Florida Power
A Progress Energy Company

Crystal River Nuclear Plant
Docket No. 50-302
Operating License No. DPR-72

Ref.: 10 CFR 50.73

August 14, 2002
3F0802-01

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: LICENSEE EVENT REPORT 50-302/02-001-00

Dear Sir:

Please find enclosed Licensee Event Report (LER) 50-302/02-001-00. The LER discusses Emergency Diesel Generator EGDG-1A automatically starting and powering the "A" 4160 Volt Engineered Safeguards Bus following a loss of the Off-Site Power Transformer on June 17, 2002, and July 20, 2002. This report is being submitted pursuant to 10CFR50.73(a)(2)(iv)(A).

If you have any questions regarding this submittal, please contact Mr. Sid Powell, Supervisor, Licensing & Regulatory Programs at (352) 563-4883.

Sincerely,

Jon A. Franke
Plant General Manager

JAF/dwh

Enclosure

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

IE22

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request 50 hours Reported lessons learned are incorporated into the licensing process and fed back to industry Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U S Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503 If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

# LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

| 1. FACILITY NAME | 2. DOCKET NUMBER | 3. PAGE |
|---|---|---|
| CRYSTAL RIVER UNIT 3 | 05000 302 | 1 OF 12 |

4. TITLE
Automatic Start Of An Emergency Diesel Generator Due To Loss Of The Offsite Power Transformer

| 5. EVENT DATE | | | 6. LER NUMBER | | | 7. REPORT DATE | | | 8. OTHER FACILITIES INVOLVED | |
|---|---|---|---|---|---|---|---|---|---|---|
| MO | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REV NO | MO | DAY | YEAR | FACILITY NAME | DOCKET NUMBER 05000 |
| 06 | 17 | 2002 | 02 | - 001 | - 00 | 08 | 14 | 2002 | FACILITY NAME | DOCKET NUMBER 05000 |

| 9. OPERATING MODE | 1 |
|---|---|
| 10. POWER LEVEL | 100% |

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

| | | | |
|---|---|---|---|
| 20 2201(b) | 20 2203(a)(3)(ii) | 50.73(a)(2)(ii)(B) | 50.73(a)(2)(ix)(A) |
| 20 2201(d) | 20 2203(a)(4) | 50.73(a)(2)(iii) | 50.73(a)(2)(x) |
| 20 2203(a)(1) | 50 36(c)(1)(i)(A) | X 50.73(a)(2)(iv)(A) | 73 71(a)(4) |
| 20.2203(a)(2)(i) | 50 36(c)(1)(ii)(A) | 50.73(a)(2)(v)(A) | 73.71(a)(5) |
| 20.2203(a)(2)(ii) | 50 36(c)(2) | 50.73(a)(2)(v)(B) | OTHER Specify in Abstract below or in NRC Form 366A |
| 20.2203(a)(2)(iii) | 50 46(a)(3)(ii) | 50.73(a)(2)(v)(C) | |
| 20.2203(a)(2)(iv) | 50 73(a)(2)(i)(A) | 50.73(a)(2)(v)(D) | |
| 20.2203(a)(2)(v) | 50.73(a)(2)(i)(B) | 50.73(a)(2)(vii) | |
| 20.2203(a)(2)(vi) | 50.73(a)(2)(i)(C) | 50 73(a)(2)(viii)(A) | |
| 20.2203(a)(3)(i) | 50.73(a)(2)(ii)(A) | 50 73(a)(2)(viii)(B) | |

12. LICENSEE CONTACT FOR THIS LER

| NAME | TELEPHONE NUMBER (Include Area Code) |
|---|---|
| Dennis W. Herrin, Lead Engineer | (352) 795-6486, Extension 3299 |

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANU-FA CTURER | REPORTABLE TO EPIX |
|---|---|---|---|---|---|---|---|---|---|
| B | EB | CBL5 | K080 | Y | | | | | |

| 14. SUPPLEMENTAL REPORT EXPECTED | | | 15. EXPECTED SUBMISSION DATE | MONTH | DAY | YEAR |
|---|---|---|---|---|---|---|
| YES (If yes, complete EXPECTED SUBMISSION DATE). | X | NO | | | | |

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On June 17, 2002, Florida Power Corporation's (FPC's) Crystal River Unit 3 (CR-3) was in MODE 1 (POWER OPERATION) at 100 percent RATED THERMAL POWER (RTP). An electrical storm was in progress. At 10:48, CR-3 experienced a loss of "A" Train offsite power due to loss of the Offsite Power Transformer (OPT). The cause for loss of the OPT was a short during a lightning storm that resulted in relay actuation. During the lightning storm, the ground potential was raised to a point where pre-existing damage allowed a short to the ground conductor. Repairs were made and the OPT was returned to service. On July 20, 2002, FPC's CR-3 was in MODE 1 at 100 percent RTP. No electrical storm was in progress. At 16:45, CR-3 experienced a loss of "A" Train offsite power due to loss of the OPT. The cause for loss of the OPT was latent damage to the cable insulation from the lightning strike that caused loss of the OPT on June 17, 2002. Repairs were made and the OPT was returned to service. In both events, Emergency Diesel Generator EGDG-1A automatically started and re-energized 4160v Engineered Safeguards (ES) Bus "A." Automatic actuation of EGDG-1A is reportable under 10CFR50.73(a)(2)(iv)(A). This condition does not represent a reduction in the public health and safety. Corrective actions include an evaluation of cable replacement. No previous similar occurrences have been reported to the NRC.

# LICENSEE EVENT REPORT (LER)

| 1. FACILITY NAME | 2. DOCKET | 6. LER NUMBER | | | 3. PAGE |
|---|---|---|---|---|---|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| CRYSTAL RIVER UNIT 3 | 05000302 | 02 | - 001 - | 00 | 2 OF 12 |

17. TEXT *(If more space is required, use additional copies of NRC Form 366A)*

EVENT DESCRIPTION

On June 17, 2002, Florida Power Corporation's (FPC's) Crystal River Unit 3 (CR-3) was in MODE 1 (POWER OPERATION) at 100 percent RATED THERMAL POWER (RTP). An electrical storm was in progress in the area. At 10:48, CR-3 experienced a loss of "A" Train offsite power due to loss of Offsite Power Transformer (OPT) MTTR-9 [EB, XFMR]. Emergency Diesel Generator EGDG-1A [EK, DG] automatically started and re-energized 4160 volt (4160V) Engineered Safeguards (ES) Bus "A" [EB, BU]. At 21:05, on June 17, 2002, 4160V ES Bus "A" was aligned to the Backup ES Transformer (BEST) [EB, XFMR] power feed and EGDG-1A was restored to ES standby.

There were no structures, systems or components that were inoperable at the start of the event that contributed to the event. No failure of equipment that should have automatically actuated was noted. CR-3 remained stable and on-line at 100 percent RTP throughout the event.

Improved Technical Specification (ITS) 3.8.1, Condition A, was entered due to loss of the OPT. ITS 3.8.1, Required Action A.3, states that the required offsite circuit must be restored to an operable status within 72 hours. At 23:45, on June 19, 2002, the OPT power feed to 4160V ES Bus "A" was restored to an operable status and ITS 3.8.1, Condition A, was no longer applicable.

On July 20, 2002, FPC's CR-3 was in MODE 1 (POWER OPERATION) at 100 percent RTP. No electrical storm was in progress in the area. At 16:45, CR-3 experienced a loss of "A" Train offsite power due to loss of OPT MTTR-9. EGDG-1A automatically started and re-energized 4160V ES Bus "A." At 21:32, on July 20, 2002, 4160V ES Bus "A" was aligned to the BEST power feed and EGDG-1A was restored to ES standby.

There were no structures, systems or components that were inoperable at the start of the event that contributed to the event. No failure of equipment that should have automatically actuated was noted. CR-3 remained stable and on-line at 100 percent RTP throughout the event.

ITS 3.8.1, Condition A, was entered due to loss of the OPT. ITS 3.8.1, Required Action A.3, states that the required offsite circuit must be restored to an operable status within 72 hours. At 11:28, on July 23, 2002, the OPT power feed to 4160V ES Bus "A" was restored to an operable status and ITS 3.8.1, Condition A, was no longer applicable.

Valid starting of an EGDG is reportable to the NRC. At 14:16, on June 17, 2002, a non-emergency eight-hour notification was made to the NRC Operations Center (Event Number 38996) in accordance with 10CFR50.72(b)(3)(iv)(A). At 22:15, on July 20, 2002, a non-emergency eight-hour notification was made to the NRC Operations Center (Event Number 39079) in accordance with 10CFR50.72(b)(3)(iv)(A). This report is being submitted pursuant to 10CFR50.73(a)(2)(iv)(A).

## SAFETY CONSEQUENCES

### General

The OPT is located in the 230 kilovolt (230KV) switchyard [EB] and supplies the normal source of power to 4160V ES Bus "A." The BEST is located on the berm inside the Protected Area and is the normal source of power to 4160V ES Bus "B." The OPT, along with the BEST, provides two full capacity, redundant, dedicated offsite power feeds to the 4160V ES buses.

The feed from the OPT to the 4160V ES switchgear is a cable run (approximately 1179 feet) in a duct bank from the 230KV switchyard to the termination building (MT-14) on the CR-3 berm. The duct bank is underground for a large portion of the route, exposing the cables to water immersion periodically prior to the June 17, 2002, event. Six three-conductor cables (Kerite, 750 MCM) run from the OPT, through three underground cable vaults (two vaults contain cable splices), two aboveground cable vaults (both contain cable splices), to a termination house (see Drawing #1 – Page 9/12). The cable run continues from the termination house to 4160V ES Bus "A."

The other offsite power supply (BEST) is fed from the 230KV switchyard via overhead lines. These lines are not subject to water submergence.

EGDG-1A is the emergency power supply for 4160V ES Bus "A." EGDG-1B is the emergency power supply for 4160V ES Bus "B."

FPC concludes that the loss of the OPT did not represent a reduction in the public health and safety. The BEST remained operable at all times and EGDG-1A started and loaded as designed. Since the BEST remained fully operable, this event does not meet the definition of a Safety System Functional Failure.

### Supplemental: Operability Between June 17, 2002, and July 20, 2002

The failure on June 17, 2002, was caused by a lightning induced voltage surge resulting in a short to ground of one 'B' phase conductor. The short occurred at a location where the three-conductor cable jacket had been stripped to splice the conductors. The damaged conductor insulation was repaired. When the OPT cabling was returned to service, several conductors were accepted for use following review of vendor test data.

The failure on July 20, 2002, is attributed to a weakness in the insulation of another 'B' phase conductor that may have been degraded by the previous lightning event. No operating or transient conditions have been identified that were coincident with this failure.

A contributing factor under consideration is the as-left configuration of the cables in the vicinity of the splices from the June repairs, where the conductors and the cable grounds are bundled together and covered with a zippered jacket. This configuration actually compressed the uninsulated grounds into the outer surface of the insulation of the conductors, potentially further compromising the insulation. In the unspliced cable sections, a filler material maintains a separation of approximately ¼-inch between the insulated conductors and the grounds. Additionally, during the July repair, water was found within the zippered jackets that had been removed and replaced in June. The water had leached out of the cable filler material after the repairs were made in June.

CR-3 Engineering has evaluated the normal and post-accident operating conditions for the OPT cables. Insulation failure is primarily related to voltage potential across the insulation. These cables are relatively lightly loaded even under the most demanding conditions relative to their current carrying capability (1135 amps carrying both ES buses versus 1872 amps capability). The post-accident operating conditions would not place additional stress on the insulation that is not observed during normal operation. Therefore, the cables and the OPT remained operable during June and July until the insulation failure on July 20, 2002.

A risk analysis was performed conservatively assuming a degraded cable condition during the period between the June 17, 2002, event restoration and the restoration following the July 17, 2002, event. This period of time includes two configurations: (1) the 30 day window with a degraded cable and (2) a 3 day window with the OPT out of service. Using the CR-3 Probabilistic Risk Assessment, the total Incremental Core Damage Probability is estimated to be well below 1.0E-06, indicating low risk significance.

CAUSE

June 17, 2002

The cause for loss of the OPT was a lightning induced voltage surge resulting in a short to ground of one 'B' phase conductor. The short occurred at a location where the three-conductor cable jacket had been stripped to splice the conductors on Cable #1, Phase B, when the splice was originally made. The damage was located near the transition of the zippered jacket to the cable outer jacket. During the lightning storm, the ground potential was raised to a point where this pre-existing damage allowed a short to the ground conductor. This caused a current imbalance in the current transformer [EB, XCT] circuit that actuated the Transformer #9 Neutral Differential Relay [EB, 87] and opened breakers 4900, 4902 and 3211 [EB, BKR]. This short during the lightning storm that resulted in the relay actuation is identified as the event cause.

Water was found in the cable vault in the CR-1/CR-2 parking lot where the damaged cable was located. When the cable vault was opened, the water level was below the level of the damaged cable. However, FPC cannot determine if the level was higher during or prior to the event. The accumulation of water in the cable vault is identified as a potential contributing factor.

On June 18, 2002, the cables in the field were meggered. The following values in megohms were recorded.

| Cable | Phase A to Phase B | Phase A to Phase C | Phase B to Phase C | Phase A to Ground | Phase B to Ground | Phase C to Ground |
|---|---|---|---|---|---|---|
| 1 | 5.44 | 6.7 | 4.0 | 6.8 | 0.48 | 3.0 |
| 2 | 25.0 | 31.8 | 25.1 | 17.5 | 8.0 | 18.4 |
| 3 | 7.5 | 8.1 | 13.1 | 2.0 | 7.3 | 7.0 |
| 4 | 30.1 | 33.5 | 26.4 | 20.2 | 10.4 | 13.8 |
| 5 | 20.1 | 20.5 | 19.5 | 11.5 | 8.5 | 9.6 |
| 6 | 8.8 | 16.6 | 18.5 | 3.24 | 5.0 | 15.01 |

July 20, 2002

The cause for loss of the OPT was latent damage from the lightning strike that caused loss of the OPT on June 17, 2002. Upon investigation, Phase B of Cable #4 conductor was found shorted to ground in the CR-1/CR-2 parking lot cable vault. When the Cable #4 splice zippered jacket was opened, approximately 0.5 gallons of water was drained.

During the June event, this cable had an as-found phase-to-ground insulation resistance of 10.4 megohms. After inspection and replacing the zippered jacket, the return to service phase-to-ground insulation resistance was 1.37 megohms. The change in resistance value could have been due to changing the configuration of the ground wire and individual conductors during the installation of the zippered jacket. It could have also been due to pressing the ground wire into the conductor insulation during the installation of the zippered jacket. Changing the configuration of the cable in the zippered jacket could have moved the ground wire closer to a portion of the insulation material degraded by the June lighting strike. The collected water inside the zippered jacket then created a path for tracking through the degraded insulation to the ground wire.

On July 21, 2002, the cables in the field were meggered. The following values in megohms were recorded.

| Cable | Phase A to Ground | Phase B to Ground | Phase C to Ground |
|---|---|---|---|
| 1 | 6.0 | 17.0 | 3.0 |
| 2 | 14.0 | 6.0 | 14.0 |
| 3 | 4.0 | 5.0 | 5.0 |
| 4 | 12.0 | 0.0 | 12.0 |
| 5 | 8.0 | 7.0 | 9.0 |
| 6 | 5.0 | 5.0 | 15.0 |

CORRECTIVE ACTIONS

June 17, 2002

1. After the initial readings were recorded, the cables were cleaned at the termination building and examined for areas where the cable insulation was damaged due to a lightning strike. Nine of the conductors were found to exhibit damage to the insulation. These conductors were repaired using Raychem 5KV rated NMCK8-2L insulation kits.

   A cable fault test was performed to determine the location of any additional faults in the cables. This test determined that Phase B of Cable #1 was damaged north of the cable bridge. Further investigation determined the cable was damaged at an area adjacent to a splice in the cable vault. This cable vault is located in the CR-1/CR-2 parking lot and was found to contain water. The cable vault was drained of water. The cable was dried and repaired using insulation material rated for the required 5KV application. The cable fault test was performed again and no additional defects were discovered.

   The other cable vaults were opened and inspected for water intrusion. Cable vaults containing water were pumped and the cables were inspected for water intrusion.

   After the cables were repaired, the cables were meggered for phase to ground resistance. The following values in megohms were recorded (values for the previous readings are in parenthesis).

| Cable | Phase A to Ground | Phase B to Ground | Phase C to Ground |
|---|---|---|---|
| 1 | 4.3 (6.8) | 36 (0.48) | 2.6 (3.0) |
| 2 | 22 (17.5) | 9.7 (8.0) | 2.3 (18.4) |
| 3 | 1.55 (2.0) | 7.9 (7.3) | 6.5 (7.0) |
| 4 | 13.8 (20.2) | 1.37 (10.4) | 13.1 (13.8) |
| 5 | 14.3 (11.5) | 11.7 (8.5) | 9.22 (9.6) |
| 6 | 8.8 (3.24) | 16.6 (5.0) | 18.5 (15.01) |

In some cases, the resistance values recorded in the second test are lower than those recorded in previous tests. FPC Engineering personnel expected that once the cables were energized, any remaining moisture would be expelled from the cable insulation whereby the insulation should exhibit higher resistance values.

2. Nuclear Condition Report (NCR) 63221 was initiated to evaluate the long-term resolution of water in the cable vaults.

3. NCR 62928 will track evaluations of: (1) the adequacy of switchyard lightning protection; (2) the addition of lightning protection for the termination building; (3) the adequacy of the switchyard grounding design; and, (4) the water submergence question for medium voltage cables.

July 20, 2002

1. The zippered jackets were removed from the cable splices in both the CR-1/CR-2 parking lot cable vault and the cable vault located near the CR-1/CR-2 gate for this cable run. The exposed conductor insulation and splices were dried and wiped clean. The zippered jackets were not re-installed over the splices in order to prevent water accumulation and to provide separation similar to nominal conductor-to-ground spacing.

   Scotch 130C Linerless Rubber Splicing Tape was used to repair and enhance the conductor insulation. A minimum of four half lapped layers of Scotch 130C was applied to the maximum extent possible to the exposed conductor insulation where the zippered jacket was removed from the six Kerite 750 MCM cables (see Drawing #2 – Page 10/12). The insulation properties provided by the tape will ensure that at least 5KV of insulation is available in this section of the cabling and that a minimum separation of approximately ¼-inch between the insulated conductors and the grounds is maintained.

   The as-left phase-to-ground megger readings in megohms (1 minute/10 minute values) of the cables after cleaning and repair tasks were performed.

| Cable | Phase A to Ground | Phase B to Ground | Phase C to Ground |
|---|---|---|---|
| 1 | 305/347 | 263/292 | 680/838 |
| 2 | 273/321 | 211/238 | 132/146 |
| 3 | 41/55.5 | 135/137 | 68.4/73.3 |
| 4 | 274/293 | 27.0/27 | 62.7/69.8 |
| 5 | 32/33 | 16.3/15 | 31.6/32 |
| 6 | 14.4/13.7 | 10.7/11.1 | 25.6/38.8 |

2. Engineering Change Request 1066 was initiated to evaluate replacing the cables from the OPT to the termination building.

3. Work Order 291891 was initiated to repeat 1-minute megger readings on the OPT cables to monitor for potential insulation resistance degradation.

4. Work Order Task Profile 292154-01 was initiated to periodically inspect the cable vaults and remove water as needed.

5. NCR 66692 was initiated to document the repeat failure of the OPT feeder circuit (MTM241).

PREVIOUS SIMILAR EVENTS

No previous similar events involving loss of the OPT have been reported to the NRC.

DRAWINGS

Drawing #1 – OPT Cable Layout

Drawing #2 – OPT Cable Spice

ATTACHMENTS

Attachment 1 - Abbreviations, Definitions, and Acronyms

Attachment 2 - List of Commitments

# LICENSEE EVENT REPORT (LER)

| 1. FACILITY NAME | 2. DOCKET | 6. LER NUMBER | | | 3. PAGE |
|---|---|---|---|---|---|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
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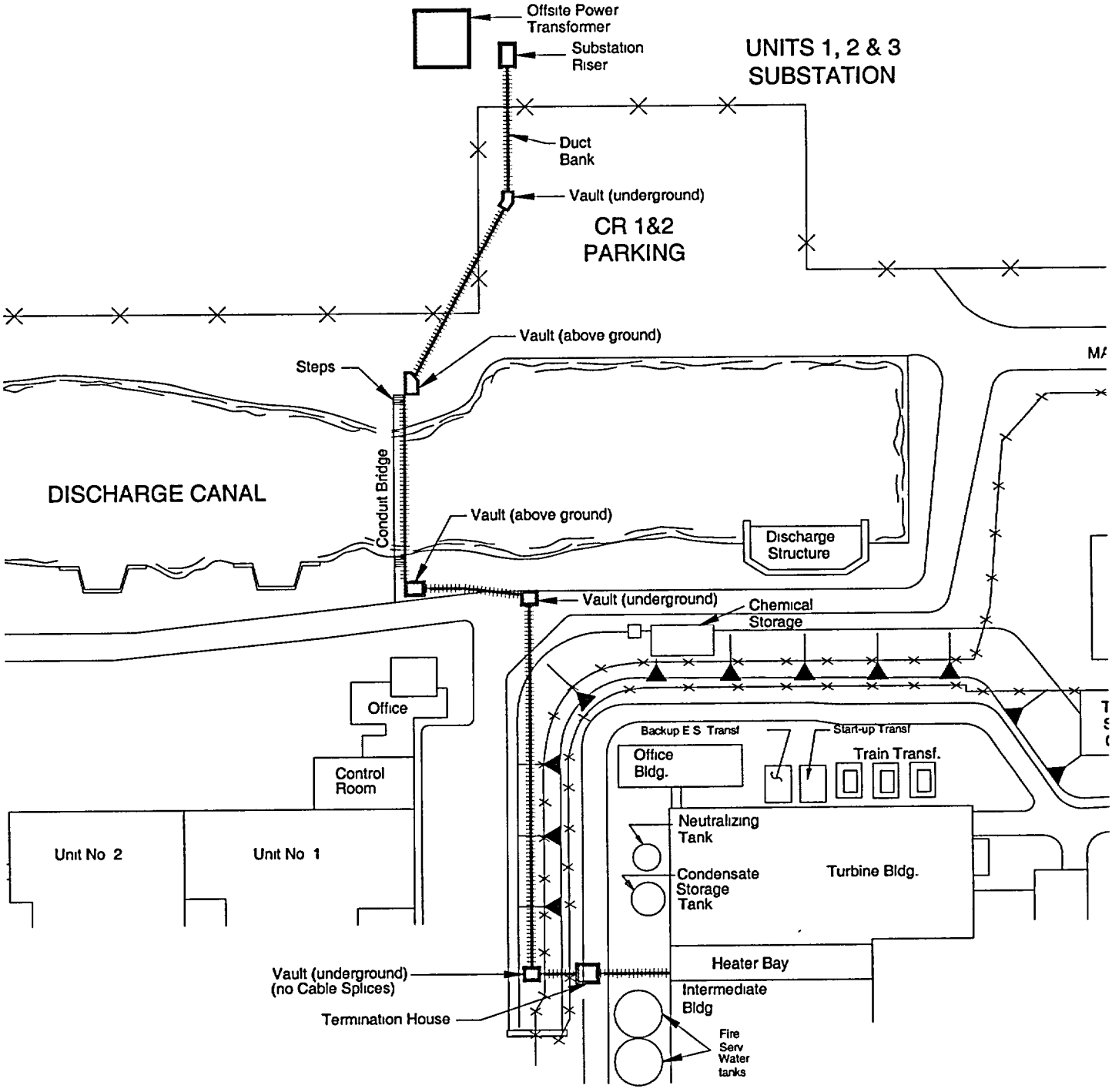
**17. TEXT** *(If more space is required, use additional copies of NRC Form 366A)*

## DRAWING #1

## OPT CABLE LAYOUT



# LICENSEE EVENT REPORT (LER)

| 1. FACILITY NAME | 2. DOCKET | 6. LER NUMBER | | | 3. PAGE |
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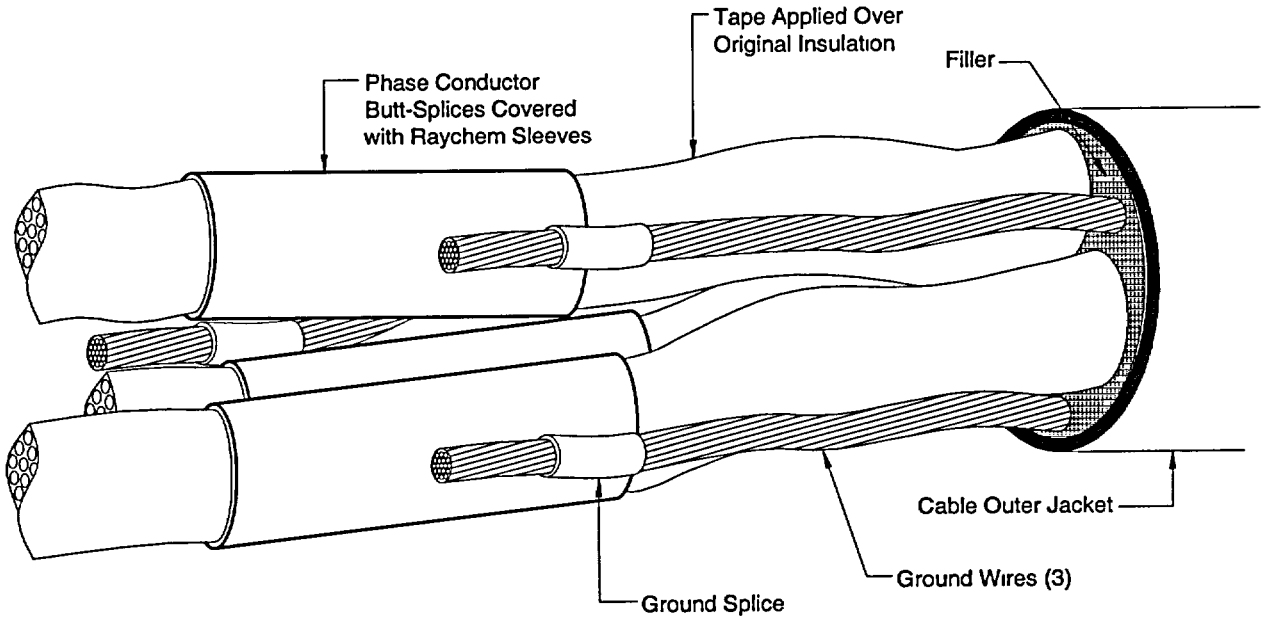
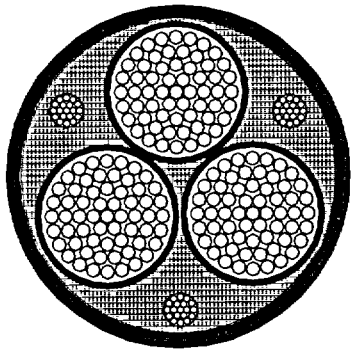
17. TEXT *(If more space is required, use additional copies of NRC Form 366A)*

DRAWING #2

OPT CABLE SPLICE




AS-LEFT CABLE CONFIGURATION AFTER JULY 20, 2002 EVENT



ORIGINAL CABLE CONFIGURATION

ATTACHMENT 1

ABBREVIATIONS, DEFINITIONS AND ACRONYMS

| | |
|---|---|
| BEST | Back-up ES Transformer |
| CFR | Code of Federal Regulations |
| CR-1/CR-2 | Crystal River Units 1 and 2 |
| CR-3 | Crystal River Unit 3 |
| FPC | Florida Power Corporation |
| ITS | Improved Technical Specifications |
| EGDG | Emergency Diesel Generator |
| ES | Engineered Safeguards |
| ITS | Improved Technical Specifications |
| NCR | Nuclear Condition Report |
| KV | kilovolt |
| OPT | Offsite Power Transformer |
| RAW | Risk Achievement Worth |
| PRA | Probabilistic Risk Assessment |
| RTP | Rated Thermal Power |
| SDP | Significance Determination Process |
| V | volt |

NOTES: Improved Technical Specifications defined terms appear capitalized in LER text {e.g., MODE 1}

Defined terms/acronyms/abbreviations appear in parenthesis when first used {e.g., Reactor Building (RB)}.

EIIS codes appear in square brackets {e.g., reactor building penetration [NH, PEN]}.

| 1. FACILITY NAME | 2. DOCKET | 6. LER NUMBER | | | 3. PAGE |
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17. TEXT *(If more space is required, use additional copies of NRC Form 366A)*

ATTACHMENT 2

LIST OF COMMITMENTS

The following table identifies those actions committed to by Florida Power Corporation in this document. Any other actions discussed in the submittal represent intended or planned actions by Florida Power Corporation. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Supervisor, Licensing & Regulatory Programs of any questions regarding this document or any associated regulatory commitments.

| RESPONSE SECTION | COMMITMENT | DUE DATE |
|---|---|---|
| | No regulatory commitments are being made in this submittal. | |