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EXECUTIVE SUMMARY

This inspection involved a review of James A. FitzPatrick's implementation of the maintenance rule per 10 CFR 50.65. The report covers a one week onsite inspection by regional and headquarters inspectors during the week of September 29 - October 3, 1997.

The team concluded that FitzPatrick had implemented a very effective, thorough maintenance rule program, based on the following aspects.

- All structures, systems and components (SSCs) were appropriately identified and included within the scope of the maintenance rule.
- Performance criteria for (a)(2) systems were acceptable, and goals and monitoring for (a((1) systems were appropriate and effective.
- System engineers had been very effective, including their root cause evaluations, corrective action determinations, and system monitoring.
- Industry operating experience (IOE) had been incorporated into the maintenance program, and system managers and the IOE coordinator maintained good communications and interaction with each other.
- Licensed reactor and senior reactor operators thoroughly understood the use of risk matrix guidelines and were generally well informed of the maintenance rule program. System engineers, and station managers had a good overall knowledge of the maintenance rule program.
- Component monitoring, separate from system monitoring, in some components (e.g., 4KV circuit breakers and auxiliary contacts) and had provided the appropriate attention to parts that were used in several systems that have had a history of failures and represented a strong aspect of the program.
- The expert panel had maintained a high level of consistent, conservative decision making.
- The quality of the probabilistic risk assessment was appropriate to risk rank systems for the maintenance rule.

Report Details

M1 Conduct of Maintenance (62706)

M1.1 Structures, Systems and Components (SSCs) Included Within the Scope of the Rule

a. Inspection Scope

The team reviewed the scoping documentation to determine if the appropriate structures, systems and components (SSCs) were included within the maintenance rule program in accordance with 10 CFR 50.65(b). The team used NRC Inspection Procedure (IP) 62706, NUMARC 93-01, Regulatory Guide (RG) 1.160, the James A. FitzPatrick (JAF) Nuclear Power Station Updated Final Safety Analysis Report (UFSAR), emergency operating procedures (EOPs), and other information provided by New York Power Authority (NYPA) as references.

The team reviewed the NYPA Administrative Procedure (AP) 05.03, Engineering Standards Manual (ESM) ES-8, ESM ES-10, Guidelines for Developing Maintenance Rule Basis Documents, and Expert Panel (EP) meeting minutes to determine the adequacy of NYPA's efforts in evaluating which SSCs were to be under the scope of the maintenance rule.

The team also reviewed additional information in system maintenance rule basis documents on scoping decisions for the following SSCs: feedwater, reactor protection, emergency diesel generators (EDG) and EDG support systems, compressed air, DC electrical, structures, secondary plant drains, residual heat removal, circulating water, automatic depressurization, essential service water, 4 kv electrical, and the primary containment atmosphere control and dilution system.

b. Observations and Findings

NYPA had determined that 84 out of a total of 107 systems were under the scope of the maintenance rule. NYPA also determined that 322 functions out of a total of 414 system functions were found to be under the scope of the maintenance rule. In addition, the team found that NYPA had adequate technical justification to exclude the 23 systems from the scope of the maintenance rule.

The team found that NYPA adequately identified scoping boundaries for each system and components within each system that had been included within the scope of the maintenance rule. The team determined that the appropriate SSCs, including the systems listed above, had been correctly identified as being within the scope of the maintenance rule. In addition, conservatism was exhibited in NYPA's expert panel scoping decisions as evident through a team review of expert panel meeting minutes which adequately and thoroughly documented initial and subsequent scoping reviews. Adequate technical justification was given for specific components excluded from the scope of the maintenance rule for the systems noted above.

The team found that NYPA identified 6 functions for the EDGs of which 3 functions were identified as being under the scope of the maintenance rule. The team questioned the facility's technical justification for excluding the eight EDG air start compressors (i.e., two compressors per EDG air start system) from the scope of the maintenance rule but later found the facility scoping conclusion acceptable. NYPA has classified the compressors as important to safety - Class M components. The facility stated that only one compressor is needed to maintain ten EDG air starting receivers pressurized to 180 psig. This provides the EDGs with approximately ten air starts. In addition, failure of both compressors is needed before starting air would lose pressure; however, the time duration before losing starting air pressure may be several hours to days depending on the size of air leaks in the system. Since the facility has 4 EDGs, the team questioned whether a common cause failure could be introduced into the air compressors that may require the EDG starting air system to be declared inoperable. NYPA stated that the starting air system is checked daily by operations and any abnormal operating conditions in air compressor performance should be identified when control room operators start the compressors to re-pressurized the receivers following daily drainage of moisture from the air receivers. The team determined that a loss of both air compressors would not directly cause a failure of the air start system. In addition, the team found that the air compressors are not used in the EOPs or used to mitigate an accident or transient; therefore, the team concluded that the non-safety-related EDG air start compressors could be excluded from the scope of the maintenance rule.

c. Conclusions

The team concluded that NYPA had completed a thorough scoping review of all SSCs under the scope of the maintenance rule and had correctly scoped all the SSCs reviewed by the team. For those SSCs that were excluded from the scope of the rule, justification was found to be correct and complete.

M1.2 Safety (Risk) Determination and Risk Ranking

a. Inspection Scope

Paragraph (a)(1) of the maintenance rule requires that goals be commensurate with safety. The guidance contained in NUMARC 93-01 also requires that safety be taken into account when setting performance criteria and monitoring under (a)(2) of the rule. This safety consideration would then be used to determine if the SSCs should be monitored at the train or plant level. The team reviewed the methods that the facility had established for making these safety determinations. The team also reviewed the safety determinations that were made for the systems that were reviewed in detail during this inspection.

The team reviewed the facility's process for establishing the safety significance of SSCs within the scope of the maintenance rule as documented in the following: JAF Administrative Procedure (AP)-05.03, "Maintenance Rule," NYPA Engineering Standards (ES)-8, "Maintenance Rule Scope Determination," and NYPA ES-9, "Risk Significance Determination."

b. Observations and Findings

Risk Ranking

The facility had used the guidance provided in NUMARC 93-01 for the identification of risk significant SSCs modeled in the facility's Individual Plant Examination (IPE) except a more conservative criterion of 95% of the overall core damage frequency (CDF) cut sets was used instead of the recommended 90%. The facility had used plant-specific Probabilistic Risk Assessment (PRA) studies to rank SSCs with regard to their safety significance. These PRA studies included the JAF IPE, the JAF Individual Plant Examination of External Events (IPEEE), and the JAF updated IPE. The IPE report was submitted to the NRC in September 1991, and the Staff Evaluation Report (SER) was issued in May 1994. The IPE was found to be complete with respect to the information requested in GL 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities," and associated NUREG-1355, "Individual Plant Examination: Submittal Guidance." The IPEEE was submitted to the NRC in June 1996 for review. The updated IPE is expected to be completed by December 1997. The 1991 IPE and updated IPE were a small event tree and large fault tree model, and Science Applications International Corporation's CAFTA and ETA codes were used to develop and quantify some of the model. Sequence quantification of the original IPE was quantified with PC-SETS and the updated IPE sequence quantification was quantified with NURELMCS.

The truncation level used for the risk significance determination process was considered to be reasonable. For the risk ranking process, the nuclear systems analysis (NSA) group supervisor stated that a truncation level of 1.0E-9 had been used with all initiating events set to 1.0 for cut set generation. The overall CDF estimate was 1.92E-6 per reactor year for the original IPE and 2.16E-6 per reactor year for the updated IPE. The initiating event frequencies ranged from 1.0E-4 per year for large LOCA to 4.72 per year for transients with condenser initially available.

The facility had used a plant-specific database in the PRA model. The plant-specific database was a Bayesian update of generic and plant-specific data. The plant-specific data for plant trips covered January 1976 to December 1989, and the plant-specific data for component failure rates and demands covered January 1980 to October 1986.

The PRA's level of detail, truncation limits and quality appeared adequate to support risk ranking for the maintenance rule. Although the updated IPE has not been submitted to the NRC (updated IPE expected to be completed in December 1997), the facility had also evaluated the IPE update to ensure that risk insights such as risk achievement worth, risk reduction worth, and percent CDF were considered for re-ranking of risk significant SSCs. AP-05.03 had documented that the expert panel shall ensure that risk insights from the IPE update be considered for re-ranking of risk significant SSCs.

FitzPatrick's approach was consistent with the NUMARC 93-01 guidance, thus was considered to be adequate. The facility's expert panel used a consensus rather than a Delphi process to ensure SSCs within the scope of the maintenance rule were determined to be risk significant or non-risk significant. No SSCs identified as risk significant from the IPE importance measures were downgraded to non-risk significant by the expert panel.

Performance Criteria

The team reviewed the facility's performance criteria to determine if the facility had adequately set performance criteria under (a)(2) of the maintenance rule consistent with the assumptions used to establish the safety significance. Section 9.3.2 of NUMARC 93-01 recommends that risk significant SSC performance criteria be set to assure that the availability and reliability assumptions used in the risk determining analysis (i.e., PRA) are maintained.

For reliability performance criteria, the facility used the EPRI methodology outlined in Technical Bulletin 96-11-01 "Monitoring Reliability for the Maintenance Rule" (November 1996) and Technical Bulletin 97-3-01 "Monitoring Reliability for the Maintenance Rule - Failures to Run" (March 1997). This approach is considered to be appropriate by the NRC if followed consistently and if a 5% confidence level is used for determining allowable MPFF limits. The facility's approach was determined to be adequate for the reliability performance criteria.

The unavailability performance criteria used by the facility were not based on the IPE unavailability values. The facility had performed a sensitivity analysis and the results were documented. The sensitivity analysis indicated an increase of 13.7% in the CDF point estimate using the unavailabilities presented in the JAF maintenance rule performance criteria matrix (September 9, 1997). For the base point estimate CDF of 1.5E-6 per year, the EPRI PSA Applications Guide (August 1995) allows a 81.6% increase. Therefore, the change in CDF was below the guideline and acceptable.

c. Conclusions

The team concluded that the approach to establishing SSC risk significance to be acceptable. The facility had used a more conservative criteria for CDF cut set contribution (i.e., cut sets that account for 95% of the CDF rather than the recommended 90%) for SSC risk significance determination; this more conservative approach was commendable. The facility's use of risk insights from the updated IPE for re-ranking of risk significant SSCs was also noteworthy.

The team concluded that the facility's approach in establishing performance criteria for the maintenance rule to be acceptable.

M1.3 Expert Panel

a. Inspection Scope

The team reviewed FitzPatrick's procedures for risk significance determination identified as Engineering Standards Manual, ES - 9, and the procedures for the expert panel identified as Engineering Standards Manual ES - 11. The team attended one expert panel meeting and meet numerous times with panel members. The expert panel established which in-scope SSCs were risk significant. The expert panel also reviewed and concurred with performance criteria, SSCs as (a)(1) or (a)(2), action plans for (a)(1) SSCs, and goals/monitoring results for (a)(1) SSCs. Comprising the expert panel were senior individuals experienced with plant operations, maintenance, engineering and probabilistic risk assessment.

The inspectors observed an expert panel meeting, during which time, the expert panel members revised the boundary description for systems that contained annunciators, revised the safety relief valves and automatic depressurization system (SRV/ADS) action plan, and revised the DC Electrical basis document. The boundary descriptions for systems that contained annunciators was considered administrative in nature because of previously accepted changes in the annunciator basis document.

b. Observations and Findings

The team judged the expert panel's SRV/ADS action plan to be reasonable given the state of the known solutions to this generic problem. The SRV/ADS was an (a)(1) system due to pilot disc seat corrosion bonding. The proposed action plan for this (a)(1) system included two parts: (1) replace pilot disc material and (2) analyze pressure switch installation plan. The plant leadership team approved the installation of the pressure actuating system as a modification for the upcoming 1998 refueling outage. However, the expert panel recommended revising the action plan to state that system engineer shall follow the BWR owner group's progress on this generic issue for most BWR plants based on GE recommendations, operating experience with platinum alloy disc at FitzPatrick and other plants, increase in TS 3% tolerances to 10% tolerances, and code acceptability of pressure transmitters to actuate the valves. While the final action plan is not completed as of this date, the initial actions are consistent with other BWR plants and prudent maintenance goals.

A review of the past expert panel meeting minutes showed that the panel has met approximately once a week.

Based on meeting minute reviews, the team determined that the expert panel has appropriately reviewed and approved (a)(1) action plans that developed the appropriate maintenance tasks and goals for (a)(1) SSCs to eventually be reclassified as an (a)(2) SSC. Also, as noted in Section M1.1, the expert panel had contributed to numerous scoping decisions in a meaningful manner.

c. Conclusion

The team concluded that the expert was performing its assigned functions in an effective, value-added manner.

M1.4 (a)(1) Goal Setting and Monitoring and (a)(2) Preventive Maintenance

a. Inspection Scope

The team reviewed program documents to evaluate the process established to set goals and monitor under (a)(1) and to verify that preventive maintenance had been demonstrated to be effective for SSCs under (a)(2) of the maintenance rule. The team also verified that appropriate performance criteria had been set for several SSCs. The team performed detailed programmatic reviews of the maintenance rule implementation for the following SSCs:

- Emergency diesel generators
- Containment purge/CAD
- 4KV breakers
- DC electrical
- Structures
- Compressed air supply
- Circulating water
- Emergency service water
- Residual heat removal
- Reactor protection
- Automatic depressurization
- Feedwater
- Secondary plant drains

Each of the above systems was reviewed to verify that goals or performance criteria had been established commensurate with safety, that industry-wide operating experience had been considered, that appropriate monitoring and trending were being performed, and that corrective actions had been taken when an SSC failed to meet its goal or performance criteria or experienced a Preventable System Functional Failure (PSFF). Goals and performance criteria for additional SSCs not listed above were also reviewed; however the depth of review was limited in scope.

b. Observations and Findings

The ADS system was placed in the (a)(1) category due to numerous functional failures which were determined to be MPFFs. The failures occurred in the functions involving the SRV lift setpoint drift and the SRV steam leak detection subsystem. The SRV lift setpoint function exceeded the performance criteria of $\leq$1 FF per 24 months and the SRV steam leak detection subsystem had 2 FFs which approached the performance criteria of $\leq$ 3 FF per 24 months.

The ADS system engineer provided a recently revised action plan which identified the root causes of the failures as valve pilot disc corrosion bonding and valve pilot steam leakage. The engineer noted that this has been a generic problem related to all Target Rock SRVs and that the Boiling Water Reactor Owners Group (BWROG) is also addressing the issues.

The corrective actions in the plan were developed by JAF, the BWROG, and General Electric. The action already taken was to process a technical specification amendment to increase the allowable SRV setpoint drift from +/- 1% to +/- 3%. This has resulted in a reduction of functional failures during the past fuel cycle. Additional recommended corrective actions in progress or under evaluation were the installation of a pressure actuating system, a further increase in allowable SRV setpoint drift, and installation of an alternate SRV pilot disc material more resistant to corrosion bonding.

The team determined that the scoping, goal setting and established corrective actions were acceptable and appropriate. The expert panel reviewed and accepted the action plan with minor revisions on October 1, 1997.

The RHR system was properly scoped to meet the requirements of the rule and was appropriately deemed safety related and risk significant in the basis document. The performance criteria for unavailability and functional failures were based on the IPE value for system unavailability and the PRA.

The basis document listed 4 functional failures (FF) which were all classified as MPFF's. This number of failures exceeded the system aggregate FF criteria of ≤ 2 FFs per cycle. The expert panel reviewed the failures to determine if the system should be placed in (a)(1) and subsequently and appropriately determined that 2 of the failures were not MPFFs and the system should remain in (a)(2). Additionally, they determined that one of the remaining 2 MPFFs should be reclassified from a system aggregate functional failure to a shutdown cooling isolation functional failure. The justification for the classification change was that the original performance criterion for system aggregate functional failures was based on the "at power" PRA and did not account for functional failures occurring during shutdown. The basis document was under revision to reflect these changes.

The first MPFF involved the isolation of shutdown cooling (SDC). It was caused by a pressure surge in the SDC piping upon a pump start after inadequate piping air space venting. The pressure surge caused automatic closure of the SDC suction valves. Initial corrective actions have been taken procedurally to initially vent the piping through the existing path for a longer period of time. The final corrective action is installation of a new high point vent to be installed during the next refuel outage (10/98). The second MPFF was the failure of the torque switch roll pin in 10MOV-12B (RHR heat exchanger outlet valve). A modification was completed on the valve, and it was also identified that this condition has the potential to affect similar valves. Corrective actions have been initiated to implement a modification on all valves potentially affected by this failure with completion scheduled during the next available outage.

Root cause determinations and corrective actions were timely for both MPFFs. The use of industry experience to assist in determining the proper course of action was evident upon review of the expert panel meeting minutes and system engineering documents.

The **RPS system** was properly scoped to meet the requirements of the rule and was appropriately deemed risk significant in the basis document. The performance criteria for unavailability and functional failures were based on the IPE value for system unavailability and the PRA. Monitoring and trending of the one existing MPFF was appropriate.

The basis document had been recently revised to redefine the scope of RPS to include various level, pressure, nuclear monitoring system instrumentation, and specific plant annunciator points. The additional scoping was reviewed and approved by the expert panel and was included in the basis document, dated September 8, 1997.

In the current cycle, 1 MPFF has occurred involving the failure of the main steam line "A" position switch input to RPS B1 and A1 channels. This was identified during a technical specification (TS) surveillance test on 11/1/96. The position switch tolerance had drifted outside the allowable TS limits. Corrective actions have been taken to resolve the problem. Monitoring and trending of the switch since then indicates that the actions taken were appropriate.

The **4KV circuit breakers** were classified as (a)(1) components by FitzPatrick on August 19, 1997 due to the excessive number of industry and regulatory identified problems, some of which have been seen or are suspected to exist at FitzPatrick. Since February 1996, FitzPatrick has experienced five failures of the GE Magne-Blast 4KV circuit breakers. The action plan for removing the components out of the (a)(1) category was to send the breakers to GE for an overhaul. The overhaul would include the replacement of the latch pawl cotter pin and several switches, addition of new lube grease, and inspection of set screw, tie bolt, trip paddle, trip crank and anti-pump relay. FitzPatrick has tentatively scheduled the completion of the overhaul of maintenance rule scoped, risk significant 4KV circuit breakers by the end of January 1998. FitzPatrick was also considering investigating new circuit breaker designs by installing different manufactures' circuit breakers in non-safety related, non-risk significant areas of the electrical distribution system.

The auxiliary contacts were classified as (a)(1) components on July 14, 1997 due to a high failure rate. There have been 81 failures over the last four years caused by sticking auxiliary contacts in both safety and non-safety-related motor controllers in a population of 677 motor controllers. FitzPatrick has developed an action plan for the System 71 motor controllers of NEMA size 00 thru 1 starters with the GE Type CR105X series auxiliary contacts. The sticking auxiliary contacts have caused blown control power fuses, burned out coils and dual indication. The sticking auxiliary contacts were a result of grease hardening. FitzPatrick has been using a new silicone based grease since May 27, 1994 that has eliminated the sticking auxiliary contact problem in the components that have the new grease. However, FitzPatrick decided in 1994 to only replace the auxiliary contacts with new grease during their schedule preventative maintenance frequency that ranges from four to ten years. Now, the component engineer and the expert panel have decided to accelerate the PM schedule for the 71 remaining auxiliary contacts with the old grease. Plans specify that each auxiliary contact will contain the new grease within 18 months from the August 26, 1997.

The **DC electrical (071) system** boundaries included the 125V DC (batteries, chargers, distribution equipment), 24V DC (batteries, chargers, distribution equipment), 419V DC LPCI (batteries, inverters and associated instrumentation/control equipment), circuit breakers directly serving the chargers and inverters, sewage treatment facility UPS battery, 13.2KV Switchgear 48V DC Control Power (battery, charger), and control room annunciator signals. The DC electrical system is a normally operating system during all modes. The team toured several of the battery rooms and battery chargers locations. Many of the batteries were new and in good material condition. The batteries and chargers undergo weekly and quarterly surveillance test.

The expert panel had classified the system as risk significant based on the Risk Reduction Worth and Risk Achievement Worth screening criteria. The performance criteria types were unavailability and functional failures. The functional failure criteria for each 125V DC Train A and B was ≤ 2 and for 125V DC aggregate was ≤ 4. These numbers were obtained by the methods described in FitzPatrick procedure ES-10 Revision 2, Attachment 4.5, Rule 2. Rule 2 states for major equipment, the performance criteria is < 2 and system/train performance criteria is $< (2 + n)$, where $n =$ the number of major equipment that is normally operating. The PRA sensitivity study supports the use of these performance criteria as commensurate with safety with regard to CDF; however, a performance criteria more closely tied to industry and plant operating experience is more useful. These performance criteria were considered weak by the team. Subsequently, the expert panel changed the functional failure criteria for each 125V DC Train A and B to ≤ 1 and for 125V DC aggregate to ≤ 1 taking into account industry-wide and plant operating experience. The expert panel revised the DC electrical basis document. This revision included a change to the performance criteria in a more conservative direction.

While discussing a previous failure in the inverter fan that was not classified as a functional failure for the system, an expert panel member had alerted the system engineer to re-consider component failures during power and non-power modes. Also, during the panel meeting, the system engineer wanted to remove the 13.2KV system from the scope of the maintenance rule; however, the expert panel had appropriately decided against such action.

FitzPatrick had several structures in the scope of the maintenance rule, which included the Reactor Building, Turbine Building, Administration Building, Screenwell Area, Intake and Discharge Structures, Emergency Diesel Generator Building, Condensate Storage Tanks, Main Stack, CAD Building, and Auxiliary Boiler Building. The maintenance rule inspection team inspected the Reactor Building, Turbine

Building, Administration Building and Emergency Diesel Generator Building. The material condition of the structures was excellent. The fire doors all closed as designed, cable trays were secure, and cracks in the structure were minimal and being monitored. All of structures were monitored under a condition monitoring program using an inspection procedure. A baseline condition assessment had found no functional failures of any structures, therefore, the structures were all classified as (a)(2). The FitzPatrick's procedures provided for regular inspections at specified frequencies. FitzPatrick also takes credit for 22 different programs that monitor structural components such as the primary containment penetrations, fire doors, ANSI pipe supports, reactor building crane and cable trays. Each inspection frequency is specified for the a various programs.

The **instrument air system (IAS)** is a normally operating, non-risk significant system. The IAS was (a)(1) due to compressor problems and taken to (a)(2) in December 1996. During the review the team noted good evidence of industry review and equipment vendor interaction. There was aggressive performance criteria setting by the system engineer in presenting information to the expert panel based on PRA group recommendations. Air compressor maintenance was included in the facility's biennial review of PM program effectiveness, there was evidence of maintenance monitoring, and PM adjustments were apparent. System improvements included the upgrade of dryer outlet piping to mitigate the adverse effects of heater failure and subsequent soldered joint failure in piping. Also, replaced carbon steel piping and components in the blowdown portion of the system were in an effort to reduce the probability of stuck open traps in the system. Review of expert panel meeting minutes from September 1996 indicated that reclassifying the IAS compressors as (a)(2) was appropriate. Also, system engineer involvement was apparent. The IAS compressors have had one MPFF since September 1, 1995, when the B compressor failed as the result of inadequate maintenance. Procedure development was in progress and facility tracking for this issue has assigned a closure date of December 1997. System deficiency event reports (DERs) were reviewed for FF and MPFFs and were discussed with the SE and the maintenance rule coordinator. The team determined the classifications to be appropriate.

The **emergency service water (ESW)** system, a standby, risk significant system, was an (a)(1) system due to continuing problems with check valve sticking in their standby position. The team discussed the historic problems with the system and valve component engineer, performed system walkdowns, reviewed system drawings and surveillance test procedures in an effort to evaluate the facility's action plan and corrective actions.

The performance criteria for each train of ESW has been set to $\leq$ 2 FF per/train per cycle. Currently, there have been a total of 7 functional failures. The failures were due to the check valves failing to meet the leakage acceptance criteria of surveillance test ST-8R, Emergency Service Water Check Valve and Strainer Test. The purpose of the testing is to verify the operability of various check valves in the combined areas of the normal service water (NSW) system and the ESW system. The NSW system provides lake water to safety and non-safety-related heat exchangers during normal operation. Upon loss of the NSW system the ESW system provides lake water to the safety-related components. The check valves provide an isolation boundary between the two systems to prevent by-pass flow around the heat exchangers. The facility had determined the failures to be the result of microbiologically influenced corrosion (MIC) and the adherence of silt, sand, and other particulate to the MIC corrosion nodules.

The facility has had a history of problems with the check valves and had implemented various corrective actions, including installing protective coating on the valve internals and increased frequency testing to flush the valves. The internal protective coating, until recently, has been effective. Following several recent failures the facility had implemented their modification process to replace the current carbon steel design with stainless steel check valves by the end of the next refueling outage. The team reviewed the failure and corrective action history with the facility staff and concluded that the corrective actions were adequate.

The **circulating water system** is a normally operating system that is not risk significant and was being tracked via the plant level performance criteria. It was within the scope of the maintenance rule because of the potential for a failure to result in a loss of condenser cooling that would lead to a turbine trip and reactor scram. The inspector completed a walkdown of the system with the system engineer and discussed component history and performance. The team concluded the SSC was being monitored effectively.

The team also reviewed the maintenance rule system basis document for the **emergency diesel generator (EDG) system**. The team found that the facility monitored the EDGs under 50.65(a)(2) with an unavailability performance criterion of 2% per cycle (i.e., 280 hours per 24 month cycle) and a reliability performance criterion of $\leq$ 1 FF per 25 demands per cycle. The last demand failure of an EDG occurred in July, 1996 when the B EDG tripped on high current prior to achieving a successful start. There have been no other failures in the last 25 demand starts. The team found the performance criteria acceptable.

The facility recently identified 5 problem identification deficiencies (PIDs) involving the EDGs. The PIDs included the A EDG air start receiver A9 relief valve that had a minor leak, the A EDG had a visible crack with no leakage from the governor oil sight glass, the A EDG watt meter oscillated following EDG runs, the B EDG had a minor leak in the circulating lube oil pipe union connection, and the C EDG had a through wall crack on the weld joint at the generator center support. The facility planned corrective maintenance to address all 5 PIDs in the near future. None of the PIDs noted above affected EDG operability.

The team reviewed the maintenance rule system basis document for the **primary containment atmosphere control and dilution system (CAD)** and the maintenance rule action plan for (a)(1) systems such as the **primary containment H_2/O_2 monitoring system**.

The team found that NYPA identified 12 functions of which 10 functions were identified as being under the scope of the maintenance rule. NYPA established 4% unavailability for the CAD subsystem, 2% unavailability for the containment instrument supply subsystem, and 1% unavailability for the drywell and torus vent trains. In addition, NYPA established reliability performance criteria of either less than 1 or 2 FFs per cycle for the applicable subsystems mentioned above. The team found these performance criteria acceptable.

The team also found that NYPA monitors the primary containment H_2/O_2 monitoring system under 50.65(a)(1) due to seven FFs that have occurred in the last 24 months. This exceeded the reliability performance criterion of three FFs. NYPA planned to periodically check (once per year) the analyzer pump's discharge pressure, rebuild the analyzer pump every three years, establish a minimum discharge pressure for pump replacement, implement vendor calibration enhancements to improve H_2/O_2 performance, and implement several other vendor recommended preventive maintenance activities. In addition, NYPA established goals of no additional FFs in the next 12 months and no repeat FFs for the H_2/O_2 analyzer sample pumps. The team found that NYPA was taking appropriate corrective action to improve H_2/O_2 monitoring system performance.

c. <u>Conclusions</u>

The team concluded that the goals established and trending planned for those systems reviewed were appropriate. Industry wide experience had been used effectively to assist in the determination of root cause failures, corrective action plans, and the establishment of goals. Additionally, JAF procedures established the proper guidelines for initiating goals, trending, and monitoring and taking into account assumptions in the PRA. The facility's use of the maintenance rule appeared to have accelerated the maintenance schedule and plant priority of several risk significant components. FitzPatrick appropriately used their ES-14 procedure to review component failures and had determined that a problem existed across several systems. From this review, several component monitoring action plans had been developed to correct these failures. The component monitoring aspect of the maintenance rule program was considered strong. The condition monitoring program was adequate to trend any potential degradation in structural components.

The team found the goals for the (a)(1) SSCs and the performance criteria for the (a)(2) SSCs to be acceptable. The team also determined that acceptable corrective actions were taken when an SSC failed to meet its goal or performance criteria or experienced an MPFF. The system engineers effectively applied the maintenance rule program to those systems for which they were responsible. The team noted that the knowledge level of the system engineers was very good, and the depth of system walkdowns were commensurate with the importance of the system. The team determined that the SSCs were classified correctly, the amount of system monitoring was good, and the system engineers' involvement in the maintenance rule activities was readily apparent. The team also found that the system engineers and the expert panel had worked well in reviewing and revising system basis documents and action plans.

M1.5 Periodic Evaluations (a)(3) and Plant Safety Assessments Before Taking Equipment Out of Service

a. Inspection Scope

Paragraph (a)(3) of the Maintenance Rule states that the total impact on plant safety should be taken into account before taking equipment out of service for monitoring or preventive maintenance. The rule also requires that periodic evaluations be performed and adjustments be made where necessary to assure that the objective of preventing failures through the performance of preventive maintenance is appropriately balanced against the objective of minimizing unavailability due to monitoring or preventive maintenance. The team reviewed the facility's procedures and risk assessment documentation, and discussed the process with the maintenance rule coordinator, the NSA group supervisor, plant operators, and work week planners and schedulers.

b. Observations and Findings

The facility's process for determining plant safety prior to taking plant equipment out of service was documented in procedure AP-10.02 "13-Week Rolling Schedule" Revision 6 (September 23, 1997). Attachment 4 of AP-10.02 provided the instructions for assessing the safety impact of daily work. Attachment 5 of AP-10.02 provided the 13-week rolling schedule configurations that had already been analyzed. These configurations are analyzed based on the PRA model and a deterministic evaluation based on loss of a particular system for each safety function. Attachment 6 of AP-10.02 provided the system dependency matrix and the On-Line Safety Function Assessment Trees (OSFATs). The facility had demonstrated how the Attachments of AP-10.02 are used to evaluate plant safety prior to taking plant equipment out of service.

The schedule is maintained by the work control center (WCC) supervisor, contains at least one system window for each major plant system, and is approved by the general manager-maintenance and the plant manager. During the time period 12 weeks through 6 weeks prior the work window the work control center receives input on work to be scheduled. At four to five weeks prior to the window, up to the point at which the schedule is approved, the work involving items of general plant impact, risk significance, and impact on plant operation are discussed at the weekly look ahead meetings. Three weeks prior to the work, the safety assessment of the impact of scheduled work is started. This safety assessment along with a separate risk assessment is completed prior to the schedule being issued for work. All during this period emergent work may be added to the schedule following concurrence of various plant groups and completion of a risk assessment. The WCC supervisor is responsible to insure that each weekly schedule is reviewed and a risk assessment completed for each activity on the schedule in addition to reviewing the item for impact on plant operations.

The team reviewed the planning and risk evaluation for upcoming scheduled work weeks with two different work week managers (WWMs). The process was well implemented, and the WWMs were knowledgeable in adjusting equipment outages to minimize risk to plant safety. Only the equipment outage configurations previously analyzed with the IPE model can be scheduled for work. The WWMs adjust the weekly work schedules as needed to avoid plant configurations that have not been analyzed. If a configuration that has not been previously evaluated cannot be rescheduled, then the NSA group is contacted to evaluate the configuration with the IPE model before the weekly work schedule is finalized and approved.

Emergent work had been defined by the facility as "any item added to a weekly work schedule after the schedule is frozen five weeks prior to the scheduled start date." The team reviewed that procedure and observed that emergent work was handled effectively, and work was frequently rescheduled to subsequent weeks to avoid undesirable equipment outage combinations. If emergent work arises due to equipment failure, the shift manager notifies the work control center and the plant configuration is evaluated based on AP-10.02 and the related attachments. If the plant configuration is one that has not been previously analyzed, the NSA group is contacted to analyze the plant configuration.

The weekly work schedule review and risk assessment consist of identifying all planned work windows for trains of equipment previously identified by the facility as being in the scope of safety consideration for on-line maintenance. The systems, including its safety function or functions, are listed in the procedure. The planned work is then divided into non-overlapping time intervals and assigned a "plant state" color based on PRA analysis as well as deterministic evaluations of the plant staff. Based on guidance in the procedure, the work activities are adjusted to give the most favorable plant state colors. For activities that have not been previously analyzed in the 13-week rolling schedule, the procedure utilizes a "dependency matrix" to aid in determining equipment trains that are unavailable or reduced in reliability. For activities which have not been analyzed, the plant state colors are determined by using an on-line safety function assessment tree (OSFAT). If high risk activities are identified, the schedule is adjusted or approval to perform the work is obtained from correspondingly higher levels of management. In instances where plant states cannot be identified for a particular configuration, the PRA group is consulted. Emergent work issues are tracked throughout the week, have a risk assessment, and are approved by the WCC supervisor and work week manager.

Outage risk assessment guidelines are documented in Administrative Procedure (AP)-10.09, Outage Risk Assessment. The procedure communicates plant management outage safety philosophy and provides guidance to be used in meeting the goals and objectives of that philosophy. The assessment is conducted by a risk assessment team based on a schedule provided by the outage coordinator. The procedure includes a process for assessing changes to the schedule once implemented by the risk assessment team. The procedure uses several key safety functions, i.e. decay heat removal, inventory control, etc., assigned to each day's activities along with a color indicator which corresponds to a depth of defense. Once established the risk assessment team makes recommendations on changes in scheduling or in the implementation of contingency plans. As in on-line maintenance, higher levels of risk require elevated levels of management approval.

The team cross-referenced the list of SSCs that met one or more of the NUMARC 93-01 PSA criteria for risk significance, as used by the facility, with the SSCs included in the evaluations of AP-10.02. The team did not identify any SSCs missing from the AP-10.02 evaluations. The facility's procedure appeared to adequately addressed the SSCs that are risk significant.

The team also reviewed the Operator Log Books covering August and September 1997 to identify different plant configurations. The log books did not indicate the daily plant status (e.g., green, yellow), but the plant configurations are documented and discussed during the daily work meetings. Plant status changes were discussed with the WWM, and the documentation for a plant status change with respect to the daily schedule was also provided. The procedure for changes in the plant status was adequate. The team was also provided a demonstration of the EPRI SENTINEL computer software that is being developed to improve the work scheduling and risk assessment processes for both on-line and outage conditions. The team determined that once fully developed and utilized, planning and scheduling efforts should be enhanced.

NYPA's approach for optimizing reliability and availability was developed using guidance in NYPA's ESM ES-13, Maintenance Rule Periodic Assessment, Attachment 4.1, Balancing Reliability and Availability. The team found that ES-13 follows the guidance contained in Regulatory Guide 1.160 and NUMARC 93-01 for optimizing reliability and availability through system engineer review of unavailability, maintenance rule functional failures (FFs), maintenance preventible function failures (MPFFs), repetitive MPFFs, and corrective action data associated with improving SSCs performance. The maintenance rule coordinator is responsible for completing the periodic assessment and will present the results of the assessment to the expert panel. The results will address whether or not a balance between reliability and availability has been achieved.

The team also reviewed NYPA's efforts to track site specific operating experience concerning maintenance rule FFs, MPFFs, and repetitive MPFFs events that have occurred at JAF nuclear power station. The team found that the facility tracks FFs, MPFFs, and repetitive MPFFs using the guidance contained in NYPA's Engineering Standards Manual ES-14, Maintenance Rule Determinations for Functional Failure Determination. This procedure provided guidance on tracking FFs, MPFFs, and repetitive MPFFs events using Deviation and Event Reports (DERs) and Problem Identification Reports (PIDs). The system engineers were responsible for tracking FFs, MPFFs, and repetitive MPFFs associated with their systems and reporting performance information to the maintenance rule coordinator and the expert panel so that decisions on moving SSCs to the (a)(1) category could be made when system performance criteria were exceeded.

In accordance with 50.65(a)(3), the periodic assessment for balancing reliability and availability must be completed once every refueling cycle not to exceed 24 months. NYPA plans to complete this activity within the next few months. The team stated that this area would be reviewed during a future inspection to ensure that this maintenance rule aspect is effectively implemented (IFI 50-337/97-80-01).

c. Conclusions

The team reviewed the facility's process for assessing plant risk from equipment being out of service for on-line maintenance. The team determined that the facility's assessment of plant risk during on-line maintenance was good, in-depth and conservative in nature. The work week manager and work week schedulers demonstrated a good understanding of the maintenance rule and were aware of their responsibilities for effective implementation of the maintenance rule. The work control center staff had a very good understanding of the work control process and methods to assess the impact of emergent work issues. Self assessments of the work control process were determined to be self critical and corrective actions to facility identified deficiencies to be appropriate. Prior to the end of the year, NYPA intends on completing the periodic assessment that determines whether a balance between SSC reliability and availability has been achieved. This completed assessment will be reviewed during a future inspection.

M2 Maintenance and Material Condition of Facilities and Equipment

a. Inspection Scope

The team performed walkdowns of those systems in which vertical slice inspections were performed. These system walkdowns were performed with the responsible system engineer, during which time the teams observed the material condition of these SSCs.

b. Observations, and Findings

The team performed material condition walkdowns of selected portions of those SSCs selected for detailed reviews. Housekeeping in the general areas around systems and components was very good. Material degradation was noted on some EDG components; however, these conditions were identified by NYPA in PIDs issued on these EDG components and corrective maintenance is planned to resolve these issues. None of the material conditions problems noted affect EDG operability. System engineers appeared to be very cognizant of their system responsibilities, which included an awareness of the material conditions for those systems in which they were assigned.

There was some confusion as to the frequency of system walkdowns required of the system engineers. This concern, however, was corrected by the facility during the inspection by providing additional procedural clarification.

c. Conclusions

The inspection team determined that the overall material condition of those SSCs selected for review were maintained in good condition. System engineers were knowledgeable of their system responsibilities and maintained an awareness of their system material condition.

M3 Staff Knowledge and Performance

a. Inspection Scope

The team interviewed engineers, managers and licensed operators to assess their understanding of the maintenance rule and associated responsibilities.

b. Observations and Findings

The system engineers were very knowledgeable of their systems even though, in some instances, they had just recently been assigned to this position within the last year. They were also familiar with the maintenance rule and understood the scoping, monitoring , and trending required of their systems as appropriate. Additionally, they made good use of industry experience to assist in performing root cause evaluations and subsequent corrective actions when needed.

Overall licensed operator knowledge of the rule was acceptable. Initial general training was provided during the summer of 1996 and during recent operator requalification training, which reinforced the various concepts and responsibilities required under the rule. All personnel understood their responsibilities. The licensed reactor and senior reactor operators were specifically questioned about their responsibilities regarding on-line and emergent maintenance risk assessment and it was apparent they were well versed on the subject. Continuing training is scheduled during upcoming requalification training sessions.

c. Conclusions

Licensed operators and system engineers were able to fulfill their responsibilities under the rule during normal operations and emergent work situations. Their understanding of rule was acceptable. Maintenance rule reviews for licensed operators will continue to be emphasized throughout future requalification training cycles.

M7 Quality Assurance (QA) in Maintenance Activities

a. Inspection Scope

The team reviewed assessments which were conducted by NYPA personnel to determine if the maintenance rule had been properly implemented.

b. Observations and Findings

The team reviewed various station-wide self assessments of the maintenance rule program implementation and determined that these assessments were generally in-depth and provided appropriate feedback for maintenance rule program improvements. Both internal and external audit reports were reviewed and discussed with responsible individuals. Audit findings from both reports were appropriately dispositioned and acted upon in a timely manner. Long term corrective actions are actively being tracked and reviewed. The team determined that the correct implementation of the maintenance rule program at the FitzPatrick facility was due, in part, to their responsiveness to the audit findings.

c. Conclusions

The self assessments and audit reports were very detailed and thorough. The thoroughness and responsiveness to these audit findings helped to ensure that FitzPatrick correctly implemented the maintenance rule program.

V. Management Meetings

X1 Exit Meeting Summary

The team discussed the progress of the inspection with NYPA representatives on a daily basis and presented the inspection results to members of management at the conclusion of the inspection on October 3, 1997.

The team asked whether any materials examined during the inspection should be considered proprietary. NYPA indicated that none of the information provided to the team was considered proprietary.

PARTIAL LIST OF PERSONS CONTACTED

<u>New York Power Authority</u>

M. Colomb, Site Executive Officer
A. Halliday, Maintenance Manager
T. Herrmann, Systems Engineering Supervisor
D. Lindsey, General Manager Operations
G. Smith, Sr. Maintenance Engineer
D. Topley, General Manager Maintenance
D. Vandermark, Quality Assurance Manager

LIST OF INSPECTION PROCEDURES

IP 62706 Maintenance Rule

LIST OF ACRONYMS USED

ADS	-	Automatic Depressurization System
BWR	-	Boiling Water Reactor
BWROG	-	Boiling Water Reactor Owners Group
CDF	-	Core Damage Frequency per year
DERs	-	Deviation and Event Reports
EDG	-	Emergency Diesel Generators
EOPs	-	Emergency Operating Procedures
EP	-	Expert Panel
EPRI	-	Electric Power Research Institute
ESM	-	Engineering Standards Manual
ESW	-	Emergency Service Water
FFs	-	Functional Failures
GE	-	General Electric
JAF	-	James A. FitzPatrick
IAS	-	Instrument Air System
IFI	-	Inspector Follow Up Item
IP	-	Inspection Procedure
IPE	-	Individual Plant Evaluation
MPFFs	-	Maintenance Preventible Function Failures
NSA	-	Nuclear Systems Analysis
NUMARC	-	Nuclear Management and Resources Council
NRC	-	Nuclear Regulatory Commission
NSW	-	Normal Service Water
NYPA	-	New York Power Authority
OSFAT	-	On-Line Safety Function Assessment Tree
PIDs	-	Problem Identification Reports
PRA	-	Probabilistic Risk Assessment
PSA	-	Probabilistic Safety Assessment

PSFF	-	Preventible System Functional Failure
RG	-	Regulatory Guide
RPS	-	Reactor Protection System
SRV	-	Safety Relief Valve
SSCs	-	Structures, Systems and Components
UFSAR	-	Updated Final Safety Analysis Report
WCC	-	Work Control Center
WWM	-	Work Week Manager
WWS	-	Work Week Schedulers
4KV	-	4160 VAC