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CLARK,R.A. Operating Reactors Branch 3

SUBJECT: Forwards explanation of selection of undervoltage relay & setpoint, in response to NRC 800529 request for addl info re grid voltage.Discussion of consequences of spurious actuation of relays also encl.

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FLORIDA POWER & LIGHT COMPANY

July 3, 1980
L-80-212

Office of Nuclear Reactor Regulation
Attention: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Clark:

Re: St. Lucie Unit 1
Docket No. 50-335
Grid Voltage

In response to an NRC letter dated May 29, 1980 requesting additional information regarding grid voltage, an explanation of our selection of the undervoltage relay and its set point is attached. Also provided is a discussion of the consequences of spurious actuation of these relays. We feel that the selected relay and its set point will provide more than adequate protection to the components involved. Further investigation of the relay set point will be completed in October 1980, as part of a continuing upgrading effort. At the completion of this investigation, revised Technical Specifications will be proposed, if necessary.

Please call if you have additional questions on this subject.

Very truly yours,

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/MAS/PLP/pa

cc: Mr. J. P. O'Reilly, Region II
Harold F. Reis, Esquire

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RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION ON DEGRADED GRID VOLTAGE FOR ST. LUCIE UNIT 1 DATED JUNE 1980.

Reference: 1) FPL letter to the NRC dated November 9, 1979

1. The selection of an undervoltage relay pickup setting is a balance of several divergent factors. The pickup setting should be at a voltage high enough to protect the connected electrical equipment, but not so high that it does not allow for equipment operation or causes spurious tripping. Other factors such as the anticipated voltage transient, its duration, normal relay tap points as well as normal operational voltage ranges must also be considered.

   The selection of the Westinghouse CV-2 relay and its tap and time dial setpoints at St. Lucie, balances these divergent factors. The Westinghouse CV-2 relay functions as an inverse-time type device, i.e., the lower the voltage, the faster the relay operates. This characteristic will protect equipment at low voltages which are determined as undesirable while allowing equipment to operate as long as possible at higher voltages. With its tap setting of 105 volts and time dial setting of 1, normal operation and starting of equipment can be accomplished when needed without spurious tripping. In addition, although the relay curves do not explicitly show operation above 90% of the tap setting, the relay does operate in this region.

   A sustained undervoltage at a level that will not allow operation of the relay has an extremely low probability. If a general system voltage reduction is initiated it is accomplished at the distribution level and not by plant output voltage reduction. Thus, in this region, the only probable undervoltage conditions which exist will be transient in nature, i.e. the voltage will either completely collapse or recover within a few seconds.

   As stated in reference 1, the electrical equipment can operate almost indefinitely, at the undervoltage setpoint of 105 volts, equivalent to 408 volts at the MCC's. Reference 1 also provides a general description for operation of the equipment at even lower voltages as the following summarizes:

   1) Motors rated 460 volts can operate at a terminal voltage of 345 volts for a short period of time without damage. This time has been defined as one minute.

   2) Motor operated valves rated 460 volts will run indefinitely at a terminal voltage of 368 volts.

   3) Motor Control Center contactors will remain picked up at a terminal voltage of 315 volts.

   4) Battery chargers similar to those used at St. Lucie rated 480 volts have been successfully tested at 3/4 of the designed load at 384 volts. During this test, if the load was increased or the input voltage was reduced, the battery chargers shutdown automatically with no detrimental effects to the equipment and automatically returned to provide power to the load when the input voltage was raised.

5) The boric acid heat tracing system can operate indefinitely at 394 volts with normal output. The electronic controls were specified to withstand a 30% (336 volts) voltage reduction for 30 seconds with no detrimental effects, although heater output would be reduced.

As can be seen from the above, the equipment has substantial short time capability for low voltage conditions. If the equipment were operated in the lower voltage region with the relay as presently set, the equipment would not be damaged.

Thus, the balance of divergent factors is achieved with the relay design and setpoints.

The 105 volt setpoint is a tap point. It is possible to set this type of relay between tap points by special calibration procedures. In our continuing efforts to improve the system, this will be investigated further. Upon completion of this investigation, revised technical specifications will be provided. This effort will be completed by mid October, 1980.

2. As stated in reference 1, our present system meets the requirements of IEEE-279 and addresses the staff's concern of spurious actuation.

Each 4.16 kV bus has individual undervoltage relay and logic circuits for diesel generator starting. This provides redundancy and avoids spurious loss of all offsite power.

There is no intertie between A and B undervoltage bus stripping logic. Should a relay malfunction occur, it would effect only one bus.

If a relay would fail to operate only one bus would be effected. And, on the other hand, should a relay act spuriously only one bus would be effected. The other bus would remain connected to the offsite power sources.

In view of the above and the fact that the relays are on separate busses, their cabling and associated logic are separated and they activate separate diesels, the redundnacy, single failure and separation requirements of IEEE 279-1971 are met.

Furthermore, the facets of the design which meet IEEE-279-1971 in combination with the time voltage characteristics of the relay address the concern of spurious loss of all AC power.