



**FPL**

10 CFR § 50.73  
L-2007-042

**MAR 28 2007**

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

Re: Turkey Point Unit 4  
Docket No. 50-251  
Reportable Event: 2006-002-00  
Date of Event: December 4, 2006  
Intermediate Range High Flux Trip Setpoint Exceeded Technical Specifications  
Allowable Value

The attached Licensee Event Report (LER) 05000251/2006-002-00 is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(B) to provide notification of the subject event. During the development and approval process of this LER, it was determined that the discovery date of this event was December 5, 2006. As a result, this LER should have been submitted by February 5, 2007. A condition report (CR 2007-8256) has been initiated to evaluate and implement improvements in the event review process to ensure timely identification and submittal of required reports.

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

Very truly yours,

William Jefferson, Jr.  
Vice President  
Turkey Point Nuclear Plant

Attachment

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

**LICENSEE EVENT REPORT (LER)**

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

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.

<b>1. FACILITY NAME</b> Turkey Point Unit 4	<b>2. DOCKET NUMBER</b> 05000251	<b>3. PAGE</b> 1 OF 5
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**4. TITLE**  
Intermediate Range High Flux Trip Setpoint Exceeded Technical Specification Allowable Value

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
12	04	2006	2006	- 002 -	00	3	29	2007		05000
									FACILITY NAME	DOCKET NUMBER
										05000

**9. OPERATING MODE**  
3

**10. POWER LEVEL**  
0

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

<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

**12. LICENSEE CONTACT FOR THIS LER**

NAME Ronald L. Everett – Licensing Engineer	TELEPHONE NUMBER (Include Area Code) 305-246-6190
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	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 December 4, 2006, prior to Low Power Physics Testing on Unit 4 for Cycle 23, the Intermediate Range (IR) detector setpoints for amps equivalent to 25% power trip and 20% rod stop were questioned and found to be non-conservative for N-35. The setpoint for N-35 would have exceeded the Technical Specification (TS) Table 2.2-1 allowable value. The primary cause of the event was determined to be inadequate change management with respect to changing the detector housing from aluminum to titanium for the IR detector. This design change affected the operating characteristics in the as-installed condition that were not recognized by the vendor or the plant staff. The change was made in the refueling outage prior to Unit 4 Cycle 22. The new detector was installed and new setpoints were calculated. Station engineering personnel failed to recognize that the installed setpoint value exceeded the TS 2.2 Allowable Value of 31%. The unit ascended in power in violation of TS 3.3.1 for having one less than the minimum channels operable. Review of the Unit 4 operating history revealed that N-35 was recalibrated once the unit reached 100% equilibrium conditions. To prevent recurrence, the procedure for validating IR trip setpoints will require comparison of installed values to TS limits.

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

**DESCRIPTION OF THE EVENT**

On December 4, 2006, prior to Low Power Physics Testing on Unit 4 for Cycle 23, the intermediate range detector [IG, DET] setpoints for amps equivalent to 25% power trip and 20% rod stop were questioned and found to be non-conservative for N-35.

Subsequent investigation determined that the event occurred when the Intermediate Range (IR) detector was changed from a model using an aluminum housing to one using a titanium housing in the refueling outage prior to Unit 4 Cycle 22. The new detector was installed and new setpoints were calculated. Plant engineering personnel failed to recognize that the installed setpoint value exceeded the Technical Specification (TS) Table 2.2-1 Allowable Value of 31%.

Unit 4 was in Mode 3 at the time of discovery in preparation for low power physics testing. Operations requested verification that the installed Intermediate Range trip setpoints were set to less than or equal to 25% power. A reactor engineer reviewed operating data from Cycle 22, expecting to find that the installed setpoints had been less than 25% of the measured current at 100% power. Instead, it was discovered that the installed setpoint for N-35 had been 34.6% of the 100% power current. Since this non-conservative setpoint had been used as an input to the Cycle 23 setpoint, it was determined that the Cycle 23 setpoint was also non-conservative.

**BACKGROUND**

Turkey Point has transitioned from aluminum housings to titanium housings for the Nuclear Instrumentation System (NIS) source range/intermediate range detectors to provide better corrosion resistance.

**CAUSE OF THE EVENT**

The primary cause of the event was determined to be inadequate change management (a process weakness) with respect to changing the detector housing from aluminum to titanium for the IR detectors. This design change affected the operating characteristics of the detector in the as-installed condition that were not recognized by the vendor or the plant staff. In particular, the vendor assessment of the design change to titanium housing did not identify any operational impacts. The vendor should have identified the need to use the neutron sensitivity value for the detector inside the housing. A contributing cause was inadequate procedures. The procedure for determining trip setpoints was not specific regarding which neutron sensitivity values should be used and which previous cycle setpoints should be used when calculating IR trip setpoints for a new operating cycle. Nor was there a procedural requirement to ensure the installed trip setpoint was less than or equal to the Technical Specifications allowable value of 31%.

**ANALYSIS OF THE EVENT**

The intermediate range (IR) NIS detectors N35 and N36 are designed for multiple (about 7) decade use and have a compensated ion chamber. The detector current is a function of the detector characteristics and the neutron and gamma flux leakage from the core, which is proportional to reactor power. The primary

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function of the IR NIS detectors is to provide a relative indication of reactor power when transitioning from the source range through the power range. The IR NIS channels provide a High Flux Reactor Trip at an IR detector current equivalent to 25% rated thermal power (RTP), increasing (1 of 2 logic). This trip should reset at 70 percent of the setpoint detector current, decreasing. This trip is required by Technical Specifications, but no credit is taken for this trip in the safety analysis.

TS Table 2.2-1 Allowable Value for the intermediate range neutron flux is " $\leq 31\%$  of RTP". The intermediate range trip is intended to mitigate the consequences of a rod cluster control assembly (RCCA) bank withdrawal accident from sub-critical conditions. This event is defined as an uncontrolled addition of reactivity to the reactor core caused by withdrawal of one or more RCCA banks, resulting in a power excursion, which would have non-conservatively occurred late for N-35 only. The trip logic for intermediate range is 1 out of 2, such that the N-36 setpoint would have generated a reactor trip prior to exceeding 31%.

For Cycle 22 (approx. April 18, 2005), Engineering generated the intermediate range detector setpoints based on the installation of two new intermediate range (N-35 and N-36) detectors. These setpoints were calculated using the new detector's neutron sensitivity and ratioing it to the previous detector's neutron sensitivity. For Cycle 22, the setpoints were adjusted at 100% power and a comparison of the pre- versus post high flux setpoint showed a 55% reduction in the N-35 setpoint and a 7% increase in the N-36 setpoint. The latent error in the process occurred at this time, when Reactor Engineering did not recognize this difference and the fact that the trip setpoint for Unit 4 N-35 was non-conservative (above TS allowable value). A review of the Unit 4 operating history revealed that N-35 was recalibrated once the unit reached 100% equilibrium conditions.

**REPORTABILITY**

A review of the reporting requirements of 10 CFR 50.72 and 10 CFR 50.73 and NRC guidance provided in "Event Reporting Guidelines," (NUREG-1022, Rev. 2) was performed for the subject event. As a result of this review, the event is considered reportable in accordance with 10CFR50.73(a)(2)(i)(B) in that two technical specifications were not met:

1. Turkey Point Technical Specification Table 2.2-1 Allowable Value for the intermediate range neutron flux is " $\leq 31\%$  of RTP" and the associated action 2.2.1.b. The setting was determined to be 34.6% of RTP for N-35.
2. The unit ascended in power in violation of TS 3.3.1 and its action statements a and b for having one less than the minimum channels operable for the intermediate range detectors. At the time the incorrect setpoint was not recognized.

APPLICABILITY: MODES 1 and 2

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**ANALYSIS OF SAFETY SIGNIFICANCE**

Based on the analysis described below, it is concluded that the health and safety of the public were not affected by this event.

The purpose of this intermediate range trip is to mitigate the consequences of a rod cluster control assembly (RCCA) bank [AA, ROD] withdrawal accident from sub-critical conditions. This event is defined as an uncontrolled addition of reactivity to the reactor core caused by withdrawal of one or more RCCA banks, resulting in a power excursion. Such a transient could be caused by a malfunction of the reactor control rod drive systems or due to operator error.

Should a continuous RCCA bank withdrawal accident occur, the transient will be terminated by one or more of the following automatic features of the Reactor Protection System (RPS).

- Source Range High Neutron Flux
- Intermediate Range High Neutron Flux
- Power Range High Neutron Flux (Low Setting)

The analysis of this accident conservatively assumes a reactor trip initiated by the Power Range High Neutron Flux (low setting, two-of-four power channels). Other RPS functions available to terminate this event as discussed above include:

- Source Range High Neutron Flux trip
- Intermediate Range High Neutron Flux trip

However, credit is not taken for these trips. Therefore, having the setpoint for one of the Intermediate Range Detectors set at 34.6% would be of little safety significance since it is a backup to the Power Range trip. Note that there is no accident analysis that takes credit for the Intermediate Range trip as the primary reactor protection. In addition, a review of the Unit 4 operating history revealed that N-35 was recalibrated once the unit reached 100% equilibrium conditions. So the condition of a high IR detector setpoint on one of the two IR detectors occurred only for a limited time frame following the Beginning of Cycle 22 startup.

**CORRECTIVE ACTIONS**

Immediate corrective actions were completed as follows:

1. New IR detector currents (setpoints) were recalculated and re-installed prior to initial criticality in Unit 4 Cycle 23.
2. New IR detector currents at 48% power and again at 100% equilibrium conditions were calculated and re-calibrated as required.
3. Unit 3 was assessed to ensure it was not impacted with acceptable conclusions.

Additional corrective actions including the following are identified in Condition Report 2006-35513:

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1. Revise the plant procedure for Nuclear Instrumentation System Setpoint and Calibration Predictions for a New Cycle Startup to address: (a) which specific setpoint should be used for the start of the previous cycle calculation; (b) enhance the description of when specific multiplier factors are used; (c) specific directions regarding the applicable neutron sensitivity values to be used; (d) validation performed by comparing the calculated beginning of cycle setpoints with the previous cycle power history; and (e) validating the neutron sensitivity of each detector against the vendor acceptance criteria.
2. Revise the plant procedure for Nuclear Instrumentation Channel Check and Calibration to address the required actions if the calculated setpoint exceeds the Technical Specification Table 2.2-1 Allowable Values of 31%.
3. Reactor Engineering to follow-up actions with the vendor to confirm correct use of the neutron sensitivity for the particular detector assemblies.

**ADDITIONAL INFORMATION**

An internal and external Operating Experience review was performed. None of the conditions specifically match the event described in this event report.

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

FAILED COMPONENTS IDENTIFIED: N/A

SIMILAR EVENTS: None