Florida Power
CORPORATION

November 9, 1984
3F1184-01

Director of Nuclear Reactor Regulation
Attention: Mr. John F. Stolz, Chief
Operating Reactors Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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

Dear Sir:

On November 19, 1982, Florida Power Corporation (FPC) provided the results of our Emergency Safeguards (ES) bus voltage calculations for Crystal River Unit 3 with a comparison to the original calculations provided for Crystal River Units 1, 2, and 3 on February 19, 1982. In accordance with a verbal request from your staff, enclosed is: 1) the comparison table for Crystal River Units 1 and 2 (Unit-3 is included for completeness), and 2) an explanation of the errors made in the assumptions and methodology of the original calculations.

Should you have any questions, please contact this office.

Sincerely,

G. R. Westafer

G. R. Westafer
Manager, Nuclear Operations
Licensing and Fuel Management

DLT/feb

Enclosures

xc: Mr. James P. O'Reilly
Regional Administrator, Region II
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
101 Marietta Street N.W., Suite 2900
Atlanta, GA 30323

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ENCLOSURE 1

CR1&2 START-UP TRANSFORMER

COMPARATIVE VOLTAGE TABLE

Bus	Calculated Value Maximum Plant Loading Maximum ESF Loading (Original Value*)	(Present Value)	Measured Values * - Plant at Full Load Steady State Condition
230kV Grid	243.6kV	244.8kV	244.8kV
4160V Switchgear			
ES Bus 3A	4202V	4206V	4256V
ES Bus 3B	4202V	4206V	4256V
480V Switchgear			
ES Bus 3A	476V	470V	480V
ES Bus 3B	479V	472V	483V
MCC 480V			
ES3A1	476V	468V	478V
ES3A2	476V	467V	477V
ES3AB	476V	466V	476V
ES3B1	479V	469V	480V
ES3B2	479V	470V	480V

* The original and measured values were provided by FPC letter dated February 19, 1982. See Enclosure 2 of this letter for an explanation of the differences between the original calculations and the present calculations.

CR-3 START-UP TRANSFORMER

COMPARATIVE VOLTAGE TABLE

Bus	Calculated Value Maximum Plant Loading Maximum ESF Loading (Original Value*)	(Present Value)	Measured Values * - Plant at Full Load Steady State Condition
230kV Grid	243.6kV	244.8kV	244.8kV
4160V Switchgear			
ES Bus 3A	4276V	4108V	4183V
ES Bus 3B	4276V	4108V	4179V
480V Switchgear			
ES Bus 3A	489V	458V	472V
ES Bus 3B	489V	460V	475V
MCC 480V			
ES3A1	489V	456V	469V
ES3A2	489V	455V	468V
ES3AB	489V	454V	468V
ES3B1	489V	457V	472V
ES3B2	489V	458V	471V

* The original and measured values were provided by FPC letter dated February 19, 1982. See Enclosure 2 of this letter for an explanation of the differences between the original calculations and the present calculations.

ENCLOSURE 2

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 originally neglected.

3. The starting voltage used for the calculations was the maximum voltage of the Startup Transformers (240 kV + 1.5% = 243.6 kV) rather than the measured voltage (244.8 kV).

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

B. Difference In Methods Of Calculation

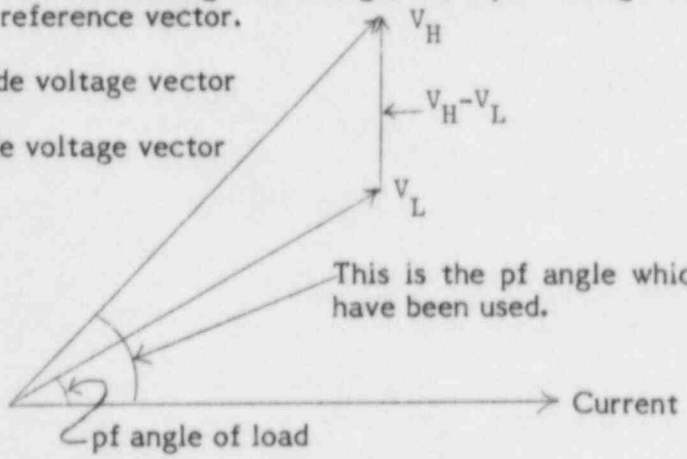
1. Original Method

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.

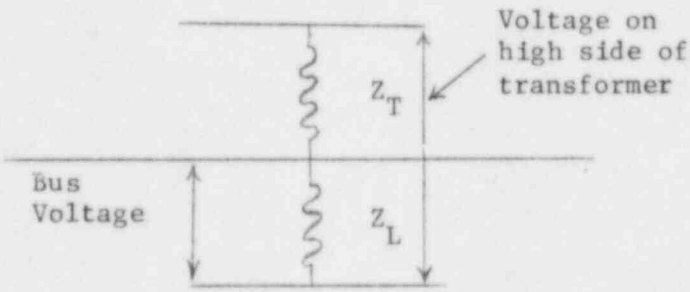
2. Present Method

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



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