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SUBJECT: Forwards response to NRC 981014 RAI re util proposed license amend to perform Keowee emergency power ESF testing during current Unit 3 refueling outage.

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October 15, 1998

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
Request for Amendment
Keowee Emergency Power Engineered Safeguards Functional Test
Response to Request for Additional Information

In a letter dated September 17, 1998, Duke Energy Corporation (Duke) submitted a proposed license amendment to perform Keowee Emergency Power Engineered Safeguards Functional testing during the current Unit 3 refueling outage. In a letter dated October 14, 1998, the NRC requested additional information concerning the planned Keowee Emergency Power Engineered Safeguards Functional Testing. The information contained in the Attachment provides Duke's response to the NRC's request for additional information.

If there are any additional questions, please contact Reene' Gambrell at (864) 885-3364.

Very truly yours,

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

RVG

Attachment

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RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REQUEST FOR AMENDMENT KEOWEE EMERGENCY POWER ENGINEERED
SAFEGUARDS FUNCTIONAL TEST

Question 1:

Was any consideration given to performing this test while Unit 3 is defueled or with the head removed and the refueling cavity flooded? Please briefly discuss any of these considerations.

Response

Consideration was given to performing the Keowee Emergency Power Engineered Safeguards Functional (KEP/ESF) test during defueled maintenance and with the head removed and the refueling cavity flooded; however, during those windows in the refueling outage many ES actuated systems and components are unavailable to perform a meaningful test. The decision to wait on the availability of these systems and components is economical. Integrating the KEP/ESF test schedule into the refueling outage schedule at those points would add approximately seven days to the planned refueling outage. With nuclear safety and availability of ES loads in mind, the window following fuel reload with the steam generator hand holes and a pressurizer safety valve removed was chosen as the optimum window for test performance. This schedule allows for testing with relatively low decay heat and no LTOP concerns.

Question 2:

The submittal indicates that the reactor head will be bolted and torqued, however, the steam generator hand holes will be open and one safety relief valve will be removed as the TS required RCS vents. Technical Specification 3.1.2.9 requires a RCS vent capable of mitigating the most limiting LTOP event. Please describe the number of hand holes and total relieving area and describe the most limiting LTOP event considered when this test is being performed. Additionally, given that three HPI pumps, two LPI pumps and part of the flow from two reactor building spray pumps will all be injecting into the RCS, how long do the operators have to terminate the test before the RCS fills? Are there any consequences to over-filling the RCS?

Response:

Calculation OSC-4437, "RCS Vent Path Alternatives to the PORV for HPI System Check Valve Functional Testing under LTOP Conditions", evaluated the maximum RCS pressure resulting from maximum HPI injection when one SG handhole was available for pressure relief. Conservatively assuming a 50° F temperature and 10,000 gpm ECCS injection flow, the delta P across the SG handhole is approximately 210 psia. The static head between the handhole and the low point in the RCS is ~30 psia. The back pressure of the RCS is 14.7 psia. The summation of delta P, static head and back pressure is ~255 psia, which is well below the LTOP limit of 495 psia (480 psig). Assuming a 50° F temperature and a 1610 gpm HPI injection, the delta P across the SG handhole is approximately 5.4 psia. Therefore, no operator action is required to meet 10CFR 50 Appendix G limits.

Handhole:
Minimum inner diameter = 4 7/8 inches
Flow length = 8 inches
Entrance curve radius = 1 3/16 inches
Entrance Loss coefficient (K ent) = 0.04
Exit loss coefficient (K exit) = 1.00
Handhole elevation = 845.60 ft

Based on the above, ECCS injection flowrates less than 10,000 gpm at temperatures greater than 50° F will not exceed the P/T limits for any of the Oconee units provided that a SG handhole is available for pressure relief.

Calculation OSC-7218 concludes that the operators must terminate the HPI pumps within 5 minutes of ES actuation to prevent overfilling the RCS. This is based on a conservative analyzed HPI injection flowrate of approximately 1500 gpm and an initial RCS level of 200 inches. The test procedure contains an action to terminate HPI as soon as manual ES actuation and verfication is complete. The consequences of over-filling the RCS are personnel safety and contamination of the reactor building. Over-filling does not pose any physical or technical concern to the RCS and associated equipment.

The two LPI pumps and the two RBS pumps will be taking suction from the decay heat drop line and will be in the recirculation mode during EP/ESF test performance; therefore, overfilling the RCS is not a concern for these pumps.

Question 3:

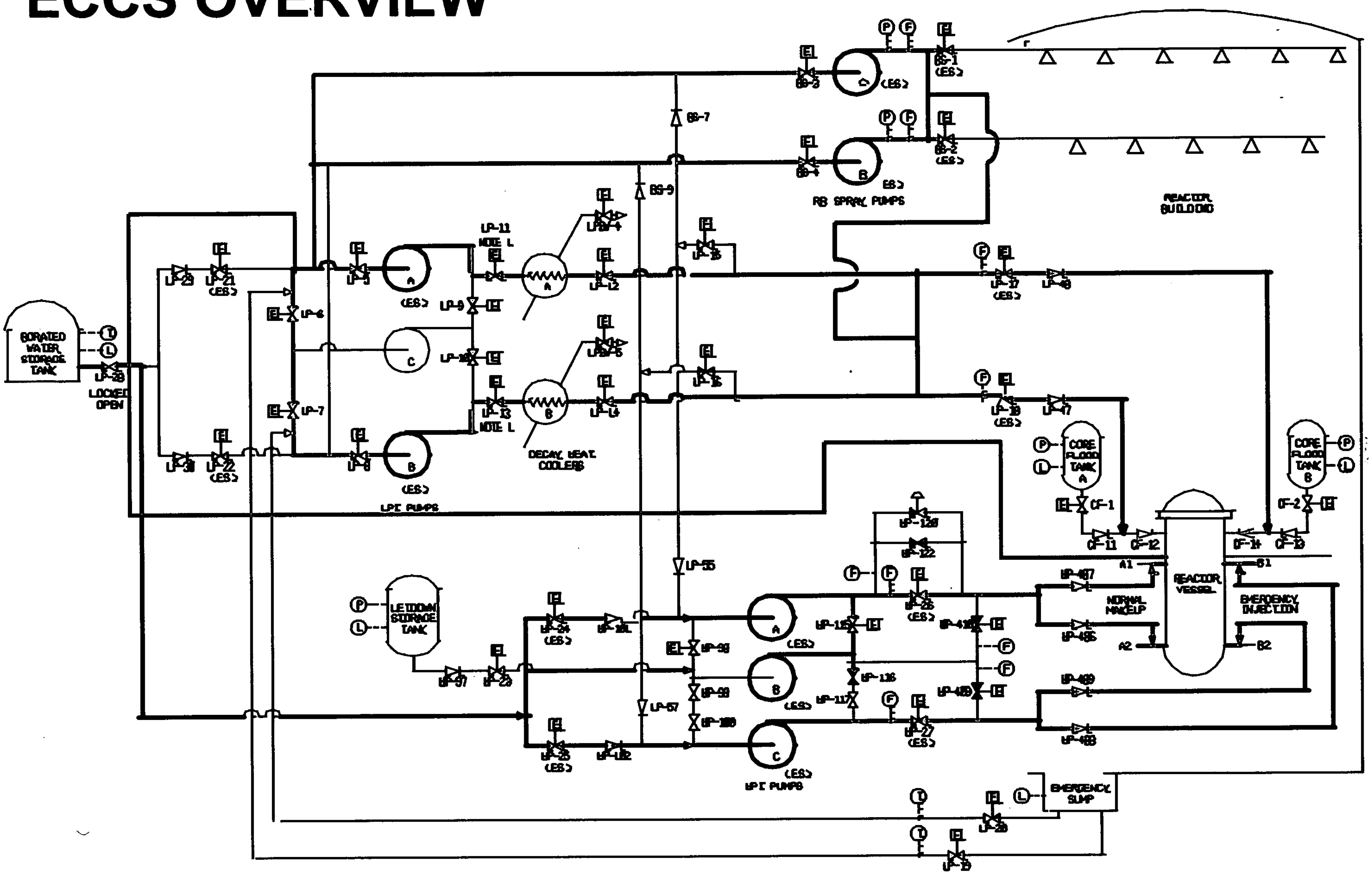
Please provide a flow diagram of the LPI and RBS taking suction from both the suction header and the RCS drop line and the discharge flow path. What is the maximum credible amount of leakage out of the RCS through the LPI or RBS?

Response:

See ECCS drawing on page 5.

Normal ECCS suction to the LPI and RBS pumps from the BWST through LP-21 and LP-22 will be isolated for this test. Suction will be from the RCS hot leg via the decay heat drop line as shown in green on the ECCS drawing. Maximum credible leakage out of the RCS through the LPI or RBS will be no more than 2 gallons per hour which is the maximum design leakage as allowed by technical specification.

ECCS OVERVIEW



LPI and RBS pump suction from Hot leg

HPI suctgion from BWST

Discharge lines to RCS

Question 4:

Please verify that the defense in depth concept being used for this test maintains ability to control RCS inventory and decay heat removal for Unit 3 with equipment that will not be subject to the transient electrical loading experienced during the test. Please describe the equipment that will not be affected by the transient electrical loading and what functions will be maintained.

Response:

In the event KHU 2 fails to power Unit 3 main feeder buses during the test, the following unaffected electrical sources are available to power the Unit 3 main feeder buses:

The Duke Power Grid via the startup transformer.
The Duke Power Grid via back charge of the main transformer.
KHU 1 via the startup transformer.
A dedicated Lee Gas Turbine via CT-5.

If both ES LPI pumps fail to start, the non ES 'C' LPI pump is available to provide forced circulation of the RCS and decay heat removal.

If both LPSW pumps fail to start on Unit 3 the system will be cross connected to the Unit 1 and 2 LPSW pumps to provide a heat sink for DHR.

If RCS inventory is lost it can be replenished from the BWST via gravity feed. This action will require operators to manually open one of two valves that supply water from the BWST to the suction of the LPI system.

Each of these actions is fully described in the test procedure contingency sections or the Loss Of Power, Loss Of Decay Heat Removal, and Loss Of Low Pressure Service Water abnormal procedures. The test procedure contingencies direct the operators to the appropriate abnormal procedures.

If Spent Fuel Cooling pumps '3A' and '3B' fail to restart during the test, the '3C' Spent Fuel Cooling pump is available to provide cooling. The RCW system is already

cross connected and being supplied by Unit 1 and 2. This action is directed by the Spent Fuel Cooling and RCW operating procedures.

Question 5:

Please verify that this license amendment request is for a one time only test and that the Oconee licensing basis will not permanently permit this type of test.

Response:

This test is intended to be performed as a one time only test; however, depending on the results, it may be necessary to repeat portions of the test. Duke will have a post-test briefing to assess the test results with respect to the acceptance criteria. If it is necessary to repeat a portion of the test, the status of the Oconee units will be evaluated to determine if a retest can be safely conducted. Duke Power does not intend to perform a portion of the test more than three times without reviewing the test plan with the NRC.

Attached from the submittal dated September 17, 1998 is a copy of Attachment I, UFSAR, Addition to Section 14.2 "Tests Prior to Reactor Fuel Loading" (Page 11). This section has been revised to reflect that the KEP/ESF test will be performed one time during 3EOC17.

Question 6:

In the Duke Energy September 17, 1998, letter it is stated that, "considering the frequency overshoot the Keowee units experience on emergency start, questions arose concerning whether the preferred loading design for the emergency power system is 60% loading or 90% loading. For this reason, the Keowee Emergency Power and Engineered Functional Test (KEP&ESF) is planned." Please identify and discuss the questions that arose. Since there are some questions regarding the 90% loading capability and this capability has not been tested before, please describe what work has been done to verify to a reasonable degree that equipment will operate properly during the test. Provide CYME computer model results that show the expected motor response characteristics against their overload protection, and the associated Keowee response. Discuss why these results are expected to be realistic or conservative relative to the test and actual case.

Response:

During the detailed design phase of NSM ON-53014 questions arose whether the preferred loading design for the entire emergency power system is to load onto Keowee at its present loading value of approximately 60% voltage and frequency or the proposed change of 90% loading. The Keowee units on emergency start from a shutdown or standby condition will overshoot 60 hz as the governor gains control of the unit's speed to maintain it at rated frequency. With the present loading scheme the Oconee loads are loaded onto the accelerating Keowee unit at approximately 60% of rated speed, and the majority of the connected loads have started by the time the Keowee unit obtains rated speed (approximately 4 seconds later) and experiences a frequency overshoot. With the proposed delayed (90% voltage) loading scheme, some of the motors and loads will still be starting and accelerating during the Keowee generator overspeed (frequency overshoot) period. For induction motors the torque output (T) varies proportionally to v^2/f^2. Therefore, as the frequency increases greater than 60 Hz and the generator voltage is held constant at its rated value by the generator voltage regulator, the torque output capability of the motors

decreases. Considering the Keowee generator frequency overshoot, it was not clear which loading scheme (60% or 90%) would result in the shortest motor acceleration time. Because of this, the testing will demonstrate which loading scheme minimizes the acceleration time for the connected motors and provides the most margin between the motor starting current curves and the motor overcurrent protective relay trip curves. Both of the loading schemes are believed to be acceptable for the power system. It is Duke's intent through this test to measure the differences and determine which of the two loading schemes is the most conservative.

The purpose of the testing is to evaluate the differences between 60% and 90% loading. Duke does not have the capability in CYME to model loading at reduced voltage and frequency (either 60% or 90%). Previous modeling was started at an initial frequency of 100%. In the January 1997, Keowee Engineered Safeguards Functional Test (KESF) Test 3, LOCA loads of Unit 3 were started simultaneously with the LOOP loads of Unit 1. Duke has modeled the January 1997 KESF Test 3 in CYME with the frequency initially at 60 hertz and simulated the overshoot of Keowee similar to that seen in Test 3 by performing a CYME load rejection. Predicted motor start times correlated well to Test 3 data. The test report has been previously supplied to the NRC. The overload trip information was also provided in the test report and shows a satisfactory margin between motor start currents and the relay trip curve.

Therefore, the January 1997 KESF Test 3 gives the most valuable information regarding successfully completing the planned EP/ESF test. Duke has determined from the results of KESF Test 3 that both planned EP/ESF tests (60% and 90%)can be successfully completed because the system is being challenged to a lesser degree. Previously, KESF Test 3, LOCA loads of Unit 3 were started simultaneously with the LOOP loads of Unit 1. For this test, only Unit 3 LOCA loads will be started. Therefore, Duke is confident that both the 60% and 90% tests scheduled for this present outage will be successful.

Attachment 1

UFSAR
Addition to Section 14.2
"Tests Prior To Reactor Fuel Loading"
Page 14-7

A one time Keowee Emergency Power - Engineering Safeguards Functional Test which involves Oconee Unit 3 during 3EOC17 has been evaluated. This test verifies certain design features of the emergency power and engineering safeguards systems in an integrated fashion. The scope of the test supports Nuclear Station Modification (NSM) ON-53014. This integrated test will emergency start the Keowee Unit aligned to the underground power path from shutdown condition and accept loads from the shutdown Oconee Unit through the standby bus.