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W. R. McCollum, Jr.
Vice President

February 19, 1998

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -289
Response to Request for Additional Information on Proposed Revision to Technical Specifications for the Upgraded ECCW System
Technical Specification Change # 96-10

In a letter to the staff dated August 28, 1997, Duke Energy Corporation (Duke) submitted amendments to the Oconee Nuclear Station Units 1, 2, and 3 Technical Specifications to modify the Emergency Condenser Cooling Water (ECCW) System. The August 28, 1997, Duke submittal also included a final design description of the modification. The conceptual design of the ECCW System upgrade had been previously submitted to the staff in a Duke letter dated December 28, 1995. It has been Duke's understanding that the review and approval of this licensing amendment will include a review of the design features of the ECCW System upgrade.

In letters dated January 20, 1998, and February 9, 1998, the staff requested additional information in support of its review of proposed Technical Specifications for the upgraded Emergency Condenser Circulating Water (ECCW) System. Duke Energy Corporation (Duke) provided responses to six of the seven questions in the January 20, 1998, staff request for additional information in a letter dated January 22, 1998. The response to the remaining question, as well as responses to the requests in the February 9, 1998, staff letter, are attached.

In the letter to the staff dated January 22, 1998, Duke indicated that the heat tracing for the ECCW Upgrade project would be tested for operability when weather conditions require the heat tracing to be in service. As presently

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scheduled, the duration of the Unit 2 outage will result in Essential Siphon Vacuum and Siphon Seal Water System operability in May 1998. This time frame is well past potential freeze protection needs. Heat trace installation will not occur until after the return to service of Unit 2, during warm weather and prior to the onset of cold weather in the fall of 1998. All heat tracing for Unit 2 will be functional in time to support the Oconee Cold Weather Protection program.

Please address any questions to J. E. Burchfield, Jr., at (864) 885-3292.

Very Truly Yours,

W. R. McCollum, Jr.
Oconee Site Vice President

Attachments

cc: Mr. L. A. Reyes
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Mr. M. A. Scott
Senior Resident Inspector

Mr. D. E. LaBarge
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Mr. M. Batavia
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Attachment
Response to February 9, 1998
Request for Additional Information

Question 1:

Page 7 of the technical justification section, a study/calculation was performed to assess the impact of the additional electrical loads on the capacity of the emergency power system.

a. What are the assumptions that are used for this study/calculation? Discuss why each of these assumptions is considered valid conservative.

b. What findings from this study/calculation are used to conclude that the emergency power system is able to support the additional electrical loads with no significant impact on the power distribution system.

Response to 1a:

The addition of the ESV Pumps and the other minor loads (instrument circuits, heat trace, solenoid valves, etc.) of the Oconee Service Water (OSW) Project on the Emergency Power System contains assumptions used to perform the Auxiliary and Emergency Power System (EPS) studies and calculations. A brief description of background information will be provided prior to describing the assumptions.

Background Information

The ESV Pump Motor start circuit contains a time delay of 2 minutes (+/- 10 seconds) in the ESV pump motor start circuit to ensure that the ESV pump motor starts after the required LOCA/LOOP or LOOP loads are loaded onto the Emergency Power System.

A time delay of 2 minutes (+/- 10 seconds) was selected for the ESV pump motors as part of the initial overall Oconee Service Water (OSW) Project engineering design to eliminate the potential impact of the major OSW project loads on the Emergency Power System LOCA/LOOP or LOOP initial loading scenarios. All major LOCA/LOOP loads (Emergency Core Cooling System ECCS pump motors, vital DC battery chargers, vital MCC's etc.) will be loaded and at steady-state conditions prior to loading the ESV pumps. This delay is implemented on an individual ESV pump basis with a time delay relay in each pump motor control circuit. The minor loads (instrument circuits, heat trace, solenoid valves, etc.) have a negligible impact on the EPS due to their small current loading at the 600 VAC level (~ 1 amp).

In order to assess the impact to the Oconee Normal and Emergency Power Systems, a calculation has been completed that evaluated the addition of the ESV Pump Motors to Oconee degraded grid conditions. Degraded grid is a postulated low voltage condition (~224KV) in the switchyard. The degraded grid condition analysis provides the most conservative case for determining voltage adequacy to plant loads whether they are normal operation loads or also serve emergency functions. Onsite emergency power system conditions are more favorable (per unit voltage) for the ESV pump motor and other emergency loads when compared to postulated offsite degraded grid conditions. If acceptable results can be engineered and designed with degraded grid conditions, then more acceptable results will be obtained with onsite power sources (Keowee/Lee). The degraded grid calculation considered both LOCA and normal loads being required with degraded grid conditions present. The calculation assumed that three ESV pumps would be required with the degraded switchyard conditions in lieu of the two normally operating pumps. The third pump is an installed spare and is not automatically started. In addition, other significant loads which are not normally running ("C" Condensate Booster Pump) are conservatively assumed to start, or to be operating. The calculation showed acceptable results. Acceptable voltage was available for the ESV and plant normal and emergency loads. As mentioned earlier, this calculation does not consider Keowee or Lee since voltage conditions are more favorable with these sources, than with degraded grid conditions.

<u>Degraded Grid Voltage Adequacy Calculation Assumptions</u>

1. A time delay of 2 minutes (+/- 10 seconds) was used in the ESV pump motor loss of power start circuit to ensure that the ESV pump motor starts after required LOCA/LOOP loads.

A time delay of 2 minutes (+/- 10 seconds) will be designed into the ESV pump motor starting circuit for a loss of offsite power (LOOP) to eliminate any potential impact of the OSW project loads on the LOOP initial loading scenarios. All major LOCA/LOOP loads (ECCS pump motors, vital DC battery chargers, vital MCC's etc.) will be loaded and at steady state prior to loading the ESV pumps.

2. Normally only two of the three ESV pump motors will be running on each unit. However, for the purpose of the degraded grid voltage adequacy study/calculation, all three

motors were assumed to be operating.

This is a conservative assumption for any study or calculation in that it results in additional margin. In reality, only two ESV pump motors will be operating at any given time.

3. The degraded grid condition provides the most conservative case for determining voltage adequacy to plant loads whether they are normal operation loads or also serve emergency functions. Due to the time delay of 2 minutes (+/- 10 second) for ESV pump motor loading, onsite emergency power system conditions are more favorable (PU Voltage) when compared to offsite degraded grid conditions. If acceptable results can be designed with degraded grid conditions, then more acceptable results will be obtained with onsite power sources (Keowee).

Response to 1b:

The results from the studies and calculations which are used to conclude that the emergency power system is able to support the additional electrical loads with no significant impact on the power distribution system include:

1. Use of the degraded grid condition as the power system voltage for defining the ESV pump motor and power supply performance conditions provides the most limiting operating condition. The Oconee Service Water (OSW) electrical equipment meets all functional system requirements for this plant condition.

2. The time delay 2 minutes (+/- 10 seconds) designed into the ESV pump motor starting circuit for a loss of offsite power (LOOP) eliminates any potential impact of the OSW project loads on the LOOP initial loading scenarios. All major LOCA/LOOP loads (ECCS pump motors, vital DC battery chargers, etc.) will be loaded and the emergency power system in a steady state condition prior to loading the ESV pump motors.

3. During postulated LOCA/LOOP conditions, the ESV pump motor loadings are delayed from starting. The 240/120 single phase VAC QA-1 panelboard loadings are insignificant and do not have any significant effect on the safety system loads starting. The impact of the 240/120 single phase loadings at the three phase feeder breaker of the 600 VAC MCC was very minimal, ~ 1amp, and considered insignificant in the power system scheme. These QA-1 panelboards feed

instrumentation and control circuits, ESV/SSW solenoids and the ESV float valve heat trace.

4. When restarting the ESV pump motors after the 2 minute delay for LOCA/LOOP or LOOP scenarios, the available voltage at the 600 VAC MCC will be higher than for the analyzed offsite conditions associated with degraded grid conditions. This is due to the conditions assumed for degraded grid. Degraded grid is a terminology used to describe a low distribution system voltage condition. A degraded grid condition which reaches the transfer setpoint from offsite power to onsite power will result in an improvement to the voltage condition for all emergency loads.

5. Confirmation was made that no changes would be required to the 600 VAC or higher power system equipment. No change at the 600 VAC MCC buss work, incoming feeder breaker level or above the 600 MCC level would be required. The 600 VAC MCC individual compartment changes were confirmed. These changes involved moving non-QA-1 loads to non-QA MCC's. Overall, the net difference in load to the QA-1 MCCs is small due to the non-QA-1 load relocations.

6. Breaker coordination reviews and calculations have confirmed acceptable coordination. The impact of the new loads does not affect the 600 VAC MCC incoming breaker coordination calculations. The 600 VAC MCC breakers are also coordinated with ESV loads. The OSW project power system (loads to ESV pump motors and panelboards) is coordinated with the plant power distribution system.

In summary, the studies and calculations carried out for the addition of the OSW project to the Oconee Nuclear site electric power distribution system, both auxiliary (normal) and emergency, determined that the load additions were acceptable with no significant impact.

Question 2:

Page 12 of the technical justification section states that the cable derating also assures that the cables and fault protection are coordinated such that faults are cleared and cables are protected.

Discuss this statement as it applies to specific cases.

Response:

With respect to a specific case, the ESV pump motor power feeder will be described. This methodology was followed for similar OSW project activities involving other loads, cables and breaker sizes.

The ESV pump motors will be supplied with 600 VAC power through a 3 conductor #2 cable. The process by which this cable was selected first began with a cable ampacity selection and then a cable/length voltage drop calculation. Duke's standard work practices initially derate cable by 30%. The ESV pump motor manufacturers information relative to motor inrush and full load current loadings were reviewed. The ESV Pump Motor draws 128 Locked Rotor Amps (LRA) and 24.4 Full Load Amps (FLA). Using the ampacity tables contained in Duke's work place procedure (which derates cable by 30%), initially a 3 conductor #6 cable could be selected (Note: Duke does not normally use #8 cable & #10 is rated for Duke at 21 amps). However, the cable length and voltage drop considerations must be factored into the cable selection. Performing a voltage drop calculation using the various cable lengths for the feeder from all three units and the source voltages resulting from Question #1 for degraded grid, requires that the cable be increased to the 3 conductor #2 cable size.

The breaker selection activity and coordination calculation is then performed with the above information. The results from this activity resulted in a GE 40 Amp THED6 breaker being selected for implementation in the MCC for the ESV pump motors. 3 Conductor #2 cables and 40A THED6 breakers will be used for all nine ESV Pump Motor applications.

As can be seen from the breaker size (40A THED6) and the cable ampacity size (3C#2 = 97 Duke Amps), any credible load side faults will be cleared and the cable protected. Cable derating assures that the cables are sized 30% larger than the Duke permitted load(s), and when combined with the breaker sizing for the maximum Duke permitted loading of the derated cable, provides additional protective margin for the actual cable installed.

Question 3:

Page 14 of the technical justification section discusses a solenoid valve that is located in the common ESV seal supply piping section downstream of each ESV Pump's seal supply cross-connect valve.

Where are these solenoid valves powered from and are they de-energized to open or energized to open?

Response:

The ESV Pump SSW solenoid valves are powered from the same Class 1E and Emergency Power System as the ESV Pump Motors. A QA-1 600 VAC MCC power feed is supplied to a QA-1 600/240/120 VAC single-phase transformer located in the ESV building. The transformer secondary is connected to a QA-1 240/120 VAC power panelboard. The solenoid is powered from a dedicated QA-1 15Amp breaker. All installations are seismically qualified and QA-1. All breaker coordination and voltage drop calculations have been performed for this power feeder and load arrangement.

The solenoid is an energize to open solenoid.

Attachment
Response to Remaining Question in January 20, 1998
Request for Additional Information

Question 3: How were the ESV and siphon seal water (SSW) systems evaluated for high and moderate energy line breaks? What are the results? If not, why is it not necessary?

Response:

The ESV and SSW piping itself is not high energy (P > 275 psig or T > 200°F). Oconee's licensing basis does not consider moderate energy piping. The requirements in Oconee's licensing basis for High Energy Line Break (HELB) outside containment are contained in UFSAR Section 3.6.1.3, Safety Evaluation, which states the following:

> "The analysis of effects resulting from postulated piping breaks outside containment is contained in Duke Power MDS Report No. OS-73.2, dated April 25, 1973 including Supplement 1, dated June 22, 1973.
>
> An evaluation of potential non-safety grade control system interactions during design basis high energy line break accidents is contained in the Duke Power/Babcock and Wilcox Report dated October 5, 1979."

Section 2.3 of MDS Report No. OS-73.2 discusses the consequences of postulated line breaks. Section 2.3.2 states:

> "Protection from the consequences of postulated pipe breaks, as required, will be furnished such that the mitigation of the accident and capability to safely shut down the reactor and maintain it in a safe shutdown condition, when necessary, are assured."

The SER for Oconee 2 & 3 contains the following:

> "The basic criteria require that:
>
> 1. Protection be provided for equipment necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming a concurrent and unrelated single active failure of protected equipment, from all effects resulting from ruptures in pipes carrying high-energy fluid, up to and including a double-ended rupture of such pipes, where the temperature and pressure conditions of the fluid exceed 200°F and 275 psig.

Breaks should be assumed to occur in those locations specified in the "pipe whip criteria." The rupture effects on equipment to be considered include pipe whip, structural (including the effects of jet impingement) and environmental.

2. Protection be provided for equipment necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming a concurrent and unrelated single active failure of protected equipment, from the environmental and structural effects (including the effects of jet impingement) resulting from a single open crack at the most adverse location in pipes carrying high-energy fluid routed in the vicinity of this equipment, where the temperature and pressure conditions of the fluid exceed 200°F and 275 psig. The size of the cracks should be assumed to be 1/2 the pipe diameter in length and 1/2 the wall thickness in width."

From the above information, it is interpreted that any HELB shall not prevent the safe shutdown of the plant, if needed, assuming an unrelated single active failure of the equipment used in achieving and maintaining safe shutdown. This is consistent with the SER for Oconee Units 2 and 3.

The ESV piping is not located near any high energy piping. ESV Electrical cabling is located near high energy piping in the Turbine Building and near an Auxiliary Steam (AS) line in the trench connecting the Turbine Building and the Radwaste Facility (RWF). Likewise, the SSW piping is near the AS line when it passes through the trench connecting the Turbine Building and the Radwaste Facility (RWF). The SSW piping in the Turbine Building is near high energy lines at various locations along its route. Damage to the ESV electrical cabling would not prohibit safe shutdown since the CCW pumps would be unaffected. Failure of an adjacent high energy line that fails one or both of the SSW lines would not prohibit safe shutdown of the plant. Safe shutdown could be achieved by a variety of means. In the worst case, shutdown would be achieved with the Turbine Driven Emergency Feedwater pump or the Auxiliary Service Water pump. This is consistent with the original HELB analysis.