

EXPIRES 5/31/95

LICENSEE EVENT REPORT (LER)

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 (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON DC 20503.

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|--|--------|-----------|-------------------|--|--------------------|------------------|-----------------|-----------|-----------------------|--|---|--|-------------------------------|--------------------|-----|------|-----|---|---|---|---|---|
| FACILITY NAME (1) CRYSTAL RIVER UNIT 3 (CR-3) | | | | | | | | | | DOCKET NUMBER (2) 0 5 0 0 0 3 0 2 | | | | PAGE (3) 1 OF 4 | | | | | | | | |
| TITLE (4) Switchyard Cable Failure Caused Degraded Voltage of Class 1E Electrical Busses and Actuation of Emergency Diesel Generators | | | | | | | | | | | | | | | | | | | | | | |
| EVENT DATE (5) | | | LER NUMBER (6) | | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | | | | | | | | | | | | |
| MONTH | DAY | YEAR | YEAR | SEQUENTIA NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAMES N/A | | | | DOCKET NUMBER(S) 0 5 0 0 0 | | | | | | | | | |
| 0 | 3 | 2 | 9 | 9 | 3 | 0 | 0 | 2 | 0 | 2 | 1 | 1 | 0 | 8 | 9 | 5 | N/A | 0 | 5 | 0 | 0 | 0 |
| OPERATING MODE (9) | | 5 | | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (CHECK ONE OR MORE OF THE FOLLOWING) (11) | | | | | | | | | | | | | | | | | | |
| POWER LEVEL (10) | | 0 0 0 | | 20.402(b) | | 20.405(c) | | X | | 50.73(a)(2)(iv) | | 73.71(b) | | | | | | | | | | |
| | | | | 20.405(a)(1)(i) | | 50.36(c)(1) | | | | 50.73(a)(2)(v) | | 73.71(c) | | | | | | | | | | |
| | | | | 20.405(a)(1)(ii) | | 50.36(c)(2) | | | | 50.73(a)(2)(vii) | | OTHER (Specify in Abstract below and in Text, NRC Form 366A) | | | | | | | | | | |
| | | | | 20.405(a)(1)(iii) | | 50.73(a)(2)(i) | | | | 50.73(a)(2)(viii)(A) | | | | | | | | | | | | |
| | | | | 20.405(a)(1)(iv) | | 50.73(a)(2)(ii) | | | | 50.73(a)(2)(viii)(B) | | | | | | | | | | | | |
| | | | | 20.405(a)(1)(v) | | 50.73(a)(2)(iii) | | | | 50.73(a)(2)(x) | | | | | | | | | | | | |
| LICENSEE CONTACT FOR (12) | | | | | | | | | | | | | | | | | | | | | | |
| NAME J. A. Frijouf, Sr. Nuclear Regulatory Specialist | | | | | | | | | | TELEPHONE NUMBER AREA CODE 9 0 4 5 6 3 ~ 6 4 8 6 | | | | | | | | | | | | |
| COMPLETE ONE LINE FOR EACH COMPONENT FAILURE IN THIS REPORT (13) | | | | | | | | | | | | | | | | | | | | | | |
| CAUSE | SYSTEM | COMPONENT | MANUFAC- TURER | REPORTABLE TO NPRDS | | CAUSE | SYSTEM | COMPONENT | MANUFAC- TURER | REPORTABLE TO NPRDS | | | | | | | | | | | | |
| X | F | K | C B | U 0 0 0 | NO | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| SUPPLEMENTAL REPORT EXPECTED (14) | | | | | | | | | | | | EXPECTED SUBMISSION DATE (15) | | MONTH | DAY | YEAR | | | | | | |
| YES (If yes, complete EXPECTED SUBMISSION DATE) | | | | | | | | | | | | X NO | | | | | | | | | | |

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On March 29, 1993, Florida Power Corporation's (FPC) Crystal River Unit 3 was in MODE 5, COLD SHUTDOWN. All electrical power was being supplied via a backfeed from the 500 kilovolt (KV) switchyard. At 0151, the 500KV output breakers opened, interrupting the backfeed. Both Emergency Diesel Generators started and energized their respective Engineered Safeguards busses.

During the loss of one (500KV backfeed) of the two available offsite power sources, decay heat removal cooling stopped and was restarted five minutes later when the alternate source of power (230KV) reenergized the safety related busses. During the time decay heat removal was not available the 94 degree Fahrenheit (F) reactor coolant temperature increased a maximum of approximately 14 degrees F near the center of the core, while temperatures near the core barrel increased substantially less. The offsite power from the 230KV switchyard was available during the entire evolution.

Salt water entered switchyard cable trenches as the result of a winter storm. Salt water immersion of a degraded cable is suspected to have contributed to the cable failure, subsequent actuation of relays which opened breakers, and loss of one of two available offsite power sources. The damaged cables were replaced and other cables were tested and replaced as necessary. FPC has approved a project for control and power cable replacement and separation.

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TEXT CONTINUATION

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

EVENT DESCRIPTION

On March 29, 1993, Florida Power Corporation's (FPC) Crystal River Unit 3 (CR-3) was in MODE 5, COLD SHUTDOWN. Reactor Coolant System (RCS) [AB] temperature was approximately 94 degrees Fahrenheit (F). All electrical power was being supplied via backfeed from the 500 kilovolt (KV) switchyard [FK] through the 500KV output breakers [EL, BKR], stepup (Output) transformers [EL, XFMR] and auxiliary transformer [EL, XFMR]. The startup transformer [E, XFMR] was out of service due to maintenance and modification activities. The other offsite power source available at this time was the offsite power transformer [EB, XFMR]. This transformer supplies power from the 230KV switchyard [FK] to the Engineered Safeguards (ES) busses [EB/ED, BU]. The offsite power transformer does not provide power to the non-ES busses [EA/EC, BU].

At 0151, the 500KV output breakers opened resulting in the loss of one of the two available offsite power sources. All ES busses and non-ES busses deenergized. Relays [EB, 27] which monitor ES bus voltages sensed the loss of power and issued a start command to the Emergency Diesel Generators (EDG) [EK, DG]. Both EDGs started and energized their respective ES busses.

When the ES busses deenergized, the operating Decay Heat (DH) removal pump [BP, P] tripped. At 0156, after verifying availability of power and condition of equipment, operators promptly restarted the "B" DH pump and restored DH removal in accordance with plant procedures.

At 0228, operators aligned the "A" ES bus to the 230KV switchyard via the offsite power transformer and began steps to secure the "A" EDG. Operators then aligned power to the "A" 480V Reactor Auxiliary Bus [EC, BU]. This allowed them to operate 480V equipment not normally powered from the ES busses. At 0258, operators transferred the "B" ES bus to the offsite power transformer and began steps to secure the "B" EDG.

The event was reported to the Nuclear Regulatory Commission at 0225 on March 29, 1993 via the Emergency Notification System per the requirements of 10 CFR 50.72(b)(2)(ii). This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv).

EVENT EVALUATION

All equipment functioned as designed during this event. Both EDGs started and energized their respective ES busses within the required time span.

During the loss of one (500KV backfeed) of the two available offsite power sources, DH removal cooling stopped and was restarted five minutes later when alternate source of power reenergized the safety related busses. During the time DH removal

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was not available, the 94 degrees F RCS temperature, as measured at the core [AC] exit, increased a maximum of approximately 14 degrees F near the center of the core, while temperatures near the core barrel increased substantially less. Maximum temperature reached was 108 degrees F. Adequate subcooling existed at all times.

CAUSE

On March 13, 1993, a severe winter storm crossed the Florida coast. The resulting storm surge caused flooding of the 230KV and 500KV switchyards. Salt water from the extreme storm surge filled cable trenches [FK] in the two switchyards. These trenches contain 480V alternating current and 120V direct current power and control cables [FK, CBL] which feed relays [FK, RLY], breakers [FK, BKR], and other equipment in the switchyards.

Salt water immersion of one of the 480V cables, which apparently contained degraded or damaged cable insulation [FK, ISL], is suspected to have contributed to the failure of the cable resulting in arcing which damaged adjacent cables. The resulting electrical transients actuated protective relays [FK, RLY] which caused the 500KV output breakers to open and the subsequent loss of one of the two available offsite power sources.

CORRECTIVE ACTION

Corrective actions for this event include the following:

1. The damaged cables were replaced and other cables were tested and replaced as necessary; and
2. An FPC management review team was organized and conducted an investigation of the events related to this severe winter storm. Following the management team's recommendations, FPC has approved a project for switchyard breaker control and power cable replacement for both the 230KV and 500KV switchyards.

The current cable configuration comprises primary and back-up control cables as well as power cables installed in the same trenches. Under the approved project, new cable trenches will be constructed which will include new primary control and new power cables separated by a barrier. The currently installed back-up control cables will remain in the existing trenches. Completion of this project will be determined by outages enabling work performance and is expected to be completed by the end of the Refuel 10 outage, currently scheduled for April 15, 1996.

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PREVIOUS SIMILAR EVENTS

This was the first interruption of offsite power that can be attributed to the loss of 500KV backfeed. On four previous occasions, offsite power was interrupted due to loss of power feeds from the 230KV switchyard.