
**OFFICE OF
THE INSPECTOR GENERAL**

**U.S. NUCLEAR
REGULATORY COMMISSION**

Review of NRC's Significance Determination
Process

OIG-02-A-15 August 21, 2002

AUDIT REPORT



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August 21, 2002

MEMORANDUM TO: William D. Travers
Executive Director for Operations

FROM: Stephen D. Dingbaum/**RA**
Assistant Inspector General for Audits

SUBJECT: REVIEW OF NRC'S SIGNIFICANCE DETERMINATION
PROCESS (OIG-02-A-15)

Attached is the Office of the Inspector General's audit report titled, *Review of NRC's Significance Determination Process* (SDP). This report reflects the results of our review to determine whether SDP is achieving its objectives, staff clearly understand the process, and staff are using the process in accordance with agency guidance.

NRC staff, licensees, and stakeholders view SDP as an improvement over NRC's previous method for establishing the significance of inspection findings. While SDP is meeting its objectives and agency staff are using SDP in accordance with guidance, additional refinements are needed. Specifically, NRC should (1) develop an action plan to correct Phase 2 analysis weaknesses or eliminate this portion of the SDP, because Phase 2 provides conservative results that have been subsequently changed, is used infrequently, and adds cost and time to the process; (2) discontinue the expenditure of about \$1,050,000 remaining to develop Phase 2 until the action plan is completed, (3) provide guidance for using information from licensee risk assessments in SDP evaluations; (4) take action to improve SDP timeliness; (5) improve its web site to more fully inform the public; and (6) improve SDP training and guidance. These refinements will help to ensure that SDP is implemented successfully.

This report makes 11 recommendations to help enhance SDP effectiveness.

The comments your office provided at a March 19, 2002, exit meeting and in your August 13, 2002, written response to the draft report have been incorporated into the report, where appropriate. Appendix D contains the written response in its entirety.

If you have any questions, please call Russ Irish at 415-5972 or me at 415-5915.

Attachment: As stated

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EXECUTIVE SUMMARY

BACKGROUND

The United States Nuclear Regulatory Commission (NRC) regulates the Nation's 103 operating commercial nuclear power plants through its reactor oversight program. NRC staff use inspection findings and performance indicators to assess plant operations within a framework of seven "cornerstones" of safety. A key feature of the inspection program is the significance determination process (SDP).

SDP is a series of analytical steps that NRC staff use to evaluate inspection findings. The process uses four colors — Green, White, Yellow, and Red — to indicate the significance of inspection findings. NRC provides the public with the results of its inspections and performance assessments on its web site and through public meetings. SDP evaluations are generally specific to each cornerstone of safety.

PURPOSE

The objectives of the audit were to determine whether (1) SDP is achieving desired results, (2) NRC staff clearly understand it, and (3) NRC staff are using SDP in accordance with agency guidance.

RESULTS IN BRIEF

NRC staff, licensees, and stakeholders view the significance determination process as an improvement over NRC's previous method for establishing the significance of inspection findings. While SDP is meeting its objectives and agency staff are using SDP in accordance with guidance, additional refinements are needed. Specifically, NRC should (1) develop an action plan to correct Phase 2 analysis weaknesses or eliminate this portion of the SDP, because Phase 2 provides conservative results that have been subsequently changed, is used infrequently, and adds cost and time to the process; (2) discontinue the expenditure of about \$1,050,000 remaining to develop Phase 2 until the action plan is completed, (3) provide guidance for using information from licensee risk assessments in SDP evaluations; (4) take action to improve SDP timeliness; (5) improve its web site to more fully inform the public; and (6) improve SDP training and guidance. These refinements will help to ensure that SDP is implemented successfully.

RECOMMENDATIONS

This report makes 11 recommendations to help enhance SDP effectiveness. A consolidated list of recommendations is on page 17.

AGENCY COMMENTS

On August 13, 2002, the Executive Director for Operations (EDO) provided a response to our April 10, 2002, draft report. We modified the report as we determined appropriate in response to comments provided at a March exit meeting and in the EDO's August 13 response. The EDO's response can be found at Appendix D.

ABBREVIATIONS AND ACRONYMS

NRC	United States Nuclear Regulatory Commission
OIG	Office of the Inspector General
PRA	probabilistic risk assessment
SDP	significance determination process

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I. BACKGROUND

The United States Nuclear Regulatory Commission's (NRC) mission is to ensure adequate protection of the public health and safety, the common defense and security, and the environment in the civilian use of nuclear materials in the United States. As part of this responsibility, the agency regulates the Nation's 103 operating commercial nuclear power plants.

NRC uses its reactor oversight process to monitor the safety performance of nuclear power plants and verify that they are being operated by licensees in accordance with agency regulations. In April 2000, after incorporating lessons learned from a 6-month pilot program, NRC implemented a revised reactor oversight process that is less subjective than the previous process and focused on areas of greatest safety significance.

The revised oversight process assesses three key performance areas: reactor safety, radiation safety, and safeguards. This report focuses primarily on the reactor safety performance area. Each area contains "cornerstones" of safety that reflect the essential aspects of safe plant operation. NRC staff use inspection findings and performance indicators to assess plant operations within the cornerstones. Satisfactory licensee performance in each cornerstone provides reasonable assurance of safe facility operation. Appendix B shows the performance areas and cornerstones within NRC's regulatory framework and Appendix C describes the cornerstones.

A key feature of the new oversight process is the significance determination process (SDP) used for evaluating the safety significance of inspection findings. SDP objectives are to (1) characterize the significance of an inspection finding for the NRC licensee performance assessment process, using risk insights as appropriate; (2) provide all stakeholders an objective and common framework for communicating the potential safety significance of inspection findings; and (3) provide a basis for assessment and/or enforcement actions associated with an inspection finding. SDP evaluations are generally specific to each cornerstone of safety.

Nuclear power plant safety is based, in part, on having multiple systems or components available to control equipment malfunctions or other adverse events that may occur during plant operations. Licensee staff and NRC inspectors identify degraded or deficient conditions, and NRC staff evaluate this information using SDP to determine what actions NRC should take in response. Evaluation of inspection findings using SDP provides one of the following results.

Result	Safety significance of the finding
Green finding	Very low safety significance
White finding	Low to moderate safety significance
Yellow finding	Substantial safety significance
Red finding	High safety significance

In general, SDP colors indicate the seriousness of the degraded or deficient conditions. For example, in the reactor safety performance area, a Green finding indicates that three or more systems were available to mitigate a condition, no matter how frequently it occurs. In contrast, a Red finding indicates that one or no systems were available to mitigate the condition, even if the condition occurs infrequently. The following are examples of findings in the reactor safety area at each level of risk significance:

Green: A licensee incorrectly scheduled preventive maintenance for an emergency diesel generator. As a result, the generator was taken out of service unnecessarily. This increased the unavailability of a safety system component. This condition was of very low safety significance because additional mitigating equipment was available during the period the generator was out-of-service for maintenance.

White: A piece of hose became lodged in the intake of an important pump, rendering the pump inoperable for more than the allowable number of hours while the plant was operating. This condition resulted in a mitigating safety system also being inoperable during that time and was determined to have low to moderate safety significance.

Yellow: A licensee did not complete a required maintenance activity in accordance with procedures. This error likely led to the failure of an auxiliary pump which provides cooling water to the steam generators when the main water supply is unavailable. This issue had substantial safety significance based on the pump's function and the length of time the condition persisted.

Red: A licensee's overall direction and execution of steam generator examinations was deficient. As a result, flawed steam generator tubing was left in service. These deficiencies resulted in a significant reduction in safety margin while the plant was operating because of the increased probability of a tube failure. Subsequent to the examination, one tube failed during operations.

For greater-than-Green findings (White, Yellow, or Red), NRC gives licensees the choice of accepting NRC's decision or presenting additional information that might change the color of a finding. If the licensee provides further information, NRC regional office staff, with headquarters' participation, make a final decision on the significance/color of the finding. If the licensee disagrees with the decision, it may appeal to the appropriate NRC regional administrator.

The agency uses its web site and public meetings to inform the public of inspection findings and performance assessments.

II. PURPOSE

The objectives of this audit were to determine whether (1) SDP is achieving desired results, (2) NRC staff clearly understand the process, and (3) NRC staff are using SDP in accordance with agency guidance. Appendix A provides additional information about the scope and methodology.

III. FINDINGS

NRC staff, licensees, and stakeholders view the significance determination process as an improvement over NRC's previous method for establishing the significance of inspection findings. While SDP is meeting its objectives and agency staff are using SDP in accordance with guidance, additional refinements are needed. Specifically, NRC should (1) develop an action plan to correct Phase 2 analysis weaknesses or eliminate this portion of the SDP, because Phase 2 provides conservative results that have been subsequently changed, is used infrequently, and adds cost and time to the process; (2) discontinue the expenditure of about \$1,050,000 remaining to develop Phase 2 until the action plan is completed, (3) provide guidance for using information from licensee risk assessments in SDP evaluations; (4) take action to improve SDP timeliness; (5) improve its web site to more fully inform the public; and (6) improve SDP training and guidance. These refinements will help to ensure that SDP is implemented successfully.

A. DEVELOP AN ACTION PLAN TO CORRECT PHASE 2 ANALYSIS WEAKNESSES OR ELIMINATE IT

Phase 2 analysis is intended to enable inspection staff to characterize the risk associated with inspection findings in the reactor safety performance area. However, Phase 2 analyses have not been effective because (1) the risk information used is incomplete, (2) Phase 2 was designed to give generally conservative results, and (3) inspectors use it infrequently. These factors have led to Phase 2 results that have been subsequently changed and decreased public confidence in the process. In addition, continuing to develop guidance for Phase 2 analysis is producing unnecessary program duplication and costs. Although NRC will expend more than \$2.2 million to develop and implement Phase 2, the agency is also developing more complete computer-based models that can be used to perform these analyses. Because there are significant questions about the usefulness of Phase 2 analysis, the agency needs to prepare an action plan to correct Phase 2 weaknesses or eliminate it. In addition, until the action plan is complete, NRC should discontinue expenditure of about \$1,050,000 remaining to develop Phase 2.

Phase 2 Analysis

NRC's inspection manual provides guidance for evaluating the risk significance of a finding in each cornerstone of safety. First, inspectors perform pre-SDP steps to screen out minor issues. After the initial screening, inspectors use SDP to evaluate the significance of findings. In the reactor safety strategic performance area, the reactor safety SDP provides for a three-phase analysis of inspection findings. The three phases are:

- Phase 1:** Phase 1 analysis is a characterization of the finding and initial screening of very low safety significance findings (Green) for disposition by the licensee's corrective action program. Most inspection issues do not proceed beyond Phase 1.
- Phase 2:** For more significant inspection issues, Phase 2 analysis is used to determine the potential risk associated with the finding. The agency intended that, when NRC officials agreed on the results of the Phase 2 analysis, the final results would be documented in an inspection report and no further review would be needed.
- Phase 3:** Phase 3 analysis relies on more advanced risk assessment techniques and is intended to confirm or modify Phase 2 results.

Phase 2 Risk Information Is Incomplete

Guidance for performing Phase 2 risk analysis is based on information from risk assessments licensees submitted to NRC in the early 1990s¹ and on recent site visits to update the information. Those assessments did not address the impact of certain events on the plant (i.e., internal fires, high winds/tornadoes, transportation accidents, external floods, and earthquakes). However, these events, especially internal fires, can have considerable influence on risk in plant operations. This limitation extends to Phase 2 evaluations, which do not consider the impact of external events. As a result, to consider the potential impact of external events, NRC must perform Phase 3 analysis.

Phase 2 Analysis Was Designed To Give Generally Conservative Results

NRC designed Phase 2 analysis to produce generally conservative results. Conservative results tend to err on the side of caution; to be more likely to identify findings as preliminarily more safety significant than they are. For

¹ NRC required all power plants to develop Individual Plant Examinations in a Generic Letter, *Individual Plant Examination For Severe Accident Vulnerabilities - 10 CFR 50.54(f)* (Generic Letter No. 88-20), November 23, 1988. The general purpose of the examination was for each utility to perform a systematic examination to identify any plant-specific vulnerabilities to severe accidents [risk assessments] and report the results to the Commission.

example, Phase 2 analysis might characterize a finding as Yellow, while a more sophisticated analysis would result in a White finding.

One NRC official estimated that 30 to 40 percent of inspection findings initially characterized as greater-than-Green are subsequently reduced to a lower risk significance level. This can occur, for example, when more accurate risk information is provided by licensees. Between April 2000 and February 2001, 3 of 10 findings using the reactor safety SDP, initially evaluated as greater-than-Green, were reduced to Green findings.

Phase 2 Analysis Is Used Infrequently

Phase 1 and 2 analyses are intended to be accomplished primarily by field inspectors² and their first-line managers. However, these inspectors use Phase 2 infrequently. There are more than 130 resident inspectors at nuclear power plants. However, only 11 issues were screened in Phase 2 during the first year of the new oversight process (April 2000 - April 2001) so the great majority of inspectors did not use Phase 2 analysis. Resident inspectors stated that their infrequent use of Phase 2 analysis led to an inability to effectively use that part of SDP. As a result, inspectors are unable to evaluate various issues that surface and NRC risk experts are providing assistance for Phase 2 analyses.

Phase 2 Analysis Results Have Not Been Final

NRC expected that when staff and management agreed on Phase 2 analysis results, no further review would be needed. However, during the first year of the new oversight process, Phase 2 analysis did not provide a final characterization for any inspection finding. In that period, 632 findings were initially characterized as Green and 26 were initially characterized as greater-than-Green. Phase 2 analysis was applied to each of the 11 findings that used the reactor safety SDP and were initially characterized as greater-than-Green.³ Although Phase 2 analysis was intended to provide a final significance determination, all 11 were also evaluated using Phase 3 analysis. Based on the additional analysis, 2 of the 11 findings were eventually characterized as Green and 9 as greater-than-Green. In addition, NRC guidance states that the significance of greater-than-Green inspection findings will be confirmed by a Phase 3 analysis.

Decreased Public Confidence

Building and maintaining public trust is an important performance goal for NRC. In addition, the agency strives toward regulation that is based on the best available knowledge from research and operational experience. Phase 2 results that are subsequently changed have a negative impact on the public's

² "Field inspectors" is used here to mean inspectors resident at power plants and also region-based inspectors.

³ The remaining 15 findings initially characterized as greater-than-Green were in other SDP areas.

confidence in NRC's position on findings. In fact, members of the public have expressed concern about the reductions in finding colors. One stakeholder described the reductions as NRC "negotiating" with licensees and "losing" the discussion. Another stakeholder cited the failure of an important feedwater pump which NRC initially determined to be a Yellow finding yet months later reduced to a White finding. The stakeholder noted that these "changed-on-appeal" determinations give the appearance of "collusion, political intimidation, or incompetence."

Program Duplication and Costs

NRC has been developing guidance for performing Phase 2 analysis for each power plant since fiscal year 2000. An NRC official estimated the total cost of that effort to be \$2.2 million. About \$1,050,000 remains to be expended in fiscal years 2002-2004 to complete the project. Additionally, maintenance costs of \$250,000 per year have been budgeted for fiscal years 2004 and 2005.

In addition, since 1999, NRC has been developing computer-based models to increase its ability to perform more comprehensive risk analyses. Results from these models are more detailed and more complete than results from Phase 2 analysis. This effort reflects NRC's policy to use state-of-the-art risk assessment methods whenever practicable. An NRC official estimated these more detailed models will cost about \$3.5 million and should be completed in 2004.

Phase 2 has been in development and use for more than 2 years, and is being used to make important regulatory decisions. However, a senior agency official acknowledged that there are still important Phase 2 development issues that may take 2 to 3 years to resolve. Because there are significant questions about its usefulness, the agency needs to prepare an action plan to correct these weaknesses or eliminate Phase 2. In addition, until the action plan is complete, NRC should discontinue expenditure of about \$1,050,000 remaining to develop Phase 2.

RECOMMENDATIONS

The Office of the Inspector General (OIG) recommends that the Executive Director for Operations:

1. Develop an action plan by September 6, 2002, to correct Phase 2 weaknesses or eliminate it.
2. Discontinue expenditure of about \$1,050,000 remaining to develop Phase 2 until the action plan is complete.

B. PROVIDE GUIDANCE FOR USING LICENSEE RISK ASSESSMENT INFORMATION IN SDP EVALUATIONS

Effective risk-informed regulation of nuclear power plants should be anchored in, among other things, risk assessments that define the safety significant structures, systems, or components of a power plant. SDP relies on risk information provided by NRC licensees and the agency has stated that it will require risk assessment quality commensurate with the particular use. NRC provides guidance for using risk information in areas other than SDP. However, NRC experts evaluating the quality of licensee risk information for SDP use must rely, for example, on their personal knowledge of plant operations or on NRC's computer-based risk models, which are primarily based on risk information provided by licensees. Although NRC's Strategic Plan emphasizes the importance of its regulatory independence, the agency has not developed guidance for an independent verification process to provide assurance that licensee risk assessment results are acceptable for SDP purposes and provide a sound basis for regulatory decisions.

Risk Assessment

Risk assessments systematically examine complex systems to identify and estimate the public health, environmental, and economic risks of nuclear plants. They attempt to quantify the probabilities and consequences of an accident's occurrence. By their nature, risk assessments are statements of uncertainty that identify and assign probabilities to events.

Probabilistic risk assessment (PRA) is a risk assessment methodology used in the nuclear power industry that systematically answers (1) what can go wrong (accident scenarios)?, (2) how likely is it to occur (probability or frequency)?, and (3) what will be the outcome (consequences)? SDP utilizes information from licensee PRAs to analyze the significance of inspection findings, primarily in the reactor safety performance area.

Within NRC, senior reactor analysts have significant responsibilities related to the use of these licensee risk assessments. These experts are generally responsible for evaluating the potential risk significance of plant events and inspection findings.

NRC's Strategic Plan emphasizes the importance of the agency's regulatory independence and states that NRC must be viewed as an independent and reliable regulator. The agency has committed to requiring PRA quality commensurate with the particular use of the information. Maintaining the quality of the technical basis for NRC decisions, which includes licensee PRA information, helps NRC to ensure adequate protection of public health and safety, and the environment. In addition, public confidence is enhanced when the agency is consistent in carrying out its mission in a thorough, disciplined, and timely manner. To accomplish these goals, staff require clear guidance for assessing the quality of licensees' PRA information.

NRC Provides Guidance for Using PRA Information in Other Areas

NRC uses licensee PRA information in many of its regulatory activities, and agency staff ensure this information is of sufficient scope and technical quality for those activities. NRC determines, on an application-specific basis, whether licensee PRA information is of sufficient quality to support its use when making regulatory decisions. For example, NRC established a framework for using licensees' PRA information in licensing actions⁴ and provided guidance for determining whether that risk information is acceptable to use for those actions. Such guidance helps ensure consistent, thorough, and disciplined regulation.

Guidance Is Needed for Ensuring PRA Information Is Acceptable

Information from licensee risk assessments generally forms the basis of SDP Phase 2 and Phase 3 analysis used in the reactor safety performance area. NRC staff use this information in evaluating potentially greater-than-Green findings. In addition, to augment NRC's SDP evaluation, a licensee may provide risk information to support its position on the significance of an inspection finding. This additional information must also be evaluated for adequacy. Currently, NRC senior reactor analysts evaluating licensee risk assessments must rely, for example, on their personal knowledge of plant operations or on NRC's computer-based risk models, which are also based on risk information provided by licensees.

Senior NRC officials confirmed that the agency is highly reliant on information from licensee risk assessments. Agency officials also noted that there are no PRA standards, no requirements for licensees' PRAs to be updated or accurate, and that the quality of the assessments varies considerably among licensees. NRC officials stated that they depend on NRC's senior reactor analysts to determine the acceptability of licensee risk assessments.

The importance of assessing the acceptability of licensee PRA data was highlighted by senior reactor analysts who stated they have identified errors in licensee PRAs. Those errors could impact the validity of a final determination of the risk significance of a finding.

However, despite its importance, NRC has not provided guidance for using licensee PRA information in SDP evaluations. Such guidance would, for example, specify an acceptable level of documentation that would enable staff to conclude that the licensee has performed a sufficiently comprehensive and acceptable PRA analysis.

⁴ "Licensing actions" are licensee requests, such as license amendments or exemptions, that require review and approval by NRC staff before they may be implemented by the licensee. Some licensing actions use PRA information.

Lack of Sound Basis for Regulatory Decisions

NRC senior reactor analysts confirmed they do not have guidance for reviewing and validating licensee risk assessments. As one NRC risk expert stated, independent assessment tools to determine the acceptability of licensees' PRAs "do not exist." Without such assurance, questions exist as to whether SDP risk evaluations are providing a sound basis for regulatory decisions.

RECOMMENDATIONS

OIG recommends that the Executive Director for Operations:

3. Develop and implement guidance for using PRA in SDP.
4. Develop and implement guidance for providing independent assurance of the quality of licensee risk information used to support SDP decisions.

C. TAKE ACTION TO IMPROVE SDP TIMELINESS

NRC's performance goals include making agency activities and decisions more effective, efficient, and realistic. The goals also call for the agency to establish program metrics and a method for addressing identified inefficiencies. NRC officials and stakeholders have expressed concerns that SDP evaluations are not timely. In addition, an internal review found a "substantive" increase in the amount of time it takes to process greater-than-Green findings under SDP when compared to the previous program. However, current metrics do not capture the entire process. As a result, agency managers are not able to effectively monitor the entire process and ensure that delays are resolved and inefficiencies are addressed.

SDP Evaluations Are Not Timely

NRC's inspection manual states that staff should make the final determination of the significance of a finding within 90 days following the exit meeting at which the licensee was officially notified of the finding. However, the 90-day goal does not reflect the time it takes to complete the entire process. Although time expended prior to the exit meeting is not tracked, a number of SDP activities may take place in that period. For example, initial assessment of a finding and the SDP and Enforcement Review Panel⁵ are typically completed prior to the exit meeting with the licensee.

⁵ The SDP and Enforcement Review Panel provides a management review of potential findings and related apparent violations.

In a recent NRC assessment of the reactor oversight process, stakeholders were critical of the time taken to finalize the safety significance of findings.⁶ One stakeholder pointed out that lower risk-significant issues are resolved more rapidly than higher risk-significant issues but that higher risk-significant issues should be resolved more quickly due to their greater safety significance. NRC officials also stated that there were many instances where evaluating findings using SDP took too long. For example, NRC regional officials expressed concerns about delays in obtaining information needed from NRC headquarters related to finding evaluations. One item of requested information was more than 300 days overdue and another issue being jointly evaluated was more than 440 days behind schedule.

An NRC internal review of SDP timeliness found that the time it took to process escalated findings (greater-than-Green under SDP) had increased substantially as a result of implementing SDP. The review also found that pre-exit assessment activities (from the date of the "event" or from NRC identification of the issue) increased the average process time by approximately 53 days; from 98 to 151.

Metrics Do Not Capture the Entire Process

Time elapses between the date of the finding "event" itself and the date NRC inspectors identify the issue and begin to evaluate it. OIG found that NRC managers do not monitor this span of time, and, therefore, may not identify and address related delays that may occur. NRC needs to monitor this interval to ensure that the entire inspection process is effective in identifying performance problems at power plants.

Management Actions

During this audit, NRC's Office of Enforcement recommended expanding SDP metrics to include processing time prior to exit meetings.⁷ NRC assigned a senior manager to monitor SDP timeliness and to provide weekly reports for management review, flagging potentially untimely SDP results for increased management attention. NRC also revised the reactor oversight process to systematically monitor key SDP timeliness metrics. NRC regional offices submit data quarterly to support the self-assessment process. However, these actions still do not capture the entire process of identifying and assessing findings and additional actions are needed to improve timeliness.

⁶ October 16, 2001, *First Annual Reactor Oversight Process Self-Assessment Report*.

⁷ NRC Office of Enforcement; *Audit of the Timeliness of Escalated Cases Handled Under the Revised Reactor Oversight Program*; August 2, 2001.

RECOMMENDATIONS

OIG recommends that the Executive Director for Operations:

5. Establish metrics to capture the entire process of identifying and assessing findings.
6. Establish a mechanism for agency managers to resolve identified delays.

D. IMPROVE THE WEB SITE TO MORE FULLY INFORM THE PUBLIC

The revised reactor oversight process is consistent with NRC's goal of providing information to enhance the public's confidence that the agency is carrying out its mission. To that end, information about inspection findings is posted at NRC's web site.⁸ However, NRC's web site does not provide information about inspection findings sufficient for the public to make informed decisions about plant performance and NRC oversight. This is because important information is missing. Specifically, additional information is needed in the inspection findings summary and NRC should more fully document licensee corrective actions. Providing this information will help to increase the public's understanding of, and confidence in, NRC's oversight process.

Additional Information Is Needed in the Inspection Findings Summary

NRC uses its web page to provide information to the public about the agency's oversight of power plants, including inspection findings and SDP results. Table 1 shows an example of the Inspection Findings Summary table for a plant. The summary shows the seven cornerstone areas and the most significant final finding color, over the previous four quarters, as of a given date in each cornerstone.

Table 1: Inspection Findings Summary for a Sample Plant

Plant	Initiating Events	Mitigating Systems	Barrier Integrity	Emergency Preparedness	Occupational Radiation Safety	Public Radiation Safety	Physical Protection
Plant 1	Green	Green	White	Green	No findings	Yellow	No findings

OIG reviewed a judgmental sample of inspection findings and determined that:

- Inspection reports do not show final results for greater-than-Green findings because licensees can provide additional information related to the finding after the inspection report is issued. Therefore, inspection

⁸

<http://www.nrc.gov/NRR/OVERSIGHT/ASSESS/index.html>

reports show some finding results as “to-be-determined”. However, the NRC letter to licensees specifying the final color for findings⁹ is not linked to the web page. For example, one White finding was shown as a “preliminary” Yellow finding in the inspection report but there is no information available at the web page to tell the public why the finding appears as White in the findings summary table.

- The web site does not provide complete inspection report results. The text summaries supporting the inspection findings summary table discuss Green and greater-than-Green findings and provide a link to inspection reports containing those findings. However, there is no discussion of or links to inspection reports where no operational deficiencies were observed. Therefore, the public does not see the complete picture of plant inspection results.
- Only one color is displayed in the findings summary for each cornerstone. For example, if a licensee has both Yellow and White findings in a cornerstone, only the most risk significant—the Yellow finding—will be displayed. To ensure that the public can make reasoned judgments about a plant's performance, such additional information should be available.

RECOMMENDATIONS

OIG recommends that the Executive Director for Operations:

7. Revise the web page to provide a link from the findings summary web pages to documents that support any changes from preliminary inspection report significance determinations.
8. Expand the web page to provide complete access to inspection report results, not just those that identify operational deficiencies.
9. Expand the web page to display all significant finding colors in a cornerstone.

NRC Should More Fully Document Licensee Corrective Actions

NRC enforcement actions focus on ensuring that the licensee is taking corrective actions. In accordance with that, the Commission requested that staff emphasize the importance of licensee corrective action programs in ongoing communication efforts. NRC guidance directs staff to discuss licensee corrective actions in inspection reports, but information about licensee corrective actions is

⁹

After the SDP and Enforcement Review Panel agrees on the final determination of significance, the licensee is informed of the final color of the finding in a letter.

not generally available at the web site. As a result, the public cannot readily obtain this important information.

Based on the importance of licensee corrective actions and requirements to discuss corrective actions in inspection reports, OIG reviewed information at the oversight process web site to determine whether NRC is providing the public with information about licensee corrective actions. OIG found that the *Plant Assessment Results* web page describing NRC's policies for the assessment of plant performance does not discuss licensee corrective actions.

Accessing and reading inspection reports, which can be highly technical and lengthy, is a time-consuming process. Therefore, NRC summarizes information about inspection findings in a short text description that is accessed via links in the inspection findings summary table. Important information about findings should be located in the text summary, including licensee corrective actions. Table 2 shows the results of OIG's review of the short text descriptions of inspection findings for three plants.

Table 2: Inspection finding descriptions that include corrective action

Finding Color/Plant	Number of findings	Number - Text description mentions corrective action
Green		
Point Beach 1	12	2
Harris 1	6	1
Seabrook 1	9	1
White		
Harris 1	1	1
Seabrook 1	1	0

These results indicate that the oversight process web site does not provide adequate information to the public in this important area. Although the Commission has emphasized the importance of licensee corrective actions and the new oversight process places additional focus on corrective action, there is no general information available at the *Plant Assessment Results* web page about licensee corrective actions. In addition, there is only infrequent mention of corrective action in the inspection findings summaries. Because of the importance of licensee corrective actions to the effective regulation of power plants, information about those actions should be readily available to the public. Lacking this information, the public cannot be fully informed of how licensees are addressing performance deficiencies at their plants.

RECOMMENDATION

OIG recommends that the Executive Director for Operations:

10. Revise the web site to fully describe licensee corrective action related to each finding.

E. IMPROVE SDP TRAINING AND GUIDANCE

Resident inspectors provide NRC's major onsite presence for direct observation and verification of licensee activities. To effectively use SDP, these inspectors must have specific training and guidance. However, results from an agency internal survey and interviews during this audit indicate that opportunities exist to improve SDP training and guidance. Suggestions from NRC staff indicate the agency has not been sufficiently proactive in identifying potential improvements in these areas. The agency needs to revise its periodic survey of inspectors and others working with SDP to specifically identify evolving training and guidance needs. With these improvements, inspectors will be more effective in monitoring and assessing conditions at power plants.

Staff Suggested Improvements

Resident inspectors are a critical component of NRC's inspection program. These inspectors must have the necessary knowledge, skills, and guidance to successfully implement the agency's oversight process. In November 1999, NRC conducted a survey to obtain feedback on the revised reactor oversight program. SDP was viewed negatively primarily because the process was perceived as not being easy to use. Limitations noted also included complexity and extensive time to use. OIG found that these same difficulties remain, in addition to others noted below.

OIG evaluated SDP-related training and guidance by meeting with a judgmental sample of resident inspectors at 10 power plants and others who work with resident inspectors, including supervisors and licensee officials. The inspection staff were generally working at plants that had been issued a greater-than-Green finding and, thus, had more experience using SDP. The following are areas where they stated NRC should improve SDP training and guidance.

Training

- Provide additional training in the application of risk to plant operations. For example, inspectors cited a need for more training in (1) relating inspection findings to core damage frequency, a key SDP element; (2) evaluating licensed operator actions; (3) using PRA information specific to their plant; and (4) integrating SDP and enforcement.

- Provide periodic training for SDPs that residents use only occasionally such as plant shutdown, fire protection, and containment integrity. Inspectors cannot use them effectively without refresher training to compensate for their infrequent use.

Guidance

- Clarify the initial screening questions that lead into SDP.¹⁰ For example, several inspectors stated that the term “credible impact on safety” was too subjective and difficult to apply. The degree of subjectivity results in inconsistent application among inspectors and places additional burden on senior reactor analysts to provide clarification. One resident inspector noted that staff have extensive debates on the meaning of that term because there is wide variation of interpretation.
- Clarify guidance on how to address issues that involve more than one SDP. In one instance, an issue involved both the fire protection and shutdown SDPs and guidance was not clear about which SDP should be entered first.
- Provide more guidance for reviewing licensee corrective actions and examples of licensee corrective action program deficiencies. NRC has reduced inspection time in this area although the oversight process places more emphasis on licensees taking adequate corrective actions. In addition, changes in inspection focus mean that resident inspectors may not be able to review all of a licensee’s condition reports. Inspectors stated that it is prohibitive at some plants to go through each issue using SDP guidance because of the number of corrective action items. A mechanism is needed to help run through those more quickly.
- Provide guidance on document retention. For example, what should be documented and retained for responses to the initial screening questions? Without clear guidance, important material may be discarded after the inspection report is issued.
- Provide guidance on the disposition of issues that are not included in inspection reports. Both NRC and licensee officials are encouraging inspectors to continue to note minor issues. Residents routinely meet with licensee management and discuss issues that are not included in inspection reports. Also, these minor issues may be discussed during an exit conference. Guidance is needed to ensure that inspectors manage these interactions as the agency expects.

¹⁰ These are the Group 1, 2, and 3 questions in NRC’s inspection manual, chapter 0610*.

- Annotate revisions to the inspection manual. Inspectors cannot currently determine what has been changed without reading through the entire manual and comparing it to the previous version.

Inspectors are key to SDP implementation. OIG interviews with inspectors and other officials indicate that improvements can be made to training and guidance. The agency needs to continue examining those needs by periodically surveying inspectors and others involved with SDP. NRC most recently surveyed staff about the revised oversight process in March 2001. However, survey questions were not targeted to training and guidance needs. Improvements based on more specific survey questions and results will help the agency provide better guidance and training to enable staff to more effectively implement SDP.

RECOMMENDATION

OIG recommends that the Executive Director for Operations:

11. Revise the NRC Reactor Oversight Process Survey to capture more specific information about SDP training and guidance.

IV. CURRENT MANAGEMENT ACTIONS

Although the new oversight process has been in place since April 2000, the agency had not issued guidance for conducting SDP and Enforcement Review Panels and regulatory conferences as of OIG's draft report in March 2002. All findings with a potential assessment greater-than-Green are reviewed by an SDP and Enforcement Review Panel. In addition, NRC allows licensees to request a public regulatory conference with NRC management to discuss potential findings. NRC officials said these meetings can lack direction, fail to reach conclusions, and can be too lengthy, thereby adding to SDP timeliness issues.

In October 2001, after completing field work in this area, OIG provided comments to the agency on a draft attachment to the NRC inspection manual. The attachment provides guidance for conducting SDP and Enforcement Review Panels, regulatory conferences, and caucuses. OIG suggested modifications to the guidance to address issues related to timeliness and the effective functioning of the meetings, among other things. In April 2002, NRC issued final guidance which should address OIG's concerns in this area.

V. CONSOLIDATED LIST OF RECOMMENDATIONS

OIG recommends that the Executive Director for Operations:

1. Develop an action plan by September 6, 2002, to correct Phase 2 weaknesses or eliminate it.
2. Discontinue expenditure of about \$1,050,000 remaining to develop Phase 2 until the action plan is complete.
3. Develop and implement guidance for using PRA in SDP.
4. Develop and implement guidance for providing independent assurance of the quality of licensee risk information used to support SDP decisions.
5. Establish metrics to capture the entire process of identifying and assessing findings.
6. Establish a mechanism for agency managers to resolve identified delays.
7. Revise the web page to provide a link from the findings summary web pages to documents that support any changes from preliminary inspection report significance determinations.
8. Expand the web page to provide complete access to inspection report results, not just those that identify operational deficiencies.
9. Expand the web page to display all significant finding colors in a cornerstone.
10. Revise the web site to fully describe licensee corrective action related to each finding.
11. Revise the NRC Reactor Oversight Process Survey to capture more specific information about SDP training and guidance.

VI. OIG DISCUSSION OF AGENCY COMMENTS

On March 19, 2002, OIG discussed its initial draft report with agency officials who generally agreed with OIG's recommendations. Also in March, NRC began an SDP Improvement Initiative. That initiative plans numerous, important improvements to the process, some of which are also noted in this report.

On August 13, 2002, the Executive Director for Operations (EDO) responded to our April 10, 2002, final draft report. The EDO stated that he has directed staff to develop a plan to address OIG's recommendations and also those of an internal review panel which examined some of the same issues. The EDO requested that staff provide a final approved plan by September 6, 2002, and that the work be completed by November 8, 2002. Where appropriate, this report incorporates the agency's suggestions provided at the March meeting and in the EDO's August 13 response. The EDO's response can be found at Appendix D.

SCOPE AND METHODOLOGY

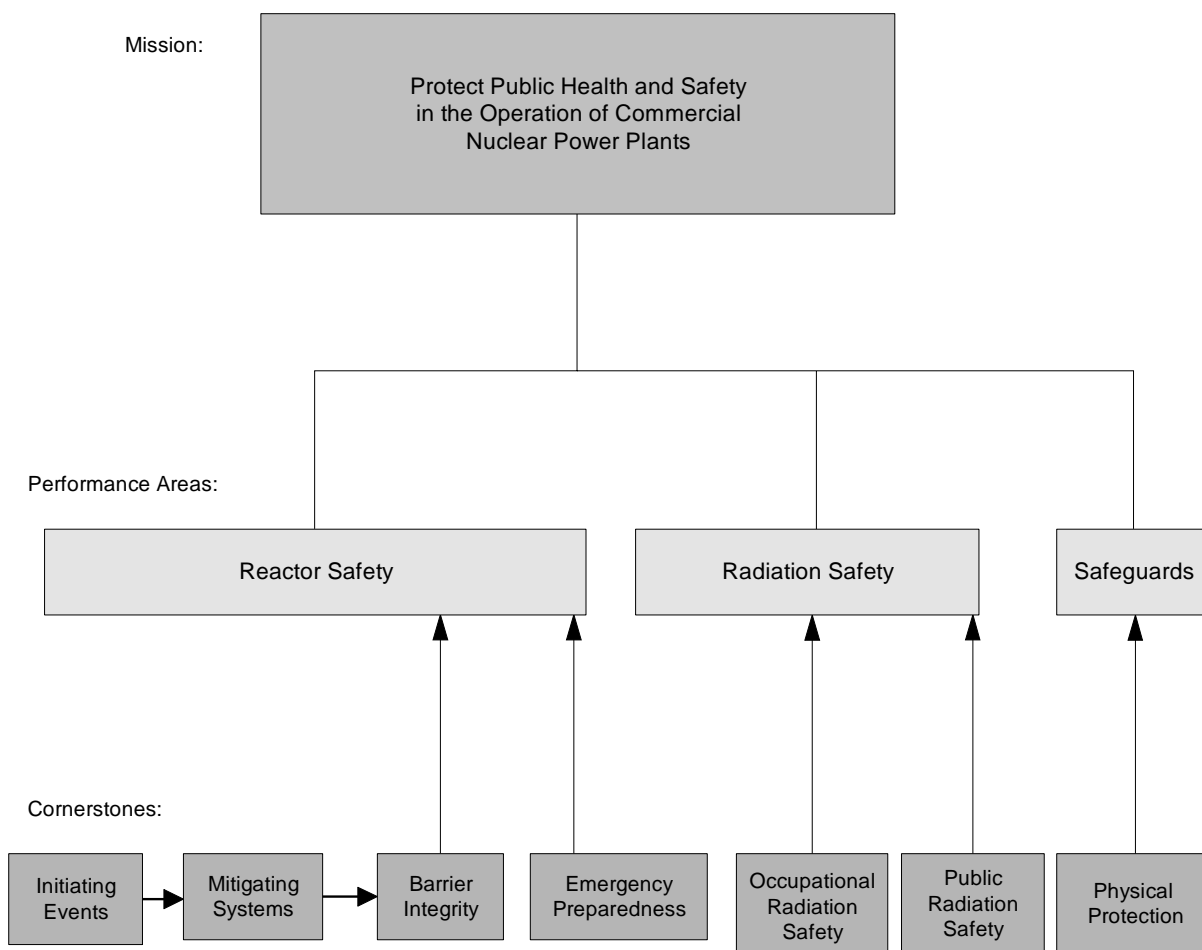
The objectives of this audit were to determine whether (1) SDP is achieving desired results, (2) NRC staff clearly understand the process, and (3) NRC staff are using SDP in accordance with agency guidance. To address the audit objectives, OIG reviewed relevant program documentation and conducted interviews with more than 80 individuals, including:

- NRC headquarters program officials,
- senior officials in the reactor safety and materials safety areas at all four NRC regional offices;
- senior reactor analysts at all four NRC regional offices;
- Office of Enforcement officials at NRC regional offices;
- NRC resident inspectors at 11 power plants;
- a public interest group active in this area;
- the Nuclear Energy Institute; and
- licensee officials at 10 power plants, including experts in the use of probabilistic risk assessment and senior operating officials.

This audit was conducted from May through October 2001 in accordance with generally accepted Government auditing standards and included review of management controls related to the objectives of the audit. The major contributors to this report were William McDowell, Team Leader; Robert Moody, Audit Manager; and David Horn, Senior Auditor.

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REACTOR OVERSIGHT PROCESS PERFORMANCE AREAS AND CORNERSTONES - CHART



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REACTOR OVERSIGHT PROCESS PERFORMANCE AREAS AND CORNERSTONES - DESCRIPTION

Reactor Safety

Initiating Events - This cornerstone focuses on operations and events at a nuclear plant that could lead to a possible accident if plant safety systems did not intervene. These events could include equipment failures leading to a plant shutdown, shutdowns with unexpected complications, or large changes in the plant's power output.

Mitigating Systems - This cornerstone measures the function of safety systems designed to prevent an accident or reduce the consequences of a possible accident. The equipment is checked by periodic testing and through actual performance.

Barrier Integrity - There are three important barriers between the highly radioactive materials in fuel within the reactor and the public and the environment outside the plant. These barriers are the sealed rods containing the fuel pellets, the heavy steel reactor vessel and associated piping, and the reinforced concrete containment building surrounding the reactor. The integrity of the fuel rods, the vessel, and the piping is continuously checked for leakage, while the ability of the containment to prevent leakage is measured on a regular basis.

Emergency Preparedness - Each nuclear plant is required to have comprehensive emergency plans to respond to a possible accident. This cornerstone measures the effectiveness of the plant staff in carrying out its emergency plans. Such emergency plans are tested every 2 years during emergency exercises involving the plant staff and local, State, and, in some cases, Federal agencies.

Radiation Safety

Occupational Radiation Safety - NRC regulations set a limit on radiation doses received by plant workers, and this cornerstone monitors the effectiveness of the plant's program to control and minimize those doses.

Public Radiation Safety - This cornerstone measures the procedures and systems designed to minimize radioactive releases from a nuclear plant during normal operations and to keep those releases within Federal limits.

Safeguards

Physical Protection - Nuclear plants are required to have well-trained security personnel and a variety of protective systems to guard vital plant equipment, as well as programs to assure that employees are constantly fit for duty through drug and alcohol testing. This cornerstone measures the effectiveness of the security and fitness-for-duty programs.

In addition to the seven cornerstones, the reactor oversight program features three "cross-cutting" elements, so named because they affect, and are therefore part of, each of the cornerstones:

- human performance;
- management attention to safety and workers' ability to raise safety issues (the "safety-conscious work environment"); and
- finding and fixing problems (the utility's corrective action program).

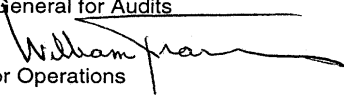
AGENCY COMMENTS



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 13, 2002

MEMORANDUM TO: Stephen D. Dingbaum
Assistant Inspector General for Audits

FROM: William D. Travers 
Executive Director for Operations

SUBJECT: DRAFT OFFICE OF THE INSPECTOR GENERAL REPORT: REVIEW
OF NUCLEAR REGULATORY COMMISSION'S SIGNIFICANCE
DETERMINATION PROCESS

We have reviewed the draft Office of the Inspector General (OIG) Report: *Review of NRC's Significance Determinations Process*. We appreciate the opportunity to provide written comments on this draft report.

The draft report recommends development of an action plan by September 30, 2002, to "correct Phase 2 weaknesses or eliminate it." The staff developed and is implementing an SDP Improvement Initiative, including the Phase 2 process. The SDP Improvement Initiative was issued on March 18, 2002. One of the objectives of this initiative includes benchmarking the Phase 2 notebooks. We believe your report should acknowledge the on-going SDP Improvement Initiative.

In addition to providing the above comment on the draft report, we would like to provide a status of recent activities regarding the Significance Determination Process for you to consider in the final report. In the draft report, you identified a number of concerns and provided specific recommendations concerning the SDP. As you know, concerns with the SDP Phase 2 analyses were also identified in a Differing Professional View (DPV) and Differing Professional Opinion (DPO) submitted by Mr. Troy Pruett. By letter dated January 10, 2002, the DPV ad hoc review panel recommended that the program office undertake a review of the overall SDP program progress to date and future program direction. The subsequent ad hoc DPO panel strongly endorsed the DPV panel's recommendation of an overall review of the SDP. Therefore, I have directed the staff to develop a plan to address the DPO panel recommendations, as well as the recommendations in the OIG report (see attachment).

We will forward a copy of the approved plan in early September. If you have any questions, please contact John Craig at 415-1707.

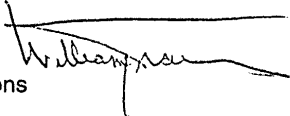
Attachment: As stated



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 WASHINGTON, D.C. 20555-0001

August 6, 2002

MEMORANDUM TO: Samuel J. Collins, Director
 Office of Nuclear Reactor Regulation

FROM: William D. Travers, Executive Director
 Office of Executive Director for Operations 

SUBJECT: DIFFERING PROFESSIONAL OPINION ON THE SIGNIFICANCE
 DETERMINATION PROCESS

In a memorandum to William D. Travers, dated March 15, 2002, Troy W. Pruett, Senior Reactor Analyst, Region IV, expressed a Differing Professional Opinion (DPO) regarding the Significance Determination Process (SDP). In the DPO, Mr. Pruett requested an independent review of the issues outlined in his Differing Professional View (DPV) and of statements made in your memorandum dated February 18, 2002, responding to the DPV.

An Ad Hoc DPO Review Panel was established in April and provided its recommendations in a memorandum, dated June 28, 2002, from James W. Johnson to William D. Travers, which is provided as Attachment 1. The DPO Panel generally agreed with the findings and recommendations of the Ad Hoc DPV Panel that had previously been formed to review Mr. Pruett's DPV. The DPO Panel found that "NRC management and staff are in the process of addressing many of the Ad Hoc DPV Panel's observations and recommendations in the SDP Improvement Initiative." However, the DPO Panel strongly supported the DPV Panel's recommendation for an overall review of the SDP in order to address fundamental concerns with the SDP.

Additionally, the Office of the Inspector General (OIG) performed a review of the SDP and provided a Draft Audit Report in a memorandum from Stephen D. Dingbaum to William D. Travers on April 10, 2002, which is provided as Attachment 2. In the report, OIG concluded that "while the SDP is meeting its objectives and agency staff are using SDP in accordance with guidance, additional refinements are needed." Some of the key OIG recommendations were similar to the DPO panel recommendations and included a recommendation that the staff develop an action plan to correct Phase 2 analysis weaknesses or eliminate this portion of the SDP and discontinue expenditure for Phase 2 development until the action plan is completed.

The purpose of this memorandum is to direct that you develop a plan which will address the DPO panel recommendations as well as the OIG recommendations. This plan shall address DPO Panel recommendation No. 1 for an overall objective review of the SDP. An overall review of the SDP will require establishing a task group. Care should be taken in identifying proposed members in order to ensure that the individuals have a broad range of expertise, including inspections, PRA, statistics, and the SDP process.

Samuel J. Collins

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The overall review should consider the issues raised in the DPO Panel report, including the following key issues: (1) a performance expectation for the process tools utilized; (2) the efficacy of the SDP Notebooks versus an alternate approach for Phase 2 analysis; (3) the range of applicability for the assessment tools utilized; and (4) the need to incorporate uncertainty analysis in the process. The review should also consider the issues raised in the OIG Draft Audit Report, including the cost/benefit of the Phase 2 process, a recommendation on the option to eliminate Phase 2, the percentage of findings that enter the Phase 2 process, and improvements to SDP training and guidance.

This review should evaluate the current SDP approach to determine if the process should consider other inputs in addition to best estimates of risk in the significance determination decision-making process, and if the significance characterization process is being implemented by the appropriate staff. The review should consider case studies such as the recent Cooper, Indian Point 2, and ongoing Davis-Besse issues as well as any lessons learned from these applications. The review should include an assessment of alternative options and specific recommendations.

Please plan to meet with me no later than August 29, 2002, to discuss the plan and proposed members of the task group. A final approved plan should be completed by September 6, 2002. The plan should include a time line for completion of a review with a goal of November 8, 2002.

Attachments: As stated

cc: OGC