Florida Power
CORPORATION

Crystal River Unit 3
Docket No. 50-302

April 27, 1992
3F0492-12

U. S. Nucle… Regulatory Commission
Attention: …ocument Control Desk
Washington, D. C. 20555

Subject: Licensee Event Report (LER) 92-01

Dear Sir:

Enclosed is Licensee Event Report (LER) 92-01 which is submitted in accordance with 10 CFR 50.73.

Sincerely,

Gary Boldt

G. L. Boldt
Vice President
Nuclear Production

EEF:mag

Enclosure

xc: Regional Administrator, Region II
Project Manager, NRR
Senior Resident Inspector

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The reactor was stabilized in MODE 3, Hot Standby. The OPT was checked, re-powered, and the ES busses returned to normal alignment. The Diesel Generators were secured. The plant was cooled down to MODE 5 for maintenance work on control rod position indication prior to post-trip restart. A four hour report was made as required by 10CFR50.72(b)(2)(ii). This event is reportable under 10 CFR 50.73(a)(2)(iv).

CAUSE:

The root cause of this event was relay design combined with the specific off-normal alignment of equipment utilized in the troubleshooting effort. Failed components in the inverter may have additionally contributed to the event.

The emergency power scheme for Crystal River 3 incorporates several levels of power sources, one of these being four uninterruptible power supplies (UPS) [EE,UJX] called the Vital Busses. Each 120 volt AC bus is powered from two sources, the preferred being the Vital Bus Static Inverter [EE,INVT] (a dual input inverter), and the alternate source being the 480 volt ES bus via a dedicated voltage regulating transformer which bypasses the inverter.

The inverter normally rectifies 480 volt ES AC power to DC power. The inverter then inverts the DC power back to 120 volt AC power, through a constant voltage transformer [EE,XFMR] within the inverter, which supplies the load. If the AC power input is lost, the inverter will instantly draw power from banks of lead-acid batteries [EE,BTRY] providing DC power and invert that to 120 volt AC power for the Vital busses.

At the beginning of this event, the 'C' Vital bus was being supplied from the alternate source, the 480 volt ES bus and voltage regulating transformer, because the normal source, the inverter, was out of service for maintenance. Under the troubleshooting package, several test configurations were to be established in the inverter to locate the root cause of the problem. A test configuration required that the Constant Voltage Transformer [EE,XFMR], within the inverter, be isolated by lifting the transformer leads. The inverter was then to be connected to the DC power input by closing the DC input breaker. In the process of isolating the transformer, the electricians had only lifted one lead. While this did take it out of the circuit, it did not isolate the transformer. When the DC input breaker was closed, the partially isolated transformer induced an AC voltage (350 volts peak-to-peak) onto the DC bus. The only apparent effect was the tripping of the interposing relays used for normal OPT feeder breaker control.

Later testing showed a unique sensitivity in these relays, not shared generically throughout the DC power system. The relay actuation isolated the transformer and de-powered both ES 4160 volt busses. The loss of bus power caused the EDGs to start.

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CRYSTAL RIVER UNIT 3 (CR-3)	0 5 0 0 0 3 0 2	9 2	0 0 1	0 0	0 4 OF 0 5

TEXT (If more space is required, use additional NRC Form 366A's) (17)

EVENT EVALUATION:

There were four main consequences of the loss of ES busses: first, both EDGs started on a valid undervoltage signal on the ES 4160 volt busses. Second, the motor driven Emergency Feedwater Pump (EFWP) auto started on ES bus undervoltage and EDG output breaker closure. Third, there was no power to the 'C' Vital Bus because it was normally aligned to the "A" ES 4160 volt bus/"A" ES 480 volt bus. Fourth, due to electrical alignment and effected busses, there was no power to the CRD motors and all control rods inserted on loss of power. Each of these consequences is discussed below.

The loss of power to the ES 4160 volt busses is accounted for in the design of the plant. Should power be lost to the busses, the EDGs auto start, come to synchronous speed and automatically power the ES bus loads. This action occurred as expected. The EDGs carried the ES 4160 bus loads until 1538 for the "B" EDG and until 1918 for the "A" EDG. The only anomaly in EDG performance was a leak in the jacket cooling system for the 'B' diesel.

The EFWP auto started, though there was no Emergency Feedwater Initiation and Control (EFIC) system actuation. This is as designed. Wherever there is an undervoltage on the ES 4160 volt busses followed by an EDG output breaker closure, the motor driven EFP (EFP-1) auto starts as the bus is block loaded by the EDG. The EFIC system and EFP-1 both worked as designed and expected.

The 'C' vital bus was deenergized because it was being fed by the ES 4160 volt bus/ES 480 volt bus. This bus powers the 'C' Channel of the Reactor Protection System (RPS). When the power to the system fails, the channel trips. In addition to the RPS, channel "C", the "C" Vital Bus also powers the Recall system, a passive data recording system, and an annunciator events recorder. The loss of power caused a loss of some transient information normally used to analyze an event.

The CRD motors lost power and all the control rods inserted into the core. The CRD motors are designed so that a sectioned roller nut engages a lead screw on the control rod. The roller nut sections are designed to be disengaged from the lead screw by springs. The roller nut is held in the engaged position by electromagnetic force. The roller nut is turned by progressing the electromagnetic field around the control rod (moving in discrete steps), turning the roller nuts around the lead screw, raising and lowering the rod in the core. When power was lost to the CRD motors, the roller nuts disengaged and the rods inserted.

NRC FORM 366A (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 50.0 HOURS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON DC 20503.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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CORRECTIVE ACTIONS:

There were several corrective actions taken to preclude recurrence of this event. Prior to plant restart, the relays that send the remote open signal to the feeder breakers for the OPT were disabled. These relays provided no protective relaying functions so there is no loss of equipment protection. The feeder breakers can now be manually opened with control switches installed in the 230 KV switchyard prior to startup. A second action to monitor the DC bus for noise prior to reduced RCS inventory operations will be implemented during the upcoming refueling outage. Lastly, a human performance review will be conducted on the inverter troubleshooting evolution to determine if the risks should have been known or anticipated. The first action is already completed, the others are scheduled for completion by July 1, 1992.

PREVIOUS SIMILAR OCCURRENCES:

A similar actuation of these relays occurred during the mid-cycle 8 maintenance outage. See LER 91-10 for details of that event.