

CATEGORY 1

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ACCESSION NBR: 9810190266 DOC.DATE: 98/10/14 NOTARIZED: NO DOCKET #
 FACIL: 50-389 St. Lucie Plant, Unit 2, Florida Power & Light Co. 05000389
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 RECIPIENT NAME RECIPIENT AFFILIATION

SUBJECT: LER 98-007-00: on 980918, identified discrepancies between fire protection design requirements & field conditions. Caused by inadequate translation & implementation of fire protection requirements. Procedures revised. With 981014 ltr.

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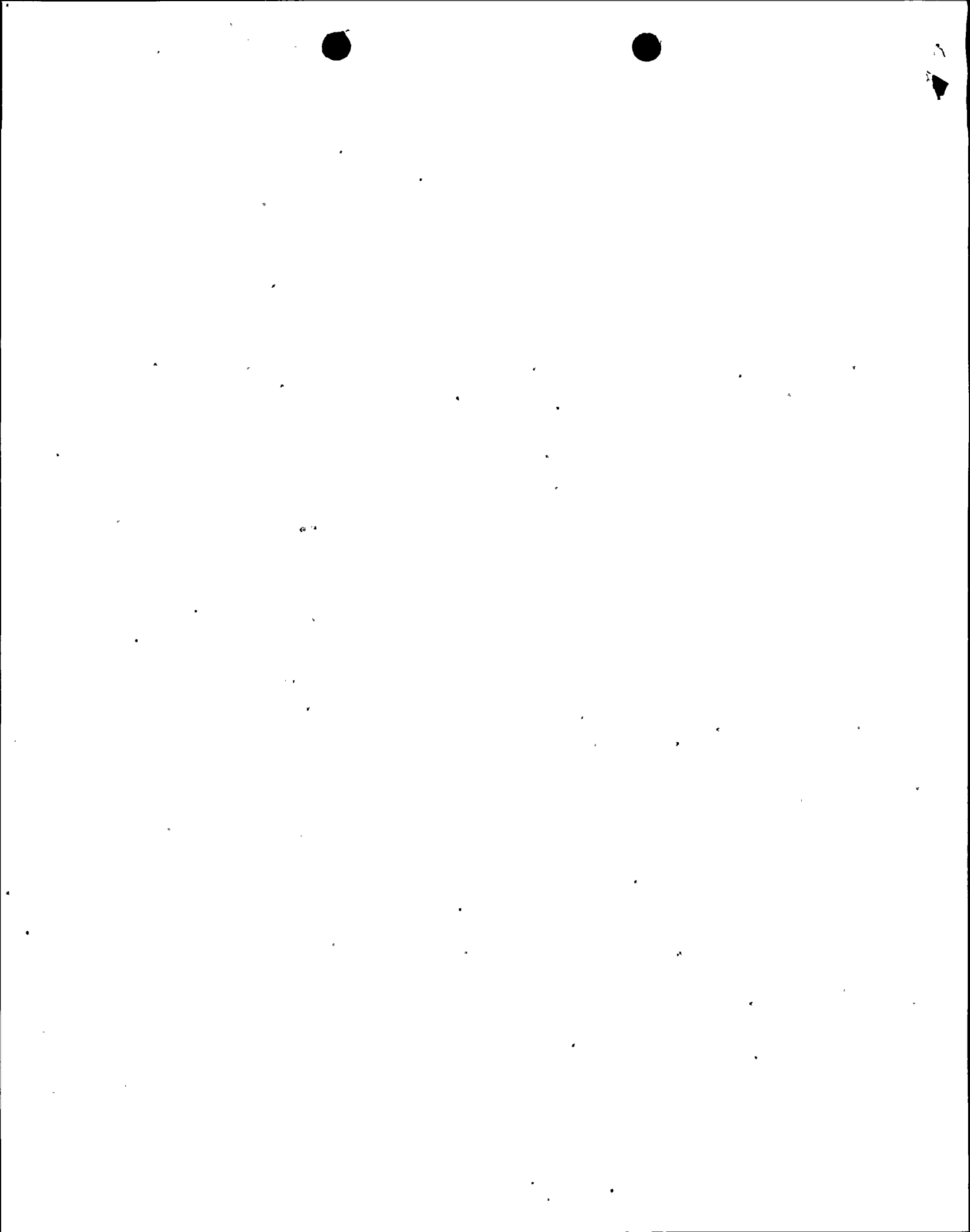
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Florida Power & Light Company, 6351 S. Ocean Drive, Jensen Beach, FL 34957

October 14, 1998

L-98-266
10 CFR § 50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Re: St. Lucie Unit 2
Docket No. 50-389
Reportable Event: 1998-007-00
Date of Event: September 18, 1998
Fire Protection SSA Re-Verification
Identified Potential PORV and 2A EDG Cable Failure Modes

The attached Licensee Event Report 1998-007 is being submitted pursuant to the requirements of 10 CFR § 50.73 to provide notification of the subject event.

Very truly yours,

J. A. Stall
Vice President
St. Lucie Nuclear Plant

JAS/EJW/KWF
Attachment

cc: Regional Administrator, USNRC Region II
Senior Resident Inspector, USNRC, St. Lucie Nuclear Plant

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11



LICENSEE EVENT REPORT (LER)

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TITLE (4)

Fire Protection SSA Re-Verification Identified Potential PORV and 2A EDG Cable Failure Modes

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
09	18	1998	1998	007	00	10	14	1998		
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
1			20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)	
POWER LEVEL (10)			20.2203(a)(1)		20.2203(a)(3)(i)		X 50.73(a)(2)(ii)		50.73(a)(2)(x)	
100			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71	
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER	
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A	
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)			

LICENSEE CONTACT FOR THIS LER (12)

NAME

K. W. Frehafer, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

(561) 467 - 7748

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On September 18, 1998, St. Lucie Unit 2 was in Mode 1 at 100 percent power. During the current re-verification effort for the St. Lucie Unit 2 fire protection Safe Shutdown Analysis, Florida Power and Light identified discrepancies between Fire Protection design requirements and field conditions. These discrepancies concern cable failure modes that could affect the operation of the pressurizer power operated relief valves, V1474 and V1475, and the 2A emergency diesel generator.

Postulated fire induced hot shorts of pressurizer power operated relief valve control power cables within the control room reactor turbine generator boards could result in spurious operation of the power operated relief valves. Postulated fire induced damage to the 2A emergency diesel generator hot shutdown control panel circuits could result in damage to the 2A emergency diesel generator.

These conditions were caused by inadequate translation and implementation of Fire Protection requirements into the St. Lucie Unit 2 safe shutdown analysis.

Interim compensatory measures include remote camera observation, pre-existing 30-minute roving fire watches, and procedure changes. Modifications to the 2A emergency diesel generator hot shutdown control panel circuitry were made to resolve the 2A emergency diesel generator issue, and modifications to resolve the PORV issue are planned.

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

Description of Event

On September 18, 1998, St. Lucie Unit 2 was in Mode 1 at 100 percent power. During the current re-verification effort for the St. Lucie Unit 2 Fire Protection Safe Shutdown Analysis (SSA), Florida Power and Light (FPL) determined that potential cable failure modes existed. These cable failure modes could affect the operation of the pressurizer power operated relief valves (PORVs) [EIS:AB:20], V1474 and V1475, and the 2A emergency diesel generator (EDG) [EIS:EK:DG]. Section III.G of 10 CFR 50 Appendix R requires that fire protection features be provided to protect one train of safe shutdown equipment from fire damage.

Criterion 3 of Appendix A to 10 CFR 50 specifies that "Structures, systems and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effects of fires and explosions." Appendix R of 10 CFR 50 states that for hot shutdown "One train of equipment necessary to achieve hot shutdown from either the control room or emergency control station(s) must be maintained free of fire damage by a single fire, including exposure fire."

Condition 1 - PORV Issue

The St. Lucie Unit 2 UFSAR Appendix 9.5A Section 6 identifies the PORVs as a high-low pressure reactor coolant interface boundary. The previous SSA design analysis concluded "All circuits controlling the operation of the PORV's located in the Control Room are housed in cabinets and control boards. ... No power cables are in the Control Room boards and cabinets. Cables are limited to 120V AC or 125V DC control circuits, which are protected by electrical interrupting devices (i.e., breakers, fuses), and instrumentation cables. ... Thus, the credibility of a self-generated cabinet or board fire is eliminated." Based on this interpretation of cable failure modes for the PORV cables, no provisions were made for isolation of control room faults.

The routing of the power and control cables, along with the existing control power isolation switches, was thought to be adequate to prevent spurious operation of the PORVs during a postulated fire. The PORV power cables are routed in dedicated conduits to eliminate spurious hot short concerns. In areas other than alternative shutdown areas where the PORV control cables are routed, the cables are protected with required fire barriers. Manual actions are performed to isolate potential cable faults in alternative shutdown areas.

NRC Generic Letter (GL) 86-10 clarifies circuit failure modes as "hot shorts, open circuits or shorts to ground. For consideration of spurious actuation, all possible functional failure states must be evaluated; that is, the component could be energized or de-energized by one or more of the above failure modes. ... For ungrounded DC circuits, if it can be shown that only two hot shorts of the proper polarity without grounding could cause spurious operation, no further evaluation is necessary except for any cases involving Hi/Lo pressure interfaces."

Strict interpretation of the NRC requirements for high/low pressure interface component cables requires analyzing the affected cables with all possible failure modes. Because other 125 volt DC control cables are routed along with the PORV control cables in the main control room reactor turbine generator (RTG) boards, an internally generated hot short of the correct polarity has been assumed in the

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current analysis of the PORVs. Isolation of the PORV control power circuitry with the existing isolation switches does not prevent the assumed hot short from energizing the PORV remote contactor relay and connecting the PORV to its source of power.

As an interim compensatory measure, a procedure change was issued for procedure 2-ONP-110.02, Appendix A, "Control Room Inaccessibility," which de-energizes the 125 volt PORV DC feeder breakers as the first step when evacuating the control room. This action removes both the motive and control power from the PORVs and eliminates the potential for spurious PORV operation.

Condition 2 - EDG 2A Issue:

FPL determined that the corrective action for a previously identified circuit failure mode for the 2A EDG control circuit was not implemented. The failure mode concerns the specific cable from the 2A EDG feeder breaker potential transformers (PTs) to the hot shutdown control panel (HSCP) which provides inputs to the 2A EDG voltmeter and wattmeter on the HSCP. This provides the HSCP operator with the operating status of the 2A EDG.

Short circuit failures of this circuit will open the EDG PTs' fuses. The 2A EDG voltage regulator and electric governor are also provided with input signals from this circuit. For a loss of voltage, the voltage regulator will attempt to raise the EDG output voltage to compensate. The electric governor will have no power for speed control and will switch speed control to the backup mechanical governor. Elevated voltage level may be beyond acceptable levels for EDG operation. This condition is not applicable to the 2B EDG due to configuration differences.

The fire protection defense in depth philosophy of prevention, detection, and suppression, in addition to pre-existing 30-minute roving fire watches in the area of concern, provided reasonable assurance that St. Lucie Unit 2 maintains post fire safe shutdown capability. Engineering completed a design modification for the addition of isolation fuses to the HSCP 2A EDG meter cable. These fuses are coordinated with the potential transformer (PT) fuses and sized to isolate cable short-circuit faults to the EDG voltage regulator circuitry. The implementation of this design modification is complete.

Cause of Event

The cause for the PORV cable failure mode issue was the misapplication or misinterpretation of NRC circuit failure mode analysis guidelines. Evaluations were performed as required and had been included in the St. Lucie Unit 2 UFSAR section for high/low pressure interfaces. However, upon further detailed review, the PORV circuitry design is not consistent with present methodology for analyzing high/low pressure circuit failures.

The cause for the 2A EDG cable failure mode issue was a failure to properly design and implement the required corrective action identified in the original SSA.

Analysis of Event

This condition is reportable under 10 CFR 50.73 as it resulted in the nuclear power plant being operated outside its design basis. As stated in the Unit 2 UFSAR, Appendix 9.5A, Section 2.3, a safe shutdown analysis has been performed to ensure

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that no single fire can prevent St. Lucie Unit 2 from safely shutting down. Contrary to this design requirement, two conditions have been identified on St. Lucie Unit 2 where adequate circuit protection has not been provided for components required for post fire safe shutdown. Since sufficient protection is not provided for the pressurizer PORVs for fires in the control room, the high/low pressure interface design requirements specified in the UFSAR are not met. In addition, a control circuit for the 2A EDG is not protected in selected areas of the St. Lucie Unit 2 reactor auxiliary building (RAB). As a result, St. Lucie Unit 2 is considered to be outside of its original design basis with respect to post fire safe shutdown. As such, this condition is reportable under 10 CFR 50.73 (a) (2) (ii). The required one hour 10 CFR 50.72 NRC notification was made on September 18, 1998.

Assessment of Safety Significance

Condition 1 - PORV Issue.

To address safety significance, a review of the failure modes for the PORV control room cables and existing compensatory measures was performed. For the postulated circuit failure to occur, the remote contactor circuit must be energized with 125 volt DC of the correct polarity with no other circuit grounds or faults. These simultaneous circuit failures have a low probability of occurrence, however for high/low pressure interface components the design must consider and preclude these types of failures.

In addition, the fire must occur inside of the control room RTG boards at the correct location to cause the insulation to burn off two or more cables of the correct polarity and cause hot shorts to occur before the control room operators have any chance of responding. Because the control room is continuously occupied and fire detection exists inside of the control room RTG boards, the existence of a fire of this magnitude would also have a low probability of occurring.

Condition 2 - EDG 2A Issue:

The Unit 2 UFSAR conservatively assumes a loss of offsite power (LOOP) concurrent with a postulated fire. In the unlikely event the 2A EDG is made unavailable due to fire damage during a concurrent fire and LOOP, power could be routed from Unit 1 via the station blackout cross tie breakers or startup transformer cross tie scheme.

A review was performed for the circuit failure modes and the existing compensatory measures that affect the 2A EDG HSCP meter instrumentation cable. For the postulated failure to occur, a fire would have to damage the affected circuit in such a way as to cause a short circuit between two conductors of the cable without burning the conductors apart. Normally, cable conductors experience damage to conductors at the same time as damage to the conductor jacket occurs. Because the affected cable is routed in a cable tray through the RAB -0.50' elevation, the probability of the identified failure occurring without grounding the cable or burning the cable apart is considered low.

In addition, there currently is a 30-minute roving fire watch throughout the RAB as an interim compensatory measure established during the SSA re-validation effort. Further assurance of fire protection features in the area of the 2A EDG HSCP instrumentation cable include:

- in-situ combustibles limited to IEEE-383 flame retardant cables in trays;

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- the large volume of this fire area helps in dissipating any smoke or hot gases generated by potential fires;
- fire detection and suppression is located above the subject cable tray runs in this area, and;
- plant procedures and limited access to a radiation control area limit introduction of transient combustibles

Based on the above, there are sufficient design features and compensatory measures in place to provide reasonable assurance that a fire of significant magnitude to damage the 2A EDG meter cable would not occur, or power would be available from Unit 1.

Conclusion

Based on the above, FPL concluded that the existing conditions had no significant impact on the health and safety of the public. The possibility of a fire induced LOCA or fire induced loss of the 2A EDG was highly unlikely. This assessment is based on the low probability of occurrence of circuit failures for the PORVs and 2A EDG, in addition to the fire protection program defense-in-depth philosophy such that fires postulated in the affected areas would not develop beyond the incipient stages for either condition.

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Corrective Actions

1. Pre-existing 30-minute roving fire watches covered the affected areas.
2. A procedure change was issued for de-energizing the 125 volt PORV DC feeder breakers as the first step in Appendix A of the Control Room Inaccessibility procedure, 2-ONP-100.02.
3. Engineering will provide a design modification to re-wire the PORV control circuit isolation relay, device 42, in the remote isolation panel.
4. Engineering completed the design modification for the addition of isolation fuses to the HSCP 2A EDG meter cable. These fuses are coordinated with the potential transformer (PT) fuses and sized to isolate cable short-circuit faults to the EDG voltage regulator circuitry. This design modification was implemented under PWO 98018372.
5. Engineering has completed the review of the original Unit 2 SSA to verify that all other required modifications identified in the SSA were properly implemented.
6. Engineering is re-validating the Unit 2 SSA. To date, no additional issues have been found during this on-going SSA review effort. The Unit 1 SSA re-validation effort has been completed.

Other Information

Similar Events

LER 50-335/98-005 reported similar SSA deficiencies with respect to St. Lucie Unit 1.

Failed Components Identified

None