Florida Power
CORPORATION

November 19, 1982

3F-1182-22
File: 3-0-3-a-3
3-E-3

Mr. John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
Adequacy of Station Electric Distribution System Voltage

Dear Mr. Stolz:

On October 19, 1982, Florida Power Corporation (FPC) submitted a report on the adequacy of Station Electric Distribution System Voltage with the following attachments which are also included in this submittal.

1. Comparative Voltage Table,
2. Explanation of Difference Between Original Calculations and Present Calculations, and
3. Engineered Safeguards Buses Voltage Calculation.

Your staff requested additional information with regard to the tap settings, how the electrical equipment would be protected from under-voltage, bases for the calculations, testing commitments, and schedules, during a telephone conversation on November 4, 1982.

This submittal includes the additional information requested, corrects the two errors listed below, and duplicates the information submitted on October 19, 1982. Therefore, this submittal completely supersedes the October 19, 1982 submittal.

1. The maximum protection relay setting is 3836 V (instead of 3866 V as specified in the October 19, 1982 letter).

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2. The calculations transmitted in the October 19, 1982 letter were for comparison to previously measured values and had been recalculated using a more precise computational method (not based upon a tap setting increase).

The calculations, contained in Florida Power Corporation's February 19, 1982 submittal, used several assumptions that did not adequately model the measured conditions. The calculations in Attachment 3 have been recalculated using a more precise computational method. The difference between the calculations submitted on February 19, 1982, and in Attachment 3 are explained in Attachment 2. The Comparative Voltage Table of these calculated voltages and measured voltages is submitted in Attachment 1.

Florida Power Corporation will install Second Level Undervoltage Relaying System (SLURS) during Refuel IV, scheduled during the Spring of 1983. The proposed setpoints on the SLURS correspond to a bus voltage of 3780 VAC, which provides the most conservative protection calculated. The basis for this initial setpoint for the SLURS is discussed below.

The relay coils of the SLURS are rated at 120 VAC and are connected to the potential transformers with 35 to 1 ratios. Therefore, the proposed setpoints on the relay coils of 108.0 VAC correspond to a bus voltage of 3780 VAC (108.0 x 35 = 3780). The 3780 VAC setpoint is 94.5% of the rated motor voltages which is 4000 VAC. This proposed setpoint is between the minimum and maximum allowed which are calculated as follows. The minimum allowable setpoint of 107.5 VAC on the relay coil corresponds to a bus voltage of 3763 VAC (107.5 x 35 = 3763) which is 94.1% of the rated bus voltage. These setpoints allow for: 1) a 0.5 VAC error in calibrating the relay coil setpoint; and 2) a 4.1% voltage drop to the motor control centers which would maintain 90% rated voltage. The upper setpoint of 3836 VAC corresponds to a relay coil setting of 109.6 VAC. This takes into account the following possible combinations of drift in the setpoint: (1) +.3 VAC due to long term stability drift (i.e., drift with time); (2) +.5 VAC calibration error; (3) +.4 VAC drift due to control voltage variation; and (4) +.4 VAC drift due to ambient temperature variations. When all of the above are added to the 108.0 VAC setpoint, the upper limit setpoint of 109.6 VAC (on the relay coil) is obtained.

For the first six months of operation, FPC will perform monthly channel function tests on the system and verify that the relay settings have not drifted beyond the desired setpoints. Provided positive results are obtained from this surveillance, the time frame for tests will be expanded to at least once every six months. This testing will be in addition to the normal functional testing which will be performed on the new installation.

The calculations performed for adequacy of station voltage yielded results which show a 4% voltage drop between the 4160V ES buses and the 480V Motor Control Centers (MCC's). In order to maintain a 90% level of voltage on the MCC's and monitor only at the 4160V switchgear, a 94% setpoint is required. FPC is concerned that a setpoint this high could cause some nuisance trips. FPC has attached a proposed plan and schedule (Attachment 4) in which further calculations and analysis be performed to see if taps on the 4160V/480V transformers can be changed and thus decreasing the voltage drop across the transformer.

This approach will allow FPC to proceed with solutions to a possible problem without having the restraint of rigid Technical Specification limitations. One Technical Specification Change Request will be submitted at the end of this plan.

As regards Generic Letter No. 82-14," Submittal of Documents to the Nuclear Regulatory Commission," our Project Manager has advised FPC that ten (10) copies of this submittal is adequate.

Very truly yours,

Patsy Y. Baynard

Dr. Patsy Y. Baynard

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Attachments

cc: Mr. J. P. O'Reilly
Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
Office of Inspection & Enforcement
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Atlanta, GA 30303

COMPARATIVE VOLTAGE TABLE

CR-3 START-UP TRANSFORMER

BUS	CALCULATED VOLTAGES		MEASURED VALUES PLANT AT FULL LOAD-STEADY STATE CONDITIONS
	Original Value (2/19/82)	Present Value (10/6/82)	Numerical Value
230 kV GRID	243.6 kV	244.8 kV	244.8 kV
4160 V SWGR			
ES BUS 3A	4276 V	4108 V	4183 V
ES BUS 3B	4276 V	4108 V	4179 V
480 V SWGR			
ES BUS 3A	489 V	458 V	472 V
ES BUS 3B	489 V	460 V	475 V
MCC 480 V			
ES 3A1	489 V	456 V	469 V
3A2	489 V	455 V	468 V
3AB	489 V	454 V	468 V
ES 3B1	489 V	457 V	472 V
3B2	489 V	458 V	471 V

EXPLANATION OF DIFFERENCE BETWEEN ORIGINAL CALCULATIONS AND PRESENT CALCULATIONS

Errors in Original Calculations

1. The H-Y Impedance of the Startup Transformer was taken as 7.96% from our early nameplate drawing instead of the later value of 8.6%.

2. Cable impedances were neglected.

The above errors would result in the calculated voltage drop being smaller than would actually be the case.

Difference In Methods of Calculation

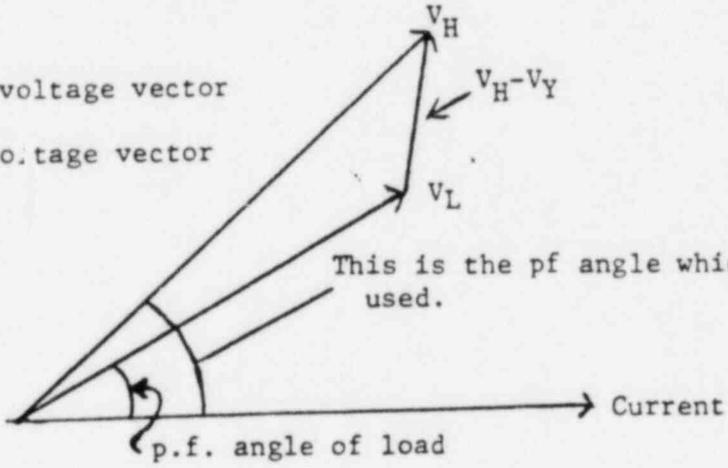
Original Method

Loads were expressed in terms of current rather than impedance. Voltage drops were calculated by multiplying currents by impedances, and then subtracted from the voltage on the high side of the impedance through which the load current passed.

Loads were expressed in terms of the transformer output voltage vector, yet when calculating this voltage, the input voltage vector was taken as the reference vector.

V_H = High side voltage vector

V_L = Low side voltage vector



The correct pf angle being greater than the load pf angle, would result in a greater voltage drop. This occurs in two cases,

a. for the Startup Transformer
b. for the 4160/480V transformers

so that when calculating the voltage drop through the two transformers, a double error is incurred.

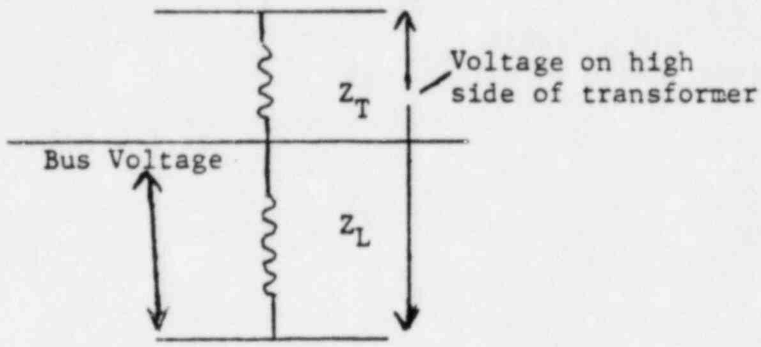
Present Method

This is the voltage divider method and avoids the error caused by using too small a pf. angle. Loads are expressed as impedances. The principle is as follows:

Z_L = Impedance of load

Z_T = Impedance of transformer

Impedances expressed vectorially



$$\text{Bus Voltage} = \frac{Z_L}{Z_L+Z_T} \times \text{Voltage on high side of transformer.}$$