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March 16, 1993
JPN-93-015

U.S. Nuclear Regulatory Commission
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SUBJECT: **James A. FitzPatrick Nuclear Power Plant**
Docket No. 50-333
Updated Response to Generic Letter 89-13
Service Water System Problems Affecting Safety Related Equipment

REFERENCES:

1. NRC Generic Letter 89-13 "Service Water System Problems Affecting Safety-Related Equipment," dated July 18, 1989.

2. NYPA letter, J. C. Brons to the NRC (JPN-90-015) dated February 13, 1990, "Response to NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

3. NYPA letter, R. E. Beedle to the NRC (JPN-91-015) dated April 18, 1991, "Updated Response to NRC Generic Letter 89-13, Service Water System Problems Affecting Safety-Related Equipment."

Dear Sir:

The Authority has completed all actions necessary for the response to and implementation of Generic Letter 89-13 (Reference 1). In its original response (Reference 2), the Authority adopted the recommendations of Generic Letter 89-13, or justified alternate means of assuring that the FitzPatrick service water systems are capable of performing their safety functions. A status of the program was submitted to the NRC on April 18, 1991 (Reference 3) outlining the Authority's progress in each of the five issues in Generic Letter 89-13. In that letter, the Authority committed to inform the NRC when all Generic Letter 89-13 actions have been implemented.

The Authority's Generic Letter 89-13 actions have demonstrated the operability of FitzPatrick service water systems and have provided the experience necessary to develop effective long term service water testing, inspection, and maintenance programs. A summary of the actions completed to satisfy Generic Letter 89-13 and the on-going activities to ensure continued operability of FitzPatrick service water systems are provided in Attachment I.

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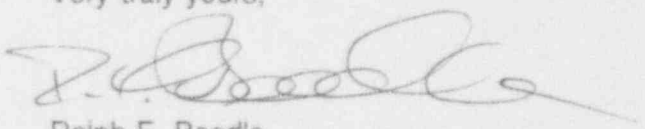
If you have any questions, please contact J. A. Gray, Jr.

Very truly yours,



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GENERIC LETTER 89-13 SERVICE WATER SYSTEMS

1.0 Introduction

The Authority has completed all actions necessary for the response to and implementation of Generic Letter 89-13 (Reference 1). In its original response (Reference 2), the Authority adopted the recommendations of Generic Letter 89-13, or justified alternate means of ensuring that the FitzPatrick service water systems are capable of performing their safety functions. A status of the program was submitted to the NRC on April 18, 1991 (Reference 3) outlining the Authority's progress in each of the five issues in Generic Letter 89-13. In that letter, the Authority committed to inform the NRC when all Generic Letter 89-13 actions have been implemented. This attachment provides a summary of the actions completed to satisfy Generic Letter 89-13 and the on-going activities to ensure continued operability of FitzPatrick service water systems.

2.0 Background

The Generic Letter 89-13 actions that were completed have demonstrated the operability of FitzPatrick service water systems and have provided the experience necessary to develop effective long term service water testing, inspection and maintenance programs. The NRC reviewed the FitzPatrick Generic Letter 89-13 program during a Safety System Functional Inspection (SSFI) of the emergency service water (ESW) system in April 1992 (Reference 4). Although some weaknesses were identified, the inspection concluded that the actions taken by the Authority are acceptable and satisfy the requests made in Generic Letter 89-13.

While the NRC determined that the actions being taken to maintain the emergency service water system were appropriate, they noted that long term implementation could be improved by preparing an overall program document. The Authority agrees with this observation and has committed to establish a FitzPatrick Service Water Program Manual. This manual, currently under development, will be completed by September 30, 1993.

3.0 Plant Systems and Equipment in the Scope of Generic Letter 89-13

The FitzPatrick Generic Letter 89-13 program addresses safety related portions of the Service Water (SW), Emergency Service Water (ESW), and Residual Heat Removal Service Water (RHRSW) Systems for the FitzPatrick Plant. Safety related components affected include the following equipment:

Residual Heat Removal (RHR) Service Water Pumps (4)
Emergency Service Water Pumps (2)
RHR Heat Exchangers (2)
Emergency Diesel Generator (EDG) Coolers (4)
Crescent Area Unit Coolers (10)
Electric Bay Unit Coolers (2)
Cable Tunnel and Switchgear Room Unit Coolers (2)
Control Room Air Handling Units (2)
Relay Room Air Handling Units (2)
Piping and valves needed to support safety related functions and pressure boundaries

4.0 Updated Response to Five Generic Letter 89-13 Issues

4.1 Surveillance and control techniques to reduce the incidence of flow blockage as a result of biofouling (Item I)

Surveillance Testing

Periodic flushing and flow verification is performed on safety related components whose normal cooling is provided by lake water. ESW and RHRSW system flow rate tests confirm that flow rates to raw water heat exchangers meet design bases (References 5 and 6). These tests also demonstrate that various in line ESW and RHRSW check valves open and pass required flow.

Based on observations identified during the ESW SSFI (Reference 4), the ESW system flow rate test ST-8Q (Reference 5) has been revised to incorporate the following improvements:

- Flow rates at design conditions are determined using data collected under test conditions by incorporating allowances for instrument inaccuracy, variations in lake level, and strainer differential pressure.
- Acceptance criteria verifying a design flow rate of 24 gallons per minute per crescent area cooler have been incorporated.
- Verification of ESW flow to EDG coolers is performed when ESW train injection valves are closed and the test-bypass valves are open.

Proper operation of interfacing ESW and SW check valves is verified by flushing lake water through the ESW check valves to verify that they open and then manipulating appropriate valves to reverse flow through the safety related SW check valves (safety function to close). These SW check valves are verified closed by measuring leakage through a drain connection upstream of the SW check valve (References 5 and 7).

Biofouling Control

The Authority has established an aggressive biofouling control program consisting of the following :

- Monitoring and Inspections (Reference 8)
- Chlorine Injection (Reference 9)
- Chemical Treatments for Microbiologically Influenced Corrosion (MIC) (Reference 10)
- Molluscicide Treatments (Reference 11)

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The zebra mussel monitoring program provides information to determine the presence of zebra mussels, their densities, rate of colonization, rate of growth, and the duration of spawning. The program consists of veliger sampling and settlement monitoring of juveniles/adults. Specific methods used for monitoring include:

- Inspections performed when plant lake water systems are opened for maintenance.
- Diver Inspections performed in conjunction with related maintenance activities or as part of a specific zebra mussel inspection.
- Water Column Veliger Sampling performed weekly when lake temperatures are greater than 40°F
- Settling racks containing removable plates are installed in the inlet canal and are removed monthly to determine zebra mussel activity.
- SW Side Stream Bio-boxes are analyzed monthly for the presence of zebra mussels.

A chlorine injection system provides water treatment to protect the following service water systems from zebra mussel fouling and to mitigate the effects of microbiologically influenced corrosion:

- Normal Service Water System
- Emergency Service Water System
- Residual Heat Removal Service Water System
- Fire Protection System

MIC corrosion nodules have decreased the cross sectional area of small bore service water piping reducing the flow of lake water to safety related heat exchangers (primarily the crescent area coolers). To correct this condition, on-line chemical cleaning of the service water system is being performed. Existing corrosion nodules, silt, and microbes were initially treated at high dose rates to shock the system. A long term chemical injection program is in place which periodically treats the piping to soften and remove deposits and prevent the formation of new deposits. Removal of deposits is expected to take anywhere from six months to two years. On going inspections and flow tests of the ESW and SW systems will determine the progress of the cleaning program.

The large water volume and high flow rate in the intake tunnel, forebay, intake structure, and the circulating water system does not permit the use of chlorine for zebra mussel control in these areas. Alternatively, based on the inspection and monitoring program, the Authority can schedule treatment of these areas with a molluscicide. The Authority is also continuing to evaluate reversing intake and discharge water flows to increase intake tunnel/structure temperatures for short periods to kill existing mussel colonies.

4.2 A test program to verify the heat transfer capability of safety-related heat exchangers cooled by service water (Item II)

Crescent Area, Cable Tunnel, and Electric Bay Coolers

Cooler performance test procedures have been developed to verify the heat transfer capability of the Crescent Area, Cable Tunnel and Electric Bay Coolers (References 12, 13, and 14). These procedures determine the heat transfer capability of individual coolers at design conditions using data collected under test conditions.

Establishing design basis flow rates to crescent area coolers has been difficult to achieve and flow rates to individual coolers may be less than the target value after system flow balancing is performed. The Authority anticipates improved flow rates to the crescent area coolers due to the chemical cleaning program described in section 4.1. If system flow rate balancing results in actual flow rates to individual heat exchangers that are less than the procedure acceptance criteria, then other tests are performed to verify operability of individual Crescent Area, Cable Tunnel and Electric Bay Coolers based on heat transfer capability (References 5, 12, 13, and 14). Because these procedures are used to determine the operability of the individual coolers, they have been revised to incorporate instrument inaccuracy.

Residual Heat Removal (RHR) Heat Exchangers

A RHR heat exchanger performance test has been performed to determine the heat transfer capability of the RHR heat exchangers (Reference 15). Revisions to the test method are under development to improve the ability to trend heat exchanger performance. Operability of the RHR Service Water System is determined by Technical Specification 4.5.B which requires each RHR service water pump to deliver 4000 gallons per minute and two RHR service water pumps to deliver 8000 gallons per minute to the associated RHR heat exchanger (Reference 6).

Emergency Diesel Generator (EDG) Heat Exchangers

The Authority does not conduct performance testing of the EDG heat exchangers. These are closed loop on the shell side with ESW providing the heat sink on the tube side. Contrary to a statement previously made by the Authority in Reference 3, these heat exchangers are cooled by lake water and are not part of a closed loop glycol-based cooling system. Because the EDG controls heat rejection through a temperature control valve (shell side), meaningful test data cannot be obtained to perform a heat balance. In lieu of testing, two of the four EDG heat exchangers are opened each refueling outage for visual and eddy current inspections. The inspection results provide a basis for determining if the remaining two EDG heat exchangers require inspection. In addition, EDG operability is verified each month during a full load functional test (Reference 16) and ESW flow rates are measured quarterly during ESW surveillance testing (Reference 5).

Control Room and Relay Room Air Handling Units (AHU)

Heat transfer testing is not performed on the Control Room and Relay Room AHUs. These coolers are closed loop, glycol based systems which are not prone to fouling. ESW provides a backup safety related heat sink requiring manual operation to establish lake water to these coolers. The manual valves needed to initiate ESW flow to these coolers are cycled each refueling outage to verify operability (Reference 17) and the ESW supply piping to the AHUs is flushed quarterly during check valve testing (Reference 7).

4.3 Inspection and maintenance program for service water system piping and components (Item III)

The FitzPatrick service water system inspection programs include the following activities:

- Service Water Piping Inspection Program
- Eddy Current Inspection Program
- Visual Inspections when systems are opened for maintenance

The service water piping inspection program is performed in accordance with Plant Standing Order PSO-66 (Reference 18). This procedure identifies individual responsibilities and the scope of a program to monitor corrosion of piping using non-destructive examination in the Service Water, ESW, and RHRSW systems.

The eddy current testing program is performed in accordance with Plant Standing Order PSO-57 (Reference 19). This procedure identifies individual responsibilities and the scope of a program to perform eddy current testing of heat exchangers. All the Generic Letter 89-13 heat exchangers listed in section 3.0 of this Attachment are included in the eddy current testing program. The scope of inspections for an outage is based on previous inspections and recommendations from Planning, Performance, and Systems Engineering. The Authority is evaluating the incorporation of heat exchanger eddy current testing into the Preventive Maintenance Program.

Visual inspections of service water components (including accessible piping) is performed and documented whenever a service water system is opened for maintenance. These inspections are identified in the component maintenance procedures.

Preventive Maintenance (PM) on service water systems is controlled by the FitzPatrick Preventive Maintenance Program. The schedule presently includes preventive maintenance activities on the following types of components within the service water system:

- Check valves - disassembly and inspection
- Motor operators - disassembly and inspection
- Strainers - lubrication
- Motors - lubrication
- Fans - inspection, cleaning, and lubrication
- Heat exchangers and Unit Coolers - inspection and cleaning

The specific equipment included in the PM schedule is determined by Maintenance Department Engineers using the following methods:

- Preventive maintenance evaluations developed for specific component types (check valves, pumps, and heat exchangers).
- Operational experience review program recommendations.
- Recommendations for new equipment included in modification packages .
- On-going reviews of completed preventive and corrective maintenance work requests.

The Preventive Maintenance program provides the necessary controls to ensure appropriate PM activities and frequencies are established and updated for FitzPatrick service water systems.

4.4 Service Water Systems licensing bases review (Item IV)

The Authority has completed its review of the FitzPatrick service water system licensing bases. The work performed to support this effort includes the following:

- Design Basis Document issued covering Normal Service Water, Emergency Service Water, and RHR Service Water Systems (Reference 20).
- Plant Safety Evaluation has been issued summarizing the design basis requirements for ESW system. This document identifies the safety related ESW components, the minimum flow rates required to those components, and the heat load imposed upon ESW (Reference 21).
- Walk-downs to confirm the as-built configuration of safety related service water systems have been completed.

Two single failure analyses have been performed. The first report (Reference 22) determined that both the RHRSW and ESW systems were capable of performing their intended safety function assuming a single active failure. The second report (Reference 23) re-evaluated the single failure analysis for the ESW system to address observations in the first report that required operator action to mitigate the effects of equipment failures and questions raised during the ESW SSFI (Reference 4).

This second report verified the ability of the ESW system to perform required safety functions in the event of a single active failure. Both analyses were developed using guidance provided in ANSI/ANS-58.9-1981, "Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems" and ANSI/IEEE 379-1977, "Application of the Single Failure Criteria to Nuclear Power Generating Station Class 1E Systems."

The results of this effort have confirmed that the ESW and RHRSW systems will perform their intended safety functions in accordance with the licensing basis for the plant.

4.5 Maintenance practice, operating and emergency procedures and training (Item V)

The Generic Letter requested licensees to confirm that maintenance practices, operating and emergency procedures, and training that involves the service water system, are adequate to ensure that safety-related equipment cooled by the service water system will function as intended and that operators of this equipment will perform effectively.

The Authority selected a contractor to review FitzPatrick ESW and RHRSW maintenance practices, training, and operating procedures. A final report was submitted to the Authority on June 28, 1991 (Reference 24). In general, the review concluded that existing documents contained the necessary elements for this aspect of Generic Letter 89-13. Recommendations for improvements were implemented by appropriate revisions to affected procedures.

During the ESW SSFI, the NRC reviewed the maintenance practices, operating procedures, and training supporting the ESW system and concluded the following (Reference 4):

- Operator training is adequate.
- Operating procedures contained adequate direction and appropriate detail.
- Maintenance procedures contained sound technical information, the appropriate level of detail, and were well written.
- Maintenance training is adequate to assure that ESW component maintenance is performed properly.

These activities have confirmed that FitzPatrick maintenance practices, operating procedures, and training ensures operability of the service water systems.

GENERIC LETTER 89-13 SERVICE WATER SYSTEMS

5.0 References

1. NRC Generic Letter 89-13 "Service Water System Problems Affecting Safety-Related Equipment," dated July 18, 1989.

2. NYPA letter, J. C. Brons to the NRC (JPN-90-015) dated February 13, 1990, "Response to NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

3. NYPA letter, R. E. Beedle to the NRC (JPN-91-015) dated April 18, 1991, "Updated Response to NRC Generic Letter 89-13, Service Water System Problems Affecting Safety-Related Equipment."

4. NRC letter, M. W. Hodges to H. P. Salmon dated June 11, 1992, " NRC Safety System Functional Inspection of the Emergency Service Water System, NRC Region I Inspection Report No. 50-333/92-81."

5. JAF Operations Surveillance Test Procedure ST-8Q, "Testing of the Emergency Service Water System (IST)," Rev. 6.

6. JAF Operations Surveillance Test Procedure ST-2X, "RHR Service Water Flow Rate and IST Test (IST)," Rev. 6.

7. JAF Operations Surveillance Test Procedure ST-8R, "Emergency Service Water Check Valve Test (IST)," Rev. 6.

8. JAF Certificates, Documents, and Permits Procedure CDP-21, "Zebra Mussel Monitoring and Control Program," Rev. 1.

9. JAF Operating Procedure OP-7A, "Chlorine Injection System," Rev. 2.

10. JAF Nuclear Safety Evaluation JAF-SE-91-114, "Chemical Cleaning of the Service Water System (System 46)," Rev. 0.

11. JAF Nuclear Safety Evaluation JAF-SE-92-006, "Chemical Treatment of Screenwell Forebays to Remove Zebra Mussels," Rev. 1.

12. JAF Operations Surveillance Test Procedure ST-19C, "Crescent Area Unit Cooler Performance Test with ESW Flow," Rev. 4.

13. JAF Operations Surveillance Test Procedure ST-19H, "Cable Tunnel Ventilation Cooler Performance Test with ESW," Rev. 3.

14. JAF Operations Surveillance Test Procedure ST-19G, "Electric Bay Unit Cooler Performance Test with ESW," Rev. 2.

15. JAF Operations Surveillance Test Procedure ST-2Y, "RHR Heat Exchanger Performance Test," Rev. 1.

16. JAF Operations Surveillance Test Procedure ST-9B, "EDG Full Load Test and ESW Pump Operability Test," Rev. 38

17. JAF Operations Surveillance Test Procedure ST-8S, "Control and Relay Room Refrigeration Water Chiller System Manual Valve Exercise Test (IST)," Rev. 0.

18. JAF Plant Standing Order Procedure PSO-66, "Service Water Piping Inspection Program," Rev. 0.

19. JAF Plant Standing Order Procedure PSO-57, "Eddy Current Testing Program, "Rev. 2.

20. NYPA Design Basis Document for the Normal Service, Emergency Service Water, and RHR Service Water, Rev. 0.

21. JAF Nuclear Safety Evaluation JAF-SE-90-067, "Clarification of Design Basis Requirements for the JAFNPP Emergency Service Water (46)," Rev. 3.

22. NUTECH Engineers, Inc. Report XNY-10-015, "New York Power Authority James A. FitzPatrick Agreement No. 029500-89, Perform Service Water Systems Scope Clarification Study, NUTECH Project No. XNY-10," dated November 2, 1990.

23. Ogden Environmental and Energy Services Co. Report "Emergency Service Water (ESW) System Single Failure Analysis for James A. FitzPatrick Nuclear Power Plant," dated October 12, 1992.

24. NUTECH Engineers Inc., Report XNY-10-020, "New York Power Authority James A. FitzPatrick Agreement No. 029500-89, Perform Service Water Systems Scope Clarification Study, NUTECH Project No. XNY-10," dated June 28, 1991.