U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REGULATORY REGULATION

Division of Reactor Inspection and Safeguards

Report No.: 50-333/88200

Docket No.: 50-333

Licensee: Power Authority of the State of New York
123 Main Street
White Plains, New York 10601

Inspection At: James A. Fitzpatrick Nuclear Power Plant

Inspection Conducted: May 23 through June 3, 1988.

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SUMMARY OF RESULTS

Scope:

On May 23 through June 3, 1988 an NRC inspection team conducted an inspection of the James A. Fitzpatrick Nuclear Power Plant (JAFNPP) Emergency Operating Procedures (EOPs). JAFNPP is a BWR-4 with a Mark I containment. The objectives of the inspection were to determine whether the EOPs are technically correct, whether the EOPs can be physically carried out in the plant, and whether the EOPs can be correctly performed by the plant staff.

The team accomplished the inspection by performing a comparison of the BWR Owners Group Emergency Procedure Guidelines (EPGs) to the Plant Specific Technical Guidelines (PSTGs); a comparison of the PSTGs to the EOPs; a review of the calculations performed to develop the plant specific curves, values, and setpoints utilized in the EOPs; a plant walkdown of all the EOPs and the Abnormal Operating Procedures (AOPs) referenced by the EOPs; a simulation of two emergency scenarios using a full size control room mock-up; a human factors review of the procedures and plant operations, including interviews of nine licensed and non-licensed personnel who utilize the EOPs and AOPs; a detailed review of the containment venting procedures; and a review of your on-going program for evaluation of EOPs. The inspection was primarily focused on the adequacy of the end product and not on a review of the process to develop the EOPs.

Results:

Based on a review of the EOPs and supporting calculations, the inspection team concluded that although the PSTGs have not been controlled and maintained up-to-date as a design basis document, the EOPs are a technically accurate incorporation of the EPGs. The plant walkdowns, operator interviews and the simulated EOP scenario identified several minor deficiencies; however, the team concluded that the EOPs can be accurately accomplished using the existing controls, instruments, and equipment. Based on the human factors review of the EOPs, Writer's Guide implementation, plant walkdowns, and the EOP simulation, the team concluded that the EOPs and associated procedures have the useability to provide the operators with an effective accident mitigation tool and can be correctly performed by the plant staff.

Several concerns were identified which will require further licensee action to resolve. The most significant concerns were:

1.) The EOPs and the PSTGs had not been maintained as a design basis document and therefore have not been maintained up-to-date and appropriately controlled. This resulted in several discrepancies between the PSTGs and the EOPs. (Section 3.a and 3.2)

2.) Plant process computer setpoints did not correspond to the EOP entry conditions and potential confusion existed in the measurement and indication methodology of suppression pool level. In addition, outstanding validation comments concerning the suppression pool level measurement methodology had not been satisfactorily documented. (Section 4.a)

3.) In a few instances, information or equipment necessary for the performance of the EOPs had not been provided. (Section 4.b)

4.) The EOP simulation adequately demonstrated that the minimum shift crew described by Technical Specifications was sufficient to accomplish the required actions of the EOPs. However the team could not conclude that sufficient personnel would be available to accomplish all of the actions required in an emergency, such as implementation of the Emergency Plan or activation of the Fire Brigade, coincidental with implementation of the EOPs. In addition, a method of placekeeping was not used by the operators during the performance of the EOPs. Placekeeping methods have not been utilized during periodic training and were not supported by the procedures. (Section 5.c.1 and 5.c.3)

5.) A response to the Safety Evaluation incorrectly indicated that action statements would not be carried over from one page to another. (Section 6.1.c)

6.) Sufficient guidance was not provided in the EOP for Primary Containment Control to describe the calculation of the Heat Capacity Temperature Limit. (Section 6.2.c)

7.) An evaluation had not been performed to demonstrate the capability of the Standby Gas Treatment System to operate under the anticipated accident conditions of high pressure and temperature during containment venting. (Section 7)

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1. INSPECTION OBJECTIVE

The inspection team reviewed the licensee's Emergency Operating Procedures (EOPs), operator training and plant systems to accomplish the following objectives in accordance with NRC Temporary Instruction (TI) 2515/92:

(1) Determine whether the EOPs conformed to the vendor generic guidelines and were technically correct for the James A. Fitzpatrick Nuclear Power Station.

(2) Assess whether the EOPs can be physically carried out in the plant using existing equipment, controls, and instrumentation, under the expected environmental conditions.

(3) Evaluate whether the plant staff has been adequately trained to perform the EOP functions in the time available.

2. BACKGROUND

Following the Three Mile Island (TMI) accident, the Office of Nuclear Reactor Regulation developed the "TMI Action Plan," (NUREG-0660 and NUREG-0737) which required licensees of operating plants to reanalyze transients and accidents and to upgrade Emergency Operating Procedures (EOPs) (Item I.C.1). The plan also required the NRC staff to develop a long-term plan that integrated and expanded efforts in the writing, reviewing, and monitoring of plant procedures (Item I.C.9). NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures,' represents the NRC staff's long-term program for upgrading EOPs, and describes the use of a Procedures Generation Package (PGP) to prepare EOPs.

The licensees formed four vendor owner's groups corresponding to the four major reactor types in the United States: Westinghouse, General Electric, Babcock & Wilcox, and Combustion Engineering. Working with the vendor company and the NRC, these owner's groups developed generic procedures that set forth the desired accident mitigation strategy. For General Electric plants, the generic guidelines are referred to as Emergency Procedure Guidelines (EPGs). These EPGs were to be used by licensees in developing their PGPs. Submittal of the PGP was made a requirement for the James A. Fitzpatrick Nuclear Power Plant by Confirmatory Order dated June 12, 1984. Generic Letter 82-33, "Supplement 1 to NUREG-0737 - Requirements for Emergency Response Capability" required each licensee to submit to the NRC a PGP which includes:

(1) Plant Specific Technical Guidelines (PSTGs) with justification for safety significant differences from the EPG.

(2) A Plant Specific Writer's Guide (PSWG).

(3) A description of the program to be used for the verification and validation of EOPs.

(4) A description of the training program for the upgraded EOPs.

Plant specific EOPs were to have been developed that would provide the operator with directions to mitigate the consequences of a broad range of accident and multiple equipment failures.

For various reasons, there were long delays in achieving NRC approval of many of the PGPs. Nevertheless, the licensees have all implemented their EOPs. To determine the success of this implementation, a series of NRC inspections are being performed to examine the final product of the program: the EOPs. A representative sample of each of the four vendor types has been selected for review by four inspection teams from Regions I, II, III and IV.

An additional 13 inspections have been scheduled at facilities with General Electric Mark I type containments. The latter inspections are being conducted by the Office of Nuclear Reactor Regulation and include a detailed review of the containment venting provisions of the EOPs. This inspection at the James A. Fitzpatrick Nuclear Power Plant is the first of the 13 Mark I inspections.

3. PROCEDURE REVIEW

This portion of the inspection was performed to determine whether the JAFNPP EOPs have been prepared in accordance with the current Procedures Generation Package (PGP) and the Plant Specific Technical Guidelines (PSTGs). The inspection team compared Revision 3 of the BWR Owners Group Emergency Procedure Guidelines (EPGs) to the PSTGs, and the PSTGs to the EOPs. All differences were identified and reviewed to ensure that safety significant deviations were identified in the PGP and that a documented basis existed for all deviations. A review of selected calculations was performed to ensure that plant specific values utilized in the EOPs are correct and have been performed in accordance with a documented engineering analysis. Section 10.2 of this report lists the procedures reviewed.

a. Record Control

In the process of reviewing the PSTGs and the EOPs, the team identified that the original copies of the EOPs, EPG Calculations (Appendix C) and the Plant Specific Technical Guidelines (PSTGs) were all being temporarily stored in the Operations Department Administrative Office as uncontrolled documents and were not being upgraded and maintained up-to-date. NUREG-0899, "Guidelines for the Preparation of Emergency Procedure Guidelines" indicates, in paragraph 4.4, that the PSTGs are the primary basis for plant EOPs and, as such, should be subject to examination under the plant's Quality Assurance (QA) Program, and are also required to be accurate and up-to-date. Further licensee action is necessary to upgrade and maintain the PSTGs as required.

A review of Administrative Procedure F-AP-1.4, "Control of Plant Procedures," Plant Standing Order PSO-4, "Quality Assurance and Plant Operating Records," and JAFNPP Records Retention/Turnover Schedule, Rev. 3.1 indicated that the location and length of storage of the PSTGs and supporting records were not in accordance with the plant's administrative requirements. The QA Department had identified similar concerns with record storage and the timeliness of turnover in QA Audit No. 584 dated February 20, 1987 and QA Audit No. 646 dated April 22, 1988. However, at the time of the inspection, none of the EOP records had been turned over to Document Control. The initial upgraded (symptomatic) EOPs were issued on December 29, 1984. Further licensee action is necessary to maintain and control these records as required.

3.1 EPG/PSTG Review

Four minor differences were identified between the EPGs and the PSTGs, as detailed below. The team concluded, based on a review of the PSTGs and the differences identified, that significant discrepancies did not exist and that there were no adverse affects on the adequacy of the JAFNPP EOPs. Further action should be taken to ensure that future revisions or upgrades of the EOPs correct these discrepancies.

a. The selection of 1090 psig as the lowest Safety Relief Valve (SRV) pressure in PSTG step RC/P-2 did not consider the setpoint tolerances of the SRVs. The EPG basis (Appendix B) indicates that the intent of RC/P-2 is to establish a control band for pressure control of the reactor at which the SRVs will not cycle. The use of the lowest SRV setpoint pressure without consideration of the setpoint tolerance of the SRV could result in cycling the SRV if the reactor pressure is controlled at 1090 psig. Additional operator guidance such as a lower pressure control band would ensure that reactor pressure is controlled below the pressure at which the SRV would lift.

b. Other steam driven equipment available at JAFNPP such as Reactor Feed Pump (RFP) turbines, RFP drains, steam seals, steam jet air ejectors and off gas heaters have not been incorporated into PSTG step RC/P-2.

c. Amplifying information for Group 1 Isolation signals, such as initiating conditions and isolation valve identification, has not been provided in PSTG step RC/L-1.

d. Alternate injection systems which are available at JAFNPP, such as demineralized water transfer to the Standby Liquid Control test tank, have not been incorporated into PSTG contingency C1-1, "Level Restoration."

3.2 PSTG/EOP Review

Six minor differences were identified between the PSTGs and the EOPs, as detailed below. The team identified that in each example the EOP was correct and concluded that the discrepancies were the result of not maintaining the PSTGs up-to-date as required. No conditions which would adversely affect the performance of the EOPs were noted. Further action is necessary to correct these deficiencies and to control and maintain the PSTGs appropriately.

a. F-EOP-1, "EOP Cautions," Caution No. 6 had a different Reactor Pressure Vessel (RPV) water level specified than the PSTG Caution #6, because the EOP was revised after an evaluation identified that the drywell temperature referenced in the PSTG was incorrect.

b. F-EOP-2, "RPV Control (Boron Injection Not Required)," specified 335 psig for the high/intermediate RPV pressure region vice 300 psig as specified in PSTG Contingency C1-2, because the EOP was revised after the PSTG was developed.

c. F-EOP-4, "Primary Containment Control," step 2.3 indicated that the suppression pool scram temperature is 100 degrees F vice 110 degrees F as specified in PSTG SP/T-3 due to a typographical error.

d. F-EOP-5, "Secondary Containment Control," Table F-EOP-5.1 listed different instruments and setpoints than specified in PSTG Table 1, because subsequent plant modifications were not incorporated into the PSTGs.

e. F-EOP-5, "Secondary Containment Control," did not have an entry condition for Unit Cooler Temperature above 104 degrees F as specified in the secondary containment control guidelines of the PSTG, because subsequent plant modifications were not incorporated into the PSTG.

f. F-EOP-7, "RPV Flooding," did not utilize the Residual Heat Removal (RHR) Keep Fill System to maintain RPV water level as specified in PSTG C6-4, because the Keep Fill System had not been made operable at JAFNPP.

3.3 Calculation Review

Specific values from the EOPs were selected for review to determine if the values were correctly calculated based on the plant specific differences and the guidance of the EPGs. The team identified that the calculations were clear, orderly and performed in accordance with the guidance of the EPGs. Any deviations were noted and substantiated. The calculations were observed to include values for each of the cautions, steps and curves. However, as noted in Section 3.a, the calculations have not been controlled as a plant basis document in accordance with the requirements and guidance of NUREG-0899. The following calculations were reviewed:

a. Hot Shutdown Boron Weight - This calculation was performed to support the values incorporated as part of F-EOP-3, "RPV Control," and documented in Section 24, Appendix C, page C24-1 of the EPG Calculations.

b. Minimum Alternate RPV Flooding Pressure - This calculation was performed to support the values incorporated as part of F-EOP-3, "RPV Control (Boron Injection Required)," and F-EOP-7, "RPV Flooding," and documented in Section 21, Appendix C, page C21-1 of the EPG Calculations.

c. Suppression Pool Load Limit - This calculation was performed to support the values incorporated as part of F-EOP-2, "RPV Control (Boron Injection Not Required)," F-EOP-3, "RPV Control (Boron Injection Required)," and F-EOP-4, "Primary Containment Control," and documented in Section 4, Appendix C, page C4-1 of the EPG Calculations.

d. Heat Capacity Temperature Limit for the Suppression Pool - This calculation was performed to support the values incorporated as part of F-EOP-4, "Primary Containment Control," and documented in Section 3.3, Appendix C, page C3-1 of the EPG Calculations.

e. Maximum Drywell Spray Flow Rate Limit - This calculation was performed to ensure that the evaporative cooling pressure drop was less than t permissible design to support a drywell spray flow rate of 10,000 gallons per minute.

f. Drywell Spray Initiation Limit - This curve was developed to determine the pressure limit when spraying at the maximum drywell spray flow rate to ensure that the reactor building to containment design negative pressure differential limit is not exceeded by initiation of drywell or wetwell sprays.

g. Maximum Primary Containment Water Level Limit - This calculation determined that the maximum containment water level was based on the highest primary containment vent elevation as opposed to the design hydrostatic loading at the most limiting containment location.

4. PLANT WALKDOWNS

In order to assure that the EOPs can be successfully accomplished, the team performed in-plant walkdowns for all the EOPs and referenced AOPs. The team verified that EOP instrument and control designations were consistent with the installed equipment and that indicators, annunciators, and controls referenced by the EOPs were available to the operators. The location and control of EOPs in the Control Room was verified. With the assistance of licensed operators, the team physically verified that activities which would occur outside of the Control Room during an accident scenario could be physically accomplished and that tools, jumpers, and test equipment were available to the operators. The post accident radiation survey map was reviewed to ensure that remote operations were not prohibited by environmental conditions. The procedures reviewed are listed in Section 10.2.

During the performance of the plant walkdowns, the team identified a specific strength in that, general area and equipment cleanliness was exceptional. The plant walkdowns also identified several discrepancies which are broken down into the following six areas.

a. EOP Entry Conditions

The team reviewed the entry conditions and associated instrumentation for F-EOP-4, "Primary Containment Control," and identified the following methods for determining suppression pool water level in the control room:

1. Utilizing the Safety Parameter Display System (SPDS) which indicates 13.95 feet normal torus water level at 100% power.

2. Utilizing the plant process computer which indicates level in Wide Range (+72 in to -72 in) and Narrow Range (+6 in to -6 in).

3. Utilizing instruments at Main Control Board Panel 09-3, which indicates approximately 14 feet normal torus water level at 100% power.

The team noted that a narrow range level instrument which was not referenced by the EOP was available on Standby Gas Treatment System Panel 09-75, which is located in the back of the control room. However an audible local or control room supervisory alarm was not available.

As a result of the review, the team identified that if the SPDS were not available as inferred by NUREG-0737, Item 4.1.c, the operator's ability to identify entry conditions would be hampered because the plant process computer alarm setpoints were +2.5 and -2.5 inches vice the EOP entry conditions of 0.0 and -1.5 inches. The team also noted that EOP-4, "Primary Containment Control," Section A, Item 6 listed drywell average temperature above 135 degrees F as a condition for entry into the EOP. Again, if the SPDS were not available as NUREG-0737 Item 4.1.c infers, the operator's ability to detect EOP entry conditions would be hampered because the alarm setpoints for plant process computer points M085 and M086 were 65 degrees F above the EOP entry condition of 135 degrees F (i.e. 200 degrees F) and the 09-75 Panel did not have a audible local alarm or a supervisory alarm in the control room. Further action is necessary to revise the computer alarm setpoints to values which support the EOP entry conditions.

In addition, the team identified a human engineering deficiency which had the potential for operator confusion with respect to the indication of torus water level. Technical Specifications 3.7.A.1.a and 3.7.A.1.b specify maximum and minimum vent submergence levels of 53 and 51.5 inches respectively as the Limiting Conditions for Operation (LCO). However, the EOP entry conditions were specified as 0.0 and -1.5 inches. Although engineering correlation exists between the TS LCO (53.0 to 51.5 inches) and the parameters monitored by the plant process computer and Panel 09-75 (0.0 to -1.5 inches) and SPDS (13.95 feet), the indication of torus water level in different units and methods is confusing. Interviews with operating staff confirmed that the correlation was not immediately apparent. The licensee has indicated that this deficiency will be resolved with the implementation of Revision 4 of the EPGs at which time all references to torus water level will be in feet of water in the torus. Additional action is necessary in the interim to ensure that operator confusion does not exist.

The team attempted to determine whether inadequacies in the licensee's program of EOP validation may have contributed to the above discrepancy related to the torus water level. The plant specific validation of the JAFNPP EOPs was performed in December 1984 by a shift supervisor in the control room. The validation criteria of F-AP-2.2, "Procedures for Emergency Operating Procedures," Appendix D, "EOP Validation Checklist," were used to perform the validation. The completed checklist included reference to the inconsistencies concerning the suppression pool level instrumentation, however objective evidence in the form of written resolution to the validation comment was not available in the licensee's records. The team determined that validation comments of a typographical nature were incorporated into the EOPs; however, the resolution of comments requiring engineering resolutions was not apparent. Future action is necessary to resolve this discrepancy as well as any other unresolved validation comments.

b. <u>Lack of Equipment or Information which could Affect Performance of the Procedure</u>

F-EOP-4, "Primary Containment Control," Step 4.7, required the operators to vent the containment in accordance with F-AOP-35, "Post Accident Venting of Containment," to maintain pressure below the limits of Figures F-EOP-4.6a and F-EOP-4.6b. The curves were specifically applicable to pressure instruments MENSOR 16-1-PIT-104 and 27-PT-101A/B respectively. Figure F-EOP-4.6a was not provided in Procedure F-AOP-35. Therefore, the possibility for operator confusion existed, in that both pressure instruments and their respective figures were not provided for use in F-AOP-35. The licensee indicated that F-AOP-35 will be modified to control containment pressure using MENSOR 16-1-PIT-104.

During the walkdown of F-AOP-34, "Alternate Control Rod Insertion," the team identified that tool cabinets containing the tools and equipment required to perform the control rod withdraw line venting portion of the procedure did not contain the necessary equipment for handling the venting components in the anticipated accident environment. Alternate control rod insertion is accomplished by venting the Hydraulic Control Unit (HCU) vent valves with a flexible stainless steel hose. Venting even relatively small flow rates of high temperature primary water would result in a dangerous two-phase steam-water mixture through the flexible hose. A caution in the procedure did not appear adequate in view of the potential adverse impact on the performance of the procedure. As a result of this concern, the licensee took immediate action to provide safety equipment (i.e. welder's gloves) in the cabinets. The team also identified that the venting procedure directed the flexible hose discharge to a floor drain and that no provision existed for securing the discharge end of the hose against the reaction loading during venting. The licensee indicated that a modification has been initiated to fabricate and install permanent drain connections for this vent procedure.

During the walkdown of F-AOP-43, "Plant Shutdown From Outside the Control Room," a potential deficiency in the performance of the procedure was identified, in that a delay was experienced when the remote shutdown panel could not be opened using the on-shift key ring. Subsequent investigation identified that the necessary key was in the previously opened, staged equipment box. The inspection team questioned the benefit of using a separate key for the remote shutdown panel, in that no additional protection is provided and the potential for confusion is increased. Further licensee action is necessary to resolve this deficiency.

F-AOP-43, also required the operation of various Emergency Diesel Generator (EDG) controls. Step D.2.2, which required the verification of control power availability by checking the indicator lights, did not indicate which lights would be energized to indicate that control power was available to the EDG synchronization circuits. The location of the indicating lights was not apparent and should be clarified to prevent confusion.

c. Uncontrolled Operator Aids

As a result of verifying that operator aids posted on plant instrumentation and control panels were the latest revision and administratively controlled, the team identified that Operations Department Standing Order No. 21, "Posting of Operator Aids," paragraph 7.7, required an annual review of all operator aids. The licensee was unable to demonstrate that this review had been performed in 1987 and 1988 and as corrective action initiated an immediate verification. As a result of this verification, six operator aids were identified which required revision. None of these aids could have resulted in performing the EOP actions incorrectly. The licensee indicated that the audit of operator aids will be incorporated into a new surveillance procedure to ensure the audit is accomplished as required.

d. Referencing Errors in Procedures

The following discrepancies in referencing were identified during the review and walkdown of the EOPs. Based on a review of the context and effect of these deficiencies, the team concluded that their effect on the ability to adequately perform the EOPs was minor.

1. F-EOP-5, "Secondary Containment Control," Table F-EOP-5.1, incorrectly identified area temperature instruments, 23-MTU-202A and 23-MTU-202B (located at Panels 09-95 and 09-96 in the Reactor Building) as 23-MTU-201C and 23-MTU-201D.

2. F-AOP-15, "Recovery from an Isolation," Paragraph I.C.2, incorrectly identified the location of alarming Reactor Building radiation monitors as Panel 09-12. The correct location for the alarming function is Panel 09-3.

3. F-AOP-36, "Stuck Open Relief Valve (SORV)," Paragraph A.6, incorrectly indicated in the last parenthetical note that the symptoms of a stuck open relief valve are four energized solenoid indicating lights. A single energized indicating light is the correct symptom.

4. F-EOP-4,"Primary Containment Control," Step 5.2, incorrectly referred to F-EOP-2, "RPV Control (Boron Injection Not Required)," Step 4 for emergency depressurization. The correct reference is Step 4.8 and 4.9. A similar reference occurred in Step 5.3.1 of F-EOP-4.

5. F-EOP-2, "RPV Control (Boron Injection Not Required)," Table F-EOP-2.1, incorrectly referenced step 4 in the third action item under pressure high / level decreasing. The correct reference is to Steps 4.8 and 4.9. A similar reference existed for the fourth action item in the same section of Table F-EOP-2.1, in that the reference should hve been to Steps 4.6 and 4.7 vice Step 4.

e. Incorrect/Inadequate Labelling

The following minor examples of incorrect or inadequate labelling were identified. The team concluded that these examples did not adversely affect the performance of the EOPs.

1. F-AOP-36, "Stuck Open Relief Valve (SORV)," required the removal of fuses at Panel 09-47 in the Relay Room. Four fuses were not labelled and eight fuses were labelled with temporary marking (i.e. Dynotape). The licensee indicated that the fuse location prevents permanent marking of the fuses and that further action would be taken to remove the temporary markings and ensure that the fuses are adequately identified by an operator aid.

2. F-OP-37, "Nitrogen Ventilation and Purge; Containment Atmosphere Dilution (CAD); Containment Vacuum Relief and Containment Differential Pressure Systems," Section G.1.b.4, required operation of the 27-MOV-121 valve on Panel 27PCP in the Relay Room. The valve switch was labeled, "Bypass Valve", however the correct name is "Purge Exhaust Fan Bypass Valve."

3. Several additional minor examples of informal marking (i.e. use of black markers) and temporary labelling (i.e. adhesive labels) were identified during the plant walkdowns. The team observed that specific actions have been undertaken to upgrade the equipment labelling throughout the plant. Although no examples were identified which would prevent the procedures from being accurately performed, further actions are necessary to upgrade the labelling of instruments and components. In particular, the Hydraulic Control Unit (HCU) vent valves used in F-AOP-34, "Alternate Control Rod Insertion," should be permanently labelled. These valves were identified with temporary marking (i.e. magic markers).

5. EOP SIMULATION USING CONTROL ROOM MOCK-UP

To ensure that the EOPs could be correctly implemented under emergency conditions, two accident scenarios were developed and conducted in a 6-hour session utilizing licensed operators. The accident scenarios were accomplished to determine whether the EOPs provide the operators with sufficient guidance such that their required actions during an emergency were clearly outlined; to verify whether the EOPs could cause the operators to physically interfere with each other; to verify that the procedures did not duplicate operator actions unless required; and to verify that transitions from one EOP to another or to other procedures were accomplished satisfactorily.

a. Control Room Mock-Up

Because JAFNPP does not have a site specific simulator and the plant was operating at full power thereby making extensive control room access difficult, a full scale photographic mock-up of the control room was utilized for the scenario. To ensure a realistic test of the EOPs using the control room mock-up, the following provisions were verified:

1. The photographic reproduction replicated the actual control room with enough fidelity so as not to cause confusion or detract measurably from the ability of the operating crew. To ensure fidelity, the mock-up was examined by the team and the licensee. Although minor differences were identified, the team concluded that the simulation would not be excessively impaired.

2. Realistic scenarios which preserved a true time line were required to be developed and executed in a believable manner. The licensee supported these efforts by providing a reactor analyst who assisted the NRC operator examiner to produce two scenarios based on an integrated analysis of computer generated transients. The time response of the reactor, primary, and secondary parameters were carefully followed. The scenarios were then examined by the licensee's training staff to confirm the adequacy and accuracy of the

system responses. To implement and control the scenario, a certified training staff member and the NRC operator examiner functioned as controllers, providing data input as required by the operators in accordance with the timed and scripted accident scenarios.

3. Licensed operators were required to simulate actions and responses based on inputs from the controllers. The shift crew was requested and fully supported the mock-up requirements to simulate obtaining data from the appropriate instrumentation and locations. Three NRC team members were used to monitor the operators' response and implementation of the EOPs. Based on the operators' actions and the team's review, the use of the mock-up was determined to be a adequate simulation for performance evaluation of the EOPs.

b. Scenario Description

The team developed two simulated accident scenarios. Both were selected to exercise parallel EOP paths and contingency procedures, with a special emphasis on reaching and utilizing the containment venting procedure. The specific paths were designed to invoke PRA-based risk significant operator actions as a means to demonstrate EOP adequacy.

The first scenario involved the loss of the main condenser with an anticipated transient without scram (ATWS) and delayed Standby Liquid Control System (SLC) actuation. The transient was initiated with an unrecoverable failure of the main condenser. The ATWS condition was then required to develop sufficient internal energy in the primary to produce a containment venting situation later in the scenario. The workability of the text-type EOPs in a multiple path sequence was demonstrated by requiring the operators to simultaneously follow F-EOP-2, "Reactor Pressure Vessel (RPV) Control," for reactor power, reactor pressure, and reactor level control. As alternate rod insertion techniques were being pursued, primary containment procedures and later SLC injection (with SQUIB valve failure) were entered due to increases in torus temperature. Power control with vessel level was then utilized to minimize power while alternate SLC injection methods were tried. On approaching the containment venting pressure, alternate rod insertion (withdraw line venting) and CRD boron injection were successfully implemented to allow reactor shutdown and plant recovery. Following containment venting, shutdown cooling was established and the scenario was terminated.

The second scenario involved an unisolable LOCA in the Secondary Containment. This sequence postulated that the inboard isolation valve in the secondary containment portion of the Reactor Water Cleanup (RWCU) system failed to close. No alarms sounded initially, but parametric values indicative of a 0.1 square foot breach of the primary system were given to the operators. This condition was intended to initiate a problem solving mode (i.e. an event based evolution) prior to any EOP entry condition. Area high temperature, and high radiation alarms were used to establish secondary containment and radiation control EOP entry with Emergency Plan actions. Secondary containment conditions were severe enough that emergency depressurization was required to minimize the radioactive release. Rapid plant shutdown and cooldown proceeded with all plant components operating normally.

c. Observations and Conclusions

The operators' cooperation under the difficult simulation circumstances involving the control room mock-up was excellent. Communications between crew members during the evolution were clear, and overall response to the scenario situations resulted in moving through a very complex scenario without any significant procedural errors. The scenario timeline was maintained with a deviation of less than five minutes at the one hour point, which resulted in a realistic event sequence. Under these real time conditions, the useability of the EOPs was demonstrated to be satisfactory. The shift from event based (i.e. abnormal operating parameters) to condition based EOPs in the second scenario was made smoothly, completely and without hesitation, as was the transition from secondary containment control to the emergency depressurization sequence. Although no significant procedural errors were evident, the following concerns were identified by the team.

1. Placekeeping Method - The team was concerned with the method utilized for placekeeping during the performance of the EOPs. The operators used multiple loose leaf copies of the procedures to follow the multiple paths required. Through direct observation and interviews, the team determined that loose leaf procedures would not be used in the control room. The control room copies are of a "lay flat" design and two copies of the EOPs are maintained to support multiple entry conditions. Although the operators did not lose their place in the procedure during either scenario, the team was concerned that the Plant Specific Writer's Guide, Operating Department Standing Orders, operator training and the EOPs themselves did not provide or support a preferred method of placekeeping. Further action should be taken to evaluate and identify a preferred method of placekeeping. This method should be procedurally supported and trained on a periodic basis.

2. Use of Cautions - The team was concerned that at no time during the performance of the scenario were the operators observed to review F-EOP-1, "EOP Cautions." This EOP contained 23 Cautions, which were referenced throughout the EOPs. Specific reference to these cautions were made by numeric and abbreviated reference. Although none of the specific requirements of this EOP were violated or overlooked during the scenario demonstrations, the team remained concerned that the collection of all cautions into one location outside the normally performed flow path of the EOPs could result in overlooking a significant caution.

3. Minimum Shift Staffing - Communications outside the control room (dispatcher, plant management, NRC, and Emergency Plan notifications) were not simulated in the first scenario due to the circumstances of the control room mock-up. Communications were adequately simulated in the second scenario, and crew communication was excellent. The Emergency Plan was not available at the simulator, but was called for by the operators. The EOP simulation demonstrated that the minimum shift crew could implement all steps of the EOPs. However, the team was concerned that sufficient control room personnel might not be available to concurrently perform all required actions, including

implementation of the Emergency Plan and activation of the Fire Brigade.

The operators confirmed that their first responsibility was to perform the EOPs and that additional actions would be required to be performed by personnel not specified in the minimum shift crew (i.e. security guards). In addition, the operator interviews (discussed in Section 6.2.a) indicated that the operators believed that the present staffing levels were adequate. The team remained concerned that all actions required to be performed in an emergency would not be able to be accomplished by the minimum shift crew defined in Technical Specifications. Further licensee and NRC action is required to resolve this concern.

6. HUMAN FACTORS REVIEW AND INTERVIEWS

In order to determine the adequacy of the EOPs with respect to the guidance provided in NUREG-0899, "Guidelines for the Preparation of the Emergency Operating Procedures," a review of the Plant Specific Writer's Guide (PSWG) and the EOPs was performed to determine the extent to which the PSWG has been implemented. In addition, structured interviews were conducted with relevant JAFNPP personnel. The results of these efforts are detailed below.

6.1 Writer's Guide Implementation

Administrative Procedure F-AP-2.2, "Writer's Guide," was reviewed to ensure that the human factor's guidance provided was incorporated during the development of the EOPs. Two specific strengths and four weaknesses were noted:

a. Paragraph 4.3, page 27, provided concise, distinctive specifications for the content of Cautions and Notes which was similar to the guidance of paragraph 5.7.9 of NUREG-0899. This application of human factors principles was used by JAFNPP to transform Cautions #4, 5 and 10 of the EPGs into either Notes or Action statements in the EOPs. This reduction in the total number of cautions creates a reduction in the operator's burden and is considered an improvement in the clarity of the EOPs.

b. The use of miniature figures within the body of the EOPs was identified as an innovative method to minimize branching outside the procedure without reducing the technical adequacy of the references. As identified in Section 6.2.e, the operator interviews confirmed that whenever extrapolations were required, the full sized figures attached to the EOPs were used.

c. JAFNPP's response to comment B.1 of the Interim Safety Evaluation dated September 11, 1985 states that an action step will be completed on the page where it begins. A review of the EOPs identified that operator action statements were often continued from one page to another with no consistency in format. This practice sometimes resulted in part of a logic statement on the first page and the remainder on the second page. For example, F-EOP-4, step 4.4 (pages 21-23), step 4.6 (pages 23-25) and step 5.3.1 (pages 31-35) each contained examples of three different formats. Based on the response to the safety evaluation and the operator concerns regarding continuity and placekeeping identified in Section

6.2.g, the Writer's Guide should be revised to provide a human factored format for the continuation of action statements to the following page when completion of the action statement on the first page is not possible. In addition, the incorrect response to the SER comment should be identified and resolved.

d. Paragraph 4.8, page 29, specified that capitalization will be used for emphasis in specified instances. A review of the EOPs indicated that the term "upper case type" is probably meant instead of "capitalization" in the Writer's Guide and only the action statements within the contingency statements were to be in upper case type. The Writer's Guide should be clarified to provide consistent guidance. In addition, Caution No. 22 of F-EOP-1, "EOP Cautions," should be changed to conform to the requirements of paragraphs 4.2 and 4.8, such that the "if" logic term is in upper case and is located at the beginning of the logical condition.

e. Paragraph 4.6, page 28, concerning the referencing and branching to other procedures or steps, provided no guidance as to how referencing or branching to Abnormal Operating Procedures (AOPs) or Operating Procedures (OPs) should be handled. The review of the EOPs identified that the practice utilized within the EOPs was not consistent, in that the AOPs or OPs were not always referenced by both procedure number and name. NUREG-0899, paragraph 5.2.2 indicates that the specific system procedures should be referenced in the EOPs.

f. Paragraph 4.7, page 28, indicated that the equipment names referenced in the EOPs may not always match the engraved names on the panels, but will be complete and in operator language. Although there were several minor examples identified during the plant walkdowns in which equipment names did not match their labels, on-going labelling efforts, identified in Section 4.e, are anticipated to correct this discrepancy. Further action should be taken to revise the Writer's Guide to reflect the current labelling philosophy.

6.2 Operator Interviews

Interviews were conducted by the human factors member of the team with individual members of the plant staff as classified below:

Job Classification (License)	Number
Shift Supervisors (SRO)	2
Asst. Shift Supervisors (SRO)	3
Senior Nuclear Operators (RO)	1
Nuclear Control Operator (RO)	1
Auxiliary Operator (unlicensed)	1
Training Coordinator (SRO certified)	1

A four page interview guide with 8 major topics was used for each interview and was reviewed by both parties. Discussions were open-ended, in that the licensee representative was encouraged to volunteer comments which were relevant. Each person was advised that the objective of the interview was to develop information on the effectiveness of the EOPs and not to examine the qualifications of the individual. The length of the individual interviews were approximately one hour. Two major changes were in progress at JAFNPP which the operators anticipate will have a positive impact on the effectiveness of the EOPs. The first is the start-up of a site specific training simulator late in 1988 and the second is the change to a flow chart EOP format in 1989. However, the interviews were confined to the context of the presently implemented EOPs. The results of this process are identified below.

a. Role/Task Definition - There was an established, uniform practice for the conduct of plant operations during the execution of EOPs. These operations were governed by Operations Department Standing Order No. 2, "Operating Principles and Philosophy," and further developed during control room crew team training during simulator and on-the-job training (OJT). Effective execution of the EOPs was also aided by crew stability (typically crew membership has been the same for 3 years) and by a recently initiated training program on effective oral communications. The control room task assignments were well defined. The consensus of opinions was that the current control room staffing level achieved the proper balance between assuring adequate staffing and avoiding confusion. At JAFNPP an off duty control room crew was assigned to "standby" and may be called to the site upon the declaration of an Unusual Event. However the availability of off duty personnel does not resolve the team's concern with the minimum shift crew manning as discussed in Section 5.c.3.

b. Use of EOPs - The control room resources for use of the EOPs were considered adequate. Two sets of EOPs were kept in the control room. A space was assigned for the lay-down of the "open-fl EOP manuals. A cart was provided for abnormal and normal operating procedures, Technical Specifications, Emergency Plan, etc.

c. Technical Adequacy - Concerns were expressed about the ability to reliably execute, under accident conditions, Step 5.2 of F-EOP-4, "Primary Containment Control," which required the combined use of Figure F-EOP-4.1, "Heat Capacity Temperature Limit," and Figure F-EOP-4.7, "Heat Capacity Level Limit." There was no explicit direction in Step 5.2, or in the EOPs overall, as to how to obtain the value of the abscissa for Figure F-EOP-4.7. Paragraphs 5.6.9 and 5.7.8 of NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures," provide guidance which suggests that step-by-step direction should be added to F-EOP-4, Step 5.2, for the proper combined use of the two curves. This direction would improve the human reliability associated with the operation of the safety systems affected by Step 5.2.

   Concerns were expressed about the ability within the time available to bypass the low RPV water level Main Steam Isolation Valve (MSIV) isolation interlocks in accordance with F-AOP-38, "EOP Isolation/Interlock Overrides," when directed by step 2.2.2 of F-EOP-3, " RPV Control (Boron Injection Required)." The operators suggested that F-EOP-3, "RPV Control (Boron Injection Required)," should specify controlling RPV water level at a control point above the automatic MSIV isolation setpoint to prevent unnecessary isolation of the RPV (and loss of the ultimate heat sink) during the installation of override jumpers.

d. Use of Cautions - The responses of the persons interviewed indicated that the first three cautions of F-EOP-1, "EOP Cautions," were not readily recalled and were therefore not fulfilling their intended function. F-EOP-1, contained all cautions applicable directly to the EOPs. The cautions were listed by serial number and consisted of a title and text. Numbers and titles of the cautions were used throughout the EOPs when reference to the specific caution was required, however the first three cautions were applicable to all EOPs and were consequently not referenced within the texts of other EOPs. These cautions required the operators to monitor overall plant conditions, monitor multiple indications and to confirm safety functions of automatic equipment. This concern is not to state that the requirements of the cautions would not be applied by the operators in the performance of the EOPs, however the effectiveness of the use of a separate volume of cautions (as discussed in Section 5.b.2) is questionable.

The effectiveness of the EOP Cautions would be enhanced if the texts on some of the associated figures were more explicit. For example, label the cross-hatched areas as "Prohibited Region," or label the figures associated with Caution # 8 with a directly worded caution such as "Do not operate pumps unless..." instead of the non-specific, "Observe NPSH Limits...".

There was a general concern among the operators over the number of cautions. The PSTGs must be observed with respect to the incorporation of technical restrictions into the EOPs, however application of human factors guidelines has reduced the burden on the operator of several technical restrictions (as discussed in Section 6.1). As previously identified, Cautions # 4, 5 and 10 of the EPGs were not incorporated as caution statements into the EOPs because they did not meet the criteria for cautions in NUREG-0899, paragraph 5.7.9. Similar further application of the criteria of accuracy, conciseness, and consistency, could reduce the impact of a large number of cautions.

e. Miniature Figures - The interviews confirmed that the use of Miniature Figures within the EOPs were used by the operators to the extent that the figures can be safely interpreted. If the small size of the figures caused any doubt, the full size figures of the EOPs were used. The miniature figures did not appear to create any additional possible error mechanism and the operators considered them useful aids.

f. Need for a Basis Document - The interviews identified the operator's desire to add the basis for the operating limits of the EOPs into the procedures. Although the addition of this information would generally interfere with the clarity of the operating instructions and is therefore not recommended, the need for this information in some form is apparent. The basis of the operating limits were supported by operator training, however the identification of a need for a "basis document" underscores the requirements (identified in Section 3.a) for a reference document which is traceable and maintained up-to-date.

g. Transitions and Placekeeping Methods - The interviews indicated that the method of handling transitions within the EOPs as well as place-keeping within the EOPs and the reliability of the methods utilized has been receiving considerable attention by the JAFNPP staff. A standard method of placekeeping has not been developed or trained. Each crew was free to implement its own method of placekeeping. The use of separate binders and color coding of the EOPs, as well as the "lay flat" capability were the operator aids in use. Based on the suggestions for additional methods, the activity involved to improve this ability, and the concerns identified in Section 5.c.1, further consideration should be given to revising the EOPs to include support for check-off spaces and the adoption of a practice of writing directly in the action copy of the EOPs.

h. Communication - The interviews indicated that the present communications methods were adequate both within the control room and to the local stations, but that a recent program for improving communications was appropriate and productive. Expectations for improvements in communications training due to the use of the site specific simulator were also noted.

i. Control Room Environment - The interviews identified that the provisions for lighting within the control room and at local stations in the event of a station blackout and the provisions for control room habitability in the event of an on-site radiation release or in the event of smoke or toxic gasses in the control room have been difficult to incorporate into OJT training and that further training with the site specific simulator should be pursued.

j. Balance of Plant/Local Control Stations - The interviews identified the use of an "operator aids" program which produced validation and improvement of the human factors at local stations including significant efforts to upgrade the labelling of components. In summary, the implementation of EOP operations at local control stations was considered adequate.

k. Validation and Verification - The interviews indicated that the operators were included to a limited extent in the process of developing, verifying, and validating the EOPs. Operators were aware that there was a procedure for initiating suggested upgrades to the EOPs and that training exercises were expected to help identify possible discrepancies. However, operators were unclear as to their personal responsibilities for initiating resolutions of possible discrepancies as evidenced by several instances in which potential discrepancies identified by the operators in the interview had not been formally identified by the operator for resolution. Further action is necessary to clarify the operator's role in EOP upgrades.

7. CONTAINMENT VENTING

The team reviewed the EPGs and the Appendix C, Calculation Procedure No. 14, "Primary Containment Pressure Limit," to determine if the PSTG values were computed correctly. The team also reviewed the method, flow path, and feasibility of the containment venting procedure.

The attributes of the vent paths are detailed in Calculation Procedure No. 14, "Primary Containment Pressure Limit," and are summarized as follows:

Suppression Chamber Vent Paths

Path	A(vi)	P(oi)	P(ci)	E(vi)
27-AOV-117,118	0.736	79.3	79.3	29.5
27-MOV-117,123	0.021	56.0	56.0	29.5

Drywell Vent Paths

Path	A(vi)	P(oi)	P(ci)	E(vi)
27-AOV-113,114	0.697	9.2	9.2	105
27-MOV-113,122	0.021	56.0	56.0	105

A(vi) - Minimum vent path area (ft^2)
P(oi) - Maximum containment pressure the vent valve can open against (psi)
P(ci) - Maximum containment pressure the vent valve can close against (psi)
E(vi) - Elevation of the vent path containment penetration referenced to torus bottom (ft)

From the above information, JAFNPP determined that the suppression chamber vent path via AOV-117 and AOV-118, is the only path capable of operating at the design pressure of the containment and meeting the criteria of removing decay heat.

Venting of the containment was controlled by F-AOP-35, "Post Accident Venting of the Primary Containment." Two flow paths are possible: a small bore path and a large bore path. Containment venting would be initiated via the small bore path, and if not effective in restoring pressure to less than the limit, venting would be continued through the large bore path. The initial path is via valves MOV-117, MOV-123 and MOV-121. Due to piping and valve size and a flow restricter between valves MOV-117 and MOV-123, this flow path will not control the containment pressure under accident conditions.

The large bore path is via valves AOV-117, AOV-118, and MOV-120. Valves AOV-117 and AOV-118 are 20 inch valves that discharge to a 30 inch carbon steel header. Valves MOV-121 and MOV-120 are 6 inch and 12 inch valves respectively which discharge in parallel through a 24 inch carbon steel header to one of two Standby Gas Treatment System (SBGT) trains. The SBGT trains are tested at 1 psig, and have a working pressure of 0.5 psig. The vent path starts near the top of the torus. When torus level increases to 29.5 feet, the vent path becomes unusable due to flooding. An alternate path from the drywell air space is not available under high pressure conditions because isolation valves in potential vent paths are not able to be stroked (closed) under high differential pressure conditions.

The team confirmed that Figure F-EOP-4.6, "Primary Containment Pressure Limits," was a result of considering the maximum constant pressure condition during the air purge and during the steam vent. During air purge, constant pressure is the result of volumetric air flow out of the vent being equal to the volumetric addition of steam generated by decay heat. During the steam vent, the steady-state condition exists where energy out of the vent is equal to energy generated by decay heat. The limiting structural component in the primary containment is the 48 inch manway to the torus. For any conditions of vacuum that may develop in the torus or drywell, vacuum breakers are provided between the torus and the drywell and between the torus and the reactor building.

Calculations were not included as part of the EPG calculations to determine the pressure which the SBGT system would be subjected to under venting conditions. The SBGT filter units are located in an enclosure adjacent to the reactor building and isolated from the environment by a non-seismically qualified door with ventilation louvers. Without further procedural precautions or hardware modifications, it is possible that the SBGT train would rupture due to the high pressure steam being vented. In the event of a failure, the vent path would then release into the environment via this unmonitored path through the SBGT room. Further evaluation is required to ensure that the SBGT train is not anticipated to rupture under the postulated pressures and temperatures associated with the containment venting sequence.

The vent paths discussed above pass through readily accessible portions of the secondary containment. Although venting would result in increased radiation levels, the team concluded that the operators could carry out other duties simultaneously with venting.

F-AOP-35 would be clearly implemented by control room operators without further direction after the accident mitigation strategies of the EOPs have failed. The operators were directed by the procedure to vent, "...irrespective of radioactive release." Appropriate cautions were included concerning implementation of the Emergency Plan and Dose Assessment. The team identified one concern with the implementation of the containment venting procedures, in that a Special Procedure, F-SP-02, "Post LOCA Venting of Containment & Operation of the Main Steam Leakage Collection System," was identified to be an active plant procedure. The vent paths described in F-SP-02 were identical to those specified in F-AOP-35, however the initiation pressure for containment venting was approximately 45 psig lower than the pressure specified in F-AOP-35. The licensee indicated that the containment venting portion of this procedure was based on old event-based operating procedures and was inadvertently issued during the last revision of the section applicable to the operation of the Main Steam Leakage Collection System. During the inspection period, F-SP-02 was withdrawn and revised to remove the non-applicable portions of containment venting.

8. ON-GOING EVALUATION OF EOPs

NUREG-0899 Paragraph 6.2.3, indicates that licensees should establish a program for on-going evaluation of the EOPs. This program should include: evaluations of the technical adequacy of the EOPs in light of operational experience and use, training experience, and any simulator exercises and control room walk-throughs; evaluation of the organization, format, style and content as a result of using the procedures during operations, training, simulator exercises, and walk-throughs; and evaluation of staffing and staff qualifications relevant to using the EOPs.

The team reviewed the Administrative Procedures which control the use of procedures at JAFNPP. F-AP-1.4, "Control of Plant Procedures," established the requirements for initiation, review, approval, revision, temporary change, withdrawal, and control of procedures and was applicable to all operational procedures. F-AP-1.2, "Plant Operating Review Committee," specified a schedule for periodic review of procedures, which included a biennial review of EOPs. Plant Standing Order No. 28, described the procedure by which internally and externally generated operating experience is evaluated, reviewed and, if necessary, incorporated into plant procedures or design changes. Although each of these programs or procedures was considered to be applicable to the EOPs, a specific program for the on-going evaluation of the EOPs did not exist. As a future upgrade of the EOPs, the licensee is in the process of upgrading the EOPs to Revision 4 of the Vendor's EPGs and has scheduled verification and implementation of flow chart EOPs by July 1989.

9. EXIT MEETING

The inspection team conducted an exit meeting on June 3, 1988, with licensee management to identify the inspection findings and provide the licensee with an opportunity to question the observations. The scope of the inspection was discussed and the licensee was informe' of the conclusions identified in the course of the inspection. Mr. C. J. Haughney, Branch Chief, Special Inspections Branch, NRR, and Mr. Jon Johnson, Section Chief, Division of Reactor Projects, Region I represented NRC management at the final exit meeting.

10. REFERENCES

10.1 Personnel Contacted

A large number of personnel were contacted during the inspection. The following is a list of the JAFNPP personnel involved:

*R. Converse, Resident Manager
*W. Fernandez, Superintendent of Power
*D. Lindsey, Operations Superintendent
*D. Burch, Reactor Analyst Supervisor
*R. Patch, Quality Assurance Superintendent
*V. Walz, Technical Services Superintendent
*D. Simpson, Training Superintendent
*J. Catella, Nuclear Training Manager
P. Brozenich, Shift Supervisor
R. Pike, Asst. Shift Supervisor
G. Davis, Reactor Operator
L. Shaffer, Reactor Operator
G. Fronk, Training Department
D. Johnson, Waste Management General Supervisor
J. Lazarus, Assoc. Plant Engineer
K. Moody, Plant Engineer
D. Ruddy, Plant Engineer Supervisor
G. Tasick, Quality Assurance Supervisor
B. Robinson, Quality Assurance Engineer
J. Prokop Jr.,Quality Assurance Engineer
D. Squires, Shift Supervisor

R. Thomas, Assistant Shift Supervisor
W. Hendricks, Reactor Operator

* Denotes those present at the Exit Meeting on June 3, 1988.

10.2 Procedures Reviewed

F-EOP-1, "EOP Cautions," Revision 3
F-EOP-2, "RPV Control (Boron Injection Not Required)," Revision 1
F-EOP-3, "RPV Control (Boron Injection Required)," Revision 1
F-EOP-4, "Primary Containment Control," Revision 1
F-EOP-5, "Secondary Containment Control," Revision 1
F-EOP-6, "Radioactivity Release Control," Revision 1
F-EOP-7, "RPV Flooding," Revision 1
F-AP-1.4, "Control of Plant Procedures," Revision 7
F-AOP-15, "Recovery from an Isolation," Revision 9
F-AOP-33, "Alternate Shutdown Cooling," Revision 0
F-AOP-34, "Alternate Control Rod Insertion," Revision 0
F-AOP-35, "Post Accident Venting of the Primary Containment," Revision 0
F-AOP-36, "Stuck Open Relief Valve," Revision 3
F-AOP-37, "Boron Injection Using the CRD System," Revision 0
F-AOP-38, "EOP Isolation/Interlock Overrides," Revision 3
F-AOP-43, "Plant Shutdown From Outside the Control Room," Revision 8
F-AP-1.2, "Plant Operating Review Committee", Revision 4
F-AP-1.4, "Control of Plant Procedures", Revision 4
F-AP-2.2, "Procedure for Emergency Operating Procedures," Revision 5
F-SP-2, "Post LOCA Venting of Containment & Operation of the Main Steam Leakage Collection System," Revision 8
JAFNPP Records Retention/Turnover Schedule, Revision 3.1
JAFNPP Emergency Procedure Guide, Revision 3
ODSO-2, "Operating Principles and Philosophy," Revision 3
ODSO-4, "Posting of Operator Aids," Revision 1
PSO-4, "Quality Assurance & Plant Operating Records," Revision 3