referred to the plant drawings, even though the valve was routinely operated, the missing name-plate had no safety consequences.

The violation:Plant procedures required that equipment be labeled.

Minor because: This is a failure to meet procedural requirements that had no safety impact. The operators used the drawings and had no trouble identifying the valve location.

Not minor if: Improper valve manipulation occurred due to the missing name-plate.

Example A small leak occurs on a welded connection in the diesel generator day tank causing a slow drip of fuel oil onto the floor in the diesel room. Maintenance used a sealant to temporarily repair the leak and wrote a work order for a permanent repair, which was scheduled for the next outage. Later, the seal failed and additional leakage occurred, which soaked a safety-related solenoid. The licensee subsequently determined that the wrong sealant was used in the temporary repair.

The violation:The licensee failed to adequately correct a condition adverse to quality.

Minor because: This is a failure to implement a corrective action that had no safety impact because the problem did not affect the operability of the diesel generator.

Not minor if: The damage to the solenoid affected diesel operability or caused a fire hazard.

Example The reach rod for a safety-related valve was jammed and could not be used. However, the valve could be operated manually one level down. This condition existed for two years and, despite complaints from the operators, it was not fixed. The NRC inspector noted that this work-around cost about one minute in operator response time and recognized that manual manipulation of this valve was required by certain off-normal procedures. The valve was accessible during all these off-normal events.

The violation:The licensee failed to identify and correct a condition adverse to quality as required by 10 CFR 50, Appendix B, Criterion XVI.

Minor because: This is a failure to implement a corrective action that had little to no safety impact. The valve could still be operated and the extra time requirement would not affect recovery operations.

Not minor if: There were occasions where access to the valve would be restricted for environmental reasons (heat, radiation, oxygen).

Example An inspector discovered that 3 of 150 emergency response organization members who are on the duty roster in different functional areas were not current in their training. The licensee's emergency plan required that all members be trained annually.

The violation: 10 CFR 50.54(q) requires that the licensee follow and maintain in effect emergency plans. The plan was not followed.

Minor because: There are others on the duty roster in each functional area whose qualifications are current.

Not minor if: Emergency response personnel qualification lapses are wide spread or occur in such a manner that positions cannot be staffed by qualified individuals.

Example An inspector found out of calibration survey instruments or less than the required number of instruments in storage cabinets in emergency facilities.

The violation: 10 CFR 50.54(q) requires that the licensee follow the emergency plan. The emergency plan requires that calibrated survey instrumentation at set quantities be available.

Minor because: There are other instruments readily available and the emergency preparedness procedures require the calibration to be verified prior to use.

Not minor if: The failure was wide spread or timely response of a function was compromised.

Example An inspector found that the evaluation of the adequacy of emergency preparedness procedures in the annual audit was not in sufficient depth in one functional area. The licensee reviewed the areas not covered and found no problems.

The violation: 10 CFR 50.54(t) requires that the audit be conducted and that it contain the evaluation of the adequacy of EP procedures.

Minor because: No problems were identified and the revisions of the procedures that were not audited addressed improvements identified in drills.

Not minor if: The procedures that were not evaluated were in a condition that would effect the licensee's response to an emergency.

Example k. **NRC Inspectors identified three ten-foot lengths of wood left from a scaffold disassembled the previous week, in the auxiliary feedwater pump room. The licensee had not completed an engineering evaluation approving this temporary storage location for transient combustible materials as required by the fire protection plan.**

The violation: These transient combustible materials were not reflected in the fire hazards analysis and the licensee failed to complete the required engineering evaluation.

Minor because: This is a failure to implement a fire protection plan requirement that has little or no safety impact. The licensee was able to show that the transient combustibles were well below the fire hazards analysis limits.

Not minor if: The fire loading was not within the fire hazard analysis limits.

Example **The technical specifications required that one-third of all safety-related molded case circuit breakers be tested each refueling outage (such that all are tested every three outages) and that the instantaneous trip currents be recorded for trending purposes. The NRC inspector found that two outages ago during testing, the instantaneous trip current for a breaker was not tested. The last recorded trip current for this breaker was five outages ago. The subject breaker was subsequently found to be in specification.**

The violation: The technical specification is violated, because all required tests were not performed on the breaker within three outages.

Minor because: This is a failure to implement a procedural requirement that has no safety impact. All other tests on the breaker were satisfactory at the time of testing and the trip was subsequently found to be in specification.

Not minor if: The subject breaker was out of specification.

Example **The technical specifications require that 10 percent of all safety-related snubbers be tested each refueling outage and that if one failure occurs, an additional 10 percent sample be tested during the same outage. One snubber in the original population of 17 snubbers (there are a total of 168 snubbers) fails, necessitating an additional sample of 17 snubbers. However, because of an oversight by the licensee, the only 16 additional snubbers are tested with no failures.**

The violation: The technical specification was violated because the required number of snubbers were not tested.

Minor because: This is a failure to implement a procedural requirement that has no safety impact since none of the additional snubbers tested failed.

Not minor if: A failure had occurred in the additional sample, necessitating yet another expansion of the sample, and this was not accomplished.

Example **An inspector discovered a small pile of low level radioactive material in the radwaste building that was not properly posted. This problem occurred because of an oversight by the licensee.**

The violation: The material should be posted as per 10 CFR 20.1902.

Minor because: This is a small area with low level radioactive material and access was restricted by a fence around the area. Other areas were sufficiently posted.

Not minor if: Other areas were also not posted or the radioactive material presented an accessible hazard.

5. Work in Progress Findings

Example a. **Prior to system restoration following a modification, the licensee determined that the modification package that replaced the spent fuel pool cooling system suction piping did not include the siphon hole called for by the original system design. The siphon hole was not installed. Due to the location of the piping, a siphoning event would lower spent fuel pool level below the point allowed in Technical Specifications but not to the point where fuel would have been uncovered.**

The violation: The pipe design was not correctly translated into work instructions and drawings.

Minor because: This was work in progress. The error was identified and corrected during turnover of the modification prior to system restoration.

Not minor if: The system was returned to service without installation of the siphon hole or completion of an evaluation to remove the requirement for the siphon hole.

Example b. **During installation of a modification, the licensee failed to follow the installation procedures and a check valve is installed backward. Quality control did not find the error. During a post-modification test, prior to returning the system to service, the licensee discovered the problem.**

The violation: The licensee failed to correctly translate the design to the as-built configuration.

Minor because: It is work in progress and there is no safety consequences.

Not minor if: The system was returned to service.

Example c. **A solenoid that did not meet the specification was screened through receipt inspection and placed in the warehouse. When the solenoid was withdrawn to be installed, an electrician noted that it was not the correct type.**

The violation: The licensee is supposed to establish controls to prevent nonconforming parts from being used inadvertently and the wrong part could have been installed.

Minor because: It was work in progress and no adverse consequences resulted.

Not minor if: The valve was installed and the system returned to service.

6. ALARA Planning or Work Controls Issues

Example a **While reviewing the ALARA planning packages for the previous outage, the inspector finds that the actual collective dose received to complete a work activity (i.e., hanging temporary shielding to support ISI work) was 12.5 person-rem as opposed to the 10 person-rem estimated in the planning process.**

The issue: The dose that the licensee determined was ALARA for this work activity was not achieved.

Minor because: The actual dose achieved did not exceed the planned, intended dose (i.e., estimated collective dose planned for) by more than 50%. This 50% criteria represents the NRC's expectation of reasonably achievable precision in the ALARA planning process.

Not minor if: The planned, intended collective dose for this work activity is unjustifiably higher than industry norms, or the licensee's past experience, for this (or similar) work activity.

Example b. **While reviewing the collective dose results for work activities completed in the previous refueling outage, the inspector finds a work activity where the actual collective exceeds the planned, intended dose by 50% but is not greater than five person-rem**

The issue: The dose that the licensee determined was ALARA for this work activity was not achieved.

Minor because: Although the resulting dose is outside the expectation for ALARA planning precision, a five person-rem work activity is not a significant contribution to the overall ALARA performance.

Not minor if: If several such issues are identified and it appears that the licensee has arbitrarily divided up the radiological work into very small "work activities" for the purpose of avoiding inspection findings.

7. Maintenance Rule Issues

Example a. **Inspectors identified that the licensee did not monitor the isolation function that is needed to mitigate a release of radioactive liquid and is provided by turbine building drainage system radiation monitors. The drainage system design included two flow paths to the facility heat sink reservoir. One path drained directly and the other drained through an oily waste separation system. These paths contained Process Radiation Monitors HFRT-45 and LERT-59 that provided alarm and automatic isolation of the flow paths. The isolation function was within the scope of the licensee's program for implementation of 10 CFR 50.65, the Maintenance Rule (MR), and classified in a paragraph**

(a)(1) status; although there was no record of the radiation monitors' or their isolation function having failed in service. Nevertheless, the licensee had not established goals nor was it monitoring the performance or condition of the isolation function against such goals as required by paragraph (a)(1). Because the isolation function was classified under (a)(1), the licensee was not demonstrating that the performance or condition of the function was being effectively controlled through appropriate preventive maintenance under paragraph (a)(2), which allows such demonstration as the alternative to monitoring under paragraph (a)(1).

The violation: Paragraph (a)(1) of the Maintenance Rule requires that licensees monitor the performance or condition of SSCs within the scope of the rule as defined by paragraph (b) against licensee-established goals, in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended function. Contrary to the above, the licensee failed to set goals and monitor the performance or condition of the affected, in-scope SSCs in question, that were classified in an (a)(1) status, against those goals.

Minor because: This is a deficiency in implementation of the maintenance rule that had no equipment performance implications. The licensee's program regarding scoping of other non-safety related systems was otherwise satisfactory and the process radiation monitors were found to be functional.

Not minor if: The affected SSCs could not perform their intended safety function(s), their performance did not meet the established (a)(1) goals, or their performance or condition was degraded and/or declining and not being effectively controlled through appropriate preventive maintenance. Note that SSCs' not meeting goals or having performance problems are not in themselves violations of the Maintenance Rule. They only make the violations (e.g., failure to monitor when required or failure to take corrective action when goals are not met) more than minor and add safety significance (determined by SDP).

Note that while the foregoing example is theoretically possible, it would be extremely rare. In practice, the industry does not typically carry SSCs in an (a)(1) status unless equipment performance problems had already indicated the performance or condition of the SSCs was not being effectively controlled through appropriate preventive maintenance in (a)(2) status. Therefore, it would be highly unusual to have an in-scope SSC classified in (a)(1) status without attendant performance problems such that failure to set goals (or set adequate goals) and monitor the SSC would be a minor violation. Note also that the other type of (a)(1) violation, failure to take corrective action when goals are not met, is almost never minor because, by definition, it involves significant equipment performance problems.

Example b. **The inspectors identified that the licensee failed to consider one maintenance preventable functional failure (MPFF) of a system component within the scope of the Maintenance Rule that was not**

being monitored under paragraph (a)(1) of the rule, but for which the licensee was ostensibly demonstrating that preventive maintenance was being effective under paragraph (a)(2). The MPFF caused the component's unreliability performance criterion to be exceeded (or the MPFF was repetitive) thereby indicating that control of performance or condition through appropriate preventive maintenance was not effective. However, the licensee, having failed to officially recognize that its demonstration under (a)(2) of effective control of SSC performance or condition through appropriate preventive maintenance had been invalidated because it did not consider the MPFF in question, had never considered putting the component into (a)(1) despite several opportunities to do so.

The violation: The Maintenance Rule 10 CFR 50.65(a)(2) provides, in part, that monitoring as specified in (a)(1) is not required where it has been demonstrated that the performance or condition of an SSC is being effectively controlled through the performance of appropriate preventive maintenance, such that the SSC remains capable of performing its intended function. For in-scope SSCs not being monitored under (a)(1), the failure to demonstrate effective control of the performance or condition of such SSCs through appropriate preventive maintenance, as provided by paragraph (a)(2), is a violation of paragraph (a)(2).

Minor because : None of the minor issue screening questions in Appendix B to this chapter can be answered yes.

Not minor if: One or more of the minor issue screening questions in Appendix B to this chapter can be answered yes or the violations involve actual performance problems with the associated SSCs/functions.

As explained in Section 8.1.11 of the NRC Enforcement Manual, failure to consider a non-repetitive MPFF, to recognize a functional failure as an MPFF, or to recognize a functional failure entirely, or the occurrence of the failure itself, are NOT necessarily by themselves violations of the Maintenance Rule for SSCs in (a)(2), if, when the additional MPFF is considered, it can still be demonstrated that preventive maintenance was/is being effective, or if not, the licensee has put the affected SSCs/functions in (a)(1) (or can justify not having done so) within a reasonable amount of time or opportunities. For SSCs in (a)(1), SSC failures do not in themselves cause violations of (a)(1) as long as goals are set and the SSCs are being monitored against them and as long as prompt and adequate corrective action is taken when those goals are not met.

Example c. **The inspectors identified that during an (a)(3) evaluation, the licensee failed to include the system unavailability time during T/S required surveillance testing of the emergency diesel generators. Although the licensee conducts monthly EDG testing, the EDGs are unavailable to perform their intended safety function during T/S surveillance testing for a few minutes during each monthly test. The unavailability time**

due to surveillance testing was insignificant when compared against total unavailability such that the (a)(3) balancing was not affected.

The violation: The licensee failed to consider all unavailability when conducting the (a)(3) evaluation.

Minor because: The small contribution to unavailability due to the surveillance testing is insignificant when compared to total unavailability.

Not minor if: The contribution to unavailability due to surveillance testing was significant enough to affect the balancing determination.

Note that most 10 CFR 50.65(a)(3) violations will usually be minor unless, for example, they involve (as in the example) failure to recognize and correct significant imbalances between reliability and availability, or have other consequences such as equipment problems attributable to failure to take industry operating experience into account where practicable.

Example d. The inspectors identified that the licensee had not included some components of the augmented off-gas system within the scope of its program for implementation of the Maintenance Rule. Failure of these components could result in a plant transient or scram for which vulnerability, they were required to be in scope by paragraph (b)(2) of the rule. However, no equipment performance problems had been identified for the components in question.

The violation: The SSCs were not scoped within the maintenance rule as required by paragraph (b)(2) and if failures had occurred, they could have caused a transient or scram to an operating unit.

Minor because: This is a failure to implement a maintenance rule requirement that has no equipment performance implications. Had the SSCs been scoped, the routine maintenance being performed on the system was adequate and would have demonstrated effective maintenance per (a)(2) of the maintenance rule.

Not minor if: An actual failure had occurred causing a transient or if equipment performance problems were such that effective control of performance or condition under (a)(2) could not be demonstrated.

Example e. **The inspectors identified that the licensee had not scoped and thus failed to adequately demonstrate the performance or condition of a pressurizer heater group power supply breaker. The pressurizer heaters are a non-safety related system used in the plant EOPs; therefore, required to be in scope by paragraph (b)(2)(I) of the rule. The breaker failed to close during routine plant operations due to a random failure. As a result of the failure, the licensee realized that the breaker should have been scoped into the rule, and placed it into (a)(2) after reviewing its performance history and concluding that an**

adequate (a)(2) demonstration could be made based on the existing preventive maintenance on this type of breaker and an acceptable failure rate.

The violation:The breaker was not scoped within the maintenance rule.

Minor because: When scoped, the routine maintenance being performed on the breaker was adequate and its overall performance history demonstrated adequate control of performance or condition per (a)(2) of the maintenance rule.

Not minor if: Equipment performance problems were such that effective control of performance or condition under (a)(2) could not be demonstrated.

Example f. **In accordance with the guidance of IP 71111.13, the inspectors first reviewed the plant's maintenance risk assessment performed pursuant to 10 CFR 50.65(a)(4) for maintenance activities in progress and identified that the risk assessment was inadequate (i.e., it necessarily underestimated the risk) because (of one or more reasons including, but not limited to the following): (a) not all on-going maintenance activities within the licensee's established (a)(4) scope had been taken into account, (b) one or more maintenance activities were taking longer than assumed in the risk assessment, ©) plant conditions or operations, including technical specifications requirements, were not consistent with the assumptions used in the risk assessment, (d) the licensee had failed to consider (1) containment integrity or functions, (2) external events including actual or imminent severe weather, flooding, etc., vulnerability, unreliability, or instability of offsite power, (3) internal spray or flooding risk, (4) maintenance support measures including temporary modifications, special equipment, interference removal, removal or impairment of barriers, seismic restraints, etc., (e) the relevant information provided to the risk assessment tool or process was inaccurate and/or incomplete...or the risk assessment tool or process was being employed in a manner inconsistent with its design, capabilities and limitiations, e.g., more maintenance activities than the tool can model, plant conditions not modeled by the tool, etc.**

The violation: Failure to perform an adequate risk assessment when required by 10 CFR 50.65(a)(4)

Minor because: The increased risk, had it been assessed correctly, would not have put the plant into a higher licensee-established risk category or would not have required risk management actions or additional risk management actions under licensee procedures.

Not Minor if: The increased risk, had it been correctly assessed, would have put the plant into a higher risk category or would have required, under plant procedures, risk management actions or additional risk management actions.

Example g. **In accordance with the guidance of IP 71111.13, the inspectors first reviewed the plant's maintenance risk assessment for maintenance activities in progress required by 10 CFR 50.65(a)(4) and identified that a risk assessment had not been performed (or re-performed/updated) when required, by one or more circumstances including, but not limited to the following: (a) prior to commencing maintenance activities or maintenance support activities that could increase plant risk (b) prior to change(s) in plant configuration, conditions, or operations that would invalidate the existing risk assessment, ©) as soon as practicable after an emergent condition that would invalidate the existing risk assessment, not to interfere with immediate plant stabilization and restoration (unless the condition is fully corrected/plant restored before the risk assessment can reasonably be performed or updated).**

The violation:Failure to perform a risk assessment when required by (a)(4)

Minor because: Same conditions as in Example f above. However, note that when no risk assessment has been performed at all, the risk deficit is equal to the entire amount of the increase in plant risk.

Not minor if: Same conditions as in Example f above.

Example h. **In accordance with the guidance of IP 71111.13, the inspectors first reviewed the plant's maintenance risk assessment for maintenance activities in progress required by 10 CFR 50.65(a)(4) and determined that a risk assessment had been performed when required and was adequate. Upon inspection of the plant, the inspectors identified that one or more of the prescribed standard risk management actions (RMAs) had not been effectively implemented.**

The violation:Failure to manage risk as required by 10 CFR 50.65(a)(4)

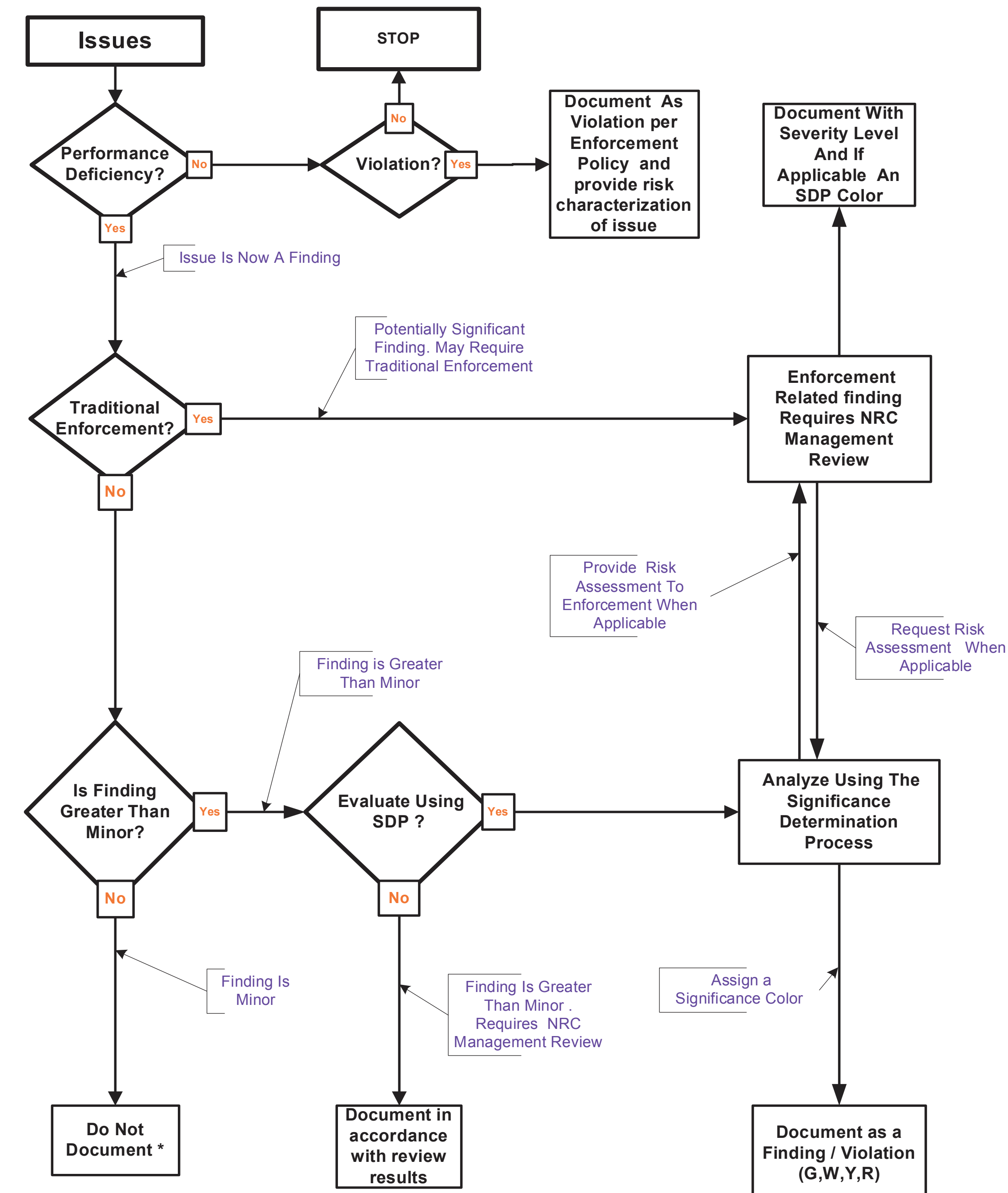
Minor because: All key safety functions are preserved and no RMAs prescribed for the assessed risk by site procedures.

Not minor if: Plant procedures required RMAs including compensatory measures for the assessed risk.

APPENDIX B
Issue Screening

Use Figure 1 and the questions listed below to determine if a finding has sufficient significance to warrant further analysis or documentation.

Figure 1



* see exception in Section 05.03

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Section 1. Performance Deficiency Question

An issue must be a "performance deficiency" before it can be considered a finding.

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?

Section 2. Enforcement Questions

(1) Does the issue have actual safety consequence (e.g.: overexposure, actual radiation release greater than 10 CFR Part 20 limits)?

(2) Does the issue have the potential for impacting the NRC's ability to perform its regulatory function? For example, a failure to provide complete and accurate information or failure to receive NRC approval for a change in licensee activity, or failure to notify NRC of changes in licensee activities , or failure to perform 10 CFR 50.59 analyses etc. (see Enforcement Policy IV.A.3)

(3) Are there any willful aspects of the violation?

Section 3. Minor Questions

(1) Could the finding be reasonably viewed as a precursor to a significant event?

(2) If left uncorrected would the finding become a more significant safety concern?

(3) Does the finding relate to performance indicators that would have caused the PI to exceed a threshold?

(4) Is the finding associated with one of the cornerstone attributes listed at the end of this attachment and does the finding affect the associated cornerstone objective?

(5) Does the finding relate to any of the following maintenance risk assessment and risk management issues?

(a) Licensee risk assessment failed to consider risk significant SSCs and support systems (included in Table 2 of the plant specific Phase 2 SDP risk-informed inspection notebook) that were unavailable during the maintenance.

(b) Licensee risk assessment failed to consider unavailable SSCs such as Residual Heat Removal Systems (PWR and BWR) that prevent or mitigate Interfacing System LOCAs.

©) Licensee risk assessment failed to consider SSCs that prevent containment failure such as containment isolation valves (BWR & PWR), BWR drywell/containment spray/containment flooding systems, and PWR containment sprays and fan coolers.

(d) Licensee risk assessment failed to consider actual severe weather in and around the plant site including potential grid reliability concerns (input usually obtained from regional transmission system operator).

(e) Licensee risk assessment failed to consider maintenance activities that could increase the likelihood of initiating events such as work in the electrical switchyard (increasing the likelihood of a loss of offsite power) and RPS testing (increasing the likelihood of a reactor trip).

(f) Licensee risk assessment failed to consider the uncompensated removal or impairment of plant internal flood barriers.

(g) Licensee risk assessment failed to account for any unavailability of a single train of a system (primary or back-up) that provides a shutdown key safety function.

(h) Licensee's risk assessment has known errors or incorrect assumptions that has the potential to change the outcome of the assessment.

(I) Licensee failed to implement any prescribed significant compensatory measures or failed to effectively manage those measures.

Section 4. <u>SDP Questions</u>

<u>REACTOR SAFETY</u>

<u>CORNERSTONES — Initiating Events, Mitigating Systems, & Barrier Integrity</u>
(1) Is the finding associated with an increase in the likelihood of an initiating event?

(2) Is the finding associated with the operability, availability, reliability, or function of a system or train in a mitigating system?

(3) 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)?

(4) Is the finding associated with degraded conditions that could concurrently influence any mitigation equipment and an initiating event?

(5) Is the finding associated with or involve impairment or degradation of a fire protection feature?

(6) Is the finding associated with inadequate 10 CFR 50.65 (a)(4) risk assessment (quantitative only) and/or risk management?

<u>Emergency Planning</u> :
(1) Is the finding associated with a failure to meet or implement a regulatory requirement?
(2) Is the finding associated with a drill or exercise critique problem?
(3) Is the finding associated with an actual event implementation problem?

Operator Requalification:
(1) Is the finding related to licensee's grading of exams?
(2) Is the finding related to written exams?
(3) Is the finding related to an individual operating test?
(4) Is the finding related to simulator fidelity?
(5) Is the finding related to simulator scenario quality?
(6) Is the finding related to scenario security?
(7) Is the finding related to crew performance?
(8) Is the finding related to operator pass/fail rate?
(9) Is the finding related to operator license conditions?

RADIATION SAFETY

CORNERSTONE — Occupational (ALARA):

(1) Does the occurrence involve a failure to maintain or implement, to the extent practical, procedures or engineering controls, needed to achieve occupational doses that are ALARA*, and that resulted in unplanned, unintended occupational collective dose for a work activity?

[1] (2) Does the occurrence involve an individual worker(s) unplanned, unintended dose(s) that resulted from actions or conditions contrary to licensee procedures, radiation work permit, technical specifications or NRC regulations?

(3) Does the occurrence involve an individual worker(s) unplanned, unintended dose(s) or potential of such a dose (resulting from actions or conditions contrary to licensee procedures, radiation work permit, technical specifications or NRC regulations) which could have been significantly greater as a result of a single minor, reasonable alteration of the circumstances?

(4) Does the occurrence involve conditions contrary to licensee procedures, technical specifications or NRC regulations which impact radiation monitors, instrumentation and/or personnel dosimetry, related to measuring worker dose?

CORNERSTONE — Public

(1) Does the finding involve an occurrence in the licensee's radiological effluent monitoring program that is contrary to NRC regulations or the licensee's TS, Offsite Dose Calculation Manual (ODCM), or procedures?

(2) Does the finding involve an occurrence in the licensee's radiological environmental monitoring program that is contrary to NRC regulations or the licensee's TS, ODCM, or procedures?

(3) Does the finding involve an occurrence in the licensee's radioactive material control program that is contrary to NRC regulations or the licensee's procedures?

(4) Does the finding involve an occurrence in the licensee's radioactive material transportation program that is contrary to NRC or Department of Transportation (DOT) regulations or licensee procedures?

[1] "Yes" answer to this question does not necessarily indicate a violation of the requirement in 10 CFR Part 20.1101 (b). Compliance will be judged on whether the licensee has incorporated measures to track and, if necessary, to reduce exposures (e.g., whether the findings indicate an ALARA program breakdown).

SAFEGUARDS

CORNERSTONE — Physical Protection

(1) Is the finding associated with or involve a failure to meet the requirements of 10 CFR 73.55 (b)-(h), or associated plans, procedure or rules?

(2) Is the finding associated with or impact any key attribute of the Physical Protection Cornerstone to meet its intended function whether in performance, design or implementation?

CORNERSTONE OBJECTIVES AND ATTRIBUTES
(related to Section 3, Minor Questions)

Cornerstone: REACTOR SAFETY / 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:	Initial Design and Plant Modifications
Protection Against External Factors:	Flood Hazard, Fire, Loss of Heat Sink, Toxic Hazard, Switchyard Activities, Grid Stability
Configuration Control:	Shutdown Equipment Lineup, Operating Equipment lineup,
Equipment Performance:	Availability, Reliability, Maintenance; Barrier Integrity (SGTR, ISLOCA, LOCA (S,M,L), Refueling/fuel handling equipment
Procedure Quality:	Procedure Adequacy
Human Performance:	Human Error

Cornerstone: REACTOR SAFETY / Mitigating Systems

Objective: to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage).

Attributes:

Design Control:	Initial Design and Plant Modifications
Protection Against External Factors:	Flood Hazard, Fire, Loss of Heat Sink, Toxic Hazard, Seismic
Configuration Control:	Shutdown Equipment Lineup, Operating Equipment Lineup,
Equipment Performance:	Availability, Reliability
Procedure Quality:	Operating (Post Event) Procedure (AOPs, SOPs, EOPs); Maintenance and Testing (Pre-event) Procedures
Human Performance:	Human Error (Post Event), Human Error (Pre-event)

Cornerstone: REACTOR SAFETY / Barrier Integrity

Objective: to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radio nuclide releases caused by accidents or events.

Attributes: (Maintain Functionality of Fuel Cladding)

Design Control:	Physics Testing; Core Design Analysis (Thermal limits, Core Operating Limit Report, Reload Analysis, 10 CFR50.46)

Configuration Control:	Reactivity Control (Control Rod Position, Reactor Manipulation, Reactor Control Systems); Primary Chemistry Control; Core Configuration (loading)
Cladding Performance:	Loose Parts (Common Cause Issues); RCS Activity Level
Procedure Quality:	Procedures which could impact cladding
Human Performance:	Procedure Adherence (FME, Core Loading, Physics Testing, Vessel; Assembly, Chemistry, Reactor Manipulation); FME Loose Parts, Common Cause Issues

Attributes: (Maintain functionality of RCS)

Design Control:	Plant Modifications
Configuration Control:	System Alignment; Primary Secondary Chemistry
RCS Equipment and Barrier Performance:	RCS Leakage; Active Components of Boundary(valves, seals); ISI Results
Procedure Quality:	Routine OPS/Maintenance procedures; EOPs and related Normal Procedures invoked by EOPs
Human Performance:	Routine OPS/Maintenance Performance; Post Accident or Event Performance

Attributes: (Maintain Functionality of Containment)

Design Control:	Plant Modifications; Structural Integrity; Operational Capability
Configuration Control:	Containment Boundary Preserved; Containment Design Parameters Maintained
SSC and Barrier Performance:	S/G Tube Integrity, ISLOCA Prevention; Containment Isolation SSC Reliability /Availability, Risk Important Systems Function
Procedure Quality:	Emergency Operating Procedures; Risk important Procedures (OPS, Maintenance, Surveillance)
Human Performance:	Post Accident or Event Performance; Routine OPS/Maintenance Performance

Cornerstone: REACTOR SAFETY / Emergency Preparedness

Objective: To ensure that the licensee is capable of implementing adequate measures to protect the health and safety of the public in the event of a radiological emergency.

Attributes:

ERO Readiness:	Duty Roster; ERO Augmentation System; ERO Augmentation Testing; Training
Facilities and Equipment:	ANS Testing; Maintenance Surveillance and Testing of Facilities, Equipment and Communications Systems; Availability of ANS, Use in Drills and Exercises.
Procedure Quality:	EAL Changes, Plan Changes; Use in Drills and Exercises;
RO Performance:	Program Elements Meet 50.47(b) Planning Standards, Actual Event Response; Training, Drills, Exercises

Offsite EP:	FEMA Evaluation

Cornerstone: RADIATION SAFETY / Occupational Radiation Safety

Objective: to ensure the adequate protection of the worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation.

Attributes:

Plant Facilities/Equipment and Instrumentation:	Plant Equipment, ARM Cals & Availability, Source Term Control; Procedures (Radiation and Maintenance)
Program & Process:	Procedures (HPT, Rad Worker, ALARA); Exposure/Contamination Control and Monitoring (Monitoring and RP Controls); ALARA Planning (Management Goals, Measures - Projected Dose)
Human Performance:	Training (Contractor HPT Quals, Radiation Worker Training, Proficiency)

Cornerstone: RADIATION SAFETY / Public Radiation Safety

Objective: to ensure adequate protection of public health and safety from exposure to radioactive materials released into the public domain as a result of routine civilian nuclear reactor operation.

Attributes:

Plant Facilities/Equipment and Instrumentation:	Process radiation Monitors (RMS) (Modifications, Calibrations, Reliability, Availability), REMP Equipment, Meteorology Equipment, Transportation Packaging; Procedures (Design/Modifications, Equipment Calculations, Transportation Packages, Counting Labs)
Program & Process:	Procedures; (Process RMS &REMP, Effluent Measurement OC, Transportation Program, Material Release, Meteorological Program, Dose Estimates); Exposure and Radioactivity Material Monitoring and Control (Projected Offsite Dose, Abnormal Release, DOT Package Radiation Limits, Measured Dose)
Human Performance:	Training (Technician Qualifications, Radiation & Chemical Technician Performance

Cornerstone: SAFEGUARDS / Physical Protection

Objective: to provide adequate assurance that the physical protection system can protect against the design basis threat of radiological sabotage.

Attributes:

Physical Protection System:	Protected Areas (Barriers and Alarms, Assessment); Vital Areas (Barriers and Alarms, Assessment)
Access Authorization System:	Personnel Screening; Behavior Observations; Fitness for Duty
Access Control System:	Search; Identification
Response to Contingency Events:	Protective Strategy; Implementation of Protective Strategy

Appendix K

MAINTENANCE RISK ASSESSMENT AND RISK MANAGEMENT SIGNIFICANCE DETERMINATION PROCESS

1.0 OBJECTIVE

To determine the significance of inspection findings related to licensee assessment and management of risk associated with performing maintenance activities under all plant operating or shutdown conditions in accordance with Baseline Inspection Procedure (IP) 71111.13, “Maintenance Risk Assessment and Emergent Work Control.”

2.0 BASIS

NRC requirements in this area are set forth in paragraph (a)(4) of 10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.” Detailed bases information for this appendix is provided in Inspection Manual Chapter (IMC) 308, “Reactor Oversight Process (ROP) Basis Document, “ Attachment 3, Appendix K.

3.0 GENERAL GUIDANCE

The input to the maintenance rule (a)(4) Significance Determination Process (SDP) is a greater than minor inspection finding that results from the licensee's underestimate of plant risk or lack of risk assessment from ongoing or completed maintenance activities and/or the licensee's ineffective implementation of risk management actions (RMAs). A licensee performance deficiency in either one or both of these paragraph (a)(4) requirements must exist for the finding to be entered into this SDP.

Attachment 1 provides the assumptions and defined terms used in this SDP. Flowcharts 1 and 2 are used to categorize individual inspection findings as either Green, White, Yellow, or Red.

It is expected that resident inspectors will support Senior Reactor Analysts (SRAs), or other risk analysts, as necessary to assess the significance of maintenance rule a(4) related inspection findings.

Note: This guidance does not apply to the following situations: (1) those licensees who only perform qualitative analyses of plant configuration risk due to maintenance activities, or (2) performance deficiencies related to maintenance activities affecting SSCs needed for fire or seismic mitigation. When performance deficiencies are identified with either 1 or 2 above, the significance of the deficiencies must be determined by an internal NRC management review using risk insights where possible in accordance with IMC 612, "Power Reactor Inspection Reports."

4.0 SPECIFIC GUIDANCE

Step 4.1 Determination of Actual Risk

The risk deficit for performance deficiencies is determined in an increasing order of magnitude to reflect the amount the risk increases from the plant's zero-maintenance risk due to an inadequate risk assessment. Specifically, the incremental core damage probability deficit (ICDPD) and the incremental large early release probability deficit (ILERPD) are the risk metrics used to evaluate the magnitude of the error in the licensee's inadequate risk assessment of the temporary risk increases due to maintenance activities/configurations. Note that this SDP uses Incremental Core Damage Probability (ICDP) metric rather than ^{a}CDF (annualized risk increase) used in other reactor safety SDPs. The incremental plant risk (ICDP), like the ^{a}CDF is a function of the amount of the time in which the plant configuration change existed. Attachment 1 provides the mathematical formulas for these metrics.

Step 4.1.1 - Licensee Evaluation of Risk

When the inspector has identified that the licensee has performed an inadequate risk assessment, or none at all, the actual maintenance risk configuration-specific CDF must first be adequately or accurately assessed. The inspector should discuss the results of the risk assessment with the licensee before proceeding with any further risk assessment. The new risk assessment value may be obtained in several ways including having the licensee perform the omitted maintenance risk assessment; or re-perform the assessment, correcting those errors and/or omissions that rendered the original risk assessment inadequate. It is expected that having the licensee re-evaluate the actual maintenance configuration would be the norm for (a)(4) issues.

Step 4.1.2 - NRC Evaluation of Risk

Alternatively, the inspector may request the regional SRA or other risk analyst to independently evaluate the risk if there are specific concerns regarding the adequacy of the licensee's assessment such as:

a. The licensee's maintenance configuration change excluded multiple systems.

b. There are notable limitations with the licensee's configuration risk assessment tool (e.g., does not address potential changes to initiating event frequencies).

c. There are known quality issues with the licensee's configuration risk assessment tool (e.g., is not consistent with the plant PRA).

d. The qualitative risk assessment contained invalid assumptions and/or omissions.

To request an independent risk assessment, the inspector should provide the following information to the regional SRA or risk analyst:

SSCs configuration in the specific time window of concern with actual time of SSCs removed from service and when returned to service.

Description of testing or other maintenance activities that potentially increased the likelihood of an initiating event

Description of actual compensatory actions implemented

Licensee's risk assessment

In addition, if the finding involves an outage risk configuration, then the appropriate checklist reflecting the plant shutdown mode from IMC 0609, Appendix G, Attachment 1, should be checked and provided to the SRA.

Step 4.2 Determination of Risk Deficit

If the licensee did not perform a risk assessment, the actual risk increase ($ICDP_{actual}$) is the product of the incremental CDF and the annualized fraction of the duration of the configuration [i.e., $ICDP_{actual}$ = ICDF x (duration in hours) ÷ (8760 hours per reactor year)], where $ICDF_{actual} = CDF_{actual} - CDF_{zero\text{-}maintenance}$

Note that the risk deficit, ICDPD = ICDP when the licensee's performance deficiency involves not conducting a risk assessment.

For a flawed risk assessment, the risk deficit ICDPD = $ICDP_{actual} - ICDP_{flawed}$ assuming the $ICDP_{actual} > ICDP_{flawed}$.

If ICDP is significantly greater than 1E-6 (i.e., one order of magnitude or greater), the net risk impact must be assessed by subtracting 1E-6 from the risk deficit (ICDPD) as determined above, prior to determining an SDP color. The safety significance of the licensee's underestimate (or lack of estimate) of the risk is then determined by using flowchart 1. The color of the ILERPD, if applicable, is determined in a similar fashion.

Step 4.3 - Assessment of Risk Management Actions

As discussed in NUMARC 93-01, Section 11.3, "Assessment of Risk Resulting from Performance of Maintenance Activities," and in Appendix A of IP 71111.13, the following categories of appropriate RMAs can be used to control risk associated with a maintenance activity.

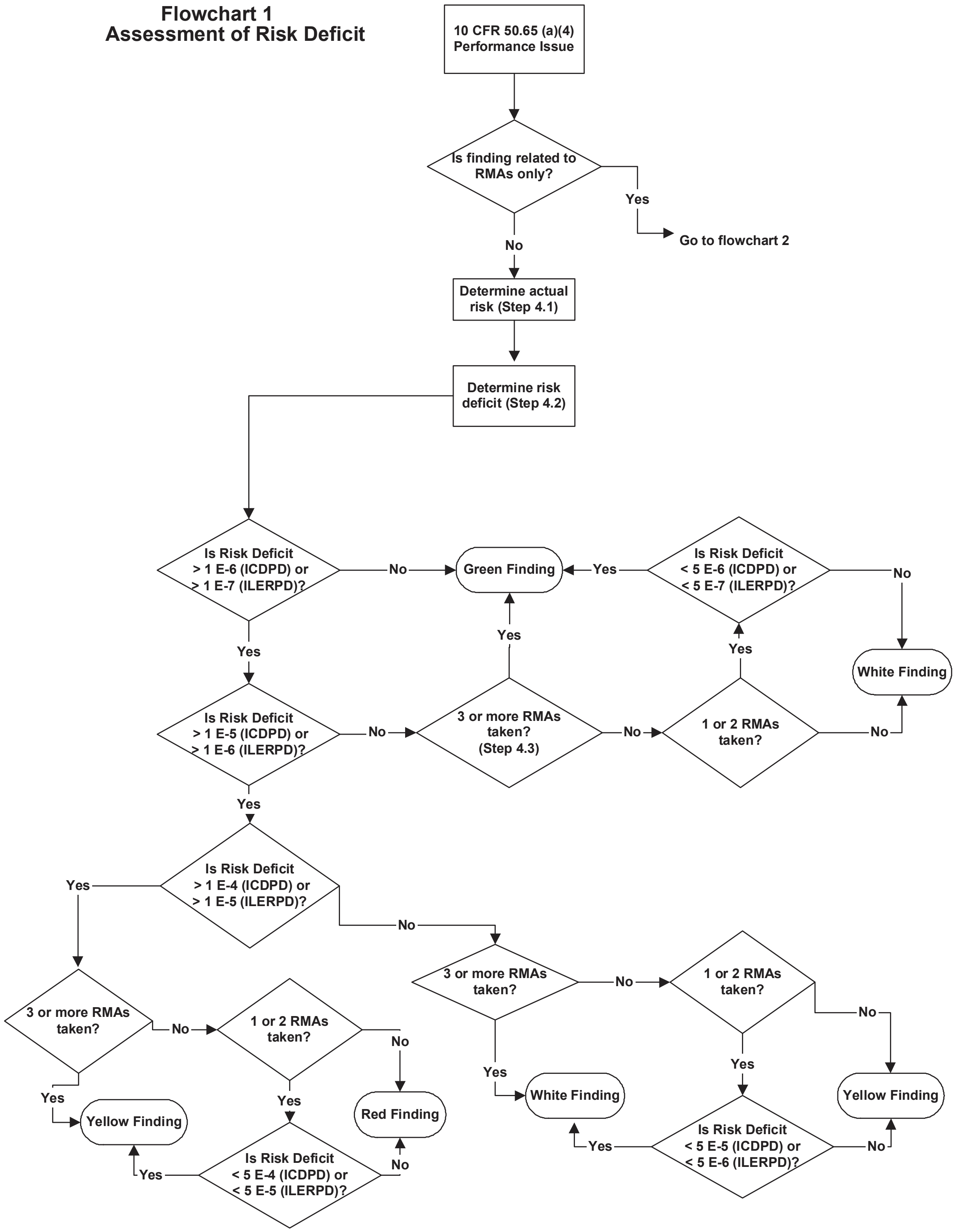
- increasing risk awareness and control
- reducing duration of maintenance activity
- minimizing magnitude of risk increase
- establishing other compensatory measures to provide alternate success paths for maintaining the safety function of the out-of-service SSC (e.g., using diverse means of accomplishing the intended safety function)

Because the risk benefits of these RMAs are generally not quantifiable, the approach chosen for quantitatively determining the significance of failure to manage risk is to assign credit for these actions in reducing the risk impact of the assessed configuration. Therefore, the simple screening rule used in this SDP is to assign a credit of one half order of magnitude reduction in risk to the correctly calculated risk if the licensee effectively implemented one or two categories of the RMAs to control risk. If the licensee effectively implemented three or more categories of the RMAs, an order of magnitude reduction in risk is credited against the actual maintenance risk. This approach allows the significance of failure to manage risk to be expeditiously determined without using quantitative approaches that would likely require intensive resources.

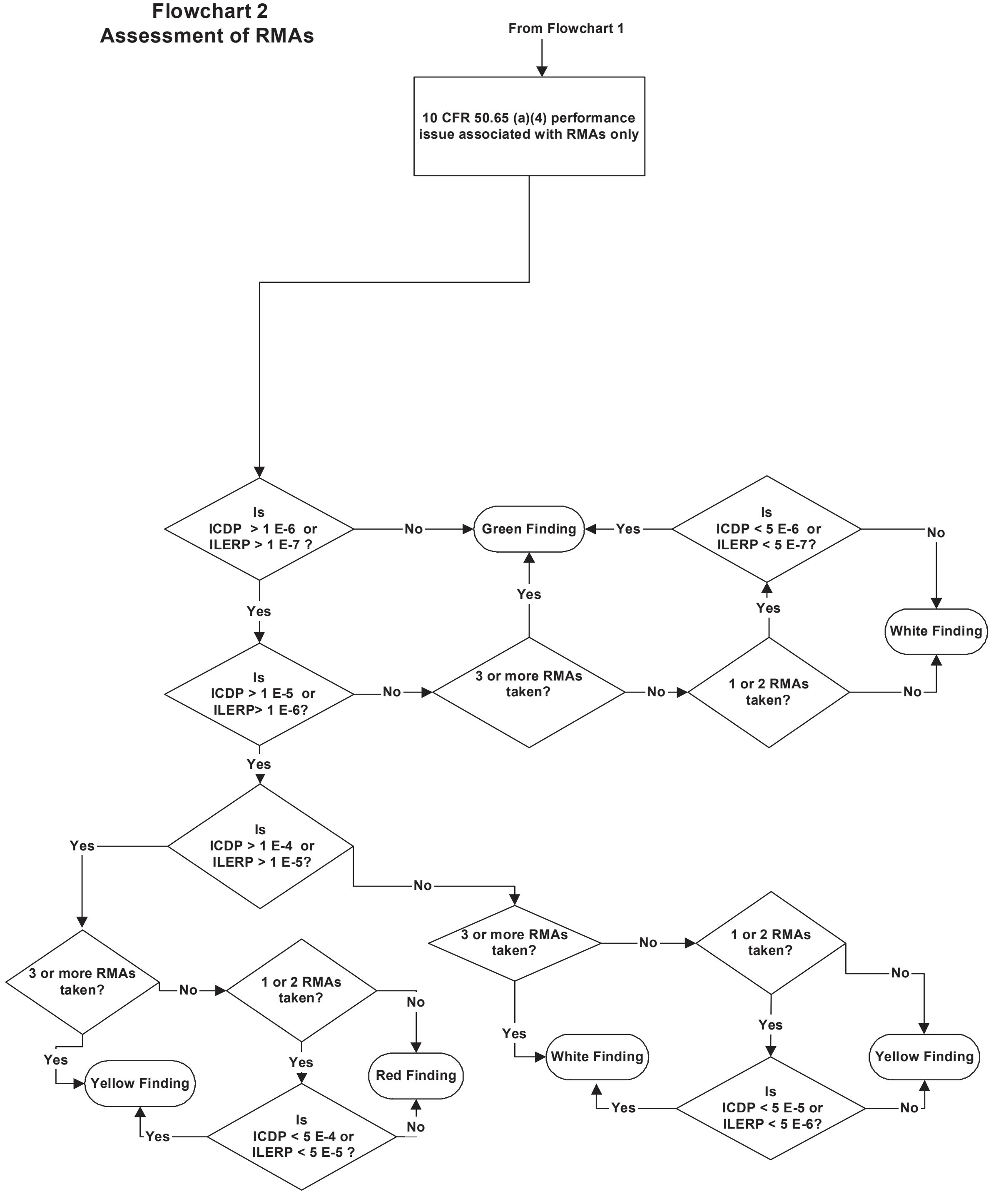
If the risk is inadequately assessed, or not assessed at all, the performance deficiency is processed through this SDP. The resultant failure to take RMAs due to lack of risk recognition merely provides no mitigation of the risk deficits.

When the risk is adequately assessed, the licensee will normally be expected to effectively implement only those RMAs prescribed for the assessed risk by site procedures. Under certain circumstances, specific compensatory measures may also be prescribed by license conditions, technical specifications, notices of enforcement discretion, and/or special commitments, as applicable. The performance deficiency to be processed through this SDP using flowchart 2 would be the licensee's failure to implement one or more categories of RMAs either as prescribed by any of the sets of requirements discussed above. The adequacy of licensee's RMAs should be assessed using the guidance provided in baseline IP 71111.13 and licensee's applicable implementing procedures.

Flowchart 1
Assessment of Risk Deficit



Flowchart 2
Assessment of RMAs



ATTACHMENT 1

ADDITIONAL GUIDANCE

The following assumptions and defined terms regarding licensee risk assessments and risk management actions (RMAs) are necessary to understand and efficiently use this maintenance rule (a)(4) SDP evaluation tool.

1.0 RISK ASSESSMENTS AND RISK MANAGEMENT ACTIONS

The intent of paragraph (a)(4) is for licensees to appropriately assess the risks of proposed maintenance activities that will:

directly, or may inadvertently, result in equipment being taken out of service,

involve temporary alterations or modifications that could impact SSC operation or performance,

be affected by other maintenance activities, plant conditions, or evolutions, and/or

be affected by external events, internal flooding, or containment integrity.

Paragraph (a)(4) requires management of the resultant risk using insights from the assessment. Therefore, licensee risk assessments should properly determine the risk impact of planned maintenance configurations to allow effective implementation of RMAs to limit any potential risk increase when maintenance activities are actually being performed. Although the level of complexity in an assessment would be expected to differ from plant to plant, as well as from configuration to configuration within a given plant, it is expected that licensee risk assessments would provide insights for identifying risk-significant activities and minimizing their durations. In general, the following two types of licensee performance deficiencies in meeting (a)(4) requirements can be defined.

<u>Failure to Perform an Adequate Risk Assessment</u>. The failure to perform an adequate risk assessment in accordance with 10CFR50.65 (a)(4) prior to the conduct of maintenance activities includes the following deficiencies which result in underestimating the risk.

1. Failure to perform a risk assessment for maintenance configuration changes.

2. Failure to update a risk assessment for changes in the assessed plant conditions (e.g., changes in maintenance activities or emergent conditions). However, performance or re-evaluation of the assessment should not interfere with, or delay, the operator and/or maintenance crew from taking timely actions to restore the equipment to service or take compensatory actions. If the plant configuration is restored prior to conducting or re-evaluating the assessment, the assessment need not be conducted, or re-evaluated if already performed.

3. Failure to perform a complete risk assessment including all affected/involved SSCs within the scope of SSCs required for (a)(4) assessments, and considering (or adequately considering) all plant-relevant plant conditions or

evolutions, external events (excluding fire and seismic), internal flooding, and/or containment integrity

4. Failure to consider maintenance activities which have historically had a high likelihood of introducing a transient leading to an initiating event that would result in risk-significant configurations

5. Improper use of the risk assessment tool or process (i.e., beyond its capabilities or limitations, or under plant conditions for which it was neither designed nor in accordance with site procedures)

6. Deficient risk-informed evaluation process for limiting the scope of SSCs to be included in (a)(4) risk assessments as identified by NRC inspection (e.g., IP 62709).

7. Flawed risk assessment tool or process as identified by NRC inspection (e.g., IP 62709).

Underestimating or not estimating the risk of maintenance activities may not significantly increase the expected overall plant risk, in terms of core damage frequency (CDF) or large early release frequency (LERF). However, underestimating the risk may result in lack of risk awareness that could preclude RMAs and allow a high-risk configuration to persist unrecognized and uncompensated. Allowing a high-risk configuration with an unassessed CDF increase to persist longer than necessary, or desirable, will increase the exposure time and hence the incremental (integrated) core damage probability (ICDP) and/or the incremental large early release probability (ILERP) as defined below. Finally, unawareness of unassessed or inadequately assessed risk may allow actions or events to occur that could directly increase risk or hamper recovery from accidents or transients.

Licensees that have adopted RMA color thresholds that are not ICDP or ILERP based, may need to have performance converted to correspond to a probability unit of measure.

Failure to Manage Risk. Failure to manage the risk impacts of proposed maintenance activities means a failure to implement, in whole or in part, the key elements of the licensee's risk management program. However, this deficiency will not result in an additional risk increase to the assessed risk of the maintenance configuration in terms of CDF or LERF. Measures to minimize the duration of the risk associated with a maintenance activity/configuration are a principal RMA. Nevertheless, failure to implement such measures when they are possible and practicable will allow the ICDP and/or the ILERP to increase further as the elevated risk condition persists. Appropriate and suitable RMAs can only reduce the risk incurred from a given configuration change.

RMAs should be implemented in a graduated manner, commensurate with various increases above the plant's baseline risk, to control the overall risk impact of an assessed maintenance configuration. However, licensees use a variety of methods for categorizing risk significance and managing the risk according to the significance category.

In Regulatory Guide 1.182, the NRC endorsed the RMA levels or categories/bands prescribed in the revised Section 11 of NUMARC 93-01, Revision 2, and subsequently incorporated in Revision 3 of NUMARC 93-01. These risk bands are defined in terms of the ICDP, making them readily comparable to the risk levels used in determining the significance of the risk deficits. For licensees that have adopted this guidance, normal work controls are allowed by site procedures for ICDPs less than 1 E-6. For ICDPs of 1E-6 or greater, RMAs are prescribed. Section 11 of NUMARC 93-01 states that maintenance risk configurations above ICDP value of 1E-5 should not be entered voluntarily. Site procedures will prohibit this activity entirely or will allow it only with fairly rigorous restrictions that typically include the plant manager's written permission along with extensive RMAs. Site procedures may further define specific detailed RMAs or plans for routinely allowable risk categories as well. It should be noted that when evaluating the adequacy of a licensee's RMAs, the inspector should consider only those actions that could have potential risk implications and are required by the licensee's procedures, such as working around the clock, installing backup equipment, and reducing duration of maintenance activity.

2.0 DEFINITIONS

The following are definitions of terms used throughout this SDP.

Incremental Core Damage Frequency (ICDF). The ICDF is the difference between the actual, adequately assessed, maintenance risk (configuration-specific CDF) and the zero-maintenance CDF. The configuration-specific CDF or ICDF are annualized risk estimates with the out-of-service or otherwise affected SSCs considered unavailable. The term, "Incremental Core Damage Frequency" is also equivalently referred to as delta CDF, or change in CDF.

Incremental Core Damage Probability (ICDP). The ICDP is the product of the incremental CDF and the annual fraction of the duration of the configuration [i.e., ICDP = ICDF x (duration in hours) ÷ (8760 hours per reactor year)]. Note that the ICDP is sometimes expressed as the integrated or integral ICDP (i.e., the delta CDF or ICDF integrated over the time of its duration which increases as the elevated-risk configuration persists). Figure 1 is a graphical representation of this concept.

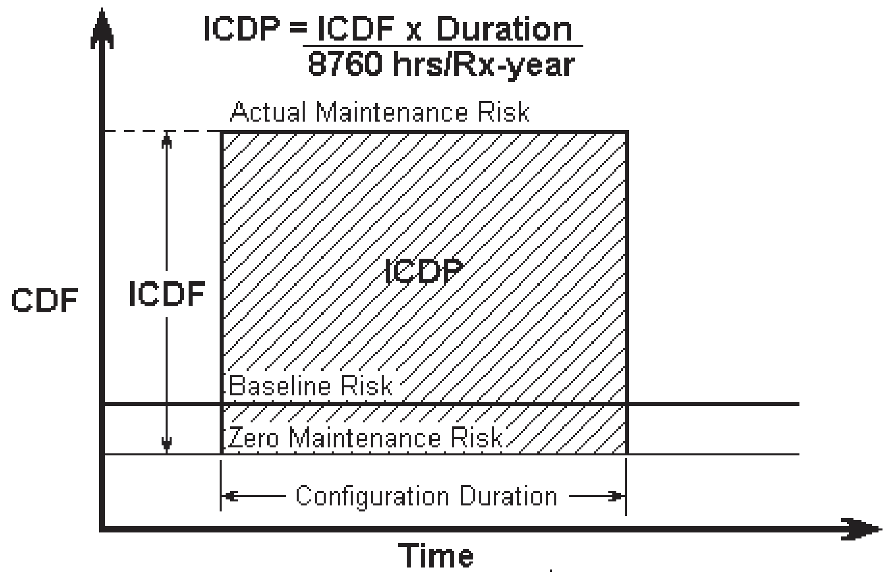


Figure 1 - Relationship of ICDF to ICDP

Incremental Core Damage Frequency Deficit (ICDFD). The ICDFD is that portion of the ICDF defined as the difference between the actual maintenance-configuration-specific CDF (called $ICDF_{actual}$ for purposes of this definition) and the maintenance-related ICDF as originally and inadequately assessed (flawed) by the licensee ($ICDF_{flawed}$). Therefore, the ICDFD = $ICDF_{actual}$ - $ICDF_{flawed}$. Note that if the licensee has failed to assess maintenance risk entirely when required (i.e., there is no licensee risk assessment), then the ICDFD will be equal to the entire value of the ICDF. The safety significance of the ICDFD (i.e., the magnitude of the licensee's underestimate (or lack of estimate) of the risk) is determined by means of this SDP.

Incremental Core Damage Probability Deficit (ICDPD). The ICDPD is the product of the ICDFD and the exposure (i.e., the annual fraction of the duration of the unassessed or inadequately assessed configuration, or that portion of the annual fraction of the duration of the maintenance configuration during which its risk remained unassessed or inadequately assessed). Thus the ICDPD = ICDFD x (exposure in hours) ÷ (8760 hours per reactor-year). Note that similar to the ICDFD, the ICDPD equals the ICDP when there is no risk assessment, rather than a flawed risk assessment. Note also that Exposure equals Duration if the risk remained unassessed or inadequately assessed for the entire duration of the configuration. The safety significance of the ICDPD (i.e., the magnitude of the licensee's underestimate (or lack of estimate) of the risk (in terms of ICDP)), may also be determined by means of this SDP. Figure 2 is a graphical representation of this concept.

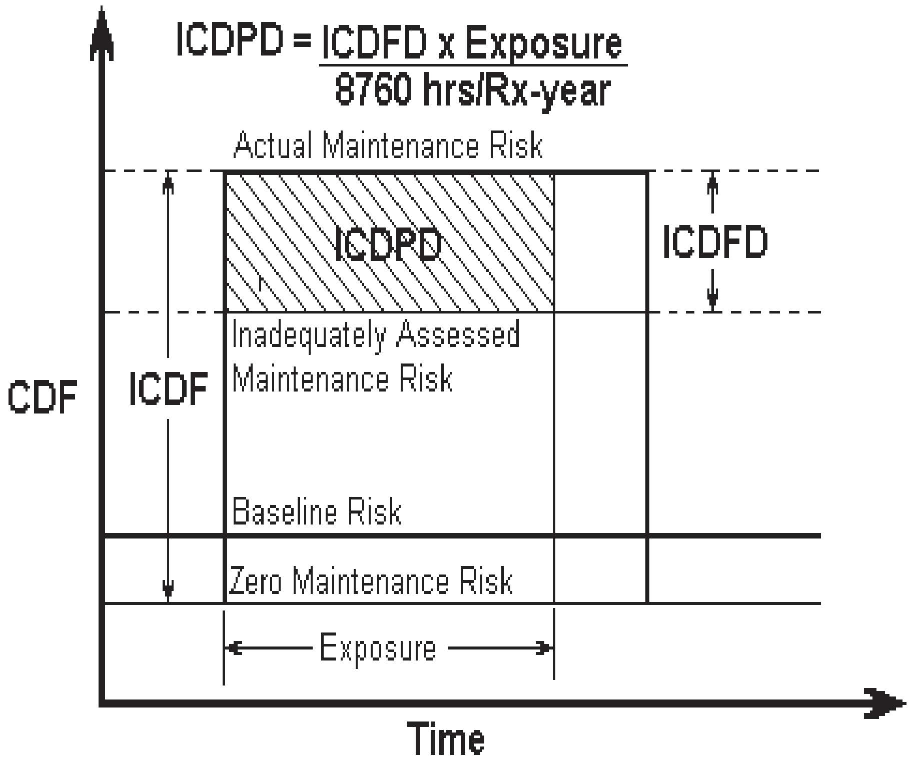


Figure 2 - Relationship of ICDFD to ICDPD

Incremental Large Early Release Frequency (ILERF). The ILERF is the difference between the actual, adequately determined maintenance activity/configuration-specific LERF and the zero maintenance model results, if determinable. Note that LERF and ILERF are determinable only if the plant has a Level-II PRA and a risk tool or process capable of quantitatively assessing Level-II risk beyond a qualitative assessment of the impact of containment integrity. If calculated, the ILERF may also be referred to as the delta LERF or LERF difference.

Incremental Large Early Release Frequency Deficit (ILERFD). The ILERFD is used to evaluate the significance of a finding under the following conditions (1) an impact on containment integrity from or concurrent with the maintenance activity occurs, (2) this impact is/was not qualitatively assessed, and (3) the impact is/was quantitatively assessed, but not adequately. Then the ILERFD is meaningful and is that portion of the ILERF defined as the difference between the actual maintenance-configuration-specific LERF (called $ILERF_{actual}$ for purposes of this definition) and the maintenance-related ILERF as originally and inadequately assessed by the licensee ($ILERF_{flawed}$). Therefore, the $ILERFD=ILERF_{actual}$! $ILERF_{flawed}$. Note that if the licensee has failed to assess maintenance risk entirely when required (i.e., there is no licensee risk assessment) and there is an impact on containment integrity from or concurrent with the maintenance activity, this impact can be neither qualitatively nor quantitatively assessed. Therefore, the ILERFD will be equal to the entire value of the ILERF. The safety significance of the licensee's underestimate (or lack of estimate) of the Level-II risk (i.e., ILERFD) may also be determined by means of this SDP, if appropriate.

Incremental Large Early Release Probability (ILERP). The ILERP is the product of the incremental large early release frequency (ILERF) and the annual fraction of the duration of the configuration. The ILERP=(ILERF x duration in hours)÷(8760 hours per reactor-year).

Incremental Large Early Release Probability Deficit (ILERPD). The ILERPD is the product of the ILERFD with the annual fraction of the duration of the unassessed or inadequately assessed configuration, or that portion of the annual fraction of the duration of the maintenance configuration during which its risk (in terms of ILERF or ILERP) remained unassessed or inadequately assessed.

NOTE: Although an adequate maintenance risk assessment is expected to include the impact of containment integrity, at least qualitatively, there is no regulatory requirement for a quantitative risk assessment using a Level-II PRA. Paragraph (a)(4) of 10 CFR 50.65 neither prohibits nor explicitly discourages incurring maintenance risk. It only requires that the risk of maintenance activities be assessed (which can be done qualitatively, quantitatively, or, as is often the case, in a blended fashion) and managed.

Loss of Function. This is the condition in which an SSC becomes incapable of performing its intended purpose. This can mean a complete functional failure or impaired or degraded performance or condition such that the affected SSC is incapable of meeting its functional success criteria. Functional success criteria include having the required trains, adequate speed, flow, pressure, load, startup time, mission time, etc. These are defined or assumed in the design and/or licensing bases (i.e., updated final safety evaluation report, license conditions, or technical specifications and/or their bases). For the purposes of determining risk/safety significance, the functional success criteria of particular interest would be those assumed in the plant's PRA and/or the licensee's risk assessment tool. In some cases such as testing, a "lost" function can be promptly restored if restoration actions (a single action or few simple actions)are done by a dedicated local operator.

Zero-Maintenance CDF(Risk). The CDF estimate of plant baseline configuration where all SSCs are considered available.

Baseline CDF(Risk). The CDF from a PRA considering average annual maintenance (preventive and corrective maintenance), and plant specific reliability data (failure rates).

Note that inadequate risk assessment or risk management for work not yet started is not an (a)(4) violation, but it still represents a licensee performance deficiency and may be indicative of deficiencies in previous risk assessments, RMAs and/or in the licensee's (a)(4) program. This SDP is not suited for determining the significance of this type of performance deficiency. This type of issue can normally be expected to be screened to Green in accordance with Reactor SDP Phase 1 screening.

TECHNICAL BASIS DOCUMENT

MAINTENANCE RISK ASSESSMENT AND RISK MANAGEMENT SIGNIFICANCE DETERMINATION PROCESS

I. INTRODUCTION

This document provides the basis for IMC 609, Appendix K for the assessment of licensee performance deficiencies related to licensee assessment and management of the risk associated with performing maintenance activities. Oversight of licensee performance in assessing and managing the risk of plant maintenance activities is conducted principally by baseline inspection procedure (IP) 71111.13, "Maintenance Risk Assessment and Emergent Work Control," or supplemental inspection IP 62709, "Configuration Risk Assessment and Risk Management Process."

BASIS

The NRC requirements in this area are set forth in paragraph (a)(4) of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," effective November 28, 2000.

The intent of paragraph (a)(4) is to have licensees appropriately assess the risks of proposed maintenance activities that will (1) directly, or may inadvertently, result in equipment being taken out of service, (2) involve temporary alterations or modifications that could impact structure, system, or component (SSC) operation or performance, (3) be affected by other maintenance activities, plant conditions, or evolutions, and/or (4) be affected by external events, internal flooding, or containment integrity. Paragraph (a)(4) requires management of the resultant risk using insights from the assessment. Therefore, licensee risk assessments should properly determine the risk impact of planned maintenance configurations to allow effective implementation of RMAs to limit any potential risk increase when maintenance activities are actually being performed. Although the level of complexity in an assessment would be expected to differ from plant to plant, as well as from configuration to configuration within a given plant, it is expected that licensee risk assessments would provide insights for identifying risk-significant activities and minimizing their durations.

BACKGROUND

During the initial implementation phase of the reactor oversight process (ROP), a task group was formed to review the adequacy of the reactor safety SDP to assess the significance of maintenance rule (MR) related inspection findings. The task group, consisted of staffs from NRR and the regions, recommended that the existing reactor SDP did not address issues related to risk assessment and risk management associated with performance of maintenance activities and a new SDP be developed to assess the risk significance of these findings. This recommendation was based on the following reasons: (1) existing SDP phase 1 worksheet may inappropriately screen risk-significant plant maintenance configurations to "green," (2) phase 2 site-specific inspection notebooks lack the necessary level of detail and completeness to assess maintenance configurations with multiple equipment out-of-service, and (3) licensees are already using phase 3 type analyses (and tools) to assess the at-power risks of maintenance configurations. The task group developed a draft SDP to evaluate the significance of MR (a)(4) issues, such as (1) failure to perform an adequate risk assessment, and (2) failure to manage risk. The proposed SDP concept was first discussed with industry groups in a public workshop held on March 2001and further SDP refinements were discussed during routine ROP public meetings to obtain industry feedback. The subject SDP incorporated internal and external feedback and recommendations.

III. METRICS USED

The incremental core damage probability deficit (ICDPD) and the incremental large early release probability deficit (ILERPD) are the metrics used to evaluate the magnitude of the error in the licensee's inadequate risk assessment of the temporary risk increases due to maintenance activities/configurations. Note that this SDP uses Incremental Core Damage Probability (ICDP) metric rather than aCDF (annualized risk increase) used in other reactor SDPs. The incremental plant risk (ICDP) is a function of the amount of the time in which the plant configuration change exists (time dependent). Thus the risk increase of a configuration can be best represented in terms of probability metric.

IVDEFINITIONS USED

The following are definitions of terms used throughout this SDP .

Incremental Core Damage Frequency (ICDF). The ICDF is the difference between the actual (adequately/accurately assessed) maintenance risk (configuration-specific CDF) and the zero-maintenance CDF. The configuration-specific CDF or ICDF is the annualized risk estimate with the out-of-service or otherwise affected SSCs considered unavailable. The term, "Incremental Core Damage Frequency" is also equivalently referred to as delta CDF, or change in CDF.

Incremental Core Damage Probability (ICDP). The ICDP is the product of the incremental CDF and the annual fraction of the duration of the configuration [i.e., ICDP = ICDF x (duration in hours)÷(8760 hours per reactor year)]. Note that the ICDP is sometimes expressed as the integrated or integral ICDP (i.e., the delta CDF or ICDF integrated over the time of its duration which increases as the elevated-risk configuration persists). Figure 1 is a graphical representation of this concept.

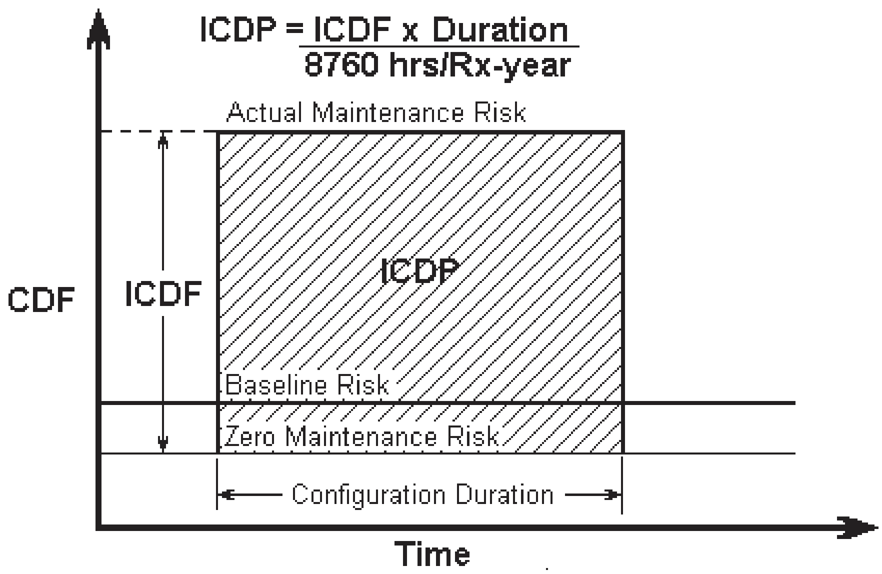


Figure 1 - Relationship of ICDF to ICDP

Incremental Core Damage Frequency Deficit (ICDFD). The ICDFD is that portion of the ICDF defined as the difference between the actual maintenance-configuration-specific CDF (called $ICDF_{actual}$ for purposes of this definition) and the maintenance-related ICDF as originally and inadequately assessed (flawed) by the licensee ($ICDF_{flawed}$). Therefore, the $ICDFD = ICDF_{actual} - ICDF_{flawed}$. Note that if the licensee has failed to assess maintenance risk entirely when required (i.e., there is no licensee risk assessment), then the ICDFD will be equal to the entire value of the ICDF. The safety significance of the ICDFD (i.e., the magnitude of the licensee's underestimate (or lack of estimate) of the risk) is determined by means of this SDP.

Incremental Core Damage Probability Deficit (ICDPD). The ICDPD is the product of the ICDFD and the Exposure (i.e., the annual fraction of the duration of the unassessed or inadequately assessed configuration, or that portion of the annual fraction of the duration of the maintenance configuration during which its risk remained unassessed or inadequately assessed). Thus the ICDPD = ICDFD x (exposure in hours) ÷ (8760 hours per reactor-year). Note that similar to the ICDFD, the ICDPD equals the ICDP when there is no risk assessment, rather than a flawed risk assessment. Note also that Exposure equals Duration if the risk remained unassessed or inadequately assessed for the entire duration of the configuration. The safety significance of the ICDPD (i.e., the magnitude of the licensee's underestimate (or lack of estimate) of the risk (in terms of ICDP)), may also be determined by means of this SDP. Figure 2 is a graphical representation of this concept.

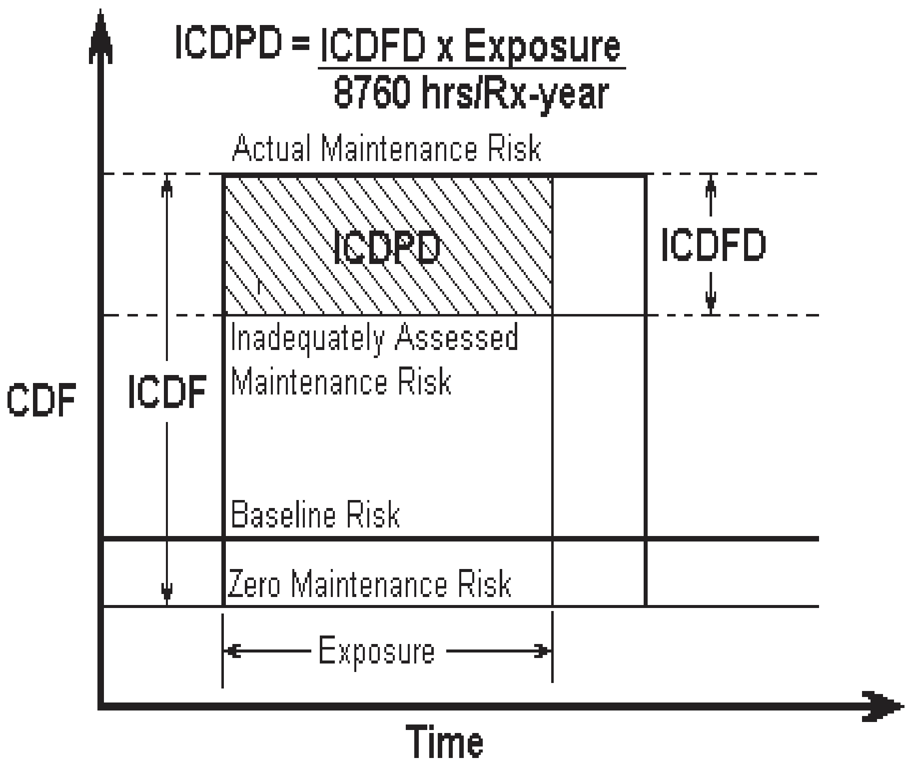


Figure 2 - Relationship of ICDFD to ICDPD

<u>Incremental Large Early Release Frequency (ILERF).</u> The ILERF is the difference between the actual, adequately determined maintenance activity/configuration-specific LERF and the zero maintenance LERF, if determinable. Note that LERF and ILERF are determinable only if the plant has a Level-II probabilistic risk analysis/probabilistic safety assessment (PRA/PSA) and a risk tool or process capable of quantitatively assessing Level-II risk beyond a qualitative assessment of the impact of containment integrity. If calculated, the ILERF may also be referred to as the delta LERF or LERF difference.

<u>Incremental Large Early Release Frequency Deficit (ILERFD)</u>. The ILERFD is used to evaluate the significance of a finding under the following conditions (1) an impact on containment integrity from or concurrent with the maintenance activity occurs, (2) this impact is/was not qualitatively assessed, and (3) the impact is/was quantitatively assessed, but not adequately. Then the ILERFD is meaningful and is that portion of the ILERF defined as the difference between the actual maintenance-configuration-specific LERF (called $ILERF_{actual}$ for purposes of this definition) and the maintenance-related ILERF as originally and inadequately assessed by the licensee ($ILERF_{flawed}$). Therefore, the $ILERFD=ILERF_{actual}$! $ILERF_{flawed}$. Note that if the licensee has failed to assess maintenance risk entirely when required (i.e., there is no licensee risk assessment) and there is an impact on containment integrity from or concurrent with the maintenance activity, this impact can be neither qualitatively nor quantitatively assessed. Therefore, the ILERFD will be equal to the entire value of the ILERF. The safety significance of the licensee's underestimate (or lack of estimate) of the Level-II risk (i.e., ILERFD) may also be determined by means of this SDP, if appropriate.

Incremental Large Early Release Probability (ILERP). The ILERP is the product of the incremental large early release frequency (ILERF) and the annual fraction of the duration of the configuration. The ILERP=(ILERF x duration in hours)÷(8760 hours per reactor-year).

Incremental Large Early Release Probability Deficit (ILERPD). The ILERPD is the product of the ILERFD with the annual fraction of the duration of the unassessed or inadequately assessed configuration, or that portion of the annual fraction of the duration of the maintenance configuration during which its risk (in terms of ILERF or ILERP) remained unassessed or inadequately assessed.

NOTE: Although an adequate maintenance risk assessment is expected to include the impact of containment integrity, at least qualitatively, there is no regulatory requirement for a quantitative risk assessment using a Level-II PRA. Paragraph (a)(4) of 10 CFR 50.65 neither prohibits nor explicitly discourages incurring maintenance risk. It only requires that the risk of maintenance activities be assessed (which can be done qualitatively, quantitatively, or, as is often the case, in a blended fashion) and managed.

Loss of Function. This is the condition in which an SSC becomes incapable of performing its intended purpose. This can mean a complete functional failure or impaired or degraded performance or condition such that the affected SSC is incapable of meeting its functional success criteria. Functional success criteria include having the required trains, adequate speed, flow, pressure, load, startup time, mission time, etc. These are defined or assumed in the design and/or licensing bases (i.e., updated final safety evaluation report, license conditions, or technical specifications and/or their bases). For the purposes of determining risk/safety significance, the functional success criteria of particular interest would be those assumed in the plant's PRA and/or the licensee's risk assessment tool. In some cases such as testing, a "lost" function can be promptly restored if restoration actions (a single action or few simple actions)are done by a dedicated local operator.

Zero-Maintenance CDF(Risk). The CDF estimate of plant baseline configuration where all SSCs are considered available.

Baseline CDF(Risk). The CDF from a PRA considering average annual maintenance (preventive and corrective maintenance), and plant specific reliability data (failure rates).

Note that inadequate risk assessment or risk management for work not yet started is not an (a)(4) violation, but it still represents a licensee performance deficiency and may be indicative of deficiencies in previous risk assessments, RMAs and/or in the licensee's (a)(4) program. This SDP is not suited for determining the significance of this type of performance deficiency. This issue will be screened to Green in accordance with Reactor SDP Phase 1 screening.

V. SDP METHODOLOGY

Once an inspection finding satisfies the Inspection Manual Chapter (IMC) 0612 minimum threshold process, the finding can then be evaluated using the following Table (Table 1) or SDP flowcharts in IMC 0609, Appendix K. The input to the maintenance rule (a)(4) Significance Determination Process (SDP) is an inspection finding that has some significance due to the licensee's underestimate of plant risk or lack of risk assessment from ongoing or completed maintenance activities and/or the licensee's ineffective implementation of risk management actions (RMAs).

The SDP methodology described below does not directly apply to those licensees who perform qualitative analyses of plant configuration risk due to maintenance activities. When performance deficiencies are identified with qualitative assessments, the inspector should determine significance of the deficiency by an internal NRC management review using risk insights where possible. Use of risk insights may include an independent NRC quantitative risk assessment (e.g., use of plant specific Standardized Plant Analysis Risk model). It is expected that most licensees will perform quantitative assessments for at-power conditions but not necessarily for plant shutdown conditions. In addition, quantitative risk assessments for the large early release frequency (LERF) and external events (e.g., fire, seismic) risk effects are not normally performed due to the lack of probabilistic risk tools for these effects. For these risk effects, a qualitative assessment is more common and the approach described above should also be used to determine significance.

Underestimating or not estimating the risk of maintenance activities may not significantly increase the expected overall plant risk, in terms of core damage frequency (CDF) or LERF. However, underestimating the risk may result in lack of risk awareness that could preclude RMAs and allow a high-risk configuration to persist unrecognized and uncompensated. Allowing a high-risk configuration with an unassessed CDF increase to persist longer than necessary, or desirable, may increase the exposure time and hence the incremental (integrated) core damage probability (ICDP) and/or the incremental large early release probability (ILERP). Finally, unawareness of unassessed or inadequately assessed risk may allow actions or events to occur that could directly increase risk or hamper recovery from accidents or transients.

Licensees that have adopted RMA color thresholds that are not ICDP or ILERP based, may need to have performance converted to correspond to a probability unit of measure.
When the inspector has identified that the licensee has performed an inadequate risk assessment (or none at all), the actual maintenance risk (configuration-specific core damage frequency [CDF]) must first be adequately or accurately assessed. The inspector should discuss the results of the risk assessment with the licensee before proceeding with any further risk assessment. The new risk assessment value may be obtained in several ways including having the licensee perform the omitted maintenance risk assessment; or re-perform it, correcting those errors and/or omissions that rendered its original risk assessment inadequate. Alternatively, the inspector may request the regional senior reactor analyst(s) or the headquarters risk analyst(s) to independently evaluate the risk using the plant-specific SPAR model. For this, the inspector needs to provide information as shown in the SDP for SPAR model input.

The original flawed risk assessment value is subtracted from the actual/correct ICDF to obtain the risk deficit or ICDFD. The ICDFD is converted into ICDPD. Note that ICDPD is equal to ICDP when there was no risk assessment performed by the licensee. If ICDP is significantly greater than 1E-6 (i.e., one order of magnitude or greater), the net risk impact must be assessed by subtracting 1E-6 from the risk deficit (ICDPD) as determined above, prior to determining an SDP color. This is because licensees are not normally expected to take RMAs for ICDP,1E-6. Therefore, the net risk deficit that should be considered for quantitative significance determination should be that portion of the ICDPD that is in excess of 1E-6. The safety significance of the licensee’s underestimate (or lack of estimate) of the risk is then determined by entering Table 1 or flowchart 1(IMC 0609, Appendix K) with the value of ICDPD as determined above and finding the matching color. The color of the ILERPD, if applicable, is determined in a similar fashion.

In general, the following two types of licensee performance deficiencies in meeting (a)(4) requirements can be defined.

a. Failure to Perform an Adequate Risk Assessment. The failure to perform an adequate risk assessment in accordance with 10 CFR 50.65 (a)(4) prior to the conduct of maintenance activities includes the following deficiencies which result in underestimating the risk.

1. failure to perform a risk assessment for maintenance configuration changes.

2. failure to update a risk assessment for changes in the assessed plant conditions (e.g., changes in maintenance activities or emergent conditions). However, performance or re-evaluation of the assessment should not interfere with, or delay, the operator and/or maintenance crew from taking timely actions to restore the equipment to service or take compensatory actions. If the plant configuration is restored prior to conducting or re-evaluating the assessment, the assessment need not be conducted, or re-evaluated if already performed.

3. failure to perform a complete risk assessment including all affected/involved SSCs within the scope of SSCs required for (a)(4) assessments, and considering (or adequately considering) all plant-relevant plant conditions or evolutions, external events, internal flooding, and/or containment integrity

4. failure to consider maintenance activities which have historically had a high likelihood of introducing a transient leading to an initiating event that would result in risk-significant configurations

5. Improper use of the risk assessment tool or process (i.e., beyond its capabilities or limitations, or under plant conditions for which it was neither designed nor in accordance with site procedures)

6. deficient risk-informed evaluation process for limiting the scope of SSCs to be included in (a)(4) risk assessments as identified by NRC inspection in accordance with IP 62709

7. flawed risk assessment tool or process as identified by NRC inspection in accordance with IP 62709

Failure to Manage Risk. Failure to manage the risk impacts of proposed maintenance activities means a failure to implement, in whole or in part, the key elements of the licensee's risk management program. However, this deficiency will not result in an additional risk increase to the assessed risk of the maintenance configuration in terms of CDF or LERF, unless an event actually occurs that results in additional risk impacts. Measures to minimize the duration of the risk associated with a maintenance activity/configuration are a principal RMA. Nevertheless, failure to implement such measures when they are possible and practicable will allow the ICDP and/or the ILERP to increase further as the elevated risk condition persists. Appropriate and suitable RMAs can only reduce the risk incurred from a given configuration change.

RMAs should be implemented in a graduated manner, commensurate with various increases above the plant's baseline risk, to control the overall risk impact of an assessed maintenance configuration. However, licensees use a variety of methods for categorizing risk significance and managing the risk according to the category.
In Regulatory Guide 1.182, the NRC endorsed the RMA levels or categories/bands prescribed in the revised Section 11 of NUMARC 93-01, Revision 2, and subsequently incorporated in Revision 3 of NUMARC 93-01. These risk bands are defined in terms of the ICDP, making them readily comparable to the risk levels used in determining the significance of the risk deficits. For licensees that have adopted this guidance, normal work controls are allowed by site procedures for ICDPs less than 1 E-6. For ICDPs of 1E-6 or greater, RMAs are prescribed. Section 11 of NUMARC 93-01 states that maintenance risk configurations above ICDP value of 1E-5 should not be entered voluntarily. Site procedures will typically prohibit this activity entirely or will allow it only with fairly rigorous restrictions that typically include the plant manager's written permission along with extensive RMAs. Site procedures may further define specific detailed RMAs or plans for routinely allowable risk categories as well. It should be noted that when evaluating the adequacy of a licensee's RMAs, the inspector should consider only those actions that could have potential risk implications and required by the licensee's procedures, such as working around the clock, installing backup equipment, and reducing duration of maintenance activity for effective implementation of RMAs.

Table 1
SDP Matrix for Quantitative Risk Assessment

Risk Results		SDP Colors for Licensee Performance Deficiency
Incremental Core Damage Probability Deficit (ICDPD)	Incremental Large Early Release Probability Deficit (ILERPD)	Failure to Perform an Adequate Risk Assessment (without any mitigation for risk management)
< 1E-6	< 1E-7	GREEN
1E-6 ~ 1E-5	1E-7 ~ 1E-6	WHITE
1E-5 ~ 1E-4	1E-6 ~ 1E-5	YELLOW
> 1E-4	> 1E-5	RED

VI. RISK MANAGEMENT ACTIONS

In accordance with licensee procedures, RMAs should be implemented in a graduated manner, commensurate with various increases above the plant's zero maintenance risk. However, the risk reduction benefits of these actions are generally not quantifiable. These actions are aimed at increasing the risk awareness of key plant personnel, providing more rigorous planning and control of maintenance activities, and controlling the duration and magnitude of the increased risk. RMAs should be considered in the development of work schedules in accordance with the licensee's program and procedures. RMAs can include (but are not limited to) the following:

1. Actions to provide increased risk awareness and control

- Discussion of planned maintenance activity with the affected operating shift(s). Ensuring operator awareness of risk level, RMAs, protected SSCs, contingency plans, etc., and obtain operations approval. Documenting risk information in logs, on status boards, etc

- Conducting pre-job briefing of maintenance personnel, emphasizing risk aspects of planned maintenance evolution

- Requesting system engineers to be present for the maintenance activity, or for applicable portions of the activity

- Obtaining plant management approval of the proposed activity

- Ensuring risk and RMA information on all work schedules, plans, etc.

- Announcing the plant risk band in effect and what risk-significant activities are in progress on the public system (e.g., Gaitronics) periodically and when changes occur.

2. Actions to reduce duration of maintenance activity

- Pre-staging parts, materials, tools and other equipment

- Walking down tagouts, equipment lineups (e.g., valves and switches) and the maintenance activity prior to starting work

- Conducting training on mockups to familiarize maintenance personnel with the activity (similar to ALARA strategies)

- Working jobs during back shifts as well as day shift

- Establishing contingency plan to restore out-of-service equipment (or functions) rapidly if needed

3. Actions to minimize magnitude of risk increase

- Minimizing other work in areas that could affect initiators (e.g., reactor protection system areas, switchyard, emergency diesel generator rooms, switchgear rooms) to decrease the frequency of initiating events that are mitigated by the function performed/supported by the out-of-service SSC

- Minimizing other work in areas that could affect other redundant systems (e.g., high pressure coolant injection/reactor core isolation cooling rooms, auxiliary feedwater pump rooms)

- Establishing alternate success paths for performance of the safety function of the out-of-service SSC (note: equipment used to establish these alternate success paths need not be within the scope of the maintenance rule). Use of administrative controls to ensure that backup equipment is protected.

- Establishing other compensatory measures

- Re-prioritizing and/or rescheduling maintenance activities

4. A final action threshold should be established so that risk significant configurations are not normally entered voluntarily.

Because the benefits of these RMAs are generally not readily quantifiable, the approach chosen for quantitatively determining the significance of failure to manage risk is to assign some credit to the effectiveness of these actions in reducing the risk impact of the assessed configuration. Therefore, the simple screening rule used in this SDP is to assign a credit of half-decade reduction in risk to the correctly calculated risk if the licensee effectively implemented one or two categories of the RMAs to control risk. If the licensee effectively implemented three or more categories of the RMAs, an order of magnitude reduction in risk can be credited against the actual maintenance risk. This approach allows the significance of failure to manage risk to be expeditiously determined without using quantitative approaches that may require intensive resources.

VII. EXAMPLE OF an (a)(4) FINDING

The following examples are provided to illustrate the use of the subject SDP for inspection findings that involve failure to perform an adequate risk assessment and failure to manage risk. These examples do not represent risk assessments of actual configurations.

I. During the period January 14-16, 2003, plant “X” was operating at 75 percent power with a Division 1 partial outage in which the residual heat removal (RHR) heat exchanger “A,” ESW “A” 4.16-kV switchgear breaker, and Division 1 emergency diesel generator (EDG) had already been assessed for the risk of their removal from service for up to 100 hours. The licensee calculated the ICDF (^{a}CDF) as 8.76E-4. (ICDF or ^{a}CDF = CDF_{actual} - $CDF_{zero\text{-}maintenance}$ = 8.77E-4 - 1.0E-6).

ICDP = ICDF x [100 hrs/(8760hrs/reactor-year)]. Therefore, the resultant ICDP in this case was about 1.0E-5.

The inspectors reviewed work orders, control room logs, and risk assessments for the maintenance activities performed during the above period. The inspector noted that the licensee failed to consider the following maintenance ongoing work activities for the above risk assessment (1) maintenance on switchyard breakers and relays by the offsite group, and (2) routine maintenance on train “B” Class 1E Battery system. In addition, during this time, the licensee’s contractors were working near the switchyard with cranes and other heavy equipment which had the potential for causing a loss-of-offsite power. Also, the licensee’s Division 1 partial outage was extended for an additional 18 hours (from the original schedule) due to the unavailability of parts and other documentation issues.

The SRA reassessed the risk with the above conditions and found the actual ICDF to be about 6.09E-3. The corresponding ICDP was 8.2 E-5.

The inspector reviewed licensee's risk management actions for the above maintenance configurations and note the following deficiencies.

- The RMAs did not contain actions to provide increased risk awareness and control, such as coordinating switchyard and other yard work activities that could affect the availability of offsite power sources; obtaining management review and approval of the proposed maintenance work; coordinating work activities with those assigned to offsite organizations; and requiring risk assessments prior to conducting maintenance activities and applicable risk management guidance.

- The RMAs did not contain actions to reduce the duration of maintenance activity, such as verifying and pre-staging parts, materials, tools and other equipment; encouraging the performance of maintenance work during back shifts, as well as day shifts; and establishing contingency plans to restore out-of-service equipment (or functions) rapidly, if needed.

- The RMAs did not contain actions to reduce the magnitude of a risk increase, such as minimizing work that could affect the frequency of initiating events which are mitigated by out-of-service SSCs; establishing alternate success paths for performance of the safety function of the out-of-service SSC; minimizing work that could affect redundant systems; developing administrative controls to ensure that backup equipment is protected; establishing other compensatory measures; and reprioritizing and/or rescheduling maintenance activities.

- The RMAs did not establish risk thresholds so that risk significant configurations could not be normally entered voluntarily.

The inspectors reviewed this issue against the guidance contained in Appendix B, "Issue Dispositioning Screening," of Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports." The inspectors concluded that the issue was more than minor since the licensee's risk assessment failed to consider unavailable SSC during the maintenance. This finding is associated with inadequate 10 CFR 50.65 (a)(4) risk assessment/management and it impacted the mitigation system cornerstone. Accordingly, the inspectors determined the significance of the finding using IMC 0609, Appendix K, "Maintenance Risk Assessment and Risk Management Significance Determination Process."

The following steps should be followed to determine the significance of the finding using this SDP (IMC 0609, Appendix K).

1. Calculate the risk deficit (ICDPD) as follows :

   Actual ICDP - original flawed ICDP-1E-6 = 8.2 E-5 - 1.0 E-5 - 1.0 E-6 = 7.1 E-5.

2. In order to determine the significance of this value (SDP color), use flowchart1 in IMC 0609, Appendix K.

For ICDPD = 7.1 E-5, the SDP color is **Yellow**. (Decision blocks “Is Risk Deficit > 1E-6", and ”Is Risk Deficit >1E-5?” were answered “Yes” and decision block ”Is Risk Deficit >1E-4?” is answered “No”with no RMAs taken).

3. Next, use flowchart-1, follow the decision block “Is Risk Deficit >1 E-4" path “No” to determine whether any RMA credit should be applied to the risk deficit.

Section 4.3 of this SDP lists the following categories of appropriate RMAs..

- increased risk awareness and control
- reducing duration of maintenance activity
- Minimizing magnitude of risk increase
- establishing other compensatory measures to provide alternate success paths for maintaining the safety function of the out-of-service SSC (e.g., using diverse means of accomplishing the intended safety function).

Based on the deficiencies identified in all four RMA categories, no credit is given to the licensee for RMAs. Therefore, the final significance color is Yellow.

This example illustrates a case where the licensee assessed the risk, but the risk assessment was flawed (incomplete or inadequate). This is because the licensee did not include the following in their risk assessment: all out-of-service components, additional hours due to extension of the maintenance, increased risk of a plant trip from switchyard work. The risk deficit was recalculated as shown above. The risk deficit value was assigned an SDP color “Yellow” using flowchart 1. The significance color remained the same (did not get any credit) because the licensee did not implement any risk management actions.

II. On August 2, 2000, the inspectors questioned the licensee’s overall risk assessment of plant XY due to several maintenance activities. The licensee had evaluated the increase in risk (ICDF) due to maintenance activities as 1.18E-5 using their Plant Risk Analysis Program (ORAM/SENTINEL) tool. The corresponding ICDP was 1E-6. The licensee implemented only the normal work controls because the ICDP was not >1E-6.

Based on plant status review the inspectors noted that the licensee had taken RCIC system out of service for maintenance and were on an LCO. The inspectors identified that the licensee had not accurately input the RCIC system maintenance activity for 12 days in their risk assessment. The inspectors asked the licensee to perform the overall risk assessment using ORAM/SENTINEL with the RCIC system unavailable since that was the plant configuration and it was credited for accident mitigation. When the licensee made the RCIC system unavailable in the ORAM/SENTINEL program, the overall risk (ICDF) changed to 6.36E-5.

The inspectors reviewed this issue against the guidance contained in Appendix B, “Issue Dispositioning Screening,” of Inspection Manual Chapter (IMC) 0612, “Power Reactor Inspection Reports.” The inspectors concluded that the issue was more than minor since the licensee’s risk assessment failed to consider unavailable SSC during the maintenance. This finding is associated with inadequate 10 CFR 50.65 (a)(4) risk assessment/management and it impacted the mitigation system cornerstone. Accordingly, the inspectors determined the significance of the finding using IMC 0609, Appendix K, "Maintenance Risk Assessment and Risk Management Significance Determination Process.”

The following steps should be followed to determine the significance of the finding using this SDP.

1. If not already done, covert actual incremental core damage frequency ($ICDF_{actual}$) to actual incremental core damage probability ($ICDP_{actual}$)
   i.e., $ICDP_{actual}$ = $ICDF_{actual}$ x [12x24 hrs/(8760hrs/reactor-year)]
   $ICDP_{actual}$ =6.36E-5 x [12x24 hrs/(8760hrs/reactor-year)]. = 2.09 E-6.

2. Calculate the risk deficit (ICDPD) as follows :

   Actual ICDP - original flawed ICDP= 2.09E-6 - 1E-6=1.09E-6

3. In order to determine the significance (SDP color) of this value, use flowchart1 in IMC 0609, Appendix K. For ICDPD = 1.09 E-6, the SDP color is **White**. (The decision block"Is Risk Deficit >1E-6?" was answered "Yes"; the decision block "Is Risk Deficit >1E-5?" was answered "No"; and no RMAs were taken).

This example illustrates a case where the licensee's risk assessment was flawed (incomplete or inadequate), and the licensee had not taken any risk management actions because they did not realize the actual risk was above 1E-6.

III. The online risk was evaluated by the licensee for plant YY to be at an elevated level (ORANGE) during a designated work window for preventive maintenance on the 2A EDG and other scheduled maintenance work including a surveillance test on the Unit 2 Solid State Protection System. The inspectors questioned operators and the work week manager concerning the plant configuration and the published risk condition for that maintenance. The licensee assessed the increase in risk (ICDP) associated with the maintenance activities to be 4.1 E-6. The inspectors verified the risk assessment to be adequate and it reflected the actual plant configurations. However, the inspectors noted that this configuration would not have been allowed by plant risk procedure PRK-001without implementing appropriate risk management actions. The inspectors reviewed the licensee's risk management actions for the above maintenance configurations. The licensee had taken the following risk management actions: conducted pre-job briefing of maintenance personnel, obtained plant management approval of the proposed activity, ensuring risk and RMA information are highlighted on all work schedules, pre-staged parts, performed walkdown of affected systems and hung and verified boundary and caution tags. The inspectors determined that the licensee has taken adequate RMAs to provide increased risk awareness and control and actions to reduce duration of the maintenance activity, but did not take actions to minimize the magnitude of risk increase as specified in the licensee's procedure.

The inspectors reviewed this issue against the guidance contained in Appendix B, "Issue Dispositioning Screening," of Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports." The inspectors concluded that the issue was more than minor since the licensee did not adequately manage the increase in risk due to maintenance activities. This finding is associated with inadequate 10 CFR 50.65 (a)(4) risk management and it impacted the mitigation system cornerstone. Accordingly, the inspectors determined the significance of the finding using IMC 0609, Appendix K, "Maintenance Risk Assessment and Risk Management Significance Determination Process."

The following steps should be followed to determine the significance of the finding using this SDP.

Since the finding is related to RMAs only, go to SDP flowchart 2.

For ICDP= 4.1E-6, the SDP color is determined as **Green.** (The decision block ”Is Risk Deficit >1E-6?” was answered “Yes”; the decision block ”Is Risk Deficit >1E-5?” was answered “No”; the decision block “3 or RMAs taken” was answered “No”; the decision block “1or 2 RMAs taken” was answered “Yes”; and the decision block “Is ICDP< 5E-6" was answered as “Yes”).

This example illustrates a case where the licensee’s risk assessment was adequate, but the licensee had not implemented all required risk management actions. Since the licensee had effectively implemented 2 RMAs and the risk increase was <5E-6, the significance was mitigated from a potential White finding to a Green finding.

VIII. REFERENCES

Section 50.65 of Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR 50.65), "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"

Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"

Regulatory Guide 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants"

Regulatory Guide 1.187, "Guidance for Implementation of 10 CFR 50.59, Changes, Tests and Experiments," November 2000

Inspection Procedure 71111.13, “Maintenance Risk Assessments and Emergent Work Control”

The Nuclear Energy Institute's (NEI's), NUMARC 91-06, "Industry Guideline for Shutdown Operations"

NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"

Revised Section 11, dated February 22, 2000, “Assessment of Risk Resulting from Performance of Maintenance Activities,” of NUMARC 93-01

END