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U.S. NUCLEAR REGULATORY COMMISSION

DOCKET NUMBER 50-269/270/287

FILE NUMBER INCIDENT REPORT

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Mr. Benard C. Rusche	Duke Power Company Charlotte, North Carolina Mr Willima O. Parker, Jr.	4/21/77
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Ltr. trans the following:

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Oconee Units 1-2-3

RJL

ENCLOSURE

Consists of Report entitled "Evaluation of Potential for Turbine Building Flooding".. (5-P)

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ACKNOWLEDGED

NOTE: IF PERSONNEL EXPOSURE IS INVOLVED SEND DIRECTLY TO KREGER/J. COLLINS

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DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
373-4083

April 21, 1977

Mr. Benard C. Rusche, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Regulatory File Cy.

Dear Mr. Rusche:

In an October 25, 1976 letter (Reportable Occurrence Report RO-287/76-18) to Mr. Norman C. Moseley, NRC/OIE, Region II, an incident was described in which the Oconee Nuclear Station Turbine Building had become partially flooded. This action had resulted from a combination of the following events: the Oconee Unit 3 condenser manways were opened for inspection; a failure of the power supply which provides power to solenoids controlling pneumatic piston-operated condenser circulating water discharge valves; and the failure of a jackscrew device which maintained these valves closed. Immediately following this incident, an investigation was initiated to determine the cause and to make recommendations to prevent recurrence. Additionally, a study was commissioned in which a determination would be made as to any potential sources of flooding, and if should occur, to provide additional assurance that critical equipment in the Turbine Building and/or Auxiliary Building would be adequately protected. The incident investigation and our more detailed study of the potential for Turbine Building flooding were described in meetings with members of your staff on November 9, 1976 in Bethesda and November 19, 1976 at Oconee. The purpose of this letter is to appraise you of our approach to final resolution. The attached report details those actions to be taken.

Very truly yours,

William O. Parker, Jr.

MST:vr
Attachment
cc: Mr. Norman C. Moseley

7711170224

O C O N E E N U C L E A R S T A T I O N

EVALUATION OF POTENTIAL FOR TURBINE BUILDING FLOODING

April 21, 1977

1.0 INTRODUCTION

On October 13, 1976, the Duke Power Company Design Engineering Department was directed to conduct a review of any potential sources of flooding of the Oconee Nuclear Station Turbine Building, and if should occur, to provide methods for additional assurance that critical equipment in the Turbine Building and/or Auxiliary Building are adequately protected. An organization was formed which represented the Civil/Environmental, Electrical, and Mechanical/Nuclear Divisions under the direction of the Chief Civil Engineer. This report details those actions which are considered necessary to mitigate the consequences of a potential Turbine Building flood. It should be noted that detailed design work has not been completed. The description presented herein is conceptual; however, calculations have been performed to verify the capability of this system.

2.0 OBJECTIVE

This study has been performed to focus exclusively on the issue of the operability of critical equipment which is required for safe control of the reactors to safeguard the public health and safety in the event of a Turbine Building flooding situation.

3.0 DESIGN BASIS TURBINE BUILDING FLOOD

The Oconee Nuclear Station FSAR Supplement 13 has addressed the concern of Turbine Building flooding. In that analysis, the failure of a rubber expansion joint spanning a 4¼" physical gap in the 78" condenser circulating water intake pipe was considered. In the incident which occurred on October 9, 1976, the flooding rate was considerably less than that assumed in the analysis. However, for the purposes of this study, a hypothetical Turbine Building flood was assumed which would result in a flow rate of approximately 1,000 cfs into the Turbine Building. The specific cause of the hypothetical Turbine Building flood has not been postulated, it was selected as an upper bound. Hypothetical flooding scenerios related to water hammer overpressure, failure of expansion joints or a condenser water box, and inadvertent opening of waterbox and pipe manways are all events of lesser magnitude than the assumed design basis Turbine Building flood.

It was assumed that the pneumatic condenser cooling water discharge valves were inoperable and the cooling water pipe crossover valves were open during the flood. The flood does not occur simultaneously with nor subsequent to any other accident condition.

4.0 RESULTS

Numerous schemes were considered to mitigate the consequences of a hypothetical Turbine Building flooding event. The scheme chosen relies on a large drain installed on the south end of the Turbine Building which would limit flood water elevation to a level such that the emergency feedwater pumps and three low pressure service water pumps could be protected. This would enable control of the reactor through existing systems using existing procedural techniques.

4.1 Major Functional Components

a. Turbine Building Drain

An opening approximately 5 x 45 feet will be placed in the south end of the Turbine Building basement wall. Water would discharge through this hole on to a spillway section and into 200' long x 10' diameter pipe. The water would then be directed by a ditch to the Keowee tailrace area.

b. Walls Around the Three Emergency Feedwater Pumps

Waterproof walls would be constructed around the emergency feedwater pumps to a height above the maximum flood elevation. Access would be provided from above. Appropriate modifications to existing piping, auxiliary equipment as well as installation of sump pumps would be accomplished.

c. Turbine Building/Auxiliary Building Wall

The wall separating the Turbine Building and Auxiliary Buildings will be waterproofed and sealed to a height above the maximum flood elevation. Structurally the wall is capable of handling this hydrostatic load.

d. Low Pressure Service Water Pump Walls

Three low pressure service water pumps will be protected by waterproof walls to a height above the maximum flood elevation. Only two pumps are required to supply all three Oconee units.

4.3 Operation During the Design Basis Flood

The source of the design basis flood is assumed to be the northernmost Unit 1 main condenser. The water must flow from Unit 1 to the drain in the south end of the Turbine Building. A back water curve was computed to determine the maximum water depth required to drive the flood through the Turbine Building and the drain. The Auxiliary Building is protected by the water-tight Turbine/Auxiliary Building wall and the three emergency feedwater pumps are protected by their individual waterproof walls. A supply line for the emergency feedwater pumps will be installed to the condenser circulating water pipe to insure an indefinite supply of feedwater. The reactor will be maintained in a condition of hot shutdown or below by allowing steam to escape from the main steam relief valves and makeup water to be supplied to the steam generator from the emergency feedwater pumps. The reactors can be brought to or maintained in a cold shutdown condition since the low pressure injection pumps and low pressure service water pumps will be protected.

There is no immediate need to trip the CCW pumps nor is there a need to prevent lake water from entering the Turbine Building through the discharge or intake pipes since it is simply routed through and out of the Turbine Building. The flood would be terminated by lowering Lake Keowee to elevation 791. This would require approximately 18.3 hours by utilizing the Keowee spillway, hydro units and discharging through the Turbine Building. Lowering Lake Keowee to elevation 791' will not affect the stored energy or ultimate heat sink for Oconee Nuclear Station.

5.0 ADVANTAGES OF THIS APPROACH

The advantages of the Turbine Building drain scheme are numerous in comparison with any other proposed alternatives. Some of these advantages are: The Turbine Building flood scheme is a passive device for controlling flood water elevation in the Turbine Building; the reactors are maintained in a hot shutdown condition or may be placed in cold shutdown for which demonstrated approved procedures already exist; installation of the Turbine Building drain can be accomplished without major impact on station operation; pump out of the Turbine Building following an event would not be a consideration; and the relative simplicity of this scheme is desirable.

6.0 SCHEDULE

Preliminary design work has been completed and is described in this report. Final design work is currently in progress. Construction is scheduled to begin August 1, 1977. Final implementation of the proposed modification is scheduled for approximately December 15, 1977.

7.0 CORRECTIVE ACTIONS

Various corrective actions were proposed in Reportable Occurrence Report RO-287/76-18 to prevent future recurrence of that incident. Due to the design of this proposed method to control Turbine Building flooding, a re-assessment of those corrective actions was conducted. Unless stated otherwise, these actions will be completed by December 15, 1977.

1. The present pilot solenoids on the condenser discharge valves will be replaced with dual coil mechanically latched types.

2. The power source for CCW controls will be changed to an ICS power panelboard.

3. Position indicating lights will be added in the control room for the condenser discharge valves. This item will not be performed since it is no longer necessary.

4. The local control stations for the condenser valves will be relocated to the mezzanine level.

5. The physical layout of electrical cabling and pneumatic tubing in the vicinity of the condensers will be reviewed to insure adequate protection from damage by water force.

6. A review will be conducted to determine the feasibility of raising the instrumentation, lube oil pump, and cooling water pump for the emergency feedwater pump. - Completed, these pumps and auxiliaries will be protected.

7. The procedures for opening the CCW system inside the Turbine Building will be reviewed and revised as necessary. - Completed

8. A design review of the station for susceptibility of similar type flooding incidents will be conducted. - Completed

DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

Central File
50-269
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287

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

April 15, 1977

TELEPHONE: AREA 704
373-4083

Mr. Norman C. Moseley, Director
U. S. Nuclear Regulatory Commission
Suite 818
230 Peachtree Street, Northwest
Atlanta, Georgia 30303

Re: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Mr. Moseley:

Prior to March 17, 1977, Oconee Nuclear Station Appendix B Technical Specification 1.2B required that all water discharged from the plant site have a pH between 6.0 and 8.5. (Appendix B Technical Specification 1.2B now requires that the pH as measured at the yard drain be between 6.0 and 9.0). On March 16, 1977, a routine sample of the year drains indicated a pH reading of 9.2.

This incident was initially considered reportable and pursuant to Appendix B Technical Specification 1.2B, a report should have been submitted by March 23, 1977. However, upon review of this incident, it was not considered to be reportable. The basis for this determination was that when considering the dilution flow available from Keowee tailrace, diluting water from the yard drain, the resulting pH in Lake Hartwell was within acceptable limits. The NRC was appraised of this evaluation on March 23, 1977.

The incident was reviewed further on April 12, 1977. By consulting the Safety Evaluation Report written on July 19, 1974, which supported the Oconee Appendix B Technical Specification 1.2, it was established that the intended pH monitoring point was the yard drain prior to dilution by the Keowee tailrace.

The following is a description of the events leading to this incident.

Since January 20, 1977, flow to the waste water collection basins (WWCB) had been controlled to provide holdup of radioactivity released to the WWCB during a January 17, 1977 incident described in Reportable Occurrence Report RO-269/77-3. To reduce flow to the basins in order to enhance holdup time, the water treatment room sump pumps have been used only during the regeneration of a demineralizer or during acid or caustic additions to the WWCB.

On March 15, 1977, approximately 36 gallons of caustic soda in the day tank was added to the upper WWCB using the water treatment room sump pump. The sump pump was secured, and the caustic drain valve, CA-68, on the day tank was closed and verified closed by checking the valve stem and caustic drain line to assure that no leakage was occurring.

During the next three hours, however, the remaining 69 gallons of caustic leaked past the caustic drain valve. It is postulated that the caustic drain valve failed to fully close due to caustic which had dried on the valve seat. The caustic dissolved after a period of time and allowed the caustic solution to drain out of the day tank.

The caustic solution filled the water treatment room sump, and since the sump pump was secured, overflowed to the storm drains. The storm drains empty into the oil collection pond which provide dilution before the water reached the yard drains and then entered the Keowee tailrace. The pH of the water leaving the site was approximately 8.3 when the dilution factor resulting from mixing with the Keowee tailrace is considered. This incident occurred over a 13 hour period. Detection of the incident was delayed due to the following facts.

As committed in our letter of November 16, 1977 to the NRC/OIE, a pH probe with remote readout in the water treatment room was placed in service at the yard drain on February 21, 1977. Approximately three weeks before this incident, the probe was struck by lightning and rendered inoperable.

The probe had been repaired on March 13, 1977 but had not been verified operable or calibrated at the time of the incident. Therefore, no credence had been placed in the information on the pH strip chart although the chart had been checked every four hours during the incident. After the incident, the probe was calibrated and determined to have been operable during the incident. The data recorded during the incident was corrected allowing for the calibration discrepancy. The corrected chart indicated that the yard drain pH had exceeded 8.5 on four occasions for a total of approximately eight hours. The maximum pH recorded was 9.2.

Valve CA-68 has been cleaned and declared operable. A caution tag has been placed on the valve to assure that the valve is closed tightly after use. Storage of caustic in the day tank will be minimized until the WWCB's are put back in normal use and the sump pump is placed back in continuous service. The yard drain pH probe was recalibrated and its operability verified on March 16, 1977.

During review of this incident, it was also discovered that a commitment made to the NRC in our response of November 16, 1977 to IE Inspection Report 50-269, -270, -287/76-10 had inadvertently not been completed. The commitment stated that a modification which would provide audible alarms to indicate excessive pH releases through the yard drains would be installed in the Oconee control rooms by April 1, 1977. This modification is being implemented and will be completed by June 1, 1977.

In the interim, our present policy of recording pH readings of the settling basins and yard drains every four hours and before and after completion of demineralizer regeneration will continue. Any abnormal change in pH will be reported to the duty chemist who will take appropriate measures. With the yard drain pH monitor now operable, it is considered that present instrumentation is adequate to monitor pH trends and that implementation of the audible alarms on the yard drain pH monitors will prevent future occurrences of this incident.

Very truly yours,

William O. Parker, Jr.

LJB:ge