FPL

10 CFR § 50.73
L-2005-180
AUG 1 2 2005

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

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Reportable Event: 2005-004-00
Date of Event: May 28, 2005
Fast Acting Control Circuit Fuses Can Cause Emergency Containment Filters to be Inoperable During Degraded Voltage Conditions

The attached Licensee Event Report 50-250/2005-004-00 is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(ii)(B), and 10 CFR 50.73(a)(2)(v)(C) and (D) to provide notification of the subject event.

If there are any questions, please call Mr. Walter Parker at (305) 246-6632.

Very truly yours,

Terry Jones

Terry O. Jones
Vice President
Turkey Point Nuclear Plant

Attachment

cc: Regional Administrator, USNRC, Region II
Senior Resident Inspector, USNRC, Turkey Point Nuclear Plant

IE22

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory 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 and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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 an 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Turkey Point Unit 3	05000250	1 OF 7

4. TITLE

Fasting Acting Control Fuses Can Cause Inoperable Emergency Containment Filters During Degraded Voltage Conditions

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Turkey Point Unit 4	05000251
05	28	2005	2005	- 004 -	00	08	12	2005	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)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☒ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☒ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☒ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Paul F. Czaya – Licensing Engineer	305-246-7150

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On May 19, 2005, the Unit 3 3A Emergency Containment Filter (ECF) fan failed to start during a scheduled surveillance test due to a blown control circuit fuse. A replacement fuse of the same type and size also blew during a subsequent start of the 3A ECF fan. It was determined that the fuse type was marginal for the application and that similar fuses were installed on two additional ECF units, 3B ECF on Unit 3 and 4C ECF on Unit 4. Three ECFs are provided in each reactor containment building to remove radioactive iodine so that offsite radiation dose is maintained within regulatory guideline values during a maximum hypothetical accident (MHA). There was a potential for two of three Unit 3 ECFs not starting if needed to mitigate an MHA with concurrent degraded voltage conditions. Using best estimate methods, analysis showed a minimal increase in offsite thyroid dose while control room thyroid dose remained within regulatory guideline values. The apparent cause for ECF 3A starter control circuit fuse opening is insufficient margin in the fuse design to ensure that the ECFs will start reliably given variations in voltage, fuse tolerances and/or starter coil inrush currents. ATM-3 and KTK-3 fuses were replaced with time delay fuses in ECF 3A, 3B and 4C motor starter circuits. Since no actual event occurred which relied on the ECFs to perform their safety function and since potential consequences increased but did not exceed regulatory limits, the health and safety of the public and plant personnel were not affected by the ECF marginal fuse application.

DESCRIPTION OF THE EVENT

On May 19, 2005, the Unit 3 3A Emergency Containment Filter (ECF) [EIIS: FLT] fan [EIIS: FAN] failed to start during a scheduled surveillance test. The failure of the fan to start was caused by a blown control circuit fuse [EIIS: FU]. A condition report was initiated and the fuse was replaced with one of the same type and size. This fuse also blew following a subsequent start of the 3A ECF fan. Further evaluation determined that the fuse type was marginal for the application and similar fuses were installed on two additional ECFs, 3B ECF on Unit 3 and 4C ECF on Unit 4. A new condition report was initiated on May 28, 2005 to evaluate the impact of the marginal fuses on the operation of the ECFs and to determine the extent of condition in the application of similar fuses.

ECF operability requirements are specified in TS Section 3/4.6.3 for Modes 1 through 4.

TS Surveillance Requirement 4.6.3.a requires:

> "Each emergency containment filtering unit shall be demonstrated OPERABLE at least once per 31 days on a STAGGERED TEST BASIS by initiating, from the control room, flow through the HEPA filters and charcoal absorbers and verifying that the system operates for at least 15 minutes."

The above requirement is satisfied by performing Procedures 3/4-OSP-056.1, "Emergency Containment Filter Fans Operating Test" within the specified time period for each ECF. Based on a review of operator logs for the past 5 years, this procedure has been satisfactorily completed on the required monthly basis for the Unit 3 and Unit 4 ECF fans. This includes the three ECF fans found with fast acting ATM-3 or KTK-3 control circuit fuses installed. All ECF fans have also been successfully tested in the past by Procedures 3/4-OSP-203.1/203.2, "Engineered Safeguards Integrated Test."

During a preventive maintenance overhaul, scheduled every 54 months, of the MCC bucket for 3A ECF on May 4, 2005, the fuse was replaced due to a cracked ferrule. While the new fuse matched the type and size previously installed as specified by the original equipment vendor and identified on the fuse list, the new fuse was likely from a batch manufactured to open toward the lower end of the manufacturing tolerance band. This is based on the previously installed fast acting fuse having operated successfully every month for about fifty-five months while at least two of the new fuses opened at the first monthly test. In order to address part availability, the fuse list allows substitution based on evaluation, therefore, three ECFs had time delay fuses installed in their control circuits over time.

Based on the record of successful surveillances on the affected ECF fans over the previous 5 years, there is some assurance that the fans would have started on demand and performed their required safety functions. However, there is no way to conclusively prove or disprove the ability of the original fuses to operate under worst case conditions since the removed fuses were discarded before any testing could be performed. Since the fans were not tested under degraded voltage conditions, there is uncertainty whether some or all of the suspect fuses would have successfully started and operated the associated ECFs on demand. The ECFs with fast acting control circuit fuses were determined to have been inoperable since reasonable assurance could not be provided that the fans would have operated within the required voltage range.

After evaluation, this condition was determined to be reportable on June 14, 2005 in accordance with 10 CFR 50.73(a)(2)(ii)(B), and 10 CFR 50.73(a)(2)(v)(C) and (D), whereupon the 60-day period for submission of this report began.

At the time of the failure of the 3A ECF fan to start, Unit 3 was operating in Mode 1 at 100% power and Unit 4 was in Mode 5 in a refueling outage.

BACKGROUND

Three Emergency Containment Filters are provided in each reactor containment building [EIIS: NH] to remove radioactive iodine so that offsite radiation dose is maintained within the guidelines in 10 CFR 100 and control room [EIIS: NA] radiation dose is maintained within the guidelines in 10 CFR 50, Appendix A, General Design Criterion 19, during a maximum hypothetical accident (MHA). A dousing system is installed to dissipate excessive decay heat on the charcoal filters [EIIS: ADS] due to adsorbed radioiodine in the event that a filter unit fan fails in service.

Updated Final Safety Analysis Report Section 6.3.1(b)(5) states that two of the three ECF units are required to operate for 2 hours to mitigate a MHA.

The Turkey Point MHA assumes that the total iodine source term is comprised of 91% elemental iodine, 4% methyl iodide, and 5% particulate iodide. Of these chemical species, elemental iodine and methyl iodide are required to be removed by the ECF charcoal adsorber, while particulate iodine is removed by the high-efficiency particulate absorber (HEPA) bank.

Operation of the ECF is modeled in the loss of coolant accident (LOCA) and control rod ejection accident (CREA) analyses. In each scenario, the filters are assumed to have 90% removal efficiency for elemental iodine, 30% removal efficiency for methyl iodide, and 95% removal efficiency for particulate iodine.

CAUSE OF THE EVENT

The apparent cause for ECF 3A starter's control circuit fuse opening is insufficient margin in the design to ensure that the ECFs will start reliably given variation in voltage, fuse tolerances and/or starter coil [EIIS: CL] inrush currents.

ANALYSIS OF THE EVENT

ATM-3 or KTK-3 fuses are considered marginal for the Size 4 ITE starter application and may cause inadvertent trips of the ECFs. Vendor information for a Size 4 motor starter indicates it draws 1400 VA on inrush or 1400/120 = 11.7 amps. The peak inrush current observed was approximately 18 amps on the first peak and 16 amps on the second peak. The first peak current is somewhat random and greatly depends on

where in the sine wave the starter is energized. However, measured peak current (16 to18 amps) is close to the vendor's published starter RMS value of 11.67 amps (i.e., 1.414 x 11.67 RMS = 16.5 amps peak). The duration of the inrush current was 0.02 to 0.03 seconds. The ATM-3 fuse curve shows that a current of 12 amps (RMS) will melt the fuse in 0.05 to 0.06 seconds and 15 amps RMS will melt the fuse at 0.03 seconds. These values are average melt times and according to the fuse manufacturer some fuses may melt at up to 13% less current. In addition, plant bus voltages can vary ±10%, which results in a corresponding change in current. Assuming worst case conditions, the fuse could see approximately 15 amps RMS for close to 0.03 seconds (11.7 amps x 1.13 x 1.1 = 14.6 amps). Considering all factors, it was concluded that the ATM-3 fuses installed do not provide sufficient margin to ensure the ECFs will start reliably.

All motor control center (MCC) starter control circuit fuses for safety related loads were reviewed to ensure the fuses would not blow due to inrush currents. The evaluation took into account vendor-specified fuse tolerances of 13% and voltage variations of 10%. The 10% voltage tolerance is a universal motor operating tolerance from NEMA Standard MG1 and the basis for the plant voltage drop analysis.

The following are the results and conclusions:

The ATM-1 fuse is an acceptable fuse for Size 1 starters and marginal for a Size 2 starter, but not acceptable for Size 3 or 4 starters.

The ATM-2 fuse is an acceptable fuse for Size 1, 2 and 3 starters but not for Size 4 starters.

The ATM-3 fuse is an acceptable fuse for Size 1, 2, and 3 starters and marginal for Size 4 starters.

A review of the fuse list determined that the Unit 3 and Unit 4 'A' Boric Acid Transfer Pumps [EIIS: CB, P] are the only additional safety related loads with a marginal control power fuse for the application (ATM-1 fuse used with a Size 2 starter). While these fuses are considered operable based on vendor information, additional margin is deemed prudent and they were replaced with time delay fuses.

Reportability

A review of the reporting requirements of 10 CFR 50.72 and 10 CFR 50.73 and NRC guidance provided in NUREG-1022, Revision 2, Event Reporting Guidelines 10 CFR 50.72 and 10 CFR 50.73, was performed for the subject condition. As a result of this review, the condition is reportable as described below.

Technical Specification (TS) Limiting Condition for Operation 3.6.3 requires each Turkey Point unit to have three operable ECFs in Modes 1, 2, 3 and 4. If one ECF becomes inoperable, the action is to "...restore the inoperable filter to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours." For a degraded voltage condition, two ECF fans for Unit 3 (3A and 3B) and one ECF fan for Unit 4 (4C) might not have started if called upon to perform their safety function. Therefore, the condition is reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by the TSs since the allowed outage time of 7 days had been exceeded for the affected ECFs. In addition, since two of the three Unit 3 ECFs were affected, continued

operation is not allowed and an immediate shutdown is required by TS 3.0.3. Retrospectively, this requirement was not satisfied since the condition of marginal ECF control circuit fusing was not known.

Since only one ECF for Unit 4 was affected, the remaining two ECFs were available to perform their design basis safety function. The two affected ECFs for Unit 3 would not have allowed the design basis safety function to be performed since only one ECF would have been operable. Therefore, the Unit 3 condition is also reportable in accordance with 10 CFR 50.73(a)(2)(v)(C) and (D) as a condition that could have prevented the fulfillment of the safety function of the ECFs to control the release of radioactive material and mitigate the consequences of an accident.

An 8-hour Emergency Notification System report, in accordance with 10 CFR 50.72(b)(3)(v)(C) and (D), was not made since the fast acting fuse for the Unit 3 3A ECF had already been replaced with a time delay fuse at the time of discovery of the condition potentially affecting other ECFs. This resulted in Unit 3 having two available ECFs to perform the safety function.

ANALYSIS OF SAFETY SIGNIFICANCE

The safety related functions of the ECFs are to remove adequate amounts of iodine from the containment atmosphere during a LOCA event to maintain offsite iodine radiation dose within the guidelines of 10 CFR 100 and to maintain control room iodine radiation dose within 10 CFR 50, Appendix A, GDC-19 guidelines.

Investigation revealed that two of the three ECFs in the Unit 4 containment were adequately fused. Furthermore, based on surveillance test results over the past five years, the two ECFs with slow acting fuses would have been operable if a MHA were to have occurred. There is some assurance that the third unit would have operated given the same historical evidence of ECF operability over the past 5 years. Since the installed fusing for that ECF has now been determined to have been marginally adequate, it cannot be stated with full confidence that the 4C ECF fuse would not have failed given a degraded voltage condition coincident with the event.

A previous Licensee Event Report identified a single failure vulnerability that could cause all ECF dousing valves associated with a unit to actuate (LER-2004-003-00, Florida Power & Light Letter L-2004-274, dated December 7, 2004). The reported condition indicated a potential change to the FSAR-reported LPZ thyroid dose from 2.79 Rem at the LPZ to a best case estimate of 2.78 Rem (vs. 10 CFR 100 LPZ thyroid dose limit of 300 Rem). Control room dose would have changed from 14.97 Rem thyroid to a best case estimate of 26.88 Rem (vs. GDC 19 thyroid dose limit of 30 Rem).

The dousing condition and marginal fusing condition existed simultaneously for a significant period of time. Since UFSAR accident analyses assume the operation of two ECFs following the MHA and two ECFs would have been operable, the safety significance of the fusing concern for Unit 4 in combination with the inadvertent dousing condition was evaluated as minimal.

One of the three ECFs for the Unit 3 containment was adequately fused while the fusing for the remaining two ECFs was marginally adequate. The existence of adequate fusing on at least one of the three ECFs ensures that one ECF would have been operable if a MHA were to have occurred. Based on surveillance test results over the past five years there is some assurance that the other two ECFs would have operated given the same historical evidence of ECF operability over the past 5 years. Since the installed fusing for those two ECFs have now been determined marginally adequate, there is no complete assurance that the fuses would not have failed given a degraded voltage condition coincident with the event. The UFSAR accident analyses assume operation of two ECFs to help mitigate an MHA, and only one ECF would have been operable. The UFSAR accident analyses (UFSAR Table 14.3.5-1) assume the operation of two ECFs for two hours. For operation of one ECF with filters doused, the best estimate LPZ thyroid dose is 3.1 Rem while control room thyroid dose is 28.25 Rem. The offsite thyroid dose increase is minimal and the control room thyroid dose is still within the regulatory guideline of 30 Rem.

For control room thyroid dose, the availability of potassium iodide (KI) pills for control room operators since 2004 would ensure the cumulative effective thyroid dose to the operators could be maintained well below 30 Rem. Prior to 2004, KI pills were controlled by the plant medical officer and were not maintained on site. However, since the control room dose limit is a 30-day cumulative dose, it is reasonable to presume that operators would be relieved periodically during this time frame and accumulated dose would be monitored and managed. Thus, the relative safety significance to control room operators is judged to have been minimal as well.

Since no actual event occurred which relied on the ECFs to perform their safety function and since potential consequences increased but did not exceed regulatory limits, the health and safety of the public and plant personnel were not affected by the ECF marginal fuse application even when combined with reduced ECF efficiency due to dousing.

CORRECTIVE ACTIONS

1. ATM-3 and KTK-3 fuses were replaced with time delay fuses in ECF 3A, 3B and 4C motor starter circuits. The fuse list drawing was revised to allow only time delay fuses for the ECF motor starter circuits.

2. The ATM fuses were replaced with time delay fuses in the Unit 3 and 4 'A' Boric Acid Transfer Pump motor starter circuits.

ADDITIONAL INFORMATION

EIIS Codes are shown in the format [EIIS SYSTEM: IEEE system identifier, component function identifier, second component function identifier (if appropriate)].

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Turkey Point Unit 3	05000250	2005	- 004 -	00	Page 7 of 7

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

FAILED COMPONENTS IDENTIFIED: The blown fast acting fuses are not considered component failures since they performed their function. The fuse type was marginal for the application.

SIMILAR EVENTS: Several previous events have occurred involving blown fuses in ECF starter control circuits. These events were evaluated and found to be unrelated to the marginal application of the fast acting fuses.