



L-2014-200
10 CFR § 50.73
June 24, 2014

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: 2014-001-00
Date of Event: April 25, 2014
Incorrect Feedwater Flow Transmitter Calibration Caused RPS Channels to be
Inoperable Longer Than Permitted by Technical Specifications

The attached Licensee Event Report 05000251/2014-001-00 is submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by the Technical Specifications.

If there are any questions, please call Mr. Robert Tomonto at 305-246-7327.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Michael Kiley', is written over a horizontal line.

Michael Kiley
Vice President
Turkey Point Nuclear Plant

Attachment

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

IEAD
NRK



LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.Resource@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.

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4. TITLE
Incorrect Feedwater Flow Transmitter Calibration Caused RPS Channels to be Inoperable

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
4	25	2014	2014	001	00	6	24	2014	Turkey Point Unit 3	05000250
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE 1

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)

10. POWER LEVEL 100%

<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

FACILITY NAME Paul F. Czaya	TELEPHONE NUMBER (Include Area Code) 305-246-7150
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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) X NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On April 25, 2014, it was identified that three feedwater flow transmitters were incorrectly calibrated during the Unit 4 startup in April 2013. The transmitters' zero calibration point had been shifted to the high end of the calibration tolerance as provided in the setpoint methodology. The impact of the calibration was to shift the actuation point of the Steam/Feedwater flow mismatch reactor trip beyond that specified in Technical Specifications (TS). The condition existed longer than allowed by the TS with the required actions not taken. An extent of condition review identified a similar condition existed on one Unit 3 feedwater flow transmitter following that unit's startup in August 2012. The causes are that the Engineering Technical Response Memorandum (ETRM now ETR) form has a missing barrier to provide defense-in-depth to prevent inappropriate usage, and lack of technical rigor and knowledge regarding the design basis impact of the flow transmitter calibration change. Corrective actions include: 1) Revise fleet procedure and form for ETRs to specifically state restrictions for which ETRs cannot be used, and 2) provide training to appropriate Engineering personnel regarding proper scope and usage of ETRs, and scaling and channel uncertainties used to define the design and licensing basis for the reactor protection system and engineered safety feature actuation system instrumentation.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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NARRATIVE

DESCRIPTION OF THE EVENT

On April 25, 2014 after Engineering review, it was identified in Condition Report 1961512 that three feedwater flow transmitters [SJ, FT] were incorrectly calibrated during the last Unit 4 startup in April 2013. One transmitter was associated with one of two required instrument channels associated with the 'B' steam generator (SG) [SB, SG]. The other two transmitters were associated with both required channels of the 'C' SG. The transmitters' zero calibration point had been shifted to the high end of the calibration tolerance as provided in the setpoint methodology. The shift resulted in transmitter output to be approximately 350,000 lb/hr even though feedwater flow was below this value. The impact of the calibration was to shift the actuation point of the Steam/Feedwater flow mismatch reactor trip beyond that specified in Technical Specifications (TS). The condition existed from April 6, 2013 at approximately 1025 (Mode 2 entry) until June 1, 2013 when the last of the three feedwater flow transmitters was calibrated correctly.

During an extent of condition review, it was identified that a similar condition existed on one Unit 3 feedwater flow transmitter from August 30, 2012 at approximately 1352 (Mode 2 entry) until February 9, 2013 when the transmitter was calibrated correctly.

The improperly calibrated flow transmitters resulted in inoperable instrument channels. Because this was not recognized at the time, the actions required by the TS were not taken, which is reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by the TS.

CAUSE OF THE EVENT

Root Cause: The Engineering Technical Response Memorandum (ETRM) form has a missing barrier to provide defense-in-depth to prevent inappropriate usage.

Contributing Cause: Engineering lack of technical rigor and knowledge: an incomplete understanding of design basis impact of flow transmitter calibration change during ETRM preparation, review and approval process resulted in an inadvertent modification to the plant.

ANALYSIS OF THE EVENT

The purpose of the Steam/Feedwater flow mismatch coincident with SG low level reactor trip is to measure the main steam flow rate and main feedwater flow rate, in order to provide indication and SG anticipatory signals for level control and protection in the event of a high flow rate mismatch between steam and feedwater.

To maintain a constant SG level during normal operation the Steam/Feedwater flow mismatch channels compare feedwater flow with steam flow as an anticipatory signal for level change in the SGs through the three signal level control. For protection, a Steam/Feedwater flow mismatch provides a reactor trip when



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coincident with SG low level to protect the reactor from a sudden loss of heat sink.

The Trip Setpoint is feedwater flow 20% below rated steam flow and the Allowable Value is feedwater flow $\leq 20.7\%$ below rated steam flow as required by TS Table 2.2-1, Functional Unit 12.

As a result of extended power uprate (EPU) conditions, the calibration data for the steam and feedwater flow transmitters and instrument loop components required adjustment. The new span of the transmitters and instrument loops was increased from 4,000,000 lbm/hr to 5,000,000 lbm/hr. The change increased the sensitivity of the steam and feedwater flow measurement at low flow rates and increased the likelihood of a mismatch occurring between steam and feedwater flow due to slight changes in transmitter output. This resulted in more alarm actuations as compared to the condition that existed prior to EPU. The system stabilizes above approximately 15% - 25% steam and feedwater flow rates.

Engineering Technical Response Memos (ETRM) were written to allow the Unit 3 and Unit 4 feedwater flow transmitters' zero calibration point to be raised. The revised calibrations were performed to reduce the number of Steam/Feedwater flow mismatch alarms and reactor trip system bistable actuations.

The feedwater flow transmitter output signal inputs to a square rooter that converts the linear flow transmitter differential pressure signal to a nonlinear calculated flow signal. The downstream flow loop square rooter creates a large change in indicated flow for a small increase in the transmitter zero point. The ETRM specified calibration resulted in the flow loop zero point increasing from the desired 0 lbm/hr to a value greater than 300,000 lbm/hr. This deviation resulted in exceeding the Allowable Value in TS Table 2.2-1 for a Steam/Feedwater flow mismatch. Based on as-found data when the transmitters were recalibrated and restored within specification, the out-of-specification values for feedwater flow less than steam flow varied between 26.5% and 30.6% thereby exceeding the Allowable Value of 20.7%.

Root cause analysis concluded that the ETRM was improperly used to change the configuration of feedwater flow instrumentation. The ETRM changed transmitter scaling requirements in engineering calculations and also changed critical design values in plant maintenance procedures. Both of these actions are beyond the scope allowed by the ETRM process. In addition, lack of technical rigor and knowledge of the setpoint basis is attributed as a contributing cause.

The site ETRM process was replaced by a fleet procedure for Engineering Technical Responses (ETR) in November 2013.

Reportability

Operability requirements for the Steam/Feedwater flow mismatch coincident with SG water level low reactor trip function are contained in TS Table 3.3-1, Functional Unit 12 as follows:

Total No. of Channels: 2 SG level and 2 steam/feedwater flow mismatch in each SG.

Channels to Trip: 1 SG level coincident with 1 steam/feedwater flow mismatch in same SG.



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Minimum Channels Operable: 1 SG level and 2 steam/feedwater flow mismatch in same SG or 2 SG level and 1 steam/feedwater flow mismatch in same SG.

If the Total No. of Channels requirement is not met, then Action 6 applies. Action 6 is as follows:

With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed until performance of the next required ANALOG CHANNEL OPERATIONAL TEST provided the inoperable channel is placed in the tripped condition within 6 hours.

For Unit 4

One required channel was inoperable for SG 'B', Action 6 was not entered, and TS 3.0.3 was not entered.

Two required channels were inoperable for SG 'C', the entry conditions for Action 6 were thus exceeded, and TS 3.0.3 was not entered. In addition, TS 3.0.4 was not met because the unit entered operational modes for which the Limiting Condition for Operation (LCO) was not met, the entry conditions for the required action were exceeded, and the provisions of TS 3.0.3 required a shutdown.

For Unit 3

One required channel was inoperable for SG 'A', Action 6 was not entered, and TS 3.0.3 was not entered.

Conclusion

The LCO in TS Table 3.3-1 for Functional Unit 12 was not met during the indicated periods, the required action was not met, and the resultant requirements to enter TS 3.0.3 and TS 3.0.4 were not recognized resulting in a condition reportable in accordance with 10 CFR 50.73(a)(2)(i)(B).

ANALYSIS OF SAFETY SIGNIFICANCE

While the affected channels did not meet the TS requirements for setpoint Allowable Value, the channels would have actuated at a greater Steam/Feedwater flow mismatch level.

Updated Final Safety Analysis Report Chapter 14, Section 14.2.7, Feed Water System Pipe Break, indicates that Steam/Feedwater flow mismatch coincident with low water level in any SG is a protection function for a feedwater system pipe break. Review of the analysis shows that the Low-Low SG Level reactor trip actuation and start of Auxiliary Feedwater (AFW) provide primary protection. The analysis also shows that if the Low-Low SG Level reactor trip actuation does not occur, the increase in Containment pressure will result in initiating a Safety Injection (SI) signal which will cause a reactor trip and start the AFW system. This actuation showed no bulk boiling in the primary coolant system will occur prior to the time that the heat removal capability of the SGs being fed by AFW exceeded NSSS residual heat generation. There is no Safety Analysis Limit associated with the Steam/Feedwater flow



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mismatch coincident with SG low level function.

Based on this analysis, the safety significance of the Steam/Feedwater flow mismatch trip not functioning is low because the primary function is provided by the SG Low-Low level reactor trip which is backed up adequately by the high Containment pressure SI actuation and start of AFW.

CORRECTIVE ACTIONS

Corrective action is in accordance with condition report AR1961512 and includes:

1. Revise the fleet procedure and form for ETRs to specifically state restrictions for which ETRs cannot be used.
2. Provide training to appropriate Engineering personnel regarding proper scope and usage of ETRs.
3. Provide training to appropriate Engineering personnel regarding scaling and channel uncertainties used to define the design and licensing basis for the reactor protection system and engineered safety feature actuation system instrumentation.

ADDITIONAL INFORMATION

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

FAILED COMPONENTS IDENTIFIED: None

PREVIOUS SIMILAR EVENTS: None