UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-269/96-08, 50-270/96-08 and 50-287/96-08

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

Docket Nos.: 50-269, 50-270, and 50-287 License Nos.: DPR-38, DPR-47, and DPR-55

Facility Name: Oconee Nuclear Station Units 1, 2 and 3

Inspection Conducted: April 22 - May 3, 1996

Inspectors: _____ 5/31/96
R. Moore Date

_____ 5/31/96
L. King Date

Approved by: _____ 5/31/96
C. Casto, Chief Date
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted to review licensee actions to verify, monitor, and maintain the capabilities of the Standby Shutdown Facility (SSF) as described in the licensing basis.

Results:

No violations or deviations were identified.

The licensee's activities to monitor and maintain the readiness of SSF equipment and systems were good. Further actions would be necessary to verify the design function of the SSF diesel generator and the Reactor Coolant Make Up (RCMU) system. Appropriate SSF DG testing has been planned for September 1996. A flow test was being developed to validate the RCMU flow model which should provide greater assurance that adequate Reactor Coolant Pump seal water flow will be supplied in an SSF event. The inspectors noted that the electrical and mechanical calculations reviewed for the SSF systems were of good quality.

Enclosure

REPORT DETAILS

1.0 Persons Contacted

Licensee Employees

B. Peele, Station Manager
E. Burchfield, Regulatory Compliance Manager
*J. Davis, Engineering Manager
W. Foster, Safety Assurance Manager
*K. Grayson, System Engineer
*J. Hampton, Vice President, Oconee Site
J. Hubbard, Maintenance Superintendent
*J. Smith, Regulatory Compliance

*Attended exit meeting.

Other licensee employees contacted included technicians, operators, mechanics, security force members, and staff engineers.

Acronyms and abbreviations are identified in paragraph 5.0.

2.0 Engineering (IP 37550)

The inspectors reviewed the licensee's actions to verify, monitor, and maintain the capabilities of the Standby Shutdown Facility (SSF) as described in the licensing basis. The SSF function was designed to provide primary and secondary side make-up water to each Oconee unit in order to maintain the units in hot shutdown for 72 hours during a postulated fire, turbine building flood, or security event. The SSF systems include: Reactor Coolant Makeup (RCMU), SSF Auxiliary Service Water (SSF ASW), SSF Building Heating, Ventilation and Air Conditioning System (SSF HVAC), the SSF diesel generator (SSF DG) and supporting subsystems. The inspectors selected a sample of critical equipment and parameters and reviewed surveillance and testing activity, integrated testing which verified the SSF design capabilities, routine maintenance and equipment history, SSF activation time, and equipment reliability.

The licensee's design base documents (DBDs) for the SSF systems identified the systems' functions, critical equipment and critical parameters. The DBD testing/calculation matrix listed the design requirements and the test or calculation which verified the requirement. Critical parameters reviewed by the inspectors included pump performance, RCMU flow (primary side make-up) to the Reactor Coolant Pump (RCP) Seals, SSF ASW flow (secondary make-up) to the steam generators, and SSF HVAC capability to maintain SSF building ambient temperatures. SSF DG capacity, performance, and reliability was also reviewed.

2.1 Surveillance

Equipment performance monitoring was accomplished by surveillance testing. Major valves and pumps were included in the licensee's ASME Section XI In-service Test Program (IST). This testing activity verified that equipment performance met the system function requirements and facilitated monitoring for equipment degradation. The inspectors reviewed the periodic tests for the SSF-RCMU Pump, SSF-ASW Pump, SSF-HVAC Pump, SSF-Diesel Engine Service Water (DESW) Pump, and the submersible pump. In all cases the pumps met the specified flow requirements referenced in the Test and Acceptance Criteria (TAC) sheets and calculations. Previous testing resulted in increasing the flow capabilities of the SSF-RC Makeup and the SSF-ASW Pump via pump modifications. Review of the test data and discussions with the component engineers indicated no degradation of the pumps..

The inspectors reviewed the type C testing for the containment isolation valves for the SSF systems. These included a review of leak rate penetration testing for penetrations 12b and 11b. The penetrations were tested using PT/2/A/0151/12b and 11b. The testing was reviewed over a period of two years. Two instances were noted in which the leak rate on containment 12b and 11b isolation valves, 1HP-427 and 2SF-98, failed the leak rate tests. Work orders were written and both valves were replaced. Valve testing demonstrated that valve closing time criteria were met. The inspectors concluded that adequate surveillance testing was performed to identify equipment degradation.

2.2 Integrated Testing

The inspectors reviewed the integrated testing which provided assurance that the critical SSF systems could accomplish their design function of providing adequate primary and secondary make-up flow. Additionally, the inspectors reviewed the SSF DG testing.

2.2.1 RCMU Flow

The primary make-up flow capability, provided by the RCMU pumps to the RCP seals, was based on a hydraulic flow model which had not been fully validated (benchmarked). The flow model was documented in Calculation, OSC 4514, SSF RC Makeup System Hydraulic Model, dated March 27, 1995, and OSC 5372, Maximum Allowed RC Pump Leakage Rate and Maximum Allowed Total Combined RCS Leakage Rate for SSF RC Makeup System, dated May 23, 1995. The model was based on piping drawings because isometric drawings were not available. Use of piping drawings, rather than isometrics, increased the potential for errors in the model development. The inspectors reviewed Drawing O-479-E, referenced for the nodes to RC Pump 1A2, and were able to reproduce the data used in the nodes.

Of particular interest was the flow distribution in the supply lines to each of the RCPs. The analysis indicated that the Unit 1 Westinghouse RCP seal flows were more limiting than the Bingham RCPs in Units 2 and 3. The results of the calculation indicated that the most restrictive flow of 5.64 gallons per minute (gpm) was provided to RCP 1A2. The minimum required flow according to the DBD was 4.7 gpm to each seal. Due to the different piping configuration a minimum required total flow of 28.3 gpm was necessary to assure the minimum flow for the most restrictive piping layout. The RCMU pump capacity verified in surveillance testing was 29 gpm. Based on the uncertainties of the flow model, the limited flow margin, and the importance of establishing the required flow during an SSF event, the inspectors concluded that actual testing was necessary to validate the RCMU flow model.

The licensee was developing a flow test to determine the seal flow to the reactor coolant pumps on Unit 1 for validation of the flow model. A flow test was performed in 1994; however, the test methodology was flawed in that it introduced variables to the system flow characteristics which invalidated the results. There is insufficient installed instrumentation at present to obtain meaningful data. This was a factor being considered in the development of the verification testing.

2.2.2 SSF ASW Flow

The inspectors reviewed the licensee's actions to validate the flow model for the SSF ASW flow to the steam generators. The SSF ASW design base document (DBD), OSS-0254.00-00-1005, Design Basis Specification for the Standby Shutdown Facility Auxiliary Service Water System, Rev.1, dated July 10, 1995, stated that the minimum required flow rate to each Unit's steam generators (SG) during an SSF event is 425 GPM and was to be established to the SG's within 14 minutes. The flow model was documented in Calculation OSC-3233, SSF Service Water System Hydraulic Model, revision 5.

The inspectors reviewed the licensee's flow test verification activities. A flow test was performed to benchmark the flow model for a portion of the SSF ASW system. The inspectors reviewed Procedure TT/3/A/0600/13, "B" Emergency Feedwater (EFDW) Header Flow Path To SSF ASW Pump Discharge Test, dated July 11, 1995. The performance data from the test was used to determine the flow resistance through the ASW supply piping and validate the flow resistance values used in the flow model. An additional test was conducted in November 1994 which demonstrated that proper flow balancing could be achieved between the steam generators, when being fed by the SSF ASW Pump. TT/2/A/0400/24, Flow Balance Test Of SSF-ASW Valves Using The 2B Motor Driven Emergency Feedwater Pump, dated November 14, 1994, documented this test. The inspectors concluded that the flow model for the SSF ASW flow to the steam generators had been adequately validated.

2.2.3 SSF HVAC

The inspectors reviewed Calculation OSC-2030, SSF HVAC Load Calculation which included 7 revisions from May 13, 1985, to August 10, 1995, and HVAC service water flow testing. The initial calculation evaluated HVAC unit performance under service water flow conditions of 24 gpm (12 gpm to each condenser) and 104 degrees F inlet temperature. Revision 6 incorporated Appendix E which determined that at 36 gpm (18 gpm per condenser) and 110 degrees F inlet temperature the HVAC system load capacity was 19 tons. The anticipated SSF building load was 14.9 tons. The addition of margin for instrument error and flow distribution resulted in service water test acceptance criteria of 47 gpm. The inspectors noted that due to uncertainties in calculations and analysis for the HVAC system that it would be beneficial to perform testing to verify the HVAC unit performs as assumed in the analysis. The licensee indicated that the testing could be performed during the planned 24 hour SSF DG run test.

Flow tests were performed periodically on the HVAC service water via PT/0/A/400/16, SSF HVAC Service Water System Flow Test. A test performed on January 11, 1996, verified a flow of 52 gpm. The inspectors also reviewed the flow test for the SSF building HVAC service water system, TT/0/A/600/12, SSF Service Water Test With ASW Pump, HVAC Pump and DESW Pump Running Simultaneously, dated April 27, 1994. This test demonstrated the ability of the SSF service water piping to provide adequate suction pressure and flow while the SSF ASW Pump, one SSF HVAC pump, and the DESW Pump are running simultaneously. The inspectors concluded that the licensee had adequately verified the HVAC service water system flow capability.

2.2.4 SSF DG Operation

The inspectors reviewed the SSF DG testing which verified the DG capability to supply the SSF electrical loads. In an SSF event the DG was required to carry a maximum load of approximately 2933 Kw and operate loaded for 72 hours. The DG was rated at approximately 3500 Kw. A 24 hour full load run was conducted at the vendor facility. The DG was subsequently disassembled and rebuilt onsite. The DG was routinely operated for one hour to the grid at 3100 Kw as a surveillance requirement since the SSF was declared operable in 1985. The longest loaded run onsite was four hours and 42 minutes in April 1995. The inspectors noted that the surveillance runs were adequate to identify degradation in DG performance; however, the limited run time had not demonstrated the DG capability in the long term fully loaded condition anticipated in the SSF event. This issue had been previously identified prior to this inspection and a 24 hour full load run was planned for September 1996.

2.3 Maintenance and Equipment History

The inspectors reviewed the periodic maintenance (PM) and equipment history of SSF critical equipment to assess the licensee's effectiveness in maintaining equipment performance. The following critical equipment was reviewed: RCMU pumps and accumulators, SSF ASW pumps, check valves, isolation valves, SSF DG, electrical system inverters, chargers, and batteries. Pump maintenance consisted primarily of packing and lubrication replacement. The recommended vendor maintenance was included in the maintenance program. Inverters and chargers received periodic inspection, cleaning, and alarm checks. The batteries were service tested annually. A review of maintenance history and the PIP data base indicated that the PM program was adequately maintaining equipment performance. The inspectors concluded that the SSF equipment was maintained consistent with its importance to safety.

2.4 SSF Activation Time

The inspectors reviewed the licensee's activities to assure that the SSF activation time constraints were achieved. The time constraints applicable to RCP seal flow were ten minutes for the Unit 1 Westinghouse pumps and 20 minutes for the Unit 2 and 3 Bingham pumps. The time constraint began when normal RCP seal flow and cooling was lost. The SSF ASW flow to the steam generators was required in 14 minutes. The ten minute constraint was the value used for assuring adequate SSF systems performance. The licensee verified the time constraint via walk-through of the activation procedure with time allotments for equipment operation. Actual activation of the SSF systems was undesirable because the injection of the lower quality emergency primary and secondary water sources would not be merited except in an emergency situation. The inspectors reviewed the drill procedure and concluded that the equipment operating time allotments were reasonable.

The history of SSF activation activities indicated that the activation time constraint of ten minutes was frequently met since the SSF was declared operable in 1985. However, there were examples in which the time constraint was not met which resulted in corrective actions to simplify the activation procedure, reduce operator manning requirements, and pre-establish SSF system alignments. Until 1994 the drills were not formally documented by the licensee. An exception was a successful drill documented on December 13, 1987. An Appendix R drill on June 27, 1994, identified that the 10 minute time constraint was not met. This was documented in PIP 0-094-1041 and identified as an NRC unresolved item 50-269, 270, 287/94-36-01. At that time the activation required one licensed operator and two non-licensed operators. A modification was implemented to replace key manual valves with electric valves and simplify the activation procedure.

A follow-up Appendix R SSF Activation drill on August 24, 1995, did not meet the time constraints due to a communications problem between the assigned operators. PIP 4-095-0596 documented this drill failure. A SSF activation drill was successfully conducted on May 26, 1995. The corrective action for the inadequate activation time was to implement a minor modification to pre-establish SSF breaker and valve positions such that only one licensed operator was required to activate the SSF. Training was subsequently provided to all control room licensed operators.

The inspectors reviewed and performed a walk-through of the revised Procedure AP/0/A/1700/65, SSF Emergency Operating Procedure, dated September 6, 1995, and concluded that adequate guidance was provided for one operator to activate the SSF. The PIP corrective actions also required the training staff to conduct annually at least two unannounced drills per shift. The inspectors reviewed the training records and verified that a drill had been conducted on each shift by December 1995. These drills verified the ten minute time constraint was achieved. The inspectors concluded that the licensee's corrective actions for the above PIPs had enhanced their capability to activate the SSF within the specified time constraints.

2.5 SSF Reliability and Unavailability

The inspectors reviewed the reliability of the SSF DG and the unavailability of the SSF systems. The licensee had established goals of 95 per cent DG reliability and less than 5 per cent (438 hours/year) unavailability of SSF systems. The reliability was determined by successful starts. Unavailability was based on inoperability of any SSF system due to equipment/system downtime. The SSF system conditions were monitored by the system engineer and documented in semi-annual System Health Reports. The inspectors reviewed the system Health Reports for 1994 and 1995. There were no DG start failures and the unavailability for 1994 was 4.1 per cent (364 hours) and 2.9 per cent (255 hours) for 1995. The inspectors review of SSF equipment history supported these values. The inspectors concluded that the licensee's DG reliability and SSF system unavailability demonstrated an appropriate level of readiness of the SSF.

3.0 Engineering Followup (92903)

(Closed) URI 50-269,270,287/94-36-01, Failure to Meet SSF Activation Time Requirement

This item identified the licensee's failure during a drill to meet the SSF activation time for supplying RCP seal water.

The inspector reviewed the licensee's evaluation and resolution of this issue which was addressed in PIP 0-094-1041. This item is discussed in paragraph 4.4 above. The licensee's evaluation determined that the procedure was overly complex and the activation task was an operator burden due to the performance of electrical and valve line-up requirements. The procedure improvements and modifications were completed and the activation drill performed again in 1995. A follow up drill on August 24, 1995, did not meet the time constraints due to a communications problem between the assigned operators. PIP 4-095-0596 was initiated. Further enhancements were incorporated to reduce the manning requirements from three operators to one operator for the activation. A minor modification was implemented to maintain the SSF systems alignment in a more complete state of readiness. Unannounced drills on all shifts were completed by December 1995. The ten minute activation time was consistently achieved. In the future, two annual unannounced drills are to be conducted by training per shift. The inspectors concluded the licensee had evaluated the SSF activation issue and implemented actions to improve performance of this activity.

(Closed) Violation 50-269,270,287/93-25-08, Inadequate SSF and ECCW Testing

This violation identified three items related to inadequate testing of the Emergency Condenser Cooling Water System (ECCW) and the SSF Auxiliary Service Water System. Item one identified that the ECCW system flow test procedure did not account for a potential input error. Item 2 was related to the lack of a flow test and flush for the SSF ASW System. Item three was closed in NRC Report Nos. 50-269,20,287/94-31.

The inspectors verified the licensee's corrective actions specified in the violation response dated May 12, 1994, were completed. Item one required the licensee to analyze the potential flow error in the ECCW flow test and incorporate the results in the test procedure. The ECCW flow error was analyzed and incorporated in Test Procedure PT/1/A/0261/07, ECCW System Flow Test, dated November 21, 1995. Item two required a reverse flow flush and test of the SSF ASW system which was performed on May 20, 1994, and documented on test report TT/1/A/600/13, SSF ASW Pump Discharge to "B" EFDW Header Flow Path Test, dated May 20, 1994.

4.0 Exit

The inspection scope and results were summarized on May 2, 1996. The inspectors described the areas inspected and discussed the inspection findings below. There were no dissenting comments received from the licensee. Proprietary information is not contained in this report.

(Closed) URI 50-269,270,287/94-36-01, Failure to Meet SSF Activation Time Requirement

(Closed) Violation 50-269,270,287/93-25-08, Inadequate SSF and ECCW Testing

5.0 Acronyms and Abbreviations

ASW	Auxiliary Service Water
DBD	Design Base Document
DG	Diesel Generator
DESW	Diesel Engine Service Water
ECCW	Emergency Condenser Cooling Water
EFDW	Emergency Feedwater
gpm	Gallons per minute
HVAC	Heating, Ventilation, and Air Conditioning
IST	Inservice Test Program
Kw	kilowatt
PIP	Problem Investigation Program (report)
PM	Periodic Maintenance
RCMU	Reactor Coolant Make-Up
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
SSF	Standby Shutdown Facility
TAC	Test and Acceptance Criteria