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April 11, 1985

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414

Dear Mr. Denton:

Ms. E. G. Adensam's letter of November 4, 1981 transmitted Question 430.9 which requested that tests and analysis of transformer tap settings be performed prior to initial full power reactor operation. This test was performed on the Catawba Unit 1 auxiliary power system during preoperational testing. The attached report describes the test and the analysis of the results. Since Catawba Units 1 and 2 are connected to the same switchyard and have identical auxiliary power systems, the transformer tap settings test will not be repeated on Unit 2.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

ROS:slb

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
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Catawba Nuclear Station
Verification of Voltage Analyses
Response to Question 430.9

As part of the preoperational test program at Catawba Nuclear Station, a transformer tap setting test was performed on the Unit 1 auxiliary power system in accordance with the requirements of the Final Safety Analysis Report. The purpose of the test was to verify that the Auxiliary System Design Optimization Program (ASDOP) accurately models the auxiliary power system at Catawba and that ASDOP can be used to analyze the performance of the auxiliary power system. Using field measured data as input for ASDOP, calculated voltages at various predetermined busses were obtained and compared to the voltage measured at these busses in the field. The results were analyzed and the ASDOP calculated voltages showed good correlation with the field measured voltages, thus satisfying the requirements of Question 430.9

The test was performed in two parts. The first test monitored the auxiliary power system during the starting of a large Class 1E motor (Nuclear Service Water Pump (RN) Motor). The second test monitored steady-state conditions and the starting of a large non-Class 1E motor (Reactor Coolant Pump (NC) Motor). Some variations were made to the test method outlined in Question 430.9 and are detailed below:

1) Part 4 of Question 430.9 specifies that the test should be performed for "all sources of offsite power". At Catawba, Unit 1 and Unit 2 are connected to the same switchyard (offsite power source). Also, the impedance of the auxiliary system through either the normal auxiliary transformers (1ATC, 1ATD), or the alternate auxiliary transformers (SATA, SATB) is approximately the same. Therefore, the analysis was performed on Train A and is applicable to all auxiliary system lineups.

2) Part 4A of Question 430.9 specifies that all Class 1E station distribution levels down to the 208/120V level be loaded to at least 30%.

Because of difficulties in obtaining any appreciable loading below the 600V level, only busses down to and including the 600V motor control centers were monitored. Loading difficulties also resulted in some busses being loaded to less than 30%. The table below gives the loading in the distribution system for the two tests:

	Transformer	Approximate Full Load Amps	Load During Test	Percent of Full Load
Test #1:	1A	16,574	1,507	9.1%
	1T2A	1,172	780	66.5%
	1ATC	833	207	24.8%
	1ETXA	1,154	470	40.7%
Test #2:	1A	16,574	2,175	13.1%
	1T2A	1,172	807	68.8%
	1ATC	833	327	39.3%
	1ETXA	1,154	390	33.8%

The load on Main Step-Up Transformer 1A was low; however, this transformer is sized to carry half of the generator output. With the dual generator circuit breaker design used at Catawba, the step-up transformer will be operating at a low load any time it is supplying plant auxiliary power.

The field measurements taken during the tests give good correlation with the results calculated by ASDOP. This favorable comparison satisfies the requirements of Question 430.9 by verifying that ASDOP accurately models the Catawba auxiliary power system and that ASDOP can be used to analyze the performance of the auxiliary power system. The results of the tests and the voltage comparison are shown below:

Steady-State Test

Bus	Field Measured Voltage	ASDOP Voltage	%△
1TA	6.867 KV = 0.9952 pu	0.9812 pu	-1.41%
1ETA	4.187 KV = 1.0065 pu	0.9938 pu	-1.26%
1ELXA	606.33 V = 1.0106 pu	1.0057 pu	-0.485%
1EMXG	604.25 V = 1.0071 pu	1.0000 pu	-0.705%

NC Pump Motor Start Test

Bus	Field Measured Voltage	ASDOP Voltage	%△
1TA	6.219 KV = 0.9013 pu	0.8795 pu	-2.42%
1ETA	3.652 KV = 0.8779 pu	0.8874 pu	1.08%
1ELXA	553 V = 0.9217 pu	0.8941 pu	-2.99%
1EMXG	550.84 V = 0.9181 pu	0.8874 pu	-3.34%

RN Pump Motor Start Test

Bus	Field Measured Voltage	ASDOP Voltage	%△
1TA	6.906 KV = 1.0009 pu	0.9711 pu	-2.98%
1ETA	3.965 KV = 0.9531 pu	0.9443 pu	-0.923%
1ELXA	571 V = 0.9517 pu	0.9526 pu	0.095%
1EMXG	568.1 V = 0.9468 pu	0.9445 pu	-0.243%

Table of Results

As shown above, the voltage comparison for the 1EMXG voltage during the NC Pump Motor Start shows a 3.34% difference between the measured and calculated voltages. Since the ASDOP calculated voltage is more conservative than the field data, this difference is acceptable.

For all but two of the cases shown in the table above, the ASDOP calculated voltages were lower (more conservative) than the field measured voltages. The comparison of the 1ETA bus voltages for the NC pump motor start shows the calculated voltage to be 1.08% (44.93 volts on a 4160 V base) higher than the measured voltage, and for the RN pump motor start test the 1ELXA calculated voltage is 0.095% (0.57 volts on a 600 V base) higher than the field measured voltage. For these two cases an additional comparison must be made to satisfy the requirements of Question 430.9, which states: "In general the test results should not be more than 3% lower than the analytical results; however, the difference between the two when subtracted from the voltage levels determined in the original analyses should never be less than Class 1E equipment ratings". Therefore, the voltage difference on these two busses must be subtracted from the worst case bus voltage calculated by ASDOP in the original Auxiliary System Voltage Study. This additional analysis was performed for these two cases, and the 1ETA and 1ELXA voltages were well above their corresponding Class 1E equipment ratings.

The favorable results obtained in the comparison of actual versus calculated voltages satisfy the requirements of Question 430.9 of the Final Safety Analysis Report.