Florida Power
CORPORATION

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Document Control Desk
U.S. Nuclear Regulatory Commission

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
Emergency Diesel Generator Voltage Dips

Dear Sir:

Additional information was requested concerning emergency diesel generator voltage dips by letter dated August 5, 1988 from H. Silver, NRC, to W. S. Wilgus, FPC. In response to this letter, the attached information is provided for your review.

Should there be any further questions, FPC suggest a meeting be held in an effort to resolve this issue.

Sincerely,

Rolf C. Widell, Director
Nuclear Operations Site Support

DGG:DLH
xc: Regional Administrator, Region II

Senior Resident Inspector

ATTACHMENT
FLORIDA POWER CORPORATION
RESPONSE TO REQUEST FOR
ADDITIONAL INFORMATION -
EMERGENCY DIESEL GENERATOR VOLTAGE DIPS

QUESTION: a) What is the normal voltage (steady state) at the 4160V bus? This value should be the selected base value for calculation of voltage dips in terms of percent.

RESPONSE: a) The steady state voltage at the ES 4160V bus when operating on the emergency diesel generator is 4160V. This value was used as the base value for calculation of voltage dips at the 120V MCC contactor level.

QUESTION: b) The original test tracing of time vs. voltage uses a conversion formula of 150 mm peak-to-peak = 70V RMS. Describe the calibration of the recorder to arrive at this conversion formula.

RESPONSE: b) The process for calibrating the recorders used for measuring voltage dips is as follows:

A variable voltage source was connected to the visicorders with calibrated instrumentation obtained from CR3's Calibration Laboratory. The voltage input to the visicorder was adjusted to 70 volts RMS. The visicorders were then adjusted to obtain a measured distance of 150mm peak-to-peak of the sine wave recorded. Therefore the conversion of the measured distance from peak-to-peak corresponded to RMS voltage by a factor of (70 V RMS)/(150 mm) for the test data obtained.

QUESTION: c) Provide the voltage measurements that were taken during the tests at the 480V and 120V loads. If no such measurements were taken, submit the voltage analysis, including assumptions and taking into consideration all impedances in the circuits and the bus loadings at the worst case condition, which establish the resulting voltage dips at the 480 and 120V loads.

RESPONSE: c) During SP-417, the voltage dips were measured at the ES A 4160V switchgear. No voltage measurements were taken at the 480V or 120V level. For blocks 2 through 5 the worst case voltage dip was measured at the ES A 4160V switchgear during Block 2. The corresponding voltage at 120V AC contactor level was calculated as follows:

1. The worst case (longest control circuit length) contactor is ES MCC 3A2, unit 7A. The minimum voltage measured at the ES A 4160V switchgear during Block 2 was 3183V which equals 76.5% on a 4160V base. This is acceptable in accordance with Safety Guide 9, 1971. The ES A 4160V switchgear provides power to the ES A 4160V/480V transformer via a 30 foot installed length of a single three conductor cable (one conductor for each phase). Each conductor is # 4/0 AWG copper. The 4160V/480V transformer

provides power to the ES A 480V switchgear. The ES A 4160V/480V transformer is a part of the ES A 480V switchgear lineup. Applicable Block 1 running loads and Block 2 starting loads were considered to calculate the corresponding voltage at 480V and 120V level. Calculating the voltage drop in the # 4/0 cable and 4160V/480V transformer, the voltage at 480V switchgear during the Block 2 dip was 352.9 volts.

2. The ES A 480V switchgear provides power to 480V ES MCC 3A2 via a 220 foot installed length of 2 conductors, 350 MCM copper per phase. Calculating the voltage drop in the 350 MCM cables, the voltage at 480V ES MCC 3A2 during the Block 2 dip was calculated to be 349.2 volts.

3. The 120V AC control power for the contactor is provided by a 480/120V control transformer located at ES MCC 3A2, unit 7A. There are 3268 feet of # 14 AWG copper control wire between the control transformer secondary (120V side) and the unit 7A contactor. Calculating the voltage drop in the # 14 AWG control wire, the voltage at the ES MCC 3A2, unit 7A contactor during the Block 2 dip was calculated to be 34.9 volts or 70.8 percent of 120VAC.

The 70.8% voltage at the contactor during the Block 2 voltage dip is higher than the contactor drop out voltage of 65%. Therefore it was concluded that the MCC contactors will not drop out during block loading. It was also concluded that the duration of the voltage dip was small enough so as not to cause actuation of any overcurrent devices related to 480V motors.