



**Entergy Operations, Inc.**  
17265 River Road  
Killona, LA 70057-3093  
Tel 504 739 6685  
Fax 504 739 6698  
jjarrel@entergy.com

**John P. Jarrell III**  
Manager, Regulatory Assurance  
Waterford 3

10 CFR 50.73

W3F1-2016-0057

September 1, 2016

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
11555 Rockville Pike  
Rockville, MD 20852

Subject: Licensee Event Report (LER) 2016-001-00, Incorrect Core Protection Calculator Addressable Constant Entered Because of Inadequate Procedure Resulting in a Condition Prohibited by Technical Specifications Waterford Steam Electric Station, Unit 3 (Waterford 3)  
Docket No. 50-382  
License No. NPF-38

Dear Sir or Madam:

On July 3, 2016, Waterford Steam Electric Station, Unit 3 (Waterford 3) determined that an incorrect value for Azimuthal Power Tilt had been entered on one channel of Core Protection Calculators (CPCs).

LER 2016-001-00 provides details associated with a condition that resulted in inoperability of CPC Channel C for approximately 29 hours, exceeding the outage time allowed by Technical Specification 3.3.1 action 2 and 3.2.3 action a. This condition is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B).

This report contains no new commitments. Please contact John P. Jarrell, Regulatory Assurance Manager, at (504) 739-6685 if you have questions regarding this information.

Sincerely,

A handwritten signature in black ink, appearing to read "J. Jarrell III", written over a light blue rectangular background.

JPJ/SWM

Attachment: LER 2016-001-00

cc: Mr. Kriss Kennedy, Regional Administrator  
U.S. NRC, Region IV  
RidsRgn4MailCenter@nrc.gov

U.S. NRC Project Manager for Waterford 3  
April.Pulvirenti@nrc.gov

U.S. NRC Senior Resident Inspector for Waterford 3  
Frances.Ramirez@nrc.gov  
Chris.Speer@nrc.gov

**Attachment**  
**to**  
**W3F1-2016-0057**  
**Licensee Event Report 2016-001-00**  
**(4 pages)**



**LICENSEE EVENT REPORT (LER)**

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

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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 e-mail to [Infocollects.Resource@nrc.gov](mailto: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.

<b>1. FACILITY NAME</b> Waterford 3 Steam Electric Station	<b>2. DOCKET NUMBER</b> 05000-382	<b>3. PAGE</b> 1 OF 4
---	--------------------------------------	--------------------------

**4. TITLE**  
Incorrect Core Protection Calculator Addressable Constant Entered Because of Inadequate Procedure Resulting in a Condition Prohibited by Technical Specifications

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
07	03	2016	2016	001	00	09	01	2016	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: <i>(Check all that apply)</i>			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
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)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<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)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<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)(vii)	<input type="checkbox"/> 73.77(a)(5)(ii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A		

**12. LICENSEE CONTACT FOR THIS LER**

LICENSEE CONTACT John Jarrell	TELEPHONE NUMBER <i>(Include Area Code)</i> (504) 739-6685
----------------------------------	---

**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
A	JC	DCC	C490	N					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES <i>(If yes, complete 15. EXPECTED SUBMISSION DATE)</i> <input checked="" type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b> MONTH:      DAY:      YEAR:
---	--

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

On July 3, 2016, the Core Protection Calculator (CPC) Tilt Exceeded alarm was received. This required the Azimuthal Power Tilt values to be adjusted for the actual condition. During the adjustment of the Type 1 addressable constants, it was discovered that the CPC Tilt value for CPC C, PID 063, had been improperly inputted following a failure and restoration of the CPC C on July 1, 2016. The value entered was 1.0064 when the value should have been 1.0102. The inputted values were taken from the last known functional printout in the CPC C book but were not verified against the addressable constant change log and did not account for any subsequent changes made by operations. The value entered was lower than intended, and because of this low value, there were several times over the next 2 days that actual Azimuthal Power Tilt was greater than the value assumed by CPC C. This should have resulted in entry into TS 3.2.3.a. The plant operated for approximately 29 hours outside of the allowed TS actions per TS 3.3.1 and 3.2.3.a. This also resulted in CPC C Local Power Density (LPD) and Departure from Nucleate Boiling Ration (DNBR) calculating a non-conservative value.

The Apparent Cause was that the CPC Functional Test procedure contains vague guidance on how to verify inputted addressable constants are correct. This resulted in this condition by implying to personnel that only using the CPC printed page of addressable constants to verify inputted addressable constants was correct and did not also prompt use of the CPC change log. Corrective actions include revising the procedure to provide specific guidance on how to verify inputted addressable constants are correct.



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

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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 e-mail to [Infocollections.Resource@nrc.gov](mailto:Infocollections.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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Waterford 3 Steam Electric Station	05000-382	2016	- 001 -	00

**NARRATIVE**

**INITIAL CONDITIONS**

At the time of discovery on July 3, 2016, Waterford 3 (WF3) was in Mode 1. A plant power reduction to 73% power was just completed due to an unrelated issue with Low Pressure Feedwater Heater [SM] strings 5 and 6. There were no safety related components, or system inoperable and all four (4) Core Protection Calculators (CPC) were operable. Between July 1, 2016, when the incorrect addressable constant was enter, and until time of discovery, July 3, 2016, all four (4) CPC's were operable.

**EVENT DESCRIPTION**

On April 29, 2016, a functional test was performed following replacement of a digital-to-analog converter card on CPC C. A new CPC C addressable constant printout obtained during performance of the functional test was placed in the CPC binder in the control room. On May 17, 2016, Reactor Engineering requested a change to the Azimuthal Power Tilt values in order to gain margin as an effect of core age. To support this, the Azimuthal Power Tilt values were raised from 1.0064 to 1.0102 for all four CPC channels using the procedure for changing Type 1 addressable constants. The changes were recorded and logged in the addressable constants change log on a separate sheet located in each CPC binder behind the addressable constant printout. On June 30, 2016 at 0012, CPC C failed (computer halted), Technical Specification (TS) 3.3.1 was entered, and LPD and DNBR were bypassed within 1 hour as required by the TS. Repairs to CPC C were completed on July 1, 2016 and the addressable constants were reentered using the last addressable constant print out from April 29, 2016. The change made to the addressable constant on May 17, 2016 was not entered. On July 2, 2016, from 2317 to 2350, the plant experienced a Rapid Plant Downpower due to Feedwater Heaters strings 5B and 6B isolating. On July 3, 2016 at 0017, the CPC Tilt Exceeded alarm was received as a function of core power distribution as part of the transient and TS 3.2.3 was entered. At 0144 an adjustment of CPC Tilt Allowance was completed on all four CPCs and TS 3.2.3 was exited. During this adjustment, it was discovered that the as found value for CPC C Tilt (PID 063) was 1.0064 instead of the expected value of 1.0102.

For some periods between July 1 and 3, 2016, actual Azimuthal Power Tilt as measured by the COLSS exceeded the value inputted into CPC C. This should have resulted in entry into TS 3.2.3.a. Also, by inputting a lower than actual Azimuthal Power Tilt value into CPC C, the calculations for LPD and DNBR moved in a non-conservative value. This action also necessitated entry into TS 3.3.1. Although the readings for LPD and DNBR were non-conservative, both LPD and DNBR passed the channel check requirements with the other three CPC channels. A Condition Report was generated and the correct value for PID 063 was entered and verified. TS 3.3.1 and TS 3.3.2 were exited on July 3, 2016 (CR-WF3-2016-4290).

TS 3.3.1 states that if the number of operable CPC channels is one less than the total number of channels, operation in the applicable mode may continue provided the inoperable channel is placed in the bypassed or tripped condition within one hour. TS 3.2.3 states the AZIMUTHAL POWER TILT shall be less than or equal to AZIMUTHAL POWER TILT Allowance used in the CPCs. With the measured AZIMUTHAL POWER TILT determined to exceed the AZIMUTHAL POWER TILT Allowance used in the CPCs, within 2 hours either correct the power tilt or adjust the AZIMUTHAL POWER TILT Allowance used in the CPCs to greater than or equal to the measured value.

**SYSTEM DESCRIPTION**

The WF3 Combustion Engineering design utilizes four CPCs. The primary safety functions of the CPCs are to provide low DNBR and high LPD reactor trips that assure that Specified Acceptable Fuel Design Limits are not exceeded during Anticipated Operational Occurrences, and to assist the Engineered Safety Features System [JE] in limiting the consequences of certain postulated accidents. These functions are accomplished when 2 out of the 4 CPC channels reach the LPD or DNBR setpoints. The CPC design incorporates a reactor core Azimuthal Power Tilt Allowance to account for "side to side" asymmetry in the core power distribution, which affects the CPC calculations of LPD and DNBR. Since the CPCs are unable to independently determine core tilt, the Azimuthal Power Tilt Allowance is set to a value that bounds the actual core tilt measured by the Incore Detector System [IG]. The actual core tilt is continuously monitored by the Core Operating Limits Supervisory System (COLSS) [ID]. To ensure conservative CPC tilt allowance is maintained, a "CPC Azimuthal Tilt Exceeded" annunciator is provided to alert operators when actual core tilt monitored by COLSS exceeds a setpoint which is more conservative than the CPC tilt allowance. If the "CPC Azimuthal Tilt Exceeded" annunciator is received, manual operator action is required to change the tilt allowance computer point (PID) 063 in each CPC.



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

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nureqs/staff/sr1022/r3/>)

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 e-mail to [Infocollects.Resource@nrc.gov](mailto: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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Waterford 3 Steam Electric Station	05000-382	2016	- 001 -	00

**NARRATIVE**

**REPORTABLE OCCURRENCE**

10 CFR 50.73(a)(2)(i)(B) - "Any operation or condition which was prohibited by the plant's Technical Specifications except when:

- (1) The Technical Specification is administrative in nature;
- (2) The event consisted solely of a case of a late surveillance test where the oversight was corrected, the test was performed, and the equipment was found to be capable of performing its specified safety functions; or
- (3) The Technical Specification was revised prior to discovery of the event such that the operation or condition was no longer prohibited at the time of discovery of the event."

The plant operated for approximately 29 hours outside of the allowed TS actions per TS 3.3.1 and 3.2.3.a.

**PREVIOUS OCCURRENCES**

A review of the Licensee's corrective action program and previous Licensee Event Reports for the previous 3 years was performed and revealed no similar event.

**CAUSAL FACTORS**

The Direct Cause of this event was that personnel manually entered an incorrect addressable constant for CPC Tilt (PID 063) on CPC C.

The Apparent Cause of this event is that the Core Protection Calculator Functional Test procedure contains vague guidance on how to verify inputted addressable constants are correct. This apparent cause resulted in this condition by implying to the operator/technician that only using the CPC printed Page of addressable constants to verify inputted addressable constants was correct and did not also prompt use of the CPC change log. This cause produced the effect of inputting a previously used and erroneous value into PID 063 (CPC Tilt). This erroneous value resulted in actual Azimuthal Power Tilt as measured by the COLSS exceeding the value inputted into CPC C. This should have resulted in entry into TS 3.2.3.a. The plant operated for approximately 29 hours outside of the allowed TS actions per TS 3.3.1 and 3.2.3.a.

The Contributing Cause of this event is that the procedure contains inadequate requirements for verification practices when inputting/changing addressable constants. This contributed to the event by not requiring an independent verification (as outlined in EN-HU-102, Human Performance Traps & Tools) of inputted addressable constants by a second operator.

**CORRECTIVE ACTIONS**

The key corrective action addressing this condition is to revise the procedure to provide specific guidance on how to verify inputted addressable constants are correct by making specific reference to the Addressable Constants change log maintained by Operations and to include an independent verification by a second operator to ensure that the addressable constants are correct.

**SAFETY SIGNIFICANCE**

No other CPC channel was inoperable during the time frame that the incorrect addressable constant was entered into CPC C. A review of the Plant Data indicates the maximum value of actual core tilt during this time period never exceeded the Core Operating Limit Report (COLR) of less than or equal to 0.03. CPC C was available during the subject time period to provide the low DNBR and high LPD reactor trip functions with the incorrect applied tilt allowance being slightly less conservative than the tilt allowance of the other three CPCs. If actual core tilt had exceeded the "CPC Azimuthal Tilt Exceeded" alarm setpoint during the subject time period, an annunciator would have prompted Operator action to evaluate the PID 063 Azimuthal Power Tilt Allowance in all four CPCs. No safety limits were challenged or exceeded during the event. Systems or components needed to safely shutdown the reactor, maintain safe shutdown conditions, remove residual heat, control the release of radioactive material,



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

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nureqs/staff/sr1022/r3/>)

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 e-mail to [Infocollects.Resource@nrc.gov](mailto: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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Waterford 3 Steam Electric Station	05000-382	2016	- 001 -	00

**NARRATIVE**  
and mitigate the consequences of an accident were available.

**ADDITIONAL INFORMATION**  
Energy industry identification system (EIS) codes and component function identifiers are identified in the text with brackets [ ].