NRC INSPECTION MANUAL

INSPECTION PROCEDURE 71150

DISCREPANT OR UNREPORTED PERFORMANCE INDICATOR DATA

PROGRAM APPLICABILITY: 2515

CORNERSTONES: ALL

71150-01 INSPECTION OBJECTIVE

01.01 To obtain performance indicator (PI) data when (a) licensees do not provide PI data in accordance with the most current guidance, (b) reported PI data has major discrepancies, or (c) NRC loses confidence in the licensee's ability to collect and report PI data.

01.02 To utilize inspections in order to obtain sufficient insights on licensee performance in the absence of reliable PI data.

71150-02 INSPECTION REQUIREMENTS

02.01 PI Review. The following should be considered in addressing the objectives of this IP, depending on the specific circumstances:

a. Ensure that licensees correct major discrepancies with reported data for one or more PIs, including the associated collection and reporting process.

b. NRC can independently collect the PI data, if this appears to be feasible considering the number and specific nature of the PIs for which data is needed.

c. When independent NRC collection of the data is not feasible, NRC should augment the baseline inspection program to provide insights on licensee performance to address the cornerstone attributes intended to be covered by the PI.

71150-03 INSPECTION GUIDANCE

Specific Guidance

03.01 PI Review

a. Discrepancies are major when they may affect NRC response in accordance with the Action Matrix (IMC 0305 "Operating Reactor Assessment Program") because correction of the discrepancy results in a PI threshold being exceeded. NEI 99-02, Revision 0, "Regulatory Assessment Performance Indicator Guideline", and NRC's external web page indicate PI thresholds. Major discrepancies may involve a licensee error in data collection and/or reporting, or an incorrect licensee interpretation of the PI guidelines in NEI 99-02 and applicable Frequently Asked Questions. The region should attempt to resolve the issue with the licensee.

b. NRC may have lost confidence in the licensee's ability to collect and report PIs due to recurring discrepancies. The issues may be identified by licensees or by NRC inspections in accordance with IP 71151,"Performance Indicator Verification". The inspector can review licensee records to determine the pertinent PI data. IP 71151, "Performance Indicator Verification," Table 1 lists pertinent licensee records for NRC use in conducting independent verification of licensee reported PI data. These records can also be used for NRC independent collection of PI data. The level of effort for this should be weighed against that for conducting NRC inspections, as outlined in c. below. For example, the PI titled "Unplanned Scrams Per 7000 Critical Hours" requires data on the number of unplanned automatic and manual scrams while critical in the previous quarter and the number of hours of critical operation in the previous quarter. This data may be obtainable from licensee event reports, monthly operating reports, operating logs and NRC inspection reports.

c. Attachment 1 is based on SECY-99-007 dated January 8, 1999, and describes the attributes considered in the development of each PI. IMC 2515, Appendix A (Attachment 2, "Cornerstone Charts") and Appendix B (Attachment 1, "Inspection Procedures to be Used for Assessing Extent of Condition") identify baseline and other inspections which assess these attributes.

   Using the above documents as guidance, the region should develop an inspection plan to assess cornerstone attributes associated with the unavailable PIs. The plan should utilize this procedure to identify and appropriately address attributes covered by baseline and other IPs. The plan should be implemented at a frequency as required to compensate for the lack of reliable PI data. Attachment 2 provides an example of a legitimate approach for developing an inspection plan if data is not available for a Safety System Unavailability PI, including the situation where the plant is in extended shutdown. Program office assistance should be sought in unique situations where the attached model or other guidance in this procedure does not seem appropriate.

Licensees may be unable to report PIs due to conditions which affect complete reporting for the period. During extended shutdown, data for some PIs are not capable of being reported, such as when the PI depends

on the number of critical hours. If PI data collection and reporting are suspended, some additional inspection (as indicated in the above paragraph) may be warranted for a few quarters after the plant restarts to compensate for the incomplete PIs while the PI data is being accumulated. See MC 0350, "Staff Guidelines for Oversight of Operating Reactor Facilities in an Extended Shutdown as a Result of Significant Performance Problems". Section 07.01, "Coordination of Post-Restart Activities", covers NRC post-restart oversight to re-establish reliable PIs.

71150-04 RESOURCE ESTIMATE

NRC independent collection of PI data may require 100% review of applicable information. In some cases, NRC effort for 100% review would be similar to the sampling that is done in IP 71151. In other cases, conducting 100% review of applicable information would require significantly greater effort.

Resource estimates for NRC inspection in lieu of obtaining PI data should be based upon the underlying framework for the pertinent cornerstone, the existing baseline or other scheduled inspections that could provide potential insights into the cornerstone attributes, and the level of effort required by the region to achieve the inspection objective. Utilization of baseline inspections to provide PI insights generally requires resources in addition to those expended on the baseline program. Depending on the situation (such as the length of time that the PI data is discrepant or unreported), the level of effort may be expended in a concentrated period of time, spread out over an extended period, or conducted on an as needed basis. All of these considerations need to be included in the determination of the appropriate course of action. Because of the wide range of potential inspection activities, resource requirements for conducting this inspection may vary widely.

END

Attachments:

1. Measurement of Cornerstone Attributes Associated With Performance Indicators

2. Approach For Developing an Inspection Plan to Provide Insights on Licensee Performance in the Absence of a Safety System Unavailability Performance

Indicator

ATTACHMENT 1

MEASUREMENT OF CORNERSTONE ATTRIBUTES ASSOCIATED WITH PERFORMANCE INDICATORS

INITIATING EVENTS: PIs: Unplanned Scrams per 7000 Critical Hours, Scrams with a Loss of Normal Heat Removal, and Unplanned Power Changes per 7000 Critical Hours

A. Human Performance

Human errors can cause initiating events, especially during plant operations, maintenance, calibration, and testing. Human-induced initiating events are relatively more frequent during shutdowns than during power operations. Compared with power operations, work during shutdown has more frequent personnel/equipment interactions and more complex scheduling due to more concurrent work activities. This leads to more human-induced initiating events. Effective work planning/control limits human-induced initiating events. PIs for Scrams and Unplanned Power Changes capture human errors that cause initiating events during both shutdown and power operations.

B. Procedure Quality

Inadequate procedures can cause initiating events by inducing plant personnel to take inappropriate actions during plant operations, maintenance, calibration, or testing. This can occur due to a missing step, ambiguous/confusing language/organization, or typographical error. PIs for Scrams and Unplanned Power Changes monitor procedural inadequacies that cause initiating events.

C. Equipment Performance

Equipment failure or degradation can cause initiating events, such as reactor scrams during power operations and losses of decay heat removal during shutdowns. These are expected to originate primarily in balance-of-plant equipment while at power and in safety-related equipment during shutdowns. To limit challenges to safety functions due to equipment problems, licensees should have preventive/corrective maintenance and other programs to achieve high availability/reliability of equipment that can cause initiating events. Initiating events caused by equipment performance will be captured by the Scram and Unplanned Power Changes PIs. In addition, licensees are required by the Maintenance Rule to monitor performance against criteria and goals for equipment that can cause initiating events.

D. Design

Inadequacies in either the design, as-built configuration, or post-installation testing of plant modifications can cause initiating events. Also, as plants age, their design bases may be misunderstood or forgotten such that an important design feature may be inadvertently removed or disabled during a plant modification. Design errors that result in initiating events will be revealed by the Scram and Unplanned Power Changes PIs.

MITIGATING SYSTEMS: PIs: Safety System Unavailability (SSU) and Safety System Functional Failures (SSFF)

A. Configuration Control

This applies to equipment lineup during power operations. For those systems monitored, the SSU PI provides information on adequacy of configuration control, especially on licensee programs/practices to maintain critical safety functions with adequate margins. When safety systems are not available or system redundancy is degraded due to misaligned valves or switches, that unplanned unavailability will be captured by the PI. Inspections monitor plant configurations that affect mitigating system performance, especially for system restoration as part of maintenance rule (MR) verification.

B. Equipment Performance

The SSU and SSFF PIs monitor the availability and reliability, respectively, of systems which mitigate the impact of initiating events on plant safety. The PIs measure the adequacy of testing for functional availability/reliability. In addition, the performance of all structures, systems, and components (SSCs) important to mitigating system performance is monitored by licensees under the MR.

C. Procedure Quality

Maintenance and testing procedures influence the capability of mitigating systems to respond to initiating events. The quality of such procedures is indirectly confirmed by the performance of mitigating systems, as monitored by the SSFF PI and verification inspection of MR implementation.

D. Human Performance

Pre-event human errors are monitored by the SSU PI since errors in operating and maintaining equipment are reflected in system unavailability. Also, when mitigating system performance is degraded, human performance should be assessed by the licensee in it problem identification and resolution program and MR implementation.

A. Cladding Performance

The RCS Specific Activity PI reliably indicates when nuclear fuel cladding has been compromised. Loose parts in the RCS, most importantly in the reactor vessel, can damage fuel cladding either by direct impact on the fuel pins or by limiting fluid flow past individual pins or assemblies. Loose parts can be introduced into the reactor vessel by poor maintenance practices or failures of internal structural components. The licensee’s foreign material exclusion (FME) programs are intended to preclude loose parts in the reactor vessel.

B. RCS Equipment and Barrier Performance

The RCS Identified Leak Rate PI provides a direct measure of RCS barrier performance. The licensee’s inservice inspection program monitors the condition of passive RCS pressure boundary components such as piping, welds, and valves because degradation can impact RCS strength margins. The baseline inspection program assesses this program. Active RCS pressure boundary components include safety relief valves, power operated relief valves, and reactor coolant pump or recirculation pump seals and associated seal cooling equipment. Failure of active components impacts RCS integrity, and availability/reliability of active components is ensured through the MR.

C. Human Performance

Nuclear fuel cladding integrity can be challenged by inappropriate human actions regarding reactivity manipulations, chemistry control practices, implementation of FME programs, and installing fuel assemblies, etc. Sometimes the inappropriate human actions result from failure to adhere to procedures. The RCS Specific Activity PI measures performance for this attribute. Licensee problem identification and corrective action programs identify adverse trends in the above human performance factors.

D. Procedure Quality

Procedures for activities affecting fuel cladding must be adequately established and maintained. Activities include reactivity control, FME, chemistry control, refueling, fuel handling, reactor vessel assembly, and physics testing. The RCS Specific Activity PI measures performance of this attribute. Adverse procedure trends are identified by licensee corrective action programs.

E. Design Control

The RCS Specific Activity PI measures performance of this attribute. Proper reactor core design assures that power operation will not challenge fuel cladding integrity. The core design analysis, including the core operating limits report and the reload analysis, establishes operational limitations for core power operation with margin to ensure thermal limits are not exceeded during anticipated transients. Startup physics testing verifies that the reactor core performs in accordance with the design analysis. This testing is conducted at low power so errors during testing would be unlikely to challenge established thermal limits and degrade fuel cladding.

F. <u>Configuration Control</u>

The RCS Specific Activity PI measures fuel cladding degradation due to the following activities. Abnormal control rod alignments or reactivity manipulations during plant operation can reduce margins to core thermal limits and challenge limits during transients. Misconfigured or malfunctioning reactivity control systems may lead to unacceptably high neutron flux. Inadequate water chemistry controls are usually identified by licensee self-assessment. Fuel loading errors should be detected during startup physics testing. Improperly placed or oriented fuel assemblies can lead to localized high neutron flux; they should be identified during independent verification prior to vessel reinstallation.

EMERGENCY PREPAREDNESS: PIs: Drill/Exercise Performance (DEP), ERO Drill Participation (ERO), Alert and Notification System (ANS) Reliability

A. <u>Facilities and Equipment</u>

The Alert and Notification System is a critical link for alerting and notifying the public of the need to take protective actions. Generally, the licensee maintains the ANS and state/local governmental authorities are responsible for activating it when necessary. The ANS PI measures the availability of this system. Licensee self-assessment addresses maintenance, surveillance, and testing of this equipment.

B. <u>Procedure Quality</u>

Emergency Plan Implementing Procedures (EPIPs) are used to classify events, notify governmental authorities, and develop/communicate protective action recommendations to offsite authorities. The quality of the EPIPs is reflected in the measured success rate indicated by the DEP PI.

C. <u>Emergency Response Organization (ERO) Performance</u>

The DEP PI assesses timely and accurate emergency classification of events, notification of offsite governmental authorities, and development/communication of protective action recommendations to offsite authorities. The ERO PI measures the percentage of key ERO members who have participated recently in proficiency enhancing drills, exercises, training opportunities, or in an actual event.

PUBLIC RADIATION SAFETY: PI: Radiological Effluent Technical Specifications (RETS) / Offsite Dose Calculation Manual (ODCM) Radiological Effluent Occurrence

A. Facilities, Equipment, and Instrumentation

The RETS/ODCM Radiological Effluent Occurrence PI assesses the performance of the radiological effluent control program. Improper installation or modification, inaccurate calibration and reduced availability of meteorological systems, process radiation monitoring system (RMS) detectors, and sampling systems, and associated counting room equipment adversely affect licensee compliance with effluent regulatory limits. Similar issues affect the radiological environmental monitoring program (REMP) equipment. Radioactive waste processing, effluent sampling, and monitoring equipment and instrumentation are assessed by offsite doses and RMS operability and availability. Shipping packages not prepared in accordance with design requirements potentially result in exposures to the public. Unconditional release of materials from protected areas requires use of sensitive radiation survey equipment. Procedures should ensure adequate meteorological/radiation systems, transport packages, and counting room instrumentation.

B. Program and Process

Procedures must be adequately written and implemented to ensure effective radiological effluent processing and control/monitoring of liquid/gaseous releases. Procedures should ensure acceptable performance of meteorological instrumentation, radwaste processing, and process RMS equipment. Procedures should ensure proper evaluation of radwaste and material radionuclide quantities/types for shipping packages and surveys to ensure that package radiological doses and contamination levels are within regulatory limits. The RETS/OCDM Radiological Effluent Occurrence PI indirectly assesses the above procedures.

C. Human Performance

Human performance affects radwaste processing, effluent monitoring, and transportation activities. Human errors have contributed to incorrect release of radwaste tanks, inaccurate determination of RMS set points, and abnormal/unmonitored effluent releases to the surrounding environs. Health physics technician errors in radiation surveys have contributed to shipping container dose rates or contamination levels exceeding regulatory limits or improper unconditional release of contaminated solid materials. The RETS/OCDM Radiological Effluent Occurrence PI assesses human performance.

OCCUPATIONAL RADIATION SAFETY: PI: Occupational Exposure Control Effectiveness

A. Facilities, Equipment and Instrumentation

Inoperable monitoring instrumentation and inadequate source term control can result in significant unplanned exposures. For selected facility areas (e.g., BWR Transverse Incore Probe drive room), reliable/accurate area radiation monitors can remotely identify transient high dose rate fields to reduce the potential for uncontrolled exposure. Chemical decontamination and proper shielding for equipment/systems having elevated source terms can preclude uncontrolled/unnecessary occupational exposures. Radiation protection systems and equipment should be properly maintained and calibrated. The Occupational Exposure Control Effectiveness PI measure the effectiveness of the facilities, equipment, and instrumentation.

B. Program/Process

Radiation protection procedures and proper implementation of program processes help control occupational exposures. Improper radiological surveillances have resulted in significant uncontrolled occupational exposure from direct exposure to radiation sources or intakes of radioactive material. Administrative and physical radiation protection controls prevent uncontrolled worker access to high radiation, significantly contaminated and airborne areas. Aggressive dose expenditure goals, combined with work planning, assessment of radiological conditions and adequate controls are necessary for an effective ALARA program. These activities are more significant during outages when personnel have increased activities with high radiation areas and contaminated systems. The Occupational Exposure Control Effectiveness PI measures the effectiveness of programs/processes.

C. Human Performance

Human performance can significantly affect occupational worker exposures during work activities conducted in elevated dose rate and contaminated areas. Inadequate performance by health physics technicians or workers can result in loss of the multiple radiation protection barriers established to prevent uncontrolled exposures. Adherence to proper radiation protection practices is necessary to implement an effective ALARA program.

PHYSICAL PROTECTION: PIs: Protected Area (PA) Security Equipment Performance Index, Personnel Screening

A. Physical Protection System

As the first line of defense against radiological sabotage, the protected/vital area barriers delay the person posing the threat, the Intrusion Detection System identifies the threat, and the alarm assessment system determines the scope of the threat. Data for the Physical Protection System are used to evaluate and respond to the threat. The PA PI monitors the capability and availability of the IDS, which includes the closed circuit television cameras.

B. Access Authorization System

The Personnel Screening Program Performance PI measures the process used to verify trustworthiness of personnel prior to granting unescorted access to the protected area. The process includes psychological testing and criminal history, background, and employer reference checks. The FFD PI measures the FFD program, which includes pre-employment, random, and for-cause alcohol/drug testing. It also includes the Behavioral Observation program, which is conducted by supervisors to detect behavior changes which, if left unattended, could lead to acts detrimental to public health and safety.

END

ATTACHMENT 2

APPROACH FOR DEVELOPING AN INSPECTION PLAN TO PROVIDE INSIGHTS ON LICENSEE PERFORMANCE IN THE ABSENCE OF A SAFETY SYSTEM UNAVAILABILITY (SSU) PERFORMANCE INDICATOR (PI)

IMC 2515, Appendix A (Attachment 2, "Cornerstone Charts") and Appendix B (Attachment 1, "Inspection Procedures to be Used for Assessing Extent of Condition") identify baseline and other inspections which assess attributes associated with PIs. The following baseline and other IPs were identified from these documents, and provide insights regarding SSU data for the reference system (such as equipment failures or human errors that make a system train unavailable).

In developing an inspection plan, consideration should be given to the length of time that the PI will be unreported or unreliable. This would result in applying a range of inspection activities. The below discussion indicates that generally baseline inspection sample sizes are increased to provide insights regarding SSU. The increases may be negligible if the overall sample population is small, or if it is decided to decrease resources due to the above aspect regarding range of inspection activities.

A. Configuration Control

Increase the sample size described in IP 71111.04, "Equipment Alignment", to address the reference system, including a complete system walkdown. Review: (1) documents to determine correct system lineup; (2) outstanding maintenance work requests on the system and any deficiencies affecting the ability of the system to perform its function; and (3) outstanding design issues including temporary modifications, operator workarounds, and items tracked by engineering. The system walkdown should identify if there are any discrepancies between existing and correct lineup, e.g., valve positioning. During extended shutdown, focus on safety-related components required for shutdown, mode changes, and infrequently performed operations.

B. Human Performance

IP 71111.14, "Personnel Performance During Nonroutine Plant Evolutions and Events", reviews personnel performance indicated by LERs, nonroutine/transient operations and reactor trips. Increase the sample size to address the reference system. Determine whether operator responses to these nonroutine plant evolutions/events were in accordance with procedures and training.

IP 71111.16, "Operator Workarounds", addresses the potential effects of operator workarounds on the functionality of mitigating systems. The sample size should be increased to address the reference system. Determine whether there are any operator workarounds which affect that system’s functional capability or human reliability in responding to an initiating event, such as the operator’s ability to implement abnormal/emergency operating procedures. Review cumulative effects of operator workarounds on (1) reliability, availability, and potential for misoperation of the system; (2) increase in initiating event frequency or effect on multiple mitigating systems; and (3) ability of operators to respond correctly and timely to plant transients/accidents.

C. Equipment Performance

The annual review for IP 71111.07, "Heat Sink Performance", requires observation of one or two heat exchanger performance tests/inspections. If the reference system contains a heat exchanger, the sample should include one performance test/inspection for that heat exchanger. Verify that: (1) test acceptance criteria/results considered differences between testing/design conditions; (2) inspection results are evaluated against acceptance criteria; (3) test/inspection frequency is sufficient to detect degradation prior to loss of design basis heat removal capability; and (4) test results considered test instrument inaccuracies.

IP 71111.12, "Maintenance Rule Implementation", reviews the licensee’s implementation of the maintenance rule (MR) for structures, systems and components (SSCs) with performance problems. Increase the sample size to address the reference system. Review: (1) inclusion of safety-related and nonsafety-related SSC within MR scope in accordance with 10 CFR 50.65(b); (2) characterizing failed SSCs as functional failures, maintenance preventable functional failures, or repetitive maintenance preventable functional failures; (3) performance criteria for SSCs as related to risk significance; and (4) monitoring performance/condition of SSC against goals in accordance with 10 CFR 50.65(a)(1). If problems/failures occur due to a specific maintenance activity, observe performance of specific maintenance activities in accordance with IP 62700, "Maintenance Program Implementation".

IP 71111.17, "Permanent Plant Modifications", focuses on modifications to risk significant SSCs. The sample size should be increased, if applicable, to include the reference system. Permanent plant modifications include permanent plant changes, design changes, set point changes, procedure changes, equivalency evaluations, suitability analyses, calculations, and commercial grade dedications. Review the following: (1) design adequacy of parameters not verified by testing, e.g., design basis heat removal under abnormal conditions; (2) effect of modification activities on safety functions and emergency/abnormal operations; (3) whether post-modification testing confirms operability and maintains the plant in a safe configuration during testing; and (4) updating design and licensing documents and plant procedures to reflect the modification.

IP 71111.19, "Post-Maintenance Testing", selects post-maintenance testing activities on risk significant systems/components with recent maintenance performance problems. Increase the sample size to address the reference system. Witness tests and/or review test data to verify that components meet design/licensing bases requirements and commitments, and are capable of performing their safety functions. Consider the following post-maintenance test attributes: (1) control room/engineering personnel address effect of testing on the plant; (2) adequate test scope relative to maintenance work: (3) acceptance criteria consistent with design/licensing bases; (4) test equipment range, accuracy and calibrations; (5) consistency of actual test with procedure; (6) test data evaluation; and (7) correct system alignment after testing, including removal of test equipment.

The reference system may be selected for IP 71111.21, "Safety System Design and Performance Capability", provided that it meets the selection criteria for the inspection. In cases where another system is selected, IP 71111.21 may be augmented to address interfacing components from the reference system. Components from the reference system should be selected based on the following: (1) failure results in loss of system or train; (2) supports multiple systems or trains; (3) risk significant design features not validated by testing, (4) either passive or active; and (5) safety/non-safety related interfaces. Perform walkdowns to identify design, installation and operations problems. Perform a design review to verify that the reference system will function as required, including during transients and accidents. Determine whether the design bases are met by the installed and tested configuration.

IP 71111.22, "Surveillance Testing", selects risk significant surveillance testing, including inservice testing (IST) of pumps/valves based upon component performance history or recent corrective/preventive maintenance. Increase the sample size to address the reference system. Witness surveillance tests and/or review test data to verify that SSCs meet Technical Specifications, UFSAR and licensee procedures, and are capable of performing their intended safety functions. Surveillance test attributes for consideration are similar to those for IP 71111.19, "Post-Maintenance Testing" (above). For additional guidance on IST inspection refer to IP 73756, "Inservice Testing of Pumps and Valves" and NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants".

IP 71111.23, "Temporary Plant Modifications", reviews temporary modifications potentially affecting the design basis or functional capability of risk significant mitigating systems. Increase the sample size, if applicable, to include the reference system. Temporary modifications include jumpers, lifted leads, temporary systems, repairs, design modifications and procedure changes which can change plant design or operations. Review temporary modifications and associated 10 CFR 50.59 screening against design bases documentation. Verify that modifications have not affected system operability/availability. See IP 71111.17, "Permanent Plant Modifications" (above) for additional attributes that may be significant for the particular modification. Review/verify the following: (1) correct installation of temporary modification; (2) impact of temporary modifications on interfacing systems, and (3) restoration and testing after removal of temporary modifications.

END