Duke Power Company
Oconee Nuclear Site
P.O. Box 1439
Seneca, SC 29679

J. W. HAMPTON
Vice President
(803)885-3499 Office
(803)885-3564 Fax

DUKE POWER

May 12, 1994

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Site
Docket Nos. 50-269, -270, -287
Inspection Report 50-269, -270, -287/93-25
Reply to Notice of Violation

By letter dated February 11, 1994 the NRC issued a Notice of Violation and Notice of Deviation as described in Inspection Report No. 50-269/93-25, 50-270/93-25, and 50-287/93-25.

The inspection report covers the Service Water System Operational Performance Inspection that was conducted at Oconee from November 1 - December 14, 1993. A total of four violations were identified as a result of the inspection, with eighteen separate examples requiring response. Two deviations were also identified, with five separate examples requiring response. An extension request of sixty days was submitted to the NRC on March 1, 1994 and approved by your Staff on March 22, 1994.

Pursuant to the provision of 10 CFR 2.201, I am submitting a written response to the violations identified in the above Inspection Report. In addition, attached is the response to the deviations that were identified.

Very truly yours,

for BPeele

J. W. Hampton

cc: Mr. S. D. Ebneter, Regional Administrator
U. S. Nuclear Regulatory Commission, Region II

Mr. L. A. Wiens, Project Manager
Office of Nuclear Reactor Regulation

Mr. P. E. Harmon
Senior Resident Inspector

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RESPONSE TO VIOLATION 'A'

A. 10CFR50, APPENDIX B, CRITERION XVI, "CORRECTIVE ACTIONS"

1. We accept this violation and agree that items 1 and 2 are examples of the violation. Reasons for the violation are discussed below under each individual item.

2. The corrective actions taken and the results achieved are discussed below under each individual item.

3. The corrective actions that will be taken to avoid further violations are discussed below under each individual item. Additional corrective actions, which will also serve to avoid further violations, were previously identified to you in our April 20, 1994 submittal in response to the potential programmatic weaknesses identified in the Service Water System Operational Performance Inspection report. As stated in our April 20, 1994 submittal, the examples cited are not indicative of a programmatic weakness.

4. We are in full comp... ce with this criterion.

ITEM 1.

Measures had not been established to assure that conditions adverse to quality had been corrected in that the evaluation of Condition Adverse to Quality Report, PIP 92-454, for a postulated water hammer within the Low Pressure Service Water piping downstream of the reactor building cooling units, did not address the water hammer effects on the structural integrity of the piping.

RESPONSE

Oconee Engineering identified the potential for water to flash in the Low Pressure Service Water (LPSW) piping downstream of the discharge from the Reactor Building Cooling Units (RBCUs). Under worst case, design basis accident conditions, the pressure in the piping could be subatmospheric. The high fluid temperature coupled with the low pressure could result in flashing of some of the LPSW in the discharge piping. Two concerns are associated with this flashing: the potential for this two-phase flow to cause pipe vibration which could threaten the integrity of the pipe, and the reduction in LPSW flow under two-phase conditions. PIP 0-O92-0454 was written in September 1992 to address this situation. In response to this PIP, a calculation was performed (OSC-4922) which assessed the potential reduction in flow under two-phase conditions and the LPSW hydraulic computer models were revised to conservatively model the reduction in flow. The issue of pipe vibration was not explicitly addressed.

In December 1992, Duke Power performed an internal review of the effectiveness of a past technical audit of the LPSW system. During this effectiveness review, it was identified and documented that the potential for two-phase flow to cause pipe vibration (and thereby threaten pipe integrity) was not explicitly addressed in the corrective actions for PIP 0-O92-0454. The review team recognized that LPSW discharges from the RBCUs as subcooled liquid and exits the Reactor Building at a relatively constant elevation. The piping enters the Auxiliary Building and then rises in elevation. The piping exits the Auxiliary Building and enters the Turbine Building where the piping elevation drops down into the Turbine Building basement floor. Water in the LPSW pipe could flash at the high point (in the Auxiliary Building) and condense at a lower elevation in the discharge piping (in the Turbine Building), where the pressure is higher. Flashing and the cavitation associated with the condensation of vapor will produce vibration loads on the piping and supports. Documentation does not exist that would indicate whether these loads were evaluated in the original design of the system.

Oconee's position on the findings of the effectiveness review team were documented in an October 1993 memo to file. In this memo, Oconee agreed that the potential exists for the two-phase flow to cause vibration of the pipe. It was recognized that the potential transient loadings were not explicitly incorporated into the analysis that supports the piping design temperature and pressure. The potential consequences of this kind of transient loading is damage to hangers (support/restraints). Oconee has had instances where hangers have been pulled out of the wall due to water and/or steam hammer. In all cases, the piping has retained its pressure boundary integrity and remained operable. It is possible that the LPSW discharge piping from the RBCUs would be damaged and be pulled out of the wall, if exposed to these transient loadings during a worst case, design basis accident. However, it was the judgement of Oconee Engineering that the piping would retain its integrity and remain operable.

Further review of this issue was initiated in December 1993. PIP 0-O93-1031 was written, specifically on the pipe vibration and integrity aspect of this issue. The acceleration forces associated with the phase change and bubble collapse can be considered a type of water hammer, though water hammers are usually the result of transient conditions whereas the forces in the LPSW piping are steady state. An engineering evaluation (OSC-6020) was performed and it was determined that the forces would occur only in that portion of piping in the Turbine Building. Upstream of these forces, the piping is restricted from moving by passing through the Turbine Building / Auxiliary Building wall. Therefore any possible pipe break would occur in the portion of the LPSW piping in the Turbine Building as it travels down towards the basement floor.

Since any possible break would not occur inside containment, dilution of the boron concentration in the Reactor Building sump is not a concern. In addition, since the break will not occur inside containment, containment isolation will not be affected. Since the potential break would occur in piping common to the discharge of all three RBCUs, a flow imbalance would not be induced. It is possible that a slight change in LPSW system pressure could result, depending on exactly where the break occurs. This could result in a slight change in LPSW flow to the RBCUs and the Low Pressure Injection (LPI) coolers. This would be accommodated for by adjusting the flow control valves for flow through the LPI coolers, since the operators would act to maintain the required flows through the coolers. The overall effect on heat removal, if any, would be negligible.

The only safety-related components in the vicinity of the potential break are air-operated flow control valves 1,2LPSW-251, 1,2LPSW-252, 3LPSW-404, and 3LPSW-405. If, during a postulated accident, these valves were operational to begin with, exposure to the water stream from a break could potentially cause the valves to fail open. These valves would not fail closed under these conditions (the valves are designed to fail open). If these air-operated throttle valves were unavailable for any reason, motor-operated valves 1,2,3LPSW-4,-5 would be used to throttle flow. The Turbine Building basement could be flooded at a rate up to 10,000 gpm due to the postulated break. As analyzed in the Oconee Probabilistic Risk Assessment, a flooding rate of less than 10,000 gpm would not impact the ability of any safety related equipment to perform its function. Therefore, the LPI system and the RBCUs, in conjunction with the LPSW System, would continue to perform its required functions.

In conclusion, a PIP was written specifically on the pipe vibration and integrity aspects of this issue and an operability evaluation was performed. The piping would most likely retain its integrity, and even if it did not, all safety systems would continue to perform their required functions. A corrective action has been identified to modify the piping system by installing an orifice downstream of the potential cavitation. The orifice will increase the upstream pressure and prevent the cavitation from occurring. A schedule for the implementation of this modification will be provided by 9/1/94.

ITEM 2.

Measures had not been established to assure that conditions adverse to quality had been corrected in that the evaluation to determine corrective actions for design study ONDS 327 and Problem Investigation Report 92-084 concerning the postulated response of the High Pressure Service Water system to the maximum hypothetical earthquake did not include the consequences of spurious fire protection component activations.

RESPONSE

The audit team recognized Oconee's efforts to resolve concerns associated with the High Pressure Service Water (HPSW) system not being seismically qualified. This issue was evaluated as part of design study ONDS-327 and further evaluated in response to PIPs 0-O92-0084 and 0-O93-0695. However, the inspection report goes on to state that Oconee's evaluation on the seismic adequacy of the HPSW system failed to consider the actuation of any of the system's fire deluge functions due to a seismic event. It is not clear that Oconee's licensing basis requires consideration of the potential actuation of the fire deluge functions during a seismic event. Duke has not been able to find any documentation of the intent of Duke Power design engineers and of the AEC (NRC) at the time Oconee was licensed. The changes occurring in the design criteria and codes at the time, especially the seismic design criteria, apparently created some inconsistencies when the overall design is reviewed on a comprehensive basis. However, the original plant design was based on good judgement and sound engineering practices.

The spurious actuation of the fire deluge functions of HPSW, due to a seismic event, can be postulated. If the event were a seismic event only, the full operation of the HPSW system would not adversely impact the safe shutdown of the plant. The two standby, 6,000 gpm HPSW pumps would start as the Elevated Water Storage Tank level decreased to pre-set limits. HPSW would continue to provide its sealing and cooling function to the Condenser Circulating Water pumps. The effect on Low Pressure Service Water (LPSW) pump NPSH would be negligible since the LPSW system would not be in its worst case configuration. If, instead of a seismic event alone, the event were a LOCA with loss of offsite power and concurrent seismic event which ruptured all the compressed air systems, then there would be an impact on LPSW pump NPSH. The effect of full HPSW flow has recently been incorporated into Revision 5 of engineering calculation OSC-2280, "LPSW $NPSH_A$ and Minimum Required Lake Level." The effect was to raise the required lake level 2 feet, from an elevation of approximately 784' to an elevation of approximately 786'. This new, minimum lake level has been incorporated into the latest revision of SLC 16.9.7. No further corrective actions are necessary.

RESPONSE TO VIOLATION 'B'

B. 10CFR50, APPENDIX B, CRITERION III, "DESIGN CONTROL"

1. We accept this violation and agree that Items 2 through 7 are examples of this violation. We do not agree that item 1 is an example of this violation. Reasons for the violation, and why we disagree with Item 1, are discussed below under each individual item.

2. The corrective actions taken and the results achieved are discussed below under each individual item.

3. The corrective actions that will be taken to avoid further violations are discussed below under each individual item. Additional corrective actions, which will also serve to avoid further violations, were previously identified to you in our April 20, 1994 submittal in response to the potential programmatic weaknesses identified in the Service Water System Operational Performance Inspection report. As stated in our April 20, 1994 submittal, the examples cited are not indicative of a programmatic weakness.

4. Though some of the corrective actions will be completed earlier, full compliance with the criterion will be achieved by 6/1/95.

ITEM 1.

The NPSH of the Low Pressure Service Water pumps was not adequately considered as a design input in that calculation OSC-5019 was accepted by the licensee's engineering personnel with inadequate NPSH.

RESPONSE

The NPSH of the Low Pressure Service Water (LPSW) pumps has been adequately considered in engineering calculations. Worst case plant configuration was assumed along with the worst case design basis accident of a LOCA with concurrent loss of offsite power (LOOP) and worst case single failure. In addition, it was conservatively assumed that a catastrophic failure of all the instrument air systems occurred at the same time as the LOCA/LOOP. The instrument air systems are not safety related and were not seismically designed. Air-operated valves in the LPSW system fail to their safe position, which is open for several large system loads. If the instrument air systems did not fail, existing administrative limits on lake level would ensure adequate NPSH to the LPSW pumps during a worst case design basis accident with single failure.

When engineering analyses determined that a complete loss of instrument air, during the accident conditions described above, could result in inadequate NPSH to the LPSW pumps, procedural guidance was developed to ensure the operators would quickly regain control of system load demands. The completion of these operator actions in a timely manner (20 to 30 minutes) reduces system demand, and therefore pump flow, to a point where NPSH is adequate. The pump manufacturer was immediately contacted to evaluate pump performance under conditions of inadequate NPSH for a limited period of time. The manufacturer's evaluation, documented in the supporting engineering calculations, determined that the LPSW pumps can withstand operation with inadequate NPSH for the limited period of time they would be exposed to these conditions. The impeller inlet would be subject to cavitation damage, but this is generally a long term effect and 20 minutes is not a significant time period for this wear.

In conclusion, engineering analyses have appropriately evaluated and documented the acceptability of this condition for a limited period of time. Procedural guidance for operators has been developed and administrative controls have been placed on lake level. No other actions are planned or necessary.

ITEM 2.

Measures established to assure design basis are correctly translated into procedures were inadequate in that no procedural controls existed to assure the Low Pressure Service Water's pump flows inputted into the hydraulic computer model for the Low Pressure Service Water system remained valid during quarterly testing of the Low Pressure Service Water pumps.

RESPONSE

We agree that formal procedural controls do not exist to assure that the Low Pressure Service Water (LPSW) pump flows inputted into the hydraulic model remain valid during quarterly testing. However, during every refueling outage, a full system flow test is performed on that unit's LPSW system. Pump flow rates are recorded over a range of header pressures for a number of different system load configurations. This is in comparison to quarterly ASME Section XI testing which is performed over a limited pressure range. Following the flow test, the data is analyzed and used to re-benchmark the LPSW hydraulic flow models. This periodic re-benchmarking provides information on pump performance over time. The re-benchmarking also provides information on the potential degradation of flow through various loads due to raw water induced fouling. If the re-benchmarking indicates a degradation in pump and/or system performance, then the hydraulic models of LPSW system performance during a worst case, design basis accident are re-analyzed. While the full system flow test data on pump performance is not collected and analyzed as often as quarterly ASME Section XI data, it is recorded over a much broader range of pressures and flows and is, therefore, more useful for ensuring the flow model remains valid.

Responsibility for both design basis and testing has recently been combined into the same systems engineering groups. As part of the expectations for these new groups, system engineers have responsibility for ensuring all design basis functions, as defined in engineering calculations and other design documents, are appropriately validated through testing. Quarterly performance test procedures will be revised to include an action step for the system engineer to review the results of the test before test procedure completion is documented. The test procedures for LPSW and other select systems, which do not have clear test acceptance criteria for pump performance, will be revised by 9/1/94. System engineers will compare quarterly pump test data, along with full system flow test data, against computer models and other calculations to ensure the validity of design basis analyses.

ITEM 3.

The measures applied to the selection of Belzona as a suitable material for application to the Unit 2 Reactor Building Cooling Unit tubes were inadequate in that the commercial grade evaluation, CGD-2021.01-01-0001, did not consider the thermal (temperature) and hydraulic (pressure) changes Belzona would experience due to accident conditions.

RESPONSE

During the commercial grade evaluation of Belzona, an analysis of the Reactor Building Cooling Unit (RBCU) application was performed. This analysis was a "static" analysis at "normal" conditions. By inspection of these results and comparison with published product specifications and peak LOCA conditions, it was judged that the material would withstand the "static" conditions (pressure, temperature, borated water spray) of a LOCA. However, no consideration was given to the steep temperature ramps imposed by a LOCA (though local ramps may be much less severe than the bulk average ramp). Similarly, no consideration was given to material degradation due to temperature or pressure changes during normal operation.

The installation of the Belzona is such that it has a free surface. Hence, thermal stresses would not be expected to exist or would be very low (localized only). Hence, only the pressure changes would be expected to contribute to the cyclic loadings. Normal Low Pressure Service Water (LPSW) pressures in the RBCU's tend to be fairly constant, changing a little over time with water temperature, lake level, and other loads (such as Low Pressure Injection Coolers during other unit RFO's). Hence, the magnitude of the alternating stresses would be small (with large periods) and the time to potential fatigue failure would be long.

There is a wide history of favorable industrial experience with the material. This favorable experience also tends to make any application oriented analytical work of lesser importance.

Belzona (or a similar product) is the only truly practical means of repairing any minor leakage of the RBCU coils. The joints are brazed and are in close proximity to each other. Any attempts at either solder or brazing repair would most likely weaken or destroy adjacent joints. Hence, Belzona-like products are the only practical products to use. Belzona itself typically has superior performance specifications compared to similar products. Also, Oconee has had good experience with previous Belzona repairs, most notably, the 'D' heater drain pump.

An effort is currently underway to obtain dynamic material property data and to analyze Belzona for usage under cyclic loading and LOCA conditions. This evaluation will be completed by 12/16/94 and will further clarify where Belzona can be used. Also, a modification to replace the RBCU cooling coils has been completed on Unit 3 during the U3EOC14 refueling outage, is currently underway on Unit 1 during the U1EOC15 refueling outage, and will be performed on Unit 2 during the U2EOC14 refueling outage.

ITEM 4.

The design basis of the Emergency Circulating Cooling Water system was not adequately translated into design documents in that the calculations supporting Emergency Circulating Cooling Water decay heat removal capability did not include numerous aspects of the design that would reduce that system's decay heat removal capability.

RESPONSE

Calculation OSC-2349, "CCW Intake Piping Degassing in the ECCW Mode," was intended to determine water level in the CCW intake piping, as a function of time, following a Station Blackout (SBO) event. The maximum analyzed flow rate of 30,000 gpm is adequate to address the SBO transient. It was never the intention of this calculation to analyze the LOCA/LOOP scenario. We intended to analyze this scenario in a separate calculation. Calculation OSC-5670, "Required Number of CCW Intake Flow Paths ," has been developed to address degassing issues for flow rates up to 90,000 gpm which are possible during a LOCA/LOOP event. In addition, using a site corrected atmospheric pressure of 14.0 psia in OSC-2349, instead of the 14.7 psia actually used, would have an insignificant effect on the analysis. No other actions are planned or necessary on OSC-2349.

Calculation OSC-2346, "ECCW System Performance Evaluation," did not account for condenser tubes plugged with Amertap balls or condenser tubes taken out of service due to plugging. Based on the large number of condenser tubes (16,960 per condenser) and the relatively small number affected (approximately 700 or less than 4.5%) the effect on the analysis is insignificant. Using a site corrected atmospheric pressure of 14.0 psia in OSC-2346, instead of the 14.7 psia actually used, would decrease the maximum allowable temperature by 5.5 degrees F to 163.1 degrees F. OSC-2346 calculates a maximum temperature of 145 degrees F; therefore, the maximum allowable temperature is not exceeded.

OSC-2346 assumes a total ECCW minimum flow rate of 4,500 gpm per unit or 13,500 gpm total tailrace flow for all three units. Oconee test data given in PT/1,2, or 3/A/0261/07, "Emergency CCW System Flow Test," yield a condenser flowrate of at least 20,000 gpm for each unit, versus the required value of 13,500 gpm. Furthermore, the three units display similar condenser flow rate values. This indicates that unit specific condenser piping configurations do not adversely affect the assumption of an approximately equal flow split among the condensers.

OSC-2346 does not presently account for outgassing of the CCW, which may decrease the heat transfer capability of the condenser. A preliminary analysis has been performed on the potential for outgassing of CCW to disrupt siphon. The preliminary analysis has demonstrated that significant margin exists and siphon will not be impaired. A formal revision to calculation OSC-2346 will be completed by 10/1/94.

ITEM 5.

The design basis of the Circulating Cooling Water system's capability to withstand loss of Lake Keowee was not translated into any design document.

RESPONSE

The appropriate level of design documentation does not exist on the Condenser Circulating Water (CCW) system's ability to withstand a loss of Lake Keowee. However, the Oconee FSAR does state that the CCW system intake canal contains an underwater weir that is designed to trap approximately 67 million gallons of water in case of loss of Lake Keowee. The trapped water in the intake canal would be pumped through the condensers to remove decay heat and recirculated back to the intake canal. Due to the influx of warmer water into the intake canal, the temperature of the water at the suction of the CCW pumps could increase, even though significant heat loss to the atmosphere is expected. Also, any evaporation or leakage would decrease the water inventory in the intake canal while any rainfall would supplement the water inventory. The water inventory would be supplemented by fire trucks or other portable sources as part of recovery efforts, as necessary. The required time frame for these recovery efforts is likely to be on the order of several days or longer, but this has not been analyzed in detail.

We have begun engineering calculations to analyze the heatup of the intake canal water and the potential water inventory losses (due to leakage, evaporation, etc.) during a postulated loss of Lake Keowee event. The effects of increased temperature and decreased water inventory on the CCW system, and any system being served by CCW during this scenario, will be addressed. The appropriate design documents will be revised as a result of these analyses. The analyses will be completed and design documents revised by 6/1/95.

ITEM 6.

RESPONSE TO VIOLATION 'B'

The design basis of the Low Pressure Service Water system's capability to function as described in Case B of Abnormal Procedure AP/1/A/1700/13, "Loss of Condenser Circulating Water Intake Canal/Dam Failure," Step 5.5.1, was not translated into any design document.

RESPONSE

Design documentation does not exist on the Low Pressure Service Water (LPSW) system's ability to function during a loss of Lake Keowee. We have begun engineering calculations to analyze the range of flowrates and heatup of LPSW. The time to reach the maximum allowable LPSW system temperature, in order to meet the NPSH requirements for the LPSW pump in this mode of operation, will be determined. If necessary, appropriate changes to the Abnormal Procedures and other documents will be made. The analyses will be completed and design documents revised by 6/1/95.

ITEM 7.

The design basis of the Safe Shutdown Facility Auxiliary Service Water System's capability to remove decay heat was not adequately translated into design documents in that a minimum flow less than required by 23 gpm per steam generator pair was established in calculation OSC-4171.

RESPONSE

Calculation OSC-4171, Rev. 2 recognizes that a 400 gpm indicated flow rate could potentially be less than the minimum flow rate required to prevent heatup of the Reactor Coolant system (RCS) if the 400 gpm indicated flow rate was maintained. However, the calculation assumes that RCS instrumentation (Tcold) would alert the Standby Shutdown Facility (SSF) control room operator to increase or decrease the SSF Auxiliary Service Water (ASW) flow rate provided to an affected unit as needed to achieve hot shutdown conditions in the RCS. This is consistent with established operating procedures. Establishing a 400 gpm initial SSF ASW flow rate would be successful since the SSF control room operator will adjust flow, if necessary, based on RCS parameters.

Though the original method used to feed an affected Unit's steam generators during an SSF event would have been successful, an improved method of feeding steam generators was implemented as part of modification NSM-52882 in April of 1994. Revision 3 to OSC-4171 was created to support this NSM and, as part of this revision, an explicit allowance for potential instrument loop error was included. No other actions are planned or necessary.

RESPONSE TO VIOLATION 'C'

C. 10CFR50, APPENDIX B, CRITERION V, "INSTRUCTIONS, PROCEDURES, AND DRAWINGS"

1. We accept this violation and agree that items 1 through 5 are examples of this violation. Reasons for the violation are discussed below under each individual item.

2. The corrective actions taken and the results achieved are discussed below under each individual item.

3. The corrective actions that will be taken to avoid further violations are discussed below under each individual item. Additional corrective actions, which will also serve to avoid further violations, were previously identified to you in our April 20, 1994 submittal in response to the potential programmatic weaknesses identified in the SWSOPI report. As stated in our April 20, 1994 submittal, the examples cited are not indicative of a programmatic weakness.

4. Though some of the corrective actions will be completed earlier, full compliance with the criterion will be achieved by 11/1/94.

ITEM 1.

As of December 14, 1993, a prescribed procedural activity affecting quality did not contain appropriate acceptance criteria for determining that the activity had been satisfactorily accomplished. Procedure EDM-101, Engineering Calculations/Analysis, Section 2.4.4 did not establish a definitive length of time for revising calculations following design changes; thus, allowing calculation OSC-3233, Safe Shutdown Facility's Service Water Hydraulic Model, and OSC-2030, Standby Shutdown Facility Heating Ventilation and Air Conditioning Load Calculations, to not be updated for years after design changes affecting those calculations were implemented.

RESPONSE

Section 2.4.4 of EDM-101 requires that all other documents affected by the revision to a calculation be appropriately revised in a "timely manner". We agree the engineering calculations OSC-3233 and OSC-2030 were not updated in a timely manner. The amount of time allowed to make a "timely revision" is normally much less than that taken for revising OSC-3233 and OSC-2030.

Calculations OSC-3233 and OSC-2030 have since been revised to incorporate the changes made to the SSF Systems. EDM-101 will be revised to clarify management expectations on the amount of time allowed to update calculations by 9/1/94.

RESPONSE TO VIOLATION 'C'

ITEM 2.

As of December 14, 1993, a prescribed procedure did not contain appropriate acceptance criteria for determining that an important activity affecting quality had been satisfactorily accomplished in that no flow instruments existed to confirm 200 gpm was being provided to each steam generator or 400 gpm to an un-isolated steam generator by the Auxiliary Service Water pump as directed by Emergency Procedure EP/1,2,3/A/1800/01, Section 502.

RESPONSE

Changes to the Emergency Operating Procedure (EP/1,2,3/A/1800/01) incorporated guidance on establishing certain flow rates to SG(s) when feeding with the Auxiliary Service Water (ASW) pump. This guidance was incorporated based on feedback from Training Center personnel and licensed operators. It was incorrectly believed that flow instruments were available to allow the operator to properly establish these specified flows. As documented by this item, flow instruments are not available which would allow the operator to establish these specified flows. However, the operator was also referred to the Loss of Main Feedwater AP (AP/1,2,3/A/1700/19) which provides guidance for feeding SG(s) using the ASW pump. This guidance instructs the operator to maintain Reactor Coolant System pressure and temperature constant, which is the main concern. Consequently, even though the operator could not have verified flows as specified in the EOP, the Loss of Main Feedwater AP would have provided guidance to allow the proper use of this pump in feeding the SG(s).

A revision to the EOP is underway which will include the removal of specific flow guidance for the ASW pump. The reference to the Loss of Main Feedwater AP will remain and the operator will feed the SG(s) in accordance to the guidance provided in that AP. Training will be completed on the procedure revision and the revision will be issued by 10/1/94.

ITEM 3.

As of December 14, 1993, drawings affecting quality were not adequately prescribed in that the Keowee Turbine Generator Cooling Water system drawings, KFD-100A-1.1 and KFD-100A-2.1, did not indicate the existence of an additional valve downstream of valve 2WL-3 for Unit 2; the supply line to the air compressor coolers was interconnected to the 13 inch main piping for Unit 1; the piping downstream of valve WL-76 was copper for both Units; or a consistent piping class break in the supply line to the generator thrust bearing coolers for both Units.

RESPONSE

The Keowee flow diagram drawings were created by design study ONDS-258 in June

1992. ONDS-258 was created to upgrade the design documents for Keowee and to create flow diagrams for the safety related mechanical systems. Following the initial release of the drawings, several minor errors were identified and corrected. During the Service Water System Operational Performance Inspection, additional errors were identified for drawings KFD-100A-1.1 and KFD-100A-2.1 (Unit 1 and 2 Turbine Generator Cooling Water System). PIP 0-O93-0986 was initiated to address these items. Due to the number of identified deficiencies, the corrective action is to re-verify the drawings by walk-down. All identified errors will be corrected on the drawings by 7/1/94.

ITEM 4.

In November 1993, an activity affecting quality was not performed in accordance with prescribed procedures in that a condition adverse to quality report associated with a broken coupling on the Keowee hydroelectric station's Unit 2 turbine guide bearing oil cooler was neither processed as an upper tier adverse quality report nor did it receive a written operability evaluation.

RESPONSE

On 10-28-93, MP/2/A/2000/25 was performed on the Turbine Guide Bearing Oil Cooler. During performance of the procedure, the soldered joint immediately downstream of the cooler was broken. PIP 0-O93-0926 was written on 10-28-93 to document the problem and discuss operability. The PIP was processed as a lower tier report and, while operability of the Keowee unit was assessed and determined to be operable, no formal operability statement, using NSD-203, "Operability Determination", was issued.

We recognize that the PIP should have been processed as an upper tier report and a formal operability evaluation should have been performed. In response, PIP 0-O93-0994 has been written to resolve the questions concerning the parameters under which the Turbine Guide Bearing Oil Cooler may be isolated and the unit remain operable. Management expectations have been clarified on when a PIP should be processed as upper tier versus lower tier. The operability evaluation will require testing when the lake temperature is high, typically late August. The evaluation will be completed by 11/1/94.

ITEM 5.

In November, 1993, an activity affecting quality was not performed in accordance with prescribed procedures in that a safety related work order, 93077640, for performing the triennial inspection of Keowee hydroelectric station's Unit 2 turbine guide bearings oil cooler per MP/2/A/2000/25 specified a housekeeping zone higher than 3.

RESPONSE

RESPONSE TO VIOLATION 'C'

We agree that the work order was not performed in accordance with prescribed procedures. Oconee Nuclear Site Directive (SD) 1.4.1 section 3.1 states, "Cleanness Zones I, II, and III are for maintaining internal cleanness of QA Condition 1 systems and components. Zone IV is for area cleanness in the vicinity of QA Condition 1 systems and components. Zone V is for area cleanness for other station areas."

Keowee personnel were cognizant of the fact that much equipment at Keowee was designated as QA Condition 1, safety related. SD 1.4.1 section 3.2.3 references locations outside the Auxiliary and Reactor Buildings, but still within the Protected Area fence. This contributed to the impression that clean zone III was for Oconee Nuclear Station equipment only. For that reason, clean zone IV was used.

Predetermined (preventative maintenance) work orders and their associated procedures will be reviewed and, if necessary, revised, to ensure correct clean zone assignment by 10/1/94. In addition, refresher training will be conducted on Site Directive 1.4.1 for Keowee Station personnel by 8/1/94.

RESPONSE TO VIOLATION 'D'

D. 10CFR50, APPENDIX B, CRITERION XI, "TEST CONTROL"

1. We accept this violation and agree that items 1 through 4 are examples of this violation. Reasons for the violation are discussed below under each individual item.

2. The corrective actions taken and the results achieved are discussed below under each individual item.

3. The corrective actions that will be taken to avoid further violations are discussed below under each individual item. Additional corrective actions, which will also serve to avoid further violations, were previously identified to you in our April 20, 1994 submittal in response to the potential programmatic weaknesses identified in the Service Water System Operational Performance Inspection report. As stated in our April 20, 1994 submittal, the examples cited are not indicative of a programmatic weakness.

4. Though some of the corrective actions will be completed earlier, full compliance with the criterion will be achieved by 8/1/95.

ITEM 1.

A test procedure did not include adequate provisions for test instrumentation in that in procedure PT/1/A/0261/07, Change 8, August 8, 1991, Emergency CCW System Flow Test, a 2,000 gpm deviation in the test instrumentation used was not accounted for in the acceptance criteria.

RESPONSE

We agree that potential test instrumentation error was not properly accounted for. The method used for measuring the flow rate for the Emergency Condenser Circulating Water (CCW) System Flow Test involves a measurement error of up to approximately 2,000 gpm. The most recent test results for each Oconee unit have been reviewed to determine whether a 2,000 gpm measurement error would have affected the acceptability of the test results. This review indicated that the minimum flow required for decay heat removal after a station blackout (plus excess flow of several thousand gpm) was available, even with a 2,000 gpm penalty. Therefore, failure to consider the flow measurement error during these tests did not have an adverse effect on safety.

A detailed analysis of the flow measurement error associated with the Emergency CCW system flow test will be completed by 7/1/94. The results of this analysis will be used to revise the test procedure to incorporate the appropriate flow measurement error by 8/1/94.

RESPONSE TO VIOLATION 'D'

ITEM 2.

The post-construction flushing procedure for the Safe Shutdown Facility's discharge lines to all the steam generators did not contain flush velocities or acceptance criteria based upon filter, turbidimetric or chemical analyses.

RESPONSE

A post-construction "fill-and-drain" was performed on the Standby Shutdown Facility (SSF) Auxiliary Service Water (ASW) system. However, the actions performed did not meet the requirements, contained in the piping specification at that time, for flushing newly installed piping systems. The velocities achieved during the "fill-and-drain" were not sufficient to meet the flush criteria.

A reverse flow test of each unit's SSF ASW supply piping will be performed to verify that an open flow path will be available during an SSF event. A modification to add piping has been installed to allow demineralized water to be flushed from the Emergency Feedwater (EFW) system back through SSF ASW piping. A reverse flow test will be performed instead of a forward flow test because it is undesirable to pump lake water from the SSF ASW supply piping into the steam generators. The 'B' motor driven EFW pump will be used to pump demineralized water from the upper surge tank through that Unit's corresponding SSF ASW supply piping. A 500 gpm flow rate will be established during the flush to ensure that adequate flush velocities will be achieved. 500 gpm was chosen because it is the maximum allowed flow rate through a Unit's SSF ASW supply header during an SSF event. Water samples will be taken during the flush to verify that the SSF supply piping flush is adequate. The test is will be performed on Unit 1 during the current U1EOC15 refueling outage (scheduled to be completed June '94), on Unit 2 during the U2EOC14 refueling outage (currently scheduled to begin September '94), and on Unit 3 during the U3EOC15 (currently scheduled to begin May '95). In addition, the existing pipe specification will be reviewed, and if necessary revised, to ensure adequate guidance is provided for properly flushing piping systems by 8/1/94.

ITEM 3.

Periodic Safe Shutdown Facility Auxiliary Service Water pump operability test, PT/0/A/0400/05, was not performed under suitable environmental conditions in that the pump was preconditioned in step 12.2 by venting the pump just prior to its being started masking any air entrapment that would affect pump performance.

RESPONSE

We agree that venting the pump just prior to its being tested could potentially mask air entrapment that could affect pump performance. The Standby Shutdown Facility (SSF) Auxiliary Service Water (ASW) pump has been vented as a good practice whenever the pump is returned to service after a maintenance period and prior to performance testing. This is consistent with Table 4.1-2 of Oconee's Technical Specifications, which requires that the high pressure injection pumps and low pressure injection pumps be vented prior to testing. Since the SSF ASW pump is at a low point in the system, any air which comes out of solution in the piping will tend to move away from the SSF ASW pump towards the high point in the piping system. Little or no air is expected to come out of solution in the piping surrounding the SSF ASW pump since the pressure at the SSF ASW pump is greater than atmospheric pressure and will be capable of holding more dissolved air in solution than the same water held at atmospheric pressure. Therefore, little or no air is expected to accumulate inside the SSF ASW pump.

To further insure that a pump will operate as required, testing procedures will be revised to eliminate venting of the SSF ASW pump and other select pumps immediately prior to a performance test. The procedures will be revised by 9/1/94.

ITEM 4.

The preoperational test program to demonstrate that systems and components would perform satisfactorily in service and meet the requirements contained in applicable design documents for the Safe Shutdown Facility's service water system was inadequate in that the flow control capabilities to the steam generators and the flow distributions among the three service water pumps (Auxiliary Service Water; Heating, Air Conditioning and Ventilation; Emergency Diesel Generator Cooling Water) when operating simultaneously as assumed in numerous design calculations was not performed.

RESPONSE

The preoperational test performed on the Standby Shutdown Facility (SSF) service water pumps (Auxiliary Service Water (ASW), HVAC cooling water, and diesel generator cooling water) was not an integrated test. Currently each of the SSF service water pumps are tested individually to demonstrate operability. Motor-operated valve testing is also performed per Generic Letter 89-10 to demonstrate valve operability. Other components, such as the diesel generator, are tested individually, as well. However, an integrated system test demonstrating flow control capabilities among all three SSF service water pumps simultaneously, has not been performed.

A periodic, integrated system performance test involving all three SSF service water pumps has been developed. SSF ASW pump flow is through the pump minimum flow line and test line. Flow rates through the SSF ASW test line were chosen to match flow rates required during an SSF event. The test has recently been conducted and has successfully demonstrated integrated system performance. This integrated test will be performed periodically.

RESPONSE TO DEVIATION 'A'

A. DURING THE 1993 SERVICE WATER SYSTEM OPERATIONAL PERFORMANCE INSPECTION CONDUCTED AT OCONEE, FOUR ITEMS WERE IDENTIFIED THAT DEVIATED FROM OCONEE'S WRITTEN RESPONSE TO GENERIC LETTER 89-13.

1. We accept this deviation and agree that items 1 through 4 are examples of this deviation. Reasons for the deviation are discussed below under each individual item.

2. The corrective actions taken and the results achieved are discussed below under each individual item.

3. The corrective actions that will be taken to avoid further deviations are discussed below under each individual item.

4. Though some of the corrective actions will be completed earlier, all corrective actions will be completed by 10/1/94.

ITEM 1.

A periodic testing program had not been established for the testable Keowee service water system heat exchangers or the Standby Shutdown Facility's testable emergency diesel generator heat exchangers.

RESPONSE

Oconee's January 1990 response to GL 89-13, Action II states that a heat exchanger test program for testable, safety-related heat exchangers has been established. In Oconee's response to GL 89-13, Low Pressure Service Water was the focus. PIP 4-O94-0192 was written to document the omission of Keowee service water systems. Additionally, item number 93-02-6B, from the Electrical Distribution System Functional Inspection identified the need for heat exchanger testing. Modifications are currently under development to facilitate testing. We will provide a revised response to GL 89-13, Action II along with a schedule for implementation of the modifications and testing by 9/1/94.

The Standby Shutdown Facility's emergency diesel generator heat exchangers are utilized monthly and service water flow and diesel temperatures are monitored to ensure they are within manufacturers specifications. On a quarterly basis, the flow is verified via a periodic test procedure. Oconee considers this an "equally effective program" to ensure satisfaction of the heat removal requirements. Per NRC recommendation for a GL 89-13 testing program, an "equally effective program" can be utilized by the utility to ensure satisfaction of the heat removal requirements of the service water system.

RESPONSE TO DEVIATION 'A'

ITEM 2.

All raw water systems were not reviewed for stagnant or intermittent flow under ONDS-252 in that Keowee service water cooled systems were not included.

RESPONSE

ONDS-252 is a design study which serves as the initial planning for the organization of a long term plant monitoring program. The purpose of this program is to assure the functional integrity of the raw water systems are maintained. Oconee's January 1990 response to GL 89-13, Action III (Inspection and Maintenance Program) stated that ONDS-252 would review the entire raw system of the plant to determine where water is stagnant or subject to intermittent flow. Once a complete "picture" was obtained, a monitoring/inspection program would be developed and implemented. In Oconee's response to GL 89-13, Low Pressure Service Water was the focus. PIP 4-O94-0192 was written to document the omission of the Keowee service water systems. <u>We recognize that Keowee service water should have been included and we will provide a revised response to GL 89-13, Action III by 9/1/94.</u>

ITEM 3.

The training and procedures review programs established for service water systems were not adequate in that these reviews never identified that there were no flow indicators in the Auxiliary Service Water discharge lines to the steam generators, no emergency procedure addressed inadequate Low Pressure Service Water flow and there were no operating procedures for Keowee service water systems.

RESPONSE

Changes to the Emergency Operating Procedure (EP/1,2,3/A/1800/01) added guidance on establishing specified flows to SG(s) using the Auxiliary Service Water (ASW) pump. This guidance was added based on feedback from Training Center personnel and licensed operators. It was incorrectly believed that flow instruments were available to allow the operator to properly establish these specified flows. The flow rates specified in this guidance were identical to those specified in other portions of this section of the Emergency Operating Procedure (EOP). Therefore, this change to the EOP was not a philosophy change, nor did it require any equipment to be operated differently than previously required by the EOP. The intent of this change was to respond to feedback based on procedure usage and provide more complete guidance on establishing flow. Consequently, it was determined that this change did not require a plant validation. This determination was in error. However, requiring these specified flow rates, where no flow instrument existed, did not preclude the establishment of proper ASW flow to the SG(s). The Loss of Main Feedwater AP (AP/1,2,3/A/1800/01), which is referred to in the same step which required these flow rates, does provide adequate guidance for establishing

RESPONSE TO DEVIATION 'A'

SG(s) feed using the ASW Pump. This AP states that the flow rate should be controlled so as to maintain Reactor Coolant System pressure and temperature constant, which is the overriding concern.

A revision to the EOP is underway which will include the removal of specific flow guidance for the ASW pump. The reference to the Loss of Main Feedwater AP will remain and the operator will feed the SG(s) in accordance to the guidance provided in that AP. Training will be completed on the procedure revision and the revision will be issued by 10/1/94.

In the event of a loss of Low Pressure Service Water (LPSW) flow, or degraded LPSW flow, the LPSW Header A/B Press Low statalarm would be received. The alarm response guide directs the operator to perform AP/1,2,3/A/1800/24, Loss of Low Pressure Service Water. As now stated in this procedure, the purpose is to provide guidance in the event that LPSW is inadvertently lost or degraded. Procedural guidance is provided to diagnose the cause of the loss or degradation, and mitigate the event. Operator training continually emphasizes the need to consult alarm response guides to determine proper actions in response to alarms received. This process of referring to the alarm response guides will ensure that the operator is properly referred to the Loss of Low Pressure Service Water AP. Current procedures are adequate and no additional procedures are needed.

Operating procedures have been created and approved for the following systems at Keowee and include the procedure numbers and approval dates:

- Unit No. 1 Thrust Bearing Oil Heat Exchanger (OP/1/A/2000/047) - 02-04-94

- Unit No. 2 Thrust Bearing Oil Heat Exchanger (OP/2/A/2000/047) - 02-04-94

- Unit No. 1 Generator Air Coolers (OP/1/A/2000/048) - 02-04-94

- Unit No. 2 Generator Air Coolers (OP/2/A/2000/048) - 02-04-94

The procedures for the identified systems include an enclosure for a valve alignment checklist. This checklist includes all valves required to operate the system including the throttled discharge valve with instructions for positioning it to the normal throttle position.

ITEM 4.

Numerous service water systems were omitted from the Self Initiated Technical Audit including the Auxiliary Service Water system, the Standby Shutdown Facility's service water systems, the Keowee service water systems, the condenser cooling mode of the Circulating Cooling Water system, and the recirculation mode of the Circulating Cooling Water system.

RESPONSE TO DEVIATION 'A'

RESPONSE

In 1987, a Self-Initiated Technical Audit (SITA) was conducted of Oconee's Low Pressure Service Water (LPSW) system to assess its operational readiness and functionality. A SITA takes a focused, in-depth look at a particular system versus a broader, but less in-depth review. A SITA also looks at the interfaces the particular system in question has with other systems. For example, during the LPSW SITA, Emergency Condenser Circulating Water (ECCW) to the suction of the LPSW pumps was studied, along with High Pressure Service Water (HPSW) to the CCW pumps. It was never the intention of this particular audit to cover the Auxiliary Service Water System, the Standby Shutdown Facility's service water systems, the Keowee service water systems, the condenser cooling mode of the CCW system or the recirculation mode of the CCW system.

Duke Power's January 1990 response to Generic Letter 89-13, Action IV (Confirmation of Licensing Basis) states that a SITA had been completed on the service water system at Oconee in 1987. The system referred to in that statement is the LPSW system, since LPSW is the nuclear safety-related service water system. It was not intended to refer to all service water systems at Oconee. We will provide a revised response to Action IV of Generic Letter 89-13 by 9/1/94.

RESPONSE TO DEVIATION 'B'

B. OCONEE'S WRITTEN COMMITMENTS ASSOCIATED WITH STATION BLACKOUT (SBO) INDICATED THAT REGULATORY GUIDE 1.155 WOULD BE FOLLOWED. CONTRARY TO THIS STATEMENT, A TEST PROCEDURE FOR DEMONSTRATING THAT SYSTEM READINESS REQUIREMENTS WERE MET, WAS INADEQUATE IN THAT THE TEST ACCEPTANCE CRITERIA DID NOT ASSURE THAT A 4-HOUR INVENTORY OF HIGH PRESSURE SERVICE WATER COOLING WATER AS ASSUMED IN THE SBO EVENT WAS AVAILABLE FROM THE MINIMUM ALLOWABLE ELEVATED WATER STORAGE TANK LEVEL.

1. We accept this deviation. Reasons for the deviation are discussed below.

2. The corrective actions taken and the results achieved are discussed below.

3. No further corrective actions are planned.

4. All corrective actions have been completed.

DETAILED RESPONSE:

Oconee's Station Blackout (SBO) submittal discussed gravity flow cooling of the Condenser Circulating Water (CCW) pumps from the Elevated Water Storage Tank (EWST) for up to four hours so the CCW pumps could be restarted immediately upon restoration of offsite power.

The EWST would provide gravity flow cooling to the CCW pumps for 4 hours. This capability is tested annually, using PT/0/A/250/38, "Elevated Water Storage Tank Drain Test." At the time of the Service Water System Operational Performance Inspection, the test procedure contained several weaknesses:

1. The calculation in the procedure for determining the capacity of the tank, in minutes, should have used the minimum full level of 90,000 gallons, instead of the actual initial EWST level.

2. Stricter controls should have been placed on re-performing the test if the original test failed due to leakage of the check valves on the High Pressure Service Water (HPSW) pump discharge.

3. The procedure should have directed the test performer to notify the operating manager when the calculated HPSW flow rate exceeds 375 gpm, not 500 gpm.

A PIP (0-O94-0307) was written on these procedure weaknesses and the procedure has been revised. Past test procedures have been retrieved and the recorded data has been reviewed. This review indicated that the identified weaknesses do not change the conclusion arrived at upon completion of each test. None of the tests would have failed due to using 90,000 gallons in the calculation instead of the initial volume. None of the tests needed to be re-performed due to check valve leakage.

Following a four hour SBO event, plant recovery would be per AP/1,2,3/A/1700/11, "Loss of Power." This procedure provides direction on restarting a CCW pump. Even if HPSW gravity flow from the EWST to the CCW pumps was not maintained for four hours, the ability to immediately restart a CCW pump upon restoration of offsite power would not be adversely impacted. Without continual HPSW flow, air inleakage could result in the formation of voids in the high points of the CCW inlet piping. However, even if this occurred, extensive fill and venting actions would not be required prior to starting a CCW pump because the pumps (and their impellers) are located underwater. Restarting a CCW pump would simply push the air through the pipe. In addition, the surge lines on the CCW piping near the inlet to the condenser would provide a relief path for any air that was swept through the pipe. Any air that was swept past the surge lines would be carried through the condenser and out the CCW discharge piping to the lake. Upon restoration of power, the HPSW pumps would also be restarted and would provide forced sealing and cooling flow to the CCW pumps. Gravity flow from the EWST to the CCW pumps is no longer needed once power is restored.

In conclusion, the weaknesses originally identified in PT/0/A/250/38 have been corrected. In addition, even if HPSW gravity flow from the EWST to the CCW pumps did not last the full four hours, the ability to immediately restart a CCW pump upon restoration of power would not be adversely impacted. No other actions are planned or necessary.