Comparison of the Reactor Oversight Process
to the
Independent Safety Assessment of Maine Yankee Atomic Power Company

1. Introduction

An Independent Safety Assessment (ISA) of Maine Yankee Atomic Power Company was performed in 1996. Since that time, many changes have occurred in the NRC regulatory oversight of the Nation's nuclear power plants, including the creation of the NRC's Reactor Oversight Process (ROP). This analysis provides a brief description of the events leading up to the ISA, describes the current ROP, and provides a comparison of the ISA to the ROP and other applicable regulatory processes.

2. Timeline of the Maine Yankee Events Leading Up to the ISA

The Maine Yankee (MY) facility was licensed in 1972 at 2440 megawatts thermal (MWt) power. In 1977, the NRC approved MY's application for a power uprate to 2630 MWt. In 1988, MY applied for a power uprate to 2700 MWt, which was approved in 1989. In December 1995, an allegation was made that the Yankee Atomic Electric Company (YAEC), acting as an agent for MY, had knowingly performed inadequate analyses to support the increase in power to 2700 MWt and further that the NRC staff may not have appropriately reviewed the MY power uprate request. The subsequent investigation by the Nuclear Regulatory Commission's (NRC's) Office of the Inspector General identified problems with the YAEC's use of computer codes as part of the power uprate analysis as well as weaknesses in the NRC review of the power uprates.[1] A confirmatory order was issued to MY limiting power operation to 2440 MWt. The regulatory oversight program at that time allowed for special inspections as a part of the process, called Diagnostic Evaluation Team (DET) inspections. In response to the above concerns, as well as those expressed by the Governor of the State of Maine, the NRC Chairman directed that an ISA be conducted.

The ISA was started in July 1996 and completed in October 1996. It focused on conformance of the facility to its design and licensing bases, operational safety performance, licensee self-assessments, corrective actions and improvement plans, and determination of the causes of safety-significant findings.

The MY ISA was unique in its scope, independence, and in its coordination with state representatives. The ISA was a modified DET that added a detailed review of analytic codes for transient and accident safety analyses. As noted in the ISA, use of application analytic codes was not typically inspected as part of the NRC regulatory process at the time, and additional focused resources were applied to this area. However, review of the codes was necessary specifically to address the allegations made against YAEC. While the exact data is no longer available, it is estimated that the ISA expended approximately 4000 hours (25 people times 4 weeks) of on-site inspection, where a typical DET expended approximately 1800 hours (15 people times 3 weeks) of on-site inspection. The difference in the on-site hours is directly related to the size of the ISA team (additional inspectors to address the highly technical and detailed allegation related to transient and accident safety analyses codes), the number of state representatives (3 on the ISA), and the extra week of on-site inspection. This can be compared to the ROP today, which utilizes approximately 2500 hours of on-site inspection time annually for a well performing single unit site. Under the ROP today, poorly performing plants may receive up to an additional 2000-2500 hours of inspection.

3. ISA Results

The results of the 25-member team inspection were that the licensee’s performance was considered adequate for operation. There were a number of findings in the final report, many of which would be considered minor under today’s more risk-informed ROP and would not be documented in an inspection report. However, the significant results were summarized as weak identification and resolution of problems; weak scope, rigor, and evaluation of testing; and declining material condition. These problems were caused in part by economic pressure to be a low-cost producer, which limited resources to address problems, and the lack of a questioning culture resulting in the failure to identify or promptly correct significant problems. The findings did not warrant or require a shutdown of the facility.

In December of 1996, the licensee shut down the plant. Soon afterward, the NRC issued a Confirmatory Action Letter (CAL) requiring specific actions to address licensee-identified safety-system electrical separation issues and logic circuit testing deficiencies. Follow-up inspections identified problems in five major categories: inoperability of safety related equipment, and inadequacies in testing, safety review, procedures, and corrective actions. Additional design and configuration control problems were identified by NRC inspectors and the licensee in 1997. Because of these and other economic considerations, the plant’s owners voted to permanently shut down the reactor in August 1997. The diverse owners of the plant decided not to make the investments needed to restore the plant to good performance. The owners of other plants with similar (or, in some cases, worse) problems but with different ownership structure and different corporate governance chose to make the investments necessary to restore their plants’ performance.

(Throughout the balance of this document many references are made to procedures used in the inspection process. To maintain brevity, in most cases these procedures are not called out in the body but are referenced with endnotes. A more detailed description of the ROP and links to Inspection Procedures can be obtained on the NRC web site: http://www.nrc.gov/reactors/operating/oversight.html.)

4. Description of the ROP

The reactor oversight process is anchored in the NRC's mission to ensure public health and safety in the operation of commercial nuclear power plants. To measure plant performance, the oversight process focuses on seven specific "cornerstones" that support the safety of plant operations: initiating events, mitigating systems, barrier integrity, emergency preparedness, occupational radiation safety, public radiation safety, and physical protection. These cornerstones are evaluated using both performance indicators (PIs) and direct inspections.

The NRC assessment program collects information from inspections and performance indicators in each cornerstone to enable the NRC to arrive at objective conclusions about the licensee's safety performance. Inspection findings are evaluated for safety significance using a generally objective significance determination process. Performance indicator data is compared against prescribed risk-informed thresholds.

Based on this assessment information, the NRC determines the appropriate level of agency response, including supplemental inspections focusing on areas of declining performance and pertinent regulatory actions ranging from management meetings to orders for plant shutdown. The process uses four levels of regulatory response, with NRC regulatory review increasing as plant performance declines. The first two levels of heightened regulatory review are managed by the appropriate NRC regional office. The next two levels call for an agency response and involve senior management attention from both headquarters and regional offices. The scope of inspections are driven by plant performance. A poor performing plant having multiple or long-standing significant issues will be inspected using a procedure that incorporates processes and techniques originally used in the previous DET process that was applied at MY.[2] For comparison purposes, in 2006 there were three plants receiving increased regulatory attention. In each case, the plant warranted this major increase in NRC oversight because plant performance had met specific pre-defined criteria.

Even if there are no earlier signs of declining plant performance, should a plant experience operational problems or events that the NRC believes require greater scrutiny, there will be additional reactive inspections. The criteria for initiating these reactive inspections are described in the publicly available NRC Management Directive (MD) 8.3, "NRC Incident Investigation Program,"[3] and are typically used about a dozen times per year. In some instances the regulatory actions dictated by the ROP framework may not be appropriate. In these instances, the NRC may deviate from the prescribed program to allow modified regulatory oversight for a facility based on specific circumstances. Historically there have been 1-3 deviations each year. Use of the deviation process requires senior NRC management approval.

5. NRC Independence

The MY ISA used independent NRC inspectors to perform the assessment. The large multi-disciplined team was composed of 25 members, including three state representatives. To ensure independence, the NRC members were selected from offices other than the Office of Nuclear Reactor Regulation or Region I; six contractors were also part of the team. Only persons with no significant prior responsibility for regulating Maine Yankee were chosen.

In the ROP, the most closely related process to the ISA are the three levels of supplemental inspections. For a poor performing plant with multiple or repetitive degraded cornerstones, the highest level of supplemental inspection effort will be used.[4] This inspection has several objectives, including providing an independent assessment to aid in the determination of whether an unacceptable margin of safety exists; assessing the adequacy of licensee programs to identify, evaluate and correct performance issues; providing insight into the root and contributing causes of performance deficiencies; and independently assessing the licensee's safety culture. These objectives are taken together to provide additional information to be used in deciding whether continued operation of the facility is acceptable and whether additional regulatory actions are necessary to arrest declining plant performance. The inspection team is staffed, in part, with inspectors from other regions or headquarters to give a degree of independence to the effort. The approximate numbers of inspection hours for the three levels of supplemental inspections are, in increasing order, 24, 240, and 2400.

Another type of inspection is the reactive inspection described in MD 8.3, which is used to investigate incidents at plants. The scope and depth of the inspection is predicated on the significance of the event being investigated, with Incident Investigation being the highest level, followed by Augmented Inspection and then Special Inspection. Similar to the MY ISA, incident investigation team inspections require that the inspection team be composed of members who have not been significantly involved in the licensing and inspection of the facility. Approximate numbers of inspection hours for these efforts are similar to, in increasing order, the supplemental inspections in the preceding paragraph.

The concept of independence is institutionalized in NRC routine procedures and practices. Inspectors are not allowed to own securities, such as company stock, that could cause a conflict of interest during an inspection. NRC employees who have previously worked for a licensee (including the parent companies) are not assigned to inspect those facilities for at least a one year period, and this time frame may be extended according to individual office policy.

In addition to inspections conducted by inspectors located at the regional office, at least two resident inspectors are assigned full-time to each site. To maintain independence, the maximum time a resident inspector can be assigned to a site is seven years unless a longer period specifically approved by the EDO. The ROP inspections are also divided so that regional office-based inspectors perform a portion of the required inspection program independent of the resident inspectors and their associated management chain. Management site visits are conducted on a routine basis to assess the adequacy of the inspection effort. Finally, inspectors from headquarters or the regions are at times assigned to inspect plants in other regions.

The NRC also provides additional independence through the use of contractors. The NRC typically hires two contractors for all Component Design Basis Inspections. These contractors must be cleared concerning any potential conflict of interest.

In addition, the NRC allegation process allows individuals, including plant employees, to bring safety concerns directly to the NRC. Overall, the necessary level of inspector independence from the licensee is maintained by the processes and procedures described above.

6. Conformance to Design and Licensing Basis

During the ISA conducted at MY, the inspection team conducted an in-depth review of the plant's conformance to the design and licensing-basis. Because of allegations regarding computer codes used to justify previously approved power uprates, significant attention was placed on the transient and accident safety analyses. Further inspections focused on design review of two plant safety systems and their associated support systems (including the electrical system) to evaluate the ability of the systems to perform their design basis safety functions.

The current ROP provides a broad and in-depth ongoing assessment of licensee performance, as described below, using various inspection procedures and the performance indicator program. Specifically, the ROP verifies that the safety system design and performance are being maintained to the approved design and licensing bases. The extensive focus of the MY ISA on computer codes and transient analysis was specific to the allegations at the time and is not now normally the focus of routine baseline inspections. Currently, when a power uprate request is made, the NRC would review changes to computer codes used to justify the uprate and transient analyses affected by the power uprate.

a. Transient and Accident Safety Analyses

Facility operating licenses specify the maximum power level at which commercial nuclear power plants may be operated; NRC approval is required to increase the maximum power output of the facility. The NRC evaluates the licensee's operational, transient, and accident analyses that are affected by the uprate as part of the license amendment process prior to approving a power uprate (license amendment). The staff also reviews any changes made to the computer codes. The staff's power uprate review confirms that the reactor can be safety operated at the new power level. The staff's review focuses on multiple areas, including the nuclear steam supply system, instrumentation and control systems, electrical systems, accident evaluations, radiological consequences, operations and training, testing, and technical specification changes.

Transient and accident analyses were performed by YAEC to support two power uprates for MY. The NRC power uprate review process has improved significantly since the MY ISA. Power uprates are now controlled by two guidance documents, RS-001, "Review Standard for Extended Power Uprates," and RIS 2002-03, "Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications."[5] As part of the review process, the NRC reviews changes to computer codes used to justify the power uprate.

Inspection Procedure (IP) 71004, "Power Uprates," is used to inspect facilities that increase their licensed power level by greater than 7.5 percent of original plant rated output. IP 71004 verifies that the licensee has taken the required actions to alleviate or prevent the effects of new or likely initiating events that were due to changes such as higher core power densities or increased flow in primary or secondary systems. IP 71004 also triggers other inspections to review design bases and safety margins, performance of heat exchangers for mitigating systems, erosion and corrosion programs, and modifications.[6] Power uprates of less than 7.5 percent also receive field inspections in the normal course of the ROP implementation.

b. Design Review of Selected Systems Including Electrical and Control Systems

The MY ISA focused on two safety systems (high-pressure safety injection and service water/component cooling water), the electrical power systems, and the instrumentation and controls area. These types of systems are also covered by the ROP in-depth as described below.

Currently, the NRC evaluates safety-related systems using several different inspection procedures to ensure the design adequacy and the ability of the systems to perform their intended functions. Design adequacy and system component margin of safety are evaluated under the NRC's inspection program during the Component Design Basis Inspection (CDBI).[7] The ISA team specifically evaluated the high-pressure safety injection, service water and component cooling water systems, the MY off-site power capability, the station batteries, the back-up emergency diesel generators, and the environmental qualification of components to determine their adequacy. Using the current process, each of these areas have potential components that can be selected for review during the CDBI. The component selection is based on risk significance and low margin relative to the design or licensing basis. The inspection is performed biennially at each operating reactor and represents approximately 650 hours of NRC direct inspection effort and additional effort for preparation and documentation time. The team consists of three engineering inspectors, one operations inspector, and typically two independent contractor design specialists with expertise in the mechanical and electrical disciplines. The team reviews the adequacy of 15-20 components typically covering 4-6 systems. The inspection includes reviews related to configuration control, design calculations, component testing, environmental qualification, and electrical component inputs/outputs.

Prior to the NRC's implementation of the CDBI in 2006, the Safety System Design Inspection (SSDI) was performed. This biennial inspection was similar to the ISA format, and two safety-related systems received a detailed inspection. The inspection was conducted by a six-person team that included a contractor about half of the time.

On a more frequent basis, the components inspected during the CDBI, as well as other safety related systems and components, are evaluated for their continued operability based on surveillance testing[8]; post maintenance testing[9]; operability determinations[10]; and modifications made to the system, component, or licensing basis.[11]

c. FSAR Inconsistencies

Discrepancies in the licensee's Final Safety Analysis Report (FSAR) were identified as a result of the MY ISA inspection. Currently, inspector preparation for most inspection procedures includes reviewing the FSAR; therefore, discrepancies may be identified during this process. Typically, FSAR inconsistencies are not significant and are not documented as findings. However, more importantly, the CDBI inspection focuses heavily on the licensing and design basis documentation and supporting calculations. Also, the licensee may make changes to the facility. Inspectors have a specific procedure to use when reviewing plant modification screenings, evaluations, and the resulting FSAR change to ensure their appropriateness.[12]

In summary, the ROP today includes elements in the baseline inspection program to assess key safety systems and conformance to the design and licensing basis either by inspection or with the performance indicator program. The MY ISA addressed transient analyses and codes to address allegations made regarding use of the codes. As noted earlier, transient analyses and related codes are not normally inspected as part of the ROP, and it was noted in the ISA that they were not normally addressed by the regulatory process at that time. However, when power uprates are now requested by licensees, affected transient analyses and changes to codes are reviewed, and current procedures typically require inspection of many other potentially impacted systems. Lessons learned from the MY ISA in the area of power uprates have been institutionalized to ensure similar problems do not recur.

7. Assessment of Operational Safety

Operational safety was inspected by the MY ISA team. The review included problem identification and resolution (PI&R); quality of operations; operational programs and procedures; and plant support programs related to operator training, radiation protection, and fire protection.

Assessment of operational safety in the ROP is done continuously by resident inspectors as well as periodically by regional inspectors using inspection procedures. Current procedures and practices are described below that compare significant aspects from the ISA to the current ROP. PI&R will be addressed in a later section.

The quality of operations is currently inspected by daily control room observations and inspector attendance at selected licensee meetings.[13] Continuous control room observations are not routinely performed; should concerns arise, a specific procedure exists for inspectors to use.[14] Safety system walkdowns are specifically performed by using two procedures as well as the requirement for the resident inspector to be cognizant of the plant status.[15] Additionally, most procedures require inspectors to enter the plant to perform the inspection and therefore observe ongoing activities and the material condition of the plant.

The MY ISA report discusses the team's effort to review Technical Specification (TS) interpretations. Inspectors monitor licensee compliance to the TS action statements, requirements, and license conditions as part of the plant status procedure.[16]

Online risk management and shutdown risk are evaluated using two procedures written for that specific purpose.[17] These procedures require inspectors to review the status of risk significant equipment and determine if the site has taken appropriate actions to reduce the overall station risk while equipment is out of service. When there are concerns regarding safety equipment performance, the licensee documents the operability of the equipment. These operability evaluations are inspected by the resident staff with a specific procedure written for that purpose; typically 15-30 reviews are performed per year per site.[18]

Operating procedures assessed during the MY ISA are also reviewed today as part of the CDBI inspection. The CDBI inspection procedure requires that several risk-significant operator actions be evaluated.19 These actions are typically found in abnormal or emergency operating procedures. Additionally, regional inspectors and resident inspectors both use inspection procedures in the observation of simulator training scenarios to evaluate operator response to events and determine if procedures are adequate to address accident scenarios.20

The configuration control program is assessed using two inspection procedures, both of which are performed annually.[21] The Restart Readiness Program and the Operations Performance Assessment Program were programs specific to Maine Yankee and are therefore not currently part of the NRC baseline inspection program. However, a plant that is in a shutdown condition due to significant performance problems or operational events may be placed under the process prescribed in Inspection Manual Chapter (IMC) 0350, "Oversight of Reactor Facilities in a Shutdown Condition Due to Significant Performance and/or Operational Concerns." This IMC provides adequate assurance that a licensee that was placed into the IMC 0350 process is ready for a return to plant operation, and under this process, a plant's restart program would be reviewed.

The licensee's other plant support programs, such as Fire Protection, Radiation Protection, and Operator Training Programs, are all inspected by NRC inspectors using a number of specific inspection procedures for each program.[22] The frequency of performance of these inspection procedures ranges from quarterly to triennially.

Overall, the ROP provides a thorough assessment of station operational performance, including quality of operations, operational programs and procedures, and plant supporting programs, such as fire protection, training, and radiation protection.

8. Maintenance and Testing Assessment

The MY ISA reviewed maintenance and testing activities at the site. The team identified several issues, particularly in the testing area. Equipment performance, PI&R, quality of maintenance, and maintenance work order control were also discussed in the ISA report. The current ROP uses a number of procedures to evaluate each of these areas as described below. PI&R will be addressed in a later section.

Surveillance testing is inspected to verify satisfactory equipment performance by observing and reviewing the results of the surveillance tests. The surveillance tests acceptance criteria are also reviewed to verify that the licensing and design requirements are satisfied. The resident inspector staff performs quarterly reviews of 5-6 surveillance tests.[23] Additionally, CDBI teams review several years of test data on the selected components (typically pumps or valves). Integrated leak rate testing of valves to verify containment integrity is inspected during refueling outages.[24]

Also, failures of key safety systems are reported quarterly through the performance indicator program. The availability and reliability of safety systems reported on by the PIs include emergency AC power, high pressure injection, heat removal, residual heat removal and cooling water.[25] Inspectors verify that the licensee accurately reports the performance indicators. Should there be a discrepancy in reporting that cannot be readily resolved, the NRC performs an additional inspection to gather the performance indicator data.[26] The inspections and performance indicators are used together to ensure that safety system performance is assessed and indications of declining performance are identified for additional inspections.

Post maintenance tests (PMT) verify that equipment is operable prior to returning the equipment to service. The NRC has a specific procedure[27] for review of PMTs, and failure of equipment is evaluated by the licensee under 10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.” Inspectors review the licensee conclusion as to the cause of the failure and the adequacy of current maintenance practices.[28]

Maintenance work order control as it relates to overall plant risk is inspected by the resident staff to ensure that the risk is fully understood by plant personnel prior to changing plant configuration.[29] Additionally, shutdown risk management is evaluated by the resident staff during refueling or forced outages.[30] In both cases, the NRC Regional Senior Reactor Analyst supports the evaluation.

In summary, the ROP has inspection procedures in place that are routinely used to assess the areas covered by the Maine Yankee ISA, including equipment performance, quality of maintenance, testing, and work order control as described above.

9. Engineering Assessment

General conclusions on problem identification and resolution (PI&R), the engineering programs, design basis information, and the quality of engineering were reached and reported on by the ISA team. The ROP includes a thorough set of inspections that encompass the MY ISA reviewed areas. PI&R will be discussed in a later section.
Engineering programs and the quality of engineering are reviewed as part of the review of modifications. Modifications are inspected by resident staff and regional inspectors to ensure that the modification maintained the design and licensing basis.[31] Service water systems are inspected by resident staff and regional inspectors to ensure that the components meet the requirements reiterated in Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment."[32] Other inspection procedures encompass service water components.[33] Erosion/corrosion issues are currently inspected on a refueling outage basis.[34]

Design basis information is frequently reviewed during several NRC inspections, but most notably during the CDBI and to a lesser extent when reviewing modifications. These inspections are all performed biennially under the current inspection program, as described above, and are used to evaluate the quality of the engineering work performed.

The CDBI probes heavily into the engineering area to ensure compliance with the design and licensing basis, including review of calculations and design margin. This has already been described in an earlier section. In summary, the ROP has procedures and processes to assess licensee performance that encompass the ISA scope, which included engineering programs, the design basis, and the quality of engineering.

10. Self Assessment, Corrective Actions, Planning & Resources

The MY ISA inspection report included several sections that discussed the licensee's ability to self-assess and identify and correct problems. A specific section in the report discussed the adequacy of the corrective action program. This area has become one of the most important areas of inspection and is a significant focus for inspectors in recent years.

A fundamental goal of the ROP is to establish confidence that each licensee is detecting and correcting problems in a manner that ensures nuclear safety. One specific PI&R inspection objective is to provide for early warning of potential performance issues that could result in heightened NRC attention due to declining performance. As a result, significant inspection effort is devoted under the ROP to PI&R.

The current ROP inspects the licensee's corrective action program in every inspection procedure. Each procedure requires that 10 percent of the inspector's effort is focused on problem identification and resolution. As part of every inspection procedure, inspectors are tasked with identifying issues that the licensee has missed. Inspectors routinely perform plant and equipment walkdowns to facilitate this requirement. Additionally, inspectors review the licensee's evaluation of, and corrective actions for, selected identified deficiencies.

The licensee's corrective action program is specifically inspected by IP 71152, "Problem Identification and Resolution." This procedure is used to inspect the licensee's program at various points in the corrective action process as well as the licensee's self-assessments. Each day, resident inspectors are required to screen all written reports of licensee identified deficiencies or condition reports (CR). The purpose of the review is to provide early warning of potential performance issues. The resident inspectors evaluate all the CRs semi-annually to identify any trends in the identified deficiencies.

The second section of this inspection procedure requires that 3-6 specific deficiencies (samples) receive an in-depth review to assess the adequacy of the licensee's actions to correct the deficiencies and self-assessments. These samples are selected by resident inspectors, and the selection may have a supervisory review. Both resident and region-based inspectors perform this portion of the inspection.

The third portion of this inspection procedure requires that an inspection team perform a biennial in-depth review of the licensee's corrective action program. The four-member team conducts a two-week inspection that samples all seven of the ROP cornerstones. Additionally, the team assesses the adequacy of the licensee's corrective actions for all NRC-identified findings since the previous PI&R team inspection was performed.

The Service Water Operational Performance Inspection (SWOPI), which was performed by MY staff, was commented on by the ISA team in their report. This was a licensee-specific self-assessment. Self-assessments are reviewed during the PI&R inspection. The service water system, in general, is a safety system inspected under the ROP by a number of inspection procedures as noted previously.

The MY ISA also assessed the licensee in the area of planning and resources. The NRC assesses all NRC findings and violations to determine if there are cross-cutting aspects associated with the issue. Inspectors determine if a cross-cutting issue exists by evaluating the apparent or root cause of the issue. If the issue is determined to be caused by a problem identification or resolution failure, human performance failure, or a safety conscious work environment issue, it can be considered to have a cross-cutting aspect. The human performance area includes evaluating problems caused by lack of resources as an attribute suitable for inclusion. The ROP assessment process reviews findings identified in the previous year and could conclude that insufficient resources are available if several findings are identified with this attribute. A substantive cross-cutting issue would then be identified and discussed in an assessment letter sent to the licensee.[35]

The inspections described above demonstrate that the current ROP provides a thorough inspection of the licensee's self-assessment and corrective action programs. Also, the adequacy of resources is reviewed as a part of a human performance cross-cutting issue along with other potential cross cutting issues. This is a key focus area for the NRC staff because cross-cutting issues are systemic and can be an indicator of declining performance.

11. Conclusions From Comparison of MY ISA to ROP

The MY ISA did not require the shutdown of the facility because performance was considered adequate. However, it did result in an in-depth review of the licensee's operation, particularly in the areas of the design basis and problem identification and resolution. Similar to the MY ISA and past DET inspections, under the ROP a poor performing plant, as defined by objective criteria, receives an inspection using IP 95003, "Supplemental Inspection for Repetitive Degraded Cornerstones, Multiple Degraded Cornerstones, Multiple Yellow Inputs, or One Red Input." The inspection has several objectives and includes gathering additional information to be used in deciding whether continued operation of the facility is acceptable and whether additional regulatory actions are necessary to arrest declining plant performance. The inspection also provides insight into the overall root and contributing causes of performance deficiencies. To provide a diversity of talent and perspectives and to add a degree of independence to the effort, the inspection team is staffed, in part, with inspectors from other regional offices or headquarters. In the situation where a plant experiences an isolated operational event that meets the criteria described in MD 8.3, a reactive inspection will take place. Similar to the MY ISA, the highest level of reactive inspection requires that the inspection team be composed of members who are independent from significant involvement in the licensing and inspection of the facility.

Problems with the power uprate codes and processes used for MY were recognized and, based on the lessons learned, procedures now prescribe specific actions and inspections to ensure that design margins are maintained.

Weak identification and resolution of problems found during the ISA are now covered in depth by the PI&R inspections that are done continuously at every site by the resident inspectors and by more rigorous PI&R inspections performed biennially with inspection teams. Weak scope, rigor, and evaluation of testing, and declining material condition are inspected thoroughly in the surveillance testing reviews, walkdowns done by resident inspectors, and by the extensive component design basis inspections which are performed biennially. The causes of the problems identified in the ISA were economic pressure to be a low-cost producer limiting resources to address problems and lack of a questioning culture resulting in failure to identify or promptly correct significant problems. While the NRC does not directly assess economic pressure, as discussed above, inspectors may address resources as part of a human performance cross-cutting issue when categorizing findings. The lack of a questioning culture and not identifying and correcting problems is the direct focus of the PI&R inspection. These areas have also received heightened attention with the safety culture enhancements implemented in July 2006.

Overall, the current ROP inspection procedures and NRC review standards provide essentially full coverage of key aspects of the MY ISA, with greater attention to safety culture and better focus on potentially risk-significant problems. This is shown in a cross-reference between the ISA and the ROP in Enclosure 1. If the resources used to review the MY allegations are subtracted from the overall direct inspection effort for the ISA, the remaining resources are similar to those used for a single unit site under the ROP each year. The ROP is designed to be objective and predictable, meaning that given the same performance, different licensees will receive the same level of regulatory oversight. Plants that show symptoms of declining performance receive increased levels of inspection above the baseline. The tools available to the inspectors, regional and headquarters management, and the Executive Director of Operations are extensive to ensure the health and safety of the public. As described in earlier sections, there are some facilities that are receiving increased oversight due to performance concerns. In summary, the current ROP is working to ensure the right level of oversight is provided based on licensee performance.

Attachment 1
Cross-Reference Between the MY ISA and the ROP

ISA	ROP	Comments
Transient and Accident Safety Analyses	N/A	Allegation related, not included in the baseline ROP. This area inspected when power uprates are requested.
Design Review of Selected Systems and Electrical and Instrument and Controls	IP 71111.21 “Component Design Basis Inspection“ IP 71111.22 “Surveillance Testing” IP 71111.19 “Post-Maintenance Testing” IP 71111.15 “Operability Evaluations” IP 71111.17 “Permanent Plant Modifications”	Addressed by ROP
FSAR Inconsistencies	Inspector preparation for most inspection procedures includes reviewing the FSAR, therefore, discrepancies may be identified during this process. The CDBI inspection does reference the safety analysis report as a potential resource and input for inspectors. IP 71111.02 “Evaluations of Changes, Tests, or Experiments”	Addressed by ROP
Operations Assessment: Quality of Operations	IMC 2515, “Light-Water Reactor Inspections – Operations Phase,” Appendix D, “Plant Status” IP 71111.04 “Equipment Alignment” IP 71111.21 "Component Design Basis Inspection” IP 71111.13 “Maintenance Risk Assessment and Emergent Work Control” IP 71111.20 “Refueling and Outage Activities” IP 71111.15 “Operability Evaluations”	Continuous control room observations are not routinely performed but the following IP is used as needed: IP 71715 “Sustained Control Room and Plant Observation.”

ISA	ROP	Comments
Operations Assessment: Programs and Procedures	IP 71111.21 "Component Design Basis Inspection" IP 71111.11 "Licensed Operator Requalification Program" IP 71111.06 "Flood Protection Measures" IP 71111.04 "Equipment Alignment" IP 71111.23 "Temporary Plant Modifications"	Addressed by ROP
Operations Assessment: Plant Support	IP 71111.05A/Q "Fire Protection Annual/Quarterly" IP 71111.05T Fire Protection (Triennial)" IP 71121 "Occupational Radiation Safety" IP 71121.01 "Access Control To Radiologically Significant Areas" IP 71121.02 "ALARA Planning and Controls" IP 71121.03 "Radiation monitoring Instrumentation," IP 71122 "Public Radiation Safety" IP 71122.01 "Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems" IP 71122.02 " Radioactive Material Processing and Transportation" IP 71122.03 "Radiological Environmental Monitoring Program (REMP) And Radioactive Material Control Program" IP 71111.11 "Licensed Operator Requalification Training"	Plant restart readiness is not a part of the baseline ROP inspections. Instead the following guidance is used: IMC 0350 "Oversight of Reactor Facilities in a Shutdown Condition Due to Significant Performance and/or Operational Concerns."
Maintenance and Testing Assessment	IP 71111.22 "Surveillance Testing" IP 71151 "Performance Indicator Verification" IP 71111.19 "Post-Maintenance Testing" IP 71111.12 "Maintenance Effectiveness" IP 71111.13 "Maintenance Risk Assessment and Emergent Work Control" IP 71111.20 "Refueling and Outage Activities"	Addressed by ROP
Maintenance and Testing Assessment: Equipment Performance	IP 71151 "Performance Indicator Verification" IP 71111.22 "Surveillance Testing" IMC 2515, "Light-Water Reactor Inspections – Operations	Addressed by ROP

ISA	ROP	Comments
Maintenance and Testing Assessment: Quality of Maintenance	IP 71111.12 "Maintenance Effectiveness"	Addressed by ROP
Maintenance and Testing Assessment: Testing Weaknesses	IP 71111.22 "Surveillance Testing" IP 71111.21 "Component Design Basis Inspection" IP 71111.19 "Post-Maintenance Testing"	Addressed by ROP
Maintenance and Testing Assessment: Maintenance Work Order Control	IP 71111.13 "Maintenance Risk Assessment and Emergent Work Control" IP 71111.20 "Refueling and Outage Activities"	Addressed by ROP
Engineering Assessment: Programs	IP 71111.02 "Evaluations of Changes, Tests, or Experiments" IP 71111.17 "Permanent Plant Modifications" IP 71111.23 "Temporary Plant Modifications" IP 71111.07 "Heat Sink Performance" IP 71111.21 "Component Design Basis Inspection" IP 71111.15 "Operability Evaluations" IP 71111.12 "Maintenance Effectiveness" IP 71111.04 "Equipment Alignment" IP 71111.22 "Surveillance Testing" IP 71111.08 "Inservice Inspections"	Addressed by ROP
Engineering Assessment: Design-Basis	IP 71111.17 "Permanent Plant Modifications" IP 71111.23 "Temporary Plant Modifications" IP 71111.21 "Component Design Basis Inspection"	Addressed by ROP
Engineering Assessment: Quality of Engineering	IP 71111.17 "Permanent Plant Modifications" IP 71111.23 "Temporary Plant Modifications" IP 71111.21 "Component Design Basis Inspection"	Addressed by ROP
Self Assessment, Corrective Actions, Planning and Resources	IP 71152 "Problem Identification and Resolution" Inspection Manual Chapter 0305 "Operating Reactor Assessment Program"	Addressed by ROP

End Notes

1. A more detailed summary of the sequence of events leading up to the MY Independent Safety Assessment (ISA) is contained in the associated NRC Office of the Inspector General report, which is publicly available at http://www.nrc.gov/reading-rm/doc-collections/insp-gen/1996/96-04s.html.

2. IP 95003 “Supplemental Inspection for Repetitive Degraded Cornerstones, Multiple Degraded Cornerstones, Multiple Yellow Inputs, or One Red Input”

3. Management Directive (MD) 8.3, “NRC Incident Investigation Program” is publically available at: http://www.nrc.gov/reactors/operating/oversight/program-documents.html.

4. IP 95003 “Supplemental Inspection for Repetitive Degraded Cornerstones, Multiple Degraded Cornerstones, Multiple Yellow Inputs, or One Red Input”

5. RS-001, “Review Standard for Extended Power Uprates” and RIS 2002-03, “Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications” are publically available at: http://www.nrc.gov/reactors/operating/licensing/power-uprates.html#relatedregs.

6. IP 71111.21 “Component Design Bases Inspections,” IP 49001 “Inspection of Erosion/Corrosion Monitoring Programs,” IP 71111.17 “Permanent Plant Modifications,” IP 71111.02 “Evaluations of Changes, Test, and Experiments”

7. IP 71111.21 “Component Design Basis Inspection“

8. IP 71111.22 “Surveillance Testing”

9. IP 71111.19 “Post-Maintenance Testing”

10. IP 71111.15 “Operability Evaluations”

11. IP 71111.17 “Permanent Plant Modifications,” IP 71111.23 “Temporary Plant Modifications,” IP 71111.02 “Evaluation of Changes, Tests, or Experiments”

12. IP 71111.02 “Evaluations of Changes, Tests, or Experiments”

13. Inspection Manual Chapter 2515, “Light-Water Reactor Inspections – Operations Phase,” Appendix D, “Plant Status”

14. IP 71715 “Sustained Control Room and Plant Observation”

15. IP 71111.04 “Equipment Alignment,” IP 71111.21 "Component Design Basis Inspection,” Inspection Manual Chapter 2515, “Light-Water Reactor Inspections – Operations Phase,” Appendix D, “Plant Status”

16. Inspection Manual Chapter 2515, “Light-Water Reactor Inspections – Operations Phase,” Appendix D, “Plant Status”

17. IP 71111.13 “Maintenance Risk Assessment and Emergent Work Control,” IP 71111.20 “Refueling and Outage Activities”

18. IP 71111.15 “Operability Evaluations”

19. IP 71111.21 “Component Design Basis Inspection“

20. IP 71111.11 “Licensed Operator Requalification Program,” IP 71111.06 “Flood Protection Measures”

21. IP 71111.04 “Equipment Alignment,” IP 71111.23 “Temporary Plant Modifications”

22. IP 71111.05A/Q “Fire Protection Annual/Quarterly,” IP 71111.05T Fire Protection (Triennial),” IP 71121 “Occupational Radiation Safety,” IP 71121.01 “Access Control To Radiologically Significant Areas,” IP 71121.02 “ALARA Planning and Controls,” IP 71121.03 “Radiation monitoring Instrumentation,” IP 71122 “Public Radiation Safety,” IP 71122.01 “Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems,” IP 71122.02 “ Radioactive Material Processing and Transportation,” IP 71122.03 “Radiological Environmental Monitoring Program (REMP) And Radioactive Material Control Program,” IP 71111.11 “Licensed Operator Requalification Training”

23. IP 71111.22 “Surveillance Testing”

24. IP 71111.22 “Surveillance Testing”

25. IP 71151 “Performance Indicator Verification,” Inspection Manual Chapter 0608 “Performance Indicator Program”

26. IP 71150 “Discrepant or Unreported Performance Indicator Data”

27. IP 71111.19 “Post-Maintenance Testing”

28. IP 71111.12 “Maintenance Effectiveness”

29. IP 71111.13 “Maintenance Risk Assessment and Emergent Work Control”

30. IP 71111.20 “Refueling and Outage Activities”

31. IP 71111.02 “Evaluations of Changes, Tests, or Experiments,” IP 71111.17 “Permanent Plant Modifications,” IP 71111.23 “Temporary Plant Modifications”

32. IP 71111.07 “Heat Sink Performance”

33. IP 71111.21 “Component Design Basis Inspection,“ IP 71111.15 “Operability Evaluations,” IP 71111.12 “Maintenance Effectiveness,” IP 71111.04 “Equipment Alignment,” IP 71111.22 “Surveillance Testing”

34. IP 71111.08 “Inservice Inspections”

35. Inspection Manual Chapter 0305 “Operating Reactor Assessment Program”