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U.S. Nuclear Regulatory Commission
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SUBJECT: **James A. FitzPatrick Nuclear Power Plant**
Docket No. 50-333
Response to Request for Additional Information Regarding Certain Diagnostic Team Findings at the James A. FitzPatrick Nuclear Power Plant

References:

1. NRC letter, B. C. McCabe to R. E. Beedle, dated January 16, 1992, "Resolution of Certain Diagnostic Evaluation Team Findings at the James A. FitzPatrick Nuclear Power Plant."

2. NRC letter, James M. Taylor to John C. Brons, dated December 3, 1991, "Diagnostic Evaluation Team Report for the FitzPatrick Nuclear Power Plant."

Dear Sir:

Attachment I is the Authority's answers to the five questions included with Reference 1. The questions concern specific issues raised during the FitzPatrick Diagnostic Evaluation Team inspection report (Reference 2).

If you have any questions, please contact J. A. Gray, Jr.

Very truly yours,

for Ralph E. Beedle
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cc: See next page.

A001

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REQUEST FOR ADDITIONAL INFORMATION
RESOLUTION OF SPECIFIC DET FINDINGS

This attachment responds to the NRC's request for additional information (NRC letter, B. C. McCabe to R. E. Beedle, dated 1/16/92) concerning resolution of certain Diagnostic Evaluation Team Findings at the James A. FitzPatrick Nuclear Power Plant.

The questions are followed by the Authority's reply.

I. Response to Individual Requests for Information

NRC Question

A. The design basis does not account for a single failure of either of the two trains of intake deicing heaters. Each Emergency Diesel Generator (EDG) train provides power to 44 intake deicing heaters for a total of 88 heaters. The technical specifications require a minimum of 18 (total) deicing heaters to be operable; the basis for which could not be located by your staff. To ensure that at least 18 heaters are operable when considering a single failure of one of the EDG's, the technical specifications should require that at least 18 heaters be operable for each train.

NYPA Response

The Authority is performing a design basis study of the intake structure deicing heaters to; (1) gain a better understanding of the environmental conditions at the intake, (2) the capabilities of the deicing heaters, (3) the need for the heaters to assure Emergency Service Water (ESW) system and Residual Heat Removal Service Water (RHRSW) system operability, and (4) the need to address design separation criteria. Items (1) through (3) will be completed prior to 1992/1993 winter and item (4) will be completed by the end of the 1992 refueling outage.

The need for a Technical Specification change to require a minimum number of heaters supplied by each EDG will be determined after the design basis study has been completed. In the interim, Maintenance surveillance test MST-71.17, "Intake De-Icing Heaters Rated Current Surveillance Test" (Reference 1) will continue to verify there are at least 18 operable heaters supplied by each emergency bus. In addition a Technical Specification Interpretation will be issued prior to start up explaining that each heater panel shall have a minimum of 18 operable heaters.

NRC Question

B. Several design deficiencies were noted by the team involving the Emergency Diesel Generator (EDG) air start system. For example, a common header between air banks made the system not entirely independent or redundant as required by the Final Safety Analysis Report (FSAR). The team also noticed several design modifications initiated as early as 1988 to correct many of these deficiencies that had not yet been implemented because of improper priority assignments.

NYPA Response

The following description of the emergency AC power system and the diesel air start system is provided to clarify NYPA's responses.

Plant safety loads are separated into two independent and redundant load groups. Each load group (emergency bus) is supplied by two emergency diesel generator units. Each diesel generator has an independent fuel oil and starting air system. The starting air system (see figure 1) consists of two 100% capacity air start motor sets. A motor set has 1 starting soleniod, 2 air start motors, 1 air relay valve, and 1 lubricator. Ten air receivers are divided into two banks, each having a dedicated air compressor. A common header between receiver banks permits starting air from either bank to supply all 4 starting motors.

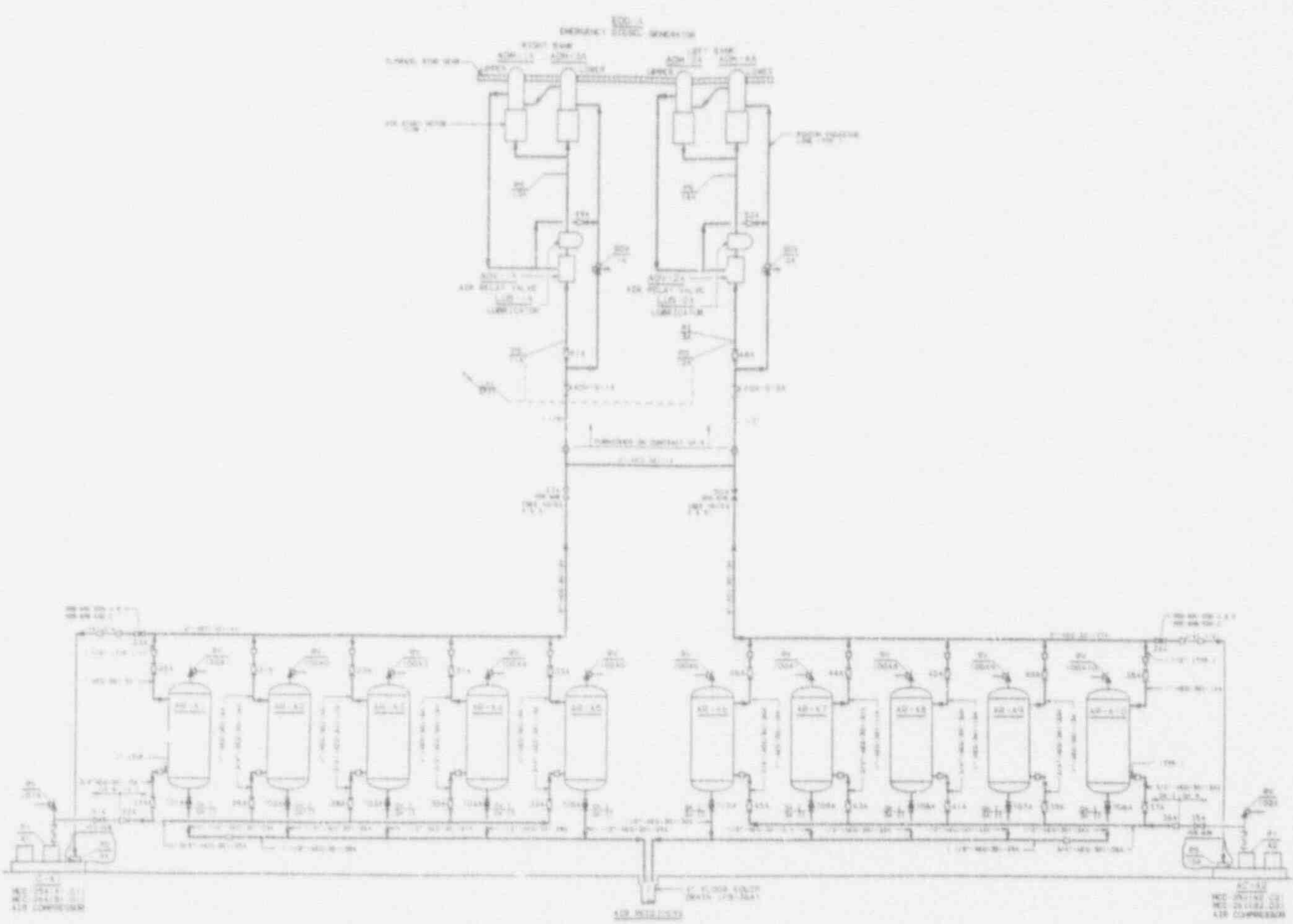
Based on discussions with the Authority personnel interviewed during the DET, we have identified seven specific questions raised by the team.

1. Can each air start motor set be tested individually?

No, the air piping configuration does not permit testing an individual air start motor set. The monthly EDG test is conducted with the air start motors and air receiver banks in the normal operating lineup verifing an EDG's ability to start in its standby configuration. Instead of individually testing a motor set, the air start motors are inspected during the test for proper operation. The inspection includes a visual check of the air start motor pinion gear teeth for damage or obstruction, air flow exhausting from the motor, and proper lubrication of the air motor (Reference 2).

The Authority also has an aggressive preventive maintenance (PM) program for these components. Each air start motor set is replaced with a new unit every six years, well before their service life expires. The air start motor PM program is effective as evidenced by the high reliability of the EDGs. The reliability of FitzPatrick's EDGs is 1.00 over the last 100 demands.

FIGURE 1



2. Why is there no procedural requirement to alternate air start receiver banks.

The EDG test procedure (Reference 2) will be revised to require alternating air start receiver banks each month.

3. There appears to be a descrepancy between an EDG's air start system piping configuration and FSAR Section 8.6.3 statement on independence.

FSAR Section 8.6.3 states, "Each diesel generator is provided with independent and redundant air starting systems with individual air compressors to furnish air for automatic and manual starting."

The Authority agrees that an air start motor system's two redundant trains are not independent. However, the Authority considers the EDG air starting system acceptable. The Authority also had concerns regarding these FSAR statements and addressed these concerns in Safety Evaluation JAF-SE-89-034 (Reference 3).

This safety evaluation concludes that each EDG (including its respective air start system) is independant of the other EDGs. Each EDG's air start system has redundant active components (two 100% air start motor sets) for high reliability but its air start system was not designed to meet single failure criteria. Single failure protection is provided by independent emergency buses and redundant EDGs having their own air start system. The Authority acknowledges the FSAR EDG air start system description is ambiguous and will submit a change as part of the July 1992 update.

4. Does the EDG's licensing basis require independency between redundant air start sets supporting each diesel?

Section 7.7.2 of NRC's original Safety Evaluation Report for FitzPatrick, dated November 20, 1972 (Reference 4) states that the existing arrangement complies with guidance in Regulatory Guide 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between their Distribution Systems" (Reference 5). This Regulatory Guide states that electrically powered safety loads be separated into redundant load groups supplied by redundant power sources. The requirement for independancy is between load groups and their respective standby power sources. There is no requirement that an individual EDG's subcomponents be redundant and independent, however the Regulatory Guide does stress that reliability of an individual standby power source should be considered in the design.

Section D.5 of the Regulatory Guide requires that if multiple EDGs are operated in parallel to energize a single safety bus then reliability equivalent to a single EDG arrangement should be demonstrated. Equivalent reliability for the air start subsystem was assured through a redundant design and the startup test program. The design of the air start system includes redundant components and results in two full capacity air start systems for each diesel. The common header between receiver banks improves EDG reliability by permitting air from either bank to supply all four air start motors. The design's reliability was demonstrated through the startup testing program as defined by the NRC Staff on page 7-11 of the original Safety Evaluation.

5. Why is one air start receiver bank normally isolated and does this configuration reduce air start capacity to less than 10 EDG starts?

The current configuration increases the reliability of an EDG by maintaining a reserve capacity of starting air and does not reduce the FSAR stated capacity of 10 EDG starts. Testing has verified that one bank provides enough air for five or more successful starts (Reference 3). Isolating one bank of receivers maintains a reserve capacity for five additional starts with operator action. If an EDG failed to start using the air available in five receivers, troubleshooting and corrective action could be performed prior to valving in the isolated bank. Operating with one receiver bank isolated enhances overall EDG reliabilty and protects against a single passive failure in the air system.

6. When one of the two air start compressors is out of service is its associated EDG declared inoperable?

No. When one compressor is out of service, its associated air starting system and EDG remain operable. EDG operability is dependent on the receivers holding air at 180 psig. The loss of a compressor does not effect the stored air in the receivers.

Normal lineup for an EDG's air start motor system is to have one bank of air receivers isolated (in reserve) and the other air receiver bank active supplying pressurized air up to the air start solenoids. The isolated bank will remain pressurized. Its air compressor cycles on and off to maintain pressure greater than 180 psig. The compressor's pressure switch is functionally checked monthly during the EDG surveillance. The active bank is also pressurized by its air compressor and a low pressure condition will be alarmed in the Control Room by redundant pressure switches PS-11 & 12. This lineup provides air for 5 successful starts using the active bank plus a 5 start reserve air supply with operator action.

If one of the two compressors is taken out of service an operator can isolate the compressor from its respective air receiver bank and open both air receiver bank isolation valves. Under this lineup all ten receivers will be pressurized by the inservice compressor. If a low system pressure condition were to occur it would alarm immediately notifying operators of the degraded condition. While this lineup reduces operating flexibility, the 10 start air capacity is maintained and the EDG remains operable.

7. How are priorities assigned to EDG air start modifications?

In the second half of 1991, all backlog modifications were distributed to cognizant and/or system engineers for evaluation. The engineers recommended priorities for each modification and clasify them as follows; (1) 1992 refueling outage work, (2) 1993 refueling outage work, (3) consider performing some future outage, and (4) cancellation of the modification. The modifications and their recommended priorities were forwarded to the Planning Department where a benefit/cost study was performed.

The Authority is presently refining its process to review and improve the benefit/cost studies. A committee comprised of representatives from Operations, Maintenance, Planning, Technical Services, and Health Physics meets on a regular basis to review the cost/benefit documentation and is developing a weighted criteria scale to improve the assigning of priorities.

NRC Question

C. The Reactor Core Isolation Cooling / High Pressure Coolant Injection (HPCI/RCIC) turbine exhaust steam line vacuum breaker isolation valves were neither being treated as primary containment isolation valves (PCIVs), nor included in the inservice testing program. These valves were not part of the original BWR-4 design, but were added at the recommendation of GE as a system performance enhancement. The Power Authority for the State of New York (PASNY) did not consider these valves PCIVs because they are not required to change position to perform their safety function during a design basis event. However, an early General Electric Service Information Letter and the standard GE BWR 4 and 6 designs did consider these valves PCIVs.

NYPA Response

The SIL's recommendation was based on 1971 draft NRC criteria in anticipation of regulatory changes. The draft criteria and the subsequent approval of Appendix A to 10CFR50 are not part of the FitzPatrick licensing basis.

Containment isolation for the HPCI/RCIC vacuum breaker lines is provided by the HPCI/RCIC turbine exhaust check valves. As described in the Preliminary Safety Evaluation Report (Section 5.3.2) and in the Final Safety Analysis Report (Section 5.2.3.5), two check valves in series may be used for containment isolation. The Authority is confirming this position. A report documenting the results of this work will be completed prior to the end of the 1992 refueling outage. Some of the information that will be included in this evaluation is provided below.

What are the HPCI/RCIC vacuum breaker design specifications?

HPCI Vacuum Breaker Line: 2"-SLP-152-49
(References 16 and 17)

- Class 152 (nuclear)
- 150 lb Carbon Steel Piping
- Seamless, ASTM Specification A106 Grade B, Schedule 80
- Operating Pressure is 65 psig
- Design Pressure is 75 psig
- FSAR Fig 16.5 Quality Control Classification is Q2
- QA Catagory I
- Seismic Catagory I

RCIC Vacuum Breaker Line: 1 1/2"-SLP-152-51
(References 16 and 17)

- Class 152 (nuclear)
- 150 lb Carbon Steel Piping
- Seamless, ASTM Specification A106 Grade B, Schedule 80
- Operating Pressure is 35 psig
- Design Pressure is 75 psig
- FASR Figure 16.5 Quality Control Classification is Q2
- QA Catagory I
- Seismic Catagory I

Is it possible to perform an outward leakage test once per refueling outage?

Both the HPCI and RCIC vacuum breaker line configurations prevent the performance of a outward leakage test being performed at anytime except during an integrated leak rate test (ILRT). To perform an outward leakage test during a non-ILRT outage would require isolating the manual (23HPI-401 and 13RCIC-11)and motor operated (23MOV-59 and 13MOV-130) gate valves. This lineup would provide an indication of check valve outward leakage, however would not detect a leakage path through the manual and motor operated gate valves' packing or bonnet.

What is the configuration of these valves during an ILRT?

During an ILRT the manual and motor operated gate valve on each line are verified open, their normal operating position. The turbine exhaust check valves provide the ILRT pressure boundary for these lines (Reference 18). Any outward leakage from the vacuum breaker line effecting the ILRT would be identified.

What is the safety significance of isolation valves not being close as practicable to containment penetrations?

This question can only be answered by a detailed engineering analysis. The analysis will include; (1) determining if the vacuum breaker lines can be qualified as an extension of primary containment, (2) operating procedure changes which would isolate a line using the installed motor operated gate valve, (3) the ability and benefit to performing leakage test on the lines and valving. The Authority will perform this analysis prior to startup from the 1992 refueling outage.

NRC Question

D. In March 1991, the flow-reversal tunnel was inspected by your staff and found to be clogged with sand. The inspection was formally documented by your staff to the NRC in a letter dated April 18, 1991. An evaluation of the flow-reversal capability of the ultimate heat sink was performed, but contained several significant errors. The evaluation (JAF-RAS-91-001, JESM-91-0021) was referenced in a letter to the NRC (JPN-91-015) which was used to jusify that the blocked gate 36G-4 constituted no safety problem. A subsequent evaluation, performed shortly after, assumed that the gate could be lifted. Since the plant began operation in 1975, reverse-flow gate 36G-4 has never been operated and the reverse flow capability never tested even though there is a surveillance test procedure to verify operability. The gate was determined, by the team and your staff, to be inoperable during the evaluation. Additional concerns included: the crane that was available was powered from a non-safety-related source, and the process for repositioning the intake and discharge gates in the event of an accident or test was extremely difficult.

NYPA Response

Reverse Flow Tunnel Evaluations

The Authority has reviewed the evaluations (References 6 and 7) and finds no descrepancies other than the safety evaluation's assumption that the reverse flow gate was operable. The Authority agrees with the NRC that the gate's operability could not be confirmed as a result of sand and silt in the tunnel and not being stroked since 1975. Reference 7, the Reasonable Assurance of Safety, questioned the gates operability however, acknowledged that the tempering gate could also be used to establish a reverse flow lineup per FSAR Section 12.3. Over the past 17 years there has not been an operational need or regulatory requirement to reposition the reverse flow gate. No surveillance test exists to stroke the gate. Instructions for implementing a reverse flow configuration are included in operating procedure OP-4 (Reference 8). These instructions however are not written as a surveillance and are only used in the event of an actual blockage of the intake structure.

Restoring Reverse Flow Capability

Sand and silt deposits will be removed from the reverse flow tunnel during the 1992 refueling outage. After the tunnel has been cleaned a test will be performed to verify operability of the intake gates, place the system in the reverse flow lineup, and evaluate the feasibility of using reverse flow for thermal backwashes to kill mussels in the intake. The cleaning and subsequent testing will restore the reverse flow system to operable status prior to startup from the 1992 refueling outage. Future intake inspections and cleanings will maintain the operability of the reverse flow tunnel.

Crane Power Source

Non-safety related power supplying the crane for the intake gates is part of the plant's original design and is acceptable. The reverse flow capability is not a safety related function but rather a design feature providing operational flexibility in the highly unlikely scenario of large masses of ice being drawn into the intake structure that blocks over 90% of the intake area. This scenario is considered to be beyond the plant's design basis. FSAR Section 12.3.7 describes the scenario of large masses of ice being drawn to the intake by a intake velocity (1.4 fps) and block the opening to the extent that the Circulating Water Pumps trip as an "unlikely event". The FSAR continues to explain that if this unlikely event was to occur it would be "inconceivable" that more than 90% of the intake area would be blocked.

Passive design features provide reliable ice blockage protection of the intake structure and service water systems. These features include; an intake structure located approximately 900 feet offshore on the lake bottom in 25 feet of water, a roofed intake structure drawing water in through side openings preventing the formation of vortices at the surface and minimizing floating ice from being drawn down from the surface, and the Residual Heat Removal Service Water (RHRSW) and the Emergency Service Water (ESW) system flow rates requiring that only 10% of the total intake area be available. The efficiency of these design features to prevent the entrainment of ice in to the intake structure has been clearly demonstrated. In 17 years of operation, the plant has never needed to operate the reverse flow gate.

The Authority recognizes the advantages of maintaining the plant's reverse flow capabilities, however safety related power is not required for the crane used to position intake gates.

NRC Question

E. Your staff was in the process of changing some safety-related Emergency Service Water (ESW) components to non-safety-related, and was substantially reducing the design required flow to various heat loads. It appears that your staff did not perform any tests that would indicate actual ESW flow under accident conditions to validate that the flow was adequately balanced. Flow to some componets also has been increased in an attempt to minimize future silting regarding the new design basis for the ESW system. Futher more calculations used to justify service water swing check valve operability in LER 90-12-01 were determined to be incomplete. Inconsistencies also existed in the design basis document for the ESW system.

NYPA Response

ESW Flow Testing

Temporary operating procedure TOP-117, Emergency Service Water Full Flow Test (Reference 9), was performed in June 1990. The test injected ESW into equipment normally aligned in the system to determine component flow rates. Adequate flow rates to all safety-related loads was achieved with exception of the crescent area coolers. Crescent cooler flow rates were slightly below the design flow rate of 120 gpm. As a result the, the non-safety related Reactor Building Closed Loop Cooling (RBCLC) heat loads are shed to increase flow to the safety related crescent area coolers if ESW is required to supply RBCLC components (Reference 10). The non-safety related Residual Heat Removal pump seal coolers ESW supply valves are tagged closed and operating procedures provide instructions to isolate ESW flow to the drywell if drywell floor drain leak rate increases as would be expected during a loss of coolant accident. These actions ensure that the crescent area unit coolers will receive 120 gpm of ESW per train during a loss of coolant accident. A chemical cleaning program is being developed to reduce system resistance which should improve the systems ability to maintain design flows. Design flow rates to all safety related components supplied by ESW are verified quarterly in accordance with test procedure ST-8Q (Reference 11).

Crescent Area Unit Coolers Flow Rate

The design flow rate to the crescent are unit coolers has not been increased. The flow rates indentified in the ESW design basis safety evaluation (Reference 12) have not changed and remain accurate. To improve the reliability of the crescent area coolers, a modification was performed to increase the velocity of cooling water flow through the coolers reducing the potential for silt accumulation.

The crescent coolers area sized to reduce area temperature during a design basis loss-of-cooling accident (LOCA). Normal heat loads in the crescent area are significantly lower (no emergency core cooling pumps running) compared to LOCA conditions, and prior to the modification, temperature control valves would throttle closed limiting cooling water flow to the coolers. This contributed to the accumulation of solids in the piping and eventually prevented the coolers from achieving design flow rates.

During the 1990 refueling outage, temperature control valves on eight of the ten coolers were removed and the fan control logic for these eight coolers was modified to start fans as a function of temperature. The end result has been continuous cooling water flow, approaching design flow rates, through the coolers during normal operations and a reduction in silt accumulation.

Additional information concerning the crescent area cooler modification was submitted to the NRC in Technical Specification Change Request JPTS-89-032 (Reference 13).

LER 90-12-01 Service Water Check Valves

The Authority recognized a weakness in performing operability determinations and has committed in the 1992 Business Plan to improve the process for resolving operability and reportability issues. A new procedure will be developed to improve making operability and reportability determinations by June 1992 (Reference 19).

Inconsistencies in ESW Design Basis Document

Draft revision A of the ESW design basis document contained a number of descrepancies including inconsistencies with the existing ESW design basis safety evaluation (Reference 12). The descrepancies were identified, corrected, and incorporated in draft revision B. The final version (Reference 15) has recently been approved and distributed.

References

1. Maintenance Surveillance Test MST-71.17, Intake De-Icing Heaters Rated Current Surveillance Test"

2. Surveillance Test ST-9B, EDG Full Load Test and ESW Pump Operability Test"

3. Nuclear Safety Evaluation JAF-SE-89-034, Revision 0, "Emergency Diesel Generator Air Start System, Air Start System Capacity and Original Design Bases", dated 5/2/89

4. NRC Safety Evaluation of the James A. FitzPatrick Nuclear Power Plant, dated 11/20/72.

5. Regulatory Guide 1.6, "Indepence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems", dated March 1973

6. Nuclear Safety Evaluation JAF-SE-91-028, "Evaluation of the Circulating Water System Reverse Flow Gate Blockage Due to Sand Accumulation, dated 4/17/91.

7. Resonable Assurance of Safety JAF-RAS-91-001, "Circulating Water Reverse Flow Gate Blocked with Sand", dated 3/16/91.

8. Operating Procedure OP-04, "Circulating Water System".

9. Temporary Operating Procedure TOP-117, "Emergency Service Water Full Flow Test".

10. Technical Services System Engineering Memo JSEM-91-059, "Update of ESW/SWS System 46 Action Plan", dated 12/16/91.

11. Surveillance Test Procedure ST-8Q, "Testing of Emergency Service Water System".

12. Nuclear Safety Evaluation JAF-SE-90-067 Rev. 1, "Clarification of Design Basis Requirements for JAFNNP Emergency Service Water System (46), dated 3/6/91.

13. NYPA Letter JPN-90-011, J. C. Brons to U.S. NRC, dated January 16, 1990, requesting Tech Spec change for crescent area unit coolers.

14. Surveillance Test ST-8R, "Emergency Service Water Check Valve Test".

15. Design Basis Document 046, "Normal Service Water, Emergency Water, and RHR Service Water", Revision 0, dated 2/1/92.

16. James A. FitzPatrick Nuclear Power Plant Piping Specification, JAF-SPEC-MISC-0034 Rev. 0.

17. James A FitzPatrick Nuclear Power Plant Line Designation Table, dated 5/6/91.

18. Surveillance Test ST-39F, "Type A Primary Containment Integrated Leakage Rate Test."

19. Nuclear Generation Business Plan 1992