

Reactor Oversight Process Program Area Evaluations

In accordance with Inspection Manual Chapter (IMC) 0307, "Reactor Oversight Process Self-Assessment Program," dated March 23, 2009, 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. ML110740073).

Performance Indicator Program

The staff furthered its ongoing efforts to improve the ROP PI program in calendar year (CY) 2010. As committed to in last year's self-assessment, the staff developed a framework for evaluating the efficacy of potential new PIs for use in the ROP and held a public meeting in April 2010 to discuss this concept. The initial approach focused on potential new PIs that would supplement the existing suite of indicators. After that meeting, the NRC and industry agreed to defer further application of resources to this endeavor until a problem statement could be defined to guide the effort in a focused, efficient manner. As such, the NRC agreed to perform a gap analysis to reveal potential areas of the ROP that may warrant additional oversight through PIs or inspection. Only one area, under the Public Radiation Safety Cornerstone, indicated the potential need for near-term changes to the ROP. The staff will consider the views of external stakeholders, reflect those views in the gap analysis, and finalize the document early in 2011. In addition, the staff revised IMC 0608, "Performance Indicator Program," to add guidance on attributes to consider when developing a new PI, and disseminated it to internal stakeholders for review and comment.

Over the past year, the staff and industry representatives on the ROP Working Group have continued to make significant progress on two Mitigating System Performance Index (MSPI) white papers—one involving emergency diesel generator fuel oil transfer pump component modeling and the other involving emergency diesel generator failure mode definitions. The staff planned to complete both activities in CY 2010; however, because of their complexity and the need for extensive data gathering and analysis, the ROP Working Group has not yet finalized these two white papers. Upon completion of these papers in 2011, attendant modifications will be made to the industry PI guidance document, Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Performance Indicator Guideline."

The staff continued efforts to improve and enhance the Emergency Preparedness (EP) PIs. Specifically, the staff reviewed the data collected from the performance of Temporary Instruction (TI) 2515/175, "Emergency Response Organization, Drill/Exercise Performance Indicator, Program Review." The staff's review of the data concluded that EP Cornerstone oversight activities could be enhanced with regard to assessment of the elements, which collectively comprise the EP Drill/Exercise Performance (DEP) PI of classification, notification and protective action recommendation development. EP inspection procedure enhancements have

been identified that will use the results of the DEP PI as an aid in determining the most effective use of EP inspection resources. These enhancements were informed by the TI results and regional feedback.

In addition, based on the staff's ongoing review of the effectiveness of security PIs, the staff discussed its CY 2010 self-assessment and analysis with stakeholders from the NRC, industry, state governments, and the public. The stakeholders discussed the publication of the new requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 73, "Physical Protection of Plants and Materials," and 10 CFR Part 26, "Fitness for Duty Programs," and resultant changes to the baseline inspection program. All involved stakeholders agreed at this meeting that, in light of the publication of the new requirements, any discussion of potential changes to the security cornerstone PIs would be better informed after completion of one complete cycle of the baseline inspection program. In addition, the staff is currently conducting a biannual ROP realignment review of the security inspection program. Therefore, the staff plans to reassess the effectiveness of the security PIs in 2013 as informed by the experience gained during these reviews and the completion of one full security baseline inspection cycle.

The staff met all of the PI metrics for CY 2010. The internal survey of stakeholders generally found the PI program to be meeting 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. They also indicated that the PIs provide an objective indication of declining safety performance and can effectively reveal outliers. Some internal survey respondents, however, wrote that the MSPI portion of the PI program is not easily understandable and lacks clarity. Other internal stakeholder comments also indicated concern that several of the indicator thresholds are not set at a meaningful level, thus contributing to a decrease in the number of greater-than-green PIs.

In an effort to make the MSPI more understandable, the staff plans to clarify and augment the MSPI inspection guidance in Inspection Procedure 71151, "Performance Indicator Verification." The staff will also evaluate the need to improve MSPI training. The staff will continue to reinforce the message that a green PI represents performance that does not require additional NRC oversight, that inspectors should continue to ensure that licensees are reporting accurately in accordance with the NEI 99-02 guidance, and that PIs provide useful trending information and are only one contributor to the identification of performance outliers. In addition, the staff will continue to refine existing PIs and explore options for introducing new PIs to ensure that the PI program continues to provide useful insights and contribute to the identification of declining performance.

Inspection Program

The inspection program independently verified that licensees operated plants safely and securely in CY 2010 and identified and corrected performance issues in a timely manner in accordance with IMC 2515, "Light-Water Reactor Inspection Program—Operations Phase," dated September 24, 2009, and IMC 2201, "Security and Safeguards Inspection Program for Commercial Nuclear Power Reactors." Each NRC Region documented its CY 2010 completion of the baseline inspection program in a memorandum available under ADAMS Accession No. ML110450581 for Region I, ADAMS Accession No. ML110530471 for Region II, ADAMS

Accession No. ML110480368 for Region III, and ADAMS Accession No. ML110460590 for Region IV. In addition, the agency completed all security baseline inspections in CY 2010 as required, as documented in a memorandum from the Office of Nuclear Security and Incident Response (NSIR) (ADAMS Accession No. ML110320010), but this memorandum contains security-related information and is not publicly available.

The staff performed its annual review of each baseline inspection procedure for CY 2010 in preparation for the biennial ROP realignment review that is scheduled to be completed during CY 2011. This in-depth baseline inspection program effectiveness review encompasses all baseline inspection procedures in all ROP cornerstone areas (Initiating Events, Mitigation Systems, Barrier Integrity, Occupational Radiation Safety, Public Radiation Safety, Emergency Preparedness, and Security) in CY 2011. Appendix B to IMC 0307 describes the ROP realignment process. The review will consider inspection results over a 3-year period from CY 2008 through CY 2010. For CY 2011, the staff improved the inspection procedure review criteria to obtain increased inspection flexibility, where warranted; improved efficiency; continued integration of operating experience into the baseline inspection program; and improved inspection resource alignment based on recent industry events and feedback from the regions. Some focus areas for the CY 2011 ROP realignment include security and operator requalification inspections. During the last ROP realignment review performed in CY 2009, the NRC revised several inspection procedures associated with reactor safety and security areas to address new regulatory requirements. The staff of the Office of Nuclear Reactor Regulation (NRR) and regional staff completed their review and made changes to the component design bases inspection (CDBI) in order to enhance the identification of more risk-significant engineering performance deficiencies through improved component selection. The revised CDBI engineering inspection became effective starting in CY 2011.

The inspection staff made improvements to the baseline inspection program based on operating experience information developed during CY 2010. For example, the staff incorporated additional guidance on preventive maintenance issues identified through operating experience into the most recent revision of the CDBI inspection procedure. Additionally, the staff issued two Operating Experience Smart Samples (OpESS)—OpESS [FY2010-01](#), “Recent Inspection Experience for Components Installed Beyond Vendor Recommended Service Life,” and OpESS [FY2010-02](#), “Sample Selections for Reviewing Licensed Operator Examinations and Training Conducted on the Plant-Referenced Simulator.” The OpESS program provides inspectors with information related to selected industry operating events that have generic applicability and potential risk significance and that can be inspected readily through the baseline inspection program. In addition, the Operating Experience Branch has routinely provided a cogent summary of operating experience to the monthly ROP teleconference with the regional offices and prepares a summary of notable operating experience (with a focus on the most recent 6 months of operating experience) to inform the regional midcycle and end-of-cycle reviews of licensee performance.

The resident inspector (RI) and senior resident inspector (SRI) turnover rates have stabilized since 2008. RI and SRI turnover rates during CY 2010 were 23 percent and 11 percent, respectively, and these rates represent improvements over those observed during CY 2007. The NRC implemented the recommendations resulting from the CY 2009 senior-level management working group, which developed strategies and initiatives to address RI and SRI retention issues. The staff reported these enhancements to the Commission in SECY-09-0050,

“Actions to Enhance Relocation and Retention for Employees,” dated March 30, 2009. In accordance with the SRM dated June 26, 2009, the staff will report on the effectiveness of the relocation and retention enhancements for SRIs and RIs in a separate paper to the Commission in CY 2011. The staff also reported the status of actions to enhance the relocation and retention of employees to the Commission in a memorandum dated March 14, 2010. The staff continues to monitor the attraction and retention of RIs and SRIs to ensure an experienced and stable RI and SRI program.

The staff continued to improve the initial and continuing inspector training programs in order to produce and maintain well-qualified, competent inspectors. The NRC reviewed recommendations identified by the staff in accordance with the ROP feedback process and incorporated the improvements into inspector training standards, as appropriate. As described further in the SDP evaluation, the staff developed and implemented additional SDP training in CY 2010 to ensure that the inspectors remain efficient and effective in determining the safety and security significance of identified performance issues. In addition, NSIR staff completed the development of the first (pilot) cyber security training course for inspectors.

The data and comments from the internal survey reflected a generally positive perception of inspector training. Although inspectors were generally satisfied with the training to implement the ROP, the effectiveness of safety culture training received relatively low ratings. NRR has created an internal working group chartered with developing options to implement the agency’s safety culture policy statement. As part of this effort, the working group will propose additional enhancements and updates to the inspector qualification training program and related guidance documents. In addition, the staff is continuing efforts to develop safety culture training as part of a larger effort to create a safety culture assessor qualification program.

All inspection program metrics met their established criteria during CY 2010. The internal feedback received was generally positive. In general, the internal stakeholders believed that the inspection program was effective in ensuring that areas important to safety and security are addressed appropriately. Some respondents commented on the need to make the information contained in the inspection report more useful and stated that the information contained in the security inspection reports and their cover letters is not sufficient to make these reports useful to members of the public. The staff will address these insights and other comments in the consolidated response to the internal survey.

Significance Determination Process

The SDP continues to be an effective tool for determining the safety and security significance of identified performance issues, although process improvements continue based on lessons learned and feedback from stakeholders. The staff met the SDP timeliness metric for a fifth consecutive year, although one finding exceeded the 90-day goal. All other SDP performance metrics were met.

In response to ROP feedback and suggestions collected through the Risk Tools Enhancement (RTE) Project, the staff revised IMC 0609, “Significance Determination Process,” its attachments, and several SDP appendices. These draft revisions were issued for internal comment in October 2010 and should be finalized in early 2011. The RTE Project considered

suggestions from internal stakeholders in the NRC Regions and Headquarters for improving the NRC risk tools used in regulatory activities for nuclear reactors. These risk tools include the SDP and simplified plant analysis risk models as well as staff training in risk-informed regulation and decision making. The SDP revisions focused on incorporating the feedback, improving and clarifying the process where needed, and aligning the guidance documents to reduce redundancy. The staff also updated and revised the technical basis documents for the occupational and public radiation safety SDPs. Further, because of two white findings involving degraded neutron absorbing material in the spent fuel pool at two separate facilities, the staff began to develop a new SDP for spent fuel pool findings. The SDP will focus on findings involving fuel handling errors, decay heat removal, and reactivity control. In addition, the Baseline Security SDP was enhanced to create a more effective tool for achieving the appropriate significance with predictable and repeatable results.

The NSIR staff continues to review and compare the CY 2009 force-on-force (FOF) exercise findings against the proposed enhancements to the FOF physical protection significance determination process (PPSDP) in response to Staff Requirements Memorandum (SRM)-M100112, "Briefing on Office of Nuclear Security and Incident Response Programs, Performance, and Future Plans," dated February 12, 2010. In the SRM, the Commission requested an update on how the proposed enhancements to the FOF PPSDP would alter the CY 2009 FOF exercise findings. The staff conducted numerous internal and external public and closed industry meetings during CY 2009, CY 2010, and the first quarter of CY 2011 to discuss the proposed enhancements to the FOF PPSDP. The staff will report its final results to the Commission, in accordance with SRM-M100112, by the end of May 2011.

In the CY 2009 self-assessment, the staff described its intent to improve SDP training for qualifying inspectors and to develop and implement additional SDP training to ensure that the inspectors remain efficient and effective in determining the safety and security significance of identified performance issues. In CY 2010, the staff updated and improved the existing SDP fundamental and overview training, which was part of the advanced reactor series training, and incorporated it with another training course required for certifying inspectors. These efforts dovetailed with training initiatives associated with the RTE Project and resulted in two new courses related to the risk-informed regulation. The first course covers risk-informed decision making fundamentals and techniques for managers. The second course provides an overview of the requirements and guidance related to risk-informed fire protection at nuclear power plants. Both new courses are available in a self-study format. Finally, the staff will consider developing additional courses in CYs 2011 and 2012 as part of the RTE Project to improve the training available for inspectors and regional staff.

The responses to the internal survey indicated that the staff has an increasingly positive perception of the SDP overall. More than 70 percent of the staff members indicated that they are proficient using the reactor-safety and non-reactor-safety SDPs. The staff indicated that training is effective, that program guidance is adequate in helping the staff to understand and use the SDP, and that the SDP results in an appropriate regulatory response. This is an improvement over responses to the CY 2008 internal ROP survey. The staff continues to believe that the SDP focuses on safety issues, contributes to effective communications with the licensee and the public, and expends an appropriate level of resources.

Assessment Program

Staff implementation of the assessment program ensured that staff and licensees took appropriate actions to address performance issues in CY 2010 commensurate with their safety significance. The staff issued a draft revision to IMC 0305, "Operating Reactor Assessment Program," for comment in late 2010 with the intent to improve its usability, incorporate stakeholder feedback and lessons learned from implementation issues, and simplify guidance for cross-cutting areas. The agency will issue and begin implementing this revised guidance in CY 2011. The staff also enhanced the infrastructure for communicating assessment program information and more current plant assessment results. Part of this effort included developing an assessment program SharePoint Web site that contains schedules, assessment-related documents and Website links, and announcements. The staff also created a common Microsoft Outlook resource to serve as a repository for receiving assessment-related information from the regional offices.

The staff reviewed the causes of the three Action Matrix deviations issued during CY 2010 and evaluated them for potential program improvements. The Executive Director for Operations (EDO) approved an Action Matrix deviation for increased oversight of the Vermont Yankee Nuclear Power Station related to onsite ground water contamination because it represented a customized approach that considered unique factors beyond the plant's Action Matrix column categorization. The staff considered this deviation in the ROP gap analysis and is preparing a separate Commission paper to seek Commission approval to evaluate the Public Radiation Safety Cornerstone to determine whether changes to the ROP are necessary to address ground water contamination issues and associated public confidence challenges. The EDO approved an Action Matrix deviation for increased oversight of the San Onofre Nuclear Generating Station to address longstanding human performance issues, protracted challenges in problem identification and resolution, and a significant increase in allegations. Based on the lessons learned from the San Onofre deviation, the staff is creating an inspection procedure for reviewing long-standing substantive cross-cutting issues. Lastly, the EDO approved an Action Matrix deviation for Browns Ferry Units 1, 2, and 3 to permit the plants to remain in Column 3 because the supplemental inspection was not completed within four quarters. As a result of the Browns Ferry deviation, the staff is clarifying the guidance in IMC 0305 regarding the definition of a repetitive degraded cornerstone to ensure consistent implementation.

The staff observed an increase in the number of plants in the Degraded Cornerstone Column (Column 3) of the ROP Action Matrix in CY 2010 when compared with CY 2008 and CY 2009. The numbers were, however, more in line with those from previous years. Twelve plants (eight sites) were in Column 3, and nine of those 12 had returned to the Licensee Response Column (Column 1) by the end of CY 2010. The staff evaluated the inputs and circumstances associated with each of the plants that entered Column 3 in CY 2010 to determine whether commonalities exist. After reviewing the events, cornerstones affected, supplemental inspections performed, Significance and Enforcement Review Panel documentation, and cross-cutting aspects, the staff concluded that no commonalities exist, nor did the staff identify the need to adjust ROP guidance.

The staff also noted that a number of plants entered Column 3 of the Security Action Matrix in CY 2010. In addition, security inspection findings were preliminarily identified as having greater-than-green significance at sites that also had greater-than-green inputs in a safety cornerstone. Although the final significance of the security findings was green, the staff recognized that, had they been white or yellow, considering these inputs in separate assessment processes would yield a regulatory response that was not commensurate with an integrated, holistic assessment of licensee performance. The current separation of safety and security inputs to the Action Matrix prevents the staff from fully leveraging (unless an Action Matrix deviation is authorized) supplemental inspection procedures and resources to detect the potential existence of more systemic, organizational issues that can manifest themselves across multiple safety cornerstones of the ROP. While the NRC modified the ROP to apply separate assessment processes in an effort to protect security-related information following the events of September 11, 2001, the bifurcation of the assessment process may programmatically constrain the NRC's regulatory response. As a result, the staff is preparing a separate Commission paper to seek Commission approval to better integrate issues that may exist across multiple cornerstones, including security.

The staff also committed in last year's ROP self-assessment to revising program guidance, as necessary, to better align with the Commission's safety culture policy statement once it is finalized. The staff has continued to consider insights from ongoing industry initiatives on safety culture. In addition, the staff has created an internal working group to work closely with the regional offices and other stakeholders to revise ROP program guidance and training, as necessary, to ensure alignment with the final Commission safety culture policy statement.

The Nuclear Energy Institute (NEI), in partnership with the Institute for Nuclear Power Operations (INPO), has tested a broad initiative to monitor and improve its nuclear safety culture through an industry pilot program. The NRC staff has observed these pilot applications to become familiar with the initiative and to evaluate associated tools that could possibly be leveraged to gain efficiencies in the ROP. The staff will also continue to work with stakeholders to develop a common terminology of safety culture, where appropriate, during the implementation phase of the policy statement.

Six of the eight assessment metrics met their established criteria during CY 2010. The ROP missed the AS-1 metric because of an increase in the number of Action Matrix deviations issued in CY 2010. Although the spike did not constitute a trend, staff considers this metric not met consistent with metric determinations in prior years. The staff reviewed the causes of the three Action Matrix deviations and evaluated them for potential program improvements as previously discussed. Additionally, the ROP did not meet metric AS-4 based on an increase in the average number of days between issuance of the assessment letters and the completion of the supplemental inspection. However, the delays in performing the followup inspections were often a result of the licensee not being ready for the inspection. The staff continues to emphasize that licensee readiness needs to be considered for planning purposes, but also needs to be balanced with the ROP objective to address performance issues in a timely manner.

Based on the results from the 2010 internal survey, the perception of the assessment program was generally positive. The majority of respondents indicated that the assessment program is objective and predictable, and that the information contained in assessment reports is relevant, useful, and written in plain English. Although more than 65 percent of the responses indicate that the substantive cross-cutting issue (SCCI) process supports the ROP objectives and provides insight into licensee safety culture, the survey comments continue to indicate the need for improvements in the SCCI process. The staff plans to continue the ROP reliability initiatives and the efforts of the safety culture working group to further improve the SCCI process and its implementation.