

## **Reactor Oversight Process Program Area Evaluations**

In accordance with Inspection Manual Chapter (IMC) 0307, "Reactor Oversight Process Self-Assessment Program," the staff of the U.S. Nuclear Regulatory Commission (NRC) performed program evaluations in each of the four key program areas of the Reactor Oversight Process (ROP), including performance indicators (PIs), inspection, significance determination process (SDP), and assessment. The staff used self-assessment metrics, feedback from internal and external stakeholders, and other information to gain insights into the effectiveness of the ROP in meeting its goals and intended outcomes. Based on the metric results, stakeholder comments, and other lessons learned through ongoing program monitoring, the staff identified certain issues and actions in each of the four key program areas, as described below. The annual ROP performance metric report provides the data and staff analysis for each of the program area metrics (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100540037).

### **Performance Indicator Program**

During calendar year (CY) 2009, the staff continued to look for ways to improve the effectiveness of the PI program. The staff reinforced the guidance and expectations governing the gathering and submittal of data for existing PIs through the frequently asked question (FAQ) process. For example, the staff reinforced the reporting requirements and governing guidance for the safety system functional failure (SSFF) PI to the NRC inspection staff and industry. In December 2009, the staff provided training on the SSFF PI to the regional inspectors at the semi-annual counterpart meetings, as it committed to do in the CY 2008 self-assessment. As evidenced by audience feedback, the SSFF training was generally well received and was noted for its direct applicability to both the inspection and PI programs.

The staff continually looks for ways to modify and improve existing PIs to ensure their effectiveness. As it committed to do in last year's self-assessment, the staff improved the mitigating system performance index (MSPI) as a result of the recently completed lessons learned review. This review generated several staff white papers, PI guidance changes, and other activities to improve the effectiveness of the MSPI. Two staff MSPI white papers have been resolved, and two others will be resolved by end of CY 2010. The two issues that were resolved concerned properly accounting for rounding errors when computing the final MSPI values and changing the MSPI planned train unavailability baseline. The two staff white papers not yet resolved concern monitoring emergency diesel generator (EDG) fuel oil transfer pumps as part of the MSPI and revising the component failure mode definitions for EDGs. The staff has formally developed additional initiatives regarding certain component boundaries and failure mode definitions. The NRC will continue to discuss these initiatives, along with any future efforts for MSPI improvement, in the ROP Working Group monthly public meetings.

In addition, the staff reviews and assesses the effectiveness of the security PI on an annual basis as part of its self-assessment. Based on this review, the staff discussed its self-assessment with stakeholders from the NRC, industry, state governments, and the public. The stakeholders discussed the publication of the new requirements of 10 CFR Part 26 and 73 and resultant changes to the baseline inspection program. It was concluded by all stakeholders at this meeting that, in light of the publication of the new requirements, any discussion of potential changes to the security cornerstone PI would be better informed after completion of one complete cycle of the baseline inspection program. Therefore, the staff plans to reassess the effectiveness of the security PI in 2013 as informed by the experience gained during the completion of one full security baseline inspection cycle.

The staff has also continued its efforts to improve the Emergency Preparedness PIs, specifically the Drill and Exercise Performance (DEP) PI. Data collection for Temporary Instruction (TI) 2515/175, "Emergency Response Organization, Drill/Exercise Performance Indicator, Program Review," issued June 5, 2008, has been completed. The staff's review of the collected raw DEP PI data is ongoing.

In addition to reinforcing the current PI guidance and improving existing PIs, the staff has made progress in exploring potential new PIs. The staff gained experience in the use of PIs outside the United States by participating as a consultant in a meeting of international regulators that completed a draft International Atomic Energy Agency safety guide titled "Development of Nuclear Power Plant Safety Performance Indicators for Use by a Regulatory Body." The staff also evaluated whether PIs already in use by the industry (i.e., non-ROP PIs) would provide meaningful regulatory insights that could be included in the ROP. A group of senior NRC inspection program managers reviewed the corporate and plant-specific indicators used by a licensee. The staff found that this licensee uses a large number of internal PIs, many of which involve information associated with NRC regulatory functions and activities. One area of interest was the use of MSPI insights to evaluate and plan potential plant modifications that, if implemented, would improve individual plant-risk profiles. Other than the MSPI, which the ROP already uses, the staff concluded that the other internal PIs either involved information and data that were too subjective for effective use as a regulatory tool or were not directly linked to regulated activities.

In December 2009, the staff introduced a white paper at the monthly public meeting of the industry-staff ROP Working Group that captured a broad spectrum of plant performance attributes, including those of PIs used by the international community, the United States nuclear power industry, and other organizations. The staff plans to host a separate public meeting to discuss the white paper in detail, with the goal of obtaining stakeholder input to develop a framework and establish a process for evaluating the efficacy of potential new PIs for use in the ROP.

Based on Commission direction in the staff requirements memorandum (SRM) dated June 30, 2008, the staff reviewed the metrics for assessing the effectiveness of the PI program and made revisions in CY 2008. The staff revised the wording to two metric definitions, as well as to the internal and external survey questions associated with them, to emphasize that the PI program is used in conjunction with the inspection program to provide useful insights (PI-4) and that the PI program contributes to the identification of performance outliers (PI-8). The results of the 2008 internal survey and recent 2009 external stakeholder survey indicate that the revisions to PI-4 and PI-8 helped to emphasize the role of the PI program, and the more accurate metric definition should ensure objective, open, and predictable future survey results. The staff is satisfied with the changes made to the PI metrics as a result of the CY 2008 review and considers the action complete to address the Commission SRM. In addition, the staff will continue to reinforce the message, through ongoing communications with both internal and external stakeholders, that the PI program is only a contributor to the identification of performance outliers and is used in conjunction with the inspection program to provide useful insights on licensee performance.

The staff met all eight of the PI metrics for CY 2009. This year, only industry stakeholders participated in the external survey though the survey was made available to all external stakeholders. This survey generally found that the PI program met the ROP goals of providing useful information on risk-significant areas. Most survey respondents found the PIs to be clearly

defined and understandable and to provide an appropriate overlap with the inspection program. In addition, the majority of the respondents stated that the PIs provide an objective indication of declining safety performance and contribute to the identification of outliers. Several respondents asserted that the MSPI is too complex, labor intensive, and difficult to understand. The NRC will endeavor to minimize the complexity of the MSPI when considering any future MSPI improvements. The staff will consolidate all responses to the external survey feedback in a separate document.

## **Inspection Program**

The inspection program independently verified that licensees operated plants safely and securely in CY 2009 and identified and corrected performance issues in a timely manner in accordance with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program—Operations Phase," and IMC 2201, "Security and Safeguards Inspection Program for Commercial Nuclear Power Reactors." Each region documented its CY 2009 completion of the baseline inspection program in a memorandum available in ADAMS (Accession No. ML100390084 for Region I, ML100550802 for Region II, ML100560313 for Region III, and ML100601032 for Region IV). Additionally, the Office of Nuclear Security and Incident Response (NSIR) completed all security baseline inspections in CY 2009.

The staff completed its third biennial ROP realignment review during CY 2009, in accordance with Appendix B to IMC 0307, "Reactor Oversight Process Self-Assessment Program." This review assesses the effectiveness of each ROP baseline inspection procedure (IP) by determining whether appropriate inspection resources were applied in each of the inspectable areas. The working group consisted of staff from the Office of Nuclear Reactor Regulation (NRR), NSIR, and each of the four Regions. Modifications and adjustments to the inspection effort were made across the baseline inspection program, but overall inspection resources for CY 2010 remain at CY 2009 levels. The 2009 ROP realignment also added new inspection requirements to accommodate inspections related to the new requirements under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 26, "Fitness-for-Duty Programs," 10 CFR 50.54(hh), "Conditions of Licenses," and lessons learned from Peach Bottom regarding inattentive security officers. Additionally, the staff adjusted some IPs in the reactor safety area to better align budgeted and expended inspection resources. The staff revised all radiation safety inspection procedures to provide a more performance-based inspection for each of the functional areas of a radiation safety program. It also made inspection resource adjustments to all security-related IPs, based on regional feedback and past inspection resources expended for each IP. Additional details on the results of the 2009 ROP realignment process appear under ADAMS Accession No. ML092090312.

In addition, the NRC revised several inspection program documents and created one new IP to address Subpart I, "Managing Fatigue," of the new requirements contained in 10 CFR Part 26. For example, the staff added guidance to Appendix D, "Plant Status," to IMC 2515 for inspectors to look for indications of fatigue when performing plant status reviews, and created IP 93002, "Managing Fatigue," to provide guidance to inspectors for fatigue-related issues. In addition, the staff added an inspection requirement to IP 71111.20, "Refueling and Other Outage Activities," to determine how licensees manage fatigue during outages. The staff also revised the Security Baseline Inspection Program to address the new requirements of 10 CFR 73.55, "Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage," and is developing a new inspection program to address the new requirements of 10 CFR 73.54, "Protection of Digital Computer and Communication Systems and Networks."

The staff is developing a new engineering inspection to potentially replace the current component design-bases inspection. The new inspection will focus on improved component sample selection by reviewing various licensee programs and using operating experience (OpE). The staff plans an initial inspection during CY 2010, with full implementation of the new engineering inspection in CY 2011 if it is determined to be effective.

The inspection staff continued to review and consider OpE in planning their inspection activities. The Operating Experience Smart Sample (OpESS) Program provides inspectors with concise information related to selected industry operating events that have generic applicability and potential risk significance and can be readily inspected through the baseline inspection program. Since the program's inception in fiscal year (FY) 2007, the staff has issued seven OpESS documents and one update. The staff compiles and communicates operating experience using single Web page summaries called OpE COMMS, daily OpE Screening Summaries, OpE summary inputs and discussions during the monthly ROP call with the Regions, and the quarterly inspector newsletters. In addition, the Reactor OpE Gateway contains a wealth of OpE information for all internal stakeholders. This internal Web page includes numerous OpE data bases and search engines for all agency employees to use. The staff incorporated OpE into the assessment process for use during the mid-cycle and end-of-cycle reviews, as noted in the assessment program discussion below. The staff continues to emphasize the use of OpE and plans to further integrate this emphasis into the inspection program in CY 2010, through the development of a new IMC or incorporation into existing IMC guidance.

Although the resident inspector (RI) and senior resident inspector (SRI) turnover rates have declined for three consecutive years, the staff continues to closely monitor the attraction and retention of RIs and SRIs to ensure an experienced and stable RI and SRI program. An NRC senior-level management working group developed strategies and initiatives to address these retention issues and reported them to the Commission in SECY-09-0050, "Actions to Enhance Relocation and Retention for Employees," dated March 30, 2009. Enclosure 4 of this SECY paper offers additional discussion and analysis of resident inspector demographics and issues.

The staff continued to improve the initial and continuing inspector training programs to develop and maintain well-qualified, competent inspectors. The staff made recommendations, reviewed them in accordance with the ROP feedback process, and incorporated the improvements into inspection standards, as appropriate. The staff also developed three new inspector qualification standards, one for fire protection inspectors and two advanced-level standards for inservice inspection and fire protection inspectors. The staff conducted regional training on the integration of traditional enforcement into the assessment process, documenting issues in inspection reports, and licensee reporting requirements associated with the SSFF PI. In addition, the staff initiated periodic knowledge management seminars to improve the NRC's understanding of the concept of safety culture and its aspects. The staff also developed and implemented industrial safety training as well as a comprehensive training curriculum to support security inspections, including Force-on-Force inspections.

All inspection program metrics met their established criteria during CY 2009, including all timeliness goals. In general, respondents to the external survey believed the inspection program was effective in ensuring areas important to safety are appropriately addressed and that the information contained in inspection reports is relevant, useful, and clearly written. The agency received some feedback on potential areas for improvement which are addressed in this self-assessment and will be further addressed in the consolidated response to the CY 2009 external survey.

## Significance Determination Process

The SDP continues to be an effective tool for determining the safety significance of identified performance issues. Oversight focuses on process improvements, based on feedback from internal and external stakeholders. The staff met the SDP timeliness metric for a fourth consecutive year. The staff received only one appeal letter, which was rejected because it failed to meet the criteria for invoking the appeal process. The goals met by the staff for other metrics included the amount of expended resources applied to SDP evaluations, compared to direct inspection hours, and ensuring that the SDP results are repeatable and predictable.

In CY 2009, the staff issued the new SDP for alternative mitigation strategies (Appendix L, "B.5.b Significance Determination Process," to IMC 0609, "Significance Determination Process.") The staff developed the appendix to support its commitment to the Commission to incorporate the lessons learned from the performance of Temporary Instruction 2515/171, "Verification of Site Specific Implementation of B.5.b Phase 2 & 3 Mitigating Strategies," into the ROP baseline inspection program. In a memorandum to the Commission, dated April 30, 2009 (ADAMS Accession No. ML090771056), the staff documented its fulfillment of this commitment. The staff revised and issued the baseline security SDP, Appendix E, Part 1, to enhance the process. The staff also updated the baseline security SDP to reflect the new requirements of 10 CFR 73.55, "Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage," and is working with stakeholders to revise the Force-on-Force (FOF) SDP to improve its effectiveness. In accordance with SRM M100112, "Briefing On Office Of Nuclear Security and Incident Response-Programs, Performance, And Future Plans", dated February 12, 2010, the staff will evaluate and report back to the Commission on how the proposed enhancements to the FOF physical protection SDP would alter the CY 2009 FOF exercise findings.

A team composed of staff members from NRR, the Office of Nuclear Regulatory Research (RES), and the Regions reviewed the NRC risk tools to identify areas for enhancement; this effort was called the partnering initiative. The team solicited feedback from internal stakeholders and end-users in the regional offices and Headquarters for improving the NRC risk tools used in everyday regulatory activities for nuclear reactors, such as the SDP, standardized plant analysis risk (SPAR) models, and the Incident Investigation Program, as well as staff training needs and interests. The team intends to use the data collected to (1) ensure the suite of risk tools is used efficiently, (2) provide clarity through improving documentation, methods, and training, (3) use the best available knowledge from research and operational experience to improve the suite of risk tools and thus improve the reliability and predictability of the NRC's performance assessment activities, and (4) provide better tools for all NRC staff engaged in probabilistic risk assessment (PRA) regulatory activities. The staff is currently working to implement many of these enhancements.

In the CY 2008 self-assessment, the staff agreed to develop and implement additional SDP training to ensure the inspectors remain efficient and effective in determining the safety and security significance of identified performance issues. Although the staff began to develop additional SDP training, it deferred implementation to incorporate input from the partnering initiative, which provided valuable insights regarding areas where training was lacking or can be improved. These areas include fundamental and overview training for certifying inspectors, as well as risk-informed decision making fundamentals and techniques for managers. The staff will resume its efforts to implement SDP training in CY 2010.

The staff continues to develop analytical tools that complement the NRC's deterministic approach and support its traditional defense-in-depth philosophy. Work on developing low power/shutdown (LPSD) SPAR models continues with a commitment of two models per year. Four LPSD models are currently available, with two more being developed and another one planned. Guidance for using the models appears in Volume 4 of the Risk Assessment of Operational Events (RASP) Handbook, which will be issued in CY 2010 for trial use and comment. Enclosure 2 of SECY-09-143, "Status of the Accident Sequence Precursor Program and the Standardized Plant Analysis Risk Models," dated September 29, 2009, provides the status of these and other SPAR model enhancements.

Based on the Commission's direction in the SRM dated June 30, 2008, the staff reviewed the SDP metrics and made several changes, including the wording for the metric and the corresponding survey question regarding stakeholder perception (SDP-4), to emphasize that the SDP should result in an "appropriate" regulatory response across all cornerstones. The responses to this question in the external survey indicated that the stakeholders thought the SDP generally resulted in the appropriate regulatory response. The staff believes the changes made to the SDP metrics as a result of the CY 2008 review clarified the metric definition and intent of the SDP, and considers the action complete to address the Commission SRM.

Although the external survey responses were generally favorable, some stakeholders indicated that the SDP was not consistent and sometimes resulted in attributing higher risk significance to an issue than was warranted, that too much time was spent challenging NRC assumptions, and that the NRC should use licensee PRA models. The staff is considering these comments but fails to see evidence that the NRC's SDP results overestimate risk significance or that NRC assumptions are subjective having received only one appeal letter for findings of greater than Green significance, which was rejected because it failed to meet the criteria for invoking the appeal process. The staff will further address the survey responses in its consolidated response to stakeholder comments. The staff will continue to streamline the SDP program, implement effective staff training, and monitor SDP timeliness.

### **Assessment Program**

Staff implementation of the assessment program ensured that staff and licensees took necessary actions to address performance issues in CY 2009. The staff revised IMC 0305, "Operating Reactor Assessment Program," to improve usability and incorporate added guidance on traditional enforcement and safety culture, as well as other clarifications and enhancements. In addition, to address its commitment in the 2009 ROP self-assessment, the staff incorporated into IMC 0305 consideration of operating experience during mid-cycle and end-of-cycle reviews to note trends in performance or the emergence of technical issues that can be considered for incorporation into ROP inspection guidance.

In addition to the changes to the IMC 0305 guidance, the staff enhanced the internal and external communication of plant assessment results. Part of this effort included a revision to the action matrix public Web site to support program changes included in the December 24, 2009, revision. Starting in CY 2010, the action matrix Web site will provide a more current status of plant assessment, rather than a purely retrospective look at the previous quarter's data. This change promotes clarity and openness with members of the public.

In its SRM M090514, "Briefing on the Results of the Agency Action Review Meeting," dated June 1, 2009, the Commission asked the staff to provide the status of the two facilities

(Davis-Besse and Indian Point) that were currently receiving increased NRC oversight as a result of deviations from the action matrix. In SECY-09-0121, "Status of the Deviation from the Reactor Oversight Process Action Matrix for Davis-Besse Nuclear Power Station and Indian Point Energy Center," dated August 24, 2009, the staff provided the plans and schedules for satisfying the criteria for these plants to return to normal NRC monitoring efforts. As of the end of CY 2009, the staff had closed out both the Davis-Besse and Indian Point deviations and there are some deviations from the action matrix in process in late CY 2009 and CY 2010.

As noted in the CY 2008 ROP self-assessment, the number of plants in the degraded cornerstone (column 3) and multiple/repetitive degraded cornerstone (column 4) was consistent with previous levels, and the industry's safety performance, as evidenced by the ROP, was consistent with the Industry Trends Program results. During CY 2009, the staff observed a decline in the number of plants in columns 3 and 4 of the action matrix. The staff will continue to closely monitor plant performance to ensure appropriate oversight.

In the CY 2008 ROP self-assessment, the staff committed to revising program documents to incorporate guidance for integrating traditional enforcement outcomes into the assessment process. During CY 2009, the staff completed efforts to integrate certain traditional enforcement items into the assessment program by changing inspection and assessment guidance documents. The staff changed Appendix B, "Issue Screening," to IMC 0612, "Power Reactor Inspection Reports," to allow performance deficiencies to be processed separately from the violation, so that the technical aspect can become a timely input into the action matrix. IMC 0305 and supporting inspection guidance were changed to allow follow up inspection on all levels of traditional enforcement outcomes. Using an escalating approach similar to that in the action matrix, the number, severity level, and similarities among the violations will allow one of three levels of inspection response to be used, as appropriate.

The staff committed, in the CY 2008 ROP self-assessment, to explore ways to use cross-regional experience to further improve the implementation of guidance on substantive cross-cutting issues (SCCIs). In response to this commitment, the staff leveraged ongoing efforts initiated by the Deputy Regional Administrators to improve the reliability of ROP implementation, including the SCCI process. Regional management developed the following four ROP reliability initiatives: (1) Enhanced Inspection Resource Sharing Among Regions, (2) Branch Chief Benchmarking Visits to Other Regions, (3) Periodic Discussion of Reliability Topics, and (4) ROP Self-Assessments of Inspection Report Quality. The regions are continuing to implement these initiatives, with NRR support.

The staff also committed, in the CY 2008 ROP self-assessment, to revising program guidance, as necessary, to better align with the Commission's safety culture policy statement once it has been completed. While the Commission safety culture policy statement is being developed, staff continues to be engaged with internal and external stakeholders. In addition, the Nuclear Energy Institute (NEI) has proposed an alternative industry-owned safety culture oversight process, aspects of which the NRC staff is observing at the request of NEI. The staff will continue to become familiar with the initiative and to evaluate associated tools that could possibly be leveraged to gain efficiencies in the ROP.

The staff implemented several changes to ROP guidance in CY 2009 regarding safety culture and the use of SCCIs. It revised IP 95003, "Supplemental Inspection for Repetitive Degraded Cornerstones, Multiple Degraded Cornerstones, Multiple Yellow Inputs or One Red Input," in January 2009. This revision incorporated a graded approach for assessing a licensee's safety culture and detailed guidance for performing an independent safety culture assessment. Based

on regional experience and feedback, the staff revised the IMC 0305 guidance to create a cross cutting theme for the area of safety-conscious work environment (SCWE). In addition, to improve program document usability, guidance related to screening inspection findings for cross-cutting aspects was relocated from IMC 0305 to IMC 0612, Appendix B, and the descriptions of the safety culture components and aspects were relocated to the new IMC 0310, "Components Within the Cross-Cutting Areas." While guidance for screening inspection findings and the component descriptions were relocated, IMC 0305 retained all guidance related to the SCCI process. The staff also developed training for regional staff on the NRC's safety culture activities related to the ROP.

The staff believes that the current process of considering cross-cutting aspects of inspection findings is effective because it offers insights into a licensee's safety culture, while maintaining consistency with the ROP objectives of being transparent, objective, understandable, predictable, risk-informed, and performance-based. The process enables the NRC staff to identify concerns about a licensee's performance in a cross-cutting area, with the expectation that the licensee will address the performance issue before it results in a more significant safety concern.

The agency met seven of the eight assessment metrics for CY 2009, including all timeliness goals. The metric regarding perceived effectiveness of the safety culture enhancements to the ROP was not met, based on the negative feedback from external stakeholders, which included only five responses, all from industry representatives. The staff is aware of the industry's concerns with the process for determining substantive cross-cutting issues and will continue to consider industry proposals as noted above. The staff also recognizes that there was a significant decrease in the number of external survey responses and notes that it would be prudent to obtain a broader perspective before drawing specific conclusions on the process. Other feedback from the external survey regarding the assessment program was generally favorable. Respondents confirmed that actions taken to address performance issues at plants are predictable and appropriate, and that information contained in assessment reports is, for the most part, relevant, useful, and well written. Some respondents questioned whether multiple White inputs should move a plant to column 3 and encouraged greater consistency and clarity on substantive cross-cutting issues. The staff will respond to specific comments as part of its consolidated response to the external survey.