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Waterford 3

W3F1-96-0026
A4.05
PR

February 29, 1996

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Reporting of Licensee Event Report

Gentlemen:

Attached is Licensee Event Report Number LER-96-003-00 for Waterford Steam Electric Station Unit 3. This Licensee Event Report is submitted in accordance with 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(v).

Very truly yours,

D.R. Keuter
General Manager
Plant Operations

DRK/WHP/tjs
Attachments

cc: L.J. Callan, NRC Region IV
C.P. Patel, NRC-NRR
D.F. Packer
J.T. Wheelock - INPO Records Center
R.B. McGehee
N.S. Reynolds
NRC Resident Inspectors Office
Administrator - LRPD

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NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
WATERFORD STEAM ELECTRIC STATION UNIT 3	05000 382	1 OF 17

TITLE (4)

LOGARITHMIC POWER CHANNELS INDICATING 5 PERCENT OF SCALE BELOW ACTUAL POWER

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
									N/A	05000
01	30	96	96	-- 003	-- 00	02	29	96	N/A	05000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

OPERATING MODE (9)	1							
POWER LEVEL (10)	100		20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)	50.73(a)(2)(viii)
			20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)	50.73(a)(2)(x)
			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)	X	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	TELEPHONE NUMBER (Include Area Code)
JASON M. LAQUE, SUPT., SYSTEM ENGINEERING	(504) 739-6630

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X YES (If yes, complete EXPECTED SUBMISSION DATE).	NO		06	30	96

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On 01/29/96 it was discovered that the Logarithmic Power Channel 'A' signal was indicating approximately 5 percent of indicator scale below actual core power. It was also determined that channels 'B', 'C' and 'D' signals were reading approximately 3 to 5 percent of indicator scale low. These channels supply control room indication and a plant protection trip at 0.257 percent reactor power to protect for unplanned criticality events which may occur while in reactor startup conditions. The errant input signals were determined to be caused by not periodically cross-correlating log power to linear power at 100 percent reactor power. Further investigation revealed that, relative to the 100 percent cross-correlated power level, conditions exist at low power that could introduce nonconservatism into the trip setpoint. Immediate corrective actions included immediately recalibrating the Log power channels with the correct bias adjustments and lowering the Log Power trip setpoint to account for other potential core condition uncertainties. This event did not compromise the health and safety of the general public.

REQUIRED NUMBER OF DIGITS/CHARACTERS FOR EACH BLOCK

BLOCK NUMBER	NUMBER OF DIGITS/CHARACTERS	TITLE
1	UP TO 46	FACILITY NAME
2	8 TOTAL 3 IN ADDITION TO 05000	DOCKET NUMBER
3	VARIES	PAGE NUMBER
4	UP TO 76	TITLE
5	6 TOTAL 2 PER BLOCK	EVENT DATE
6	7 TOTAL 2 FOR YEAR 3 FOR SEQUENTIAL NUMBER 2 FOR REVISION NUMBER	LER NUMBER
7	6 TOTAL 2 PER BLOCK	REPORT DATE
8	UP TO 18 -- FACILITY NAME 8 TOTAL -- DOCKET NUMBER 3 IN ADDITION TO 05000	OTHER FACILITIES INVOLVED
9	1	OPERATING MODE
10	3	POWER LEVEL
11	1 CHECK BOX THAT APPLIES	REQUIREMENTS OF 10 CFR
12	UP TO 50 FOR NAME 14 FOR TELEPHONE	LICENSEE CONTACT
13	CAUSE VARIES 2 FOR SYSTEM 4 FOR COMPONENT 4 FOR MANUFACTURER NPRDS VARIES	EACH COMPONENT FAILURE
14	1 CHECK BOX THAT APPLIES	SUPPLEMENTAL REPORT EXPECTED
15	6 TOTAL 2 PER BLOCK	EXPECTED SUBMISSION DATE

REPORTABLE OCCURRENCE

On 1/29/96 it was discovered that the Logarithmic (Log) Power Channel 'A' signal (EIIS Identifier JC) was reading approximately 5 percent of indicator scale below actual core power. It was then determined that the 'B', 'C', and 'D' Channels signals were also reading low from approximately 3 percent to 5 percent of the indicator scale. These channels provide control room indications and a plant trip safety function at 0.257 percent power if an unplanned criticality occurs during startup conditions. These errant input signals were determined to be caused by not periodically cross-correlating log power to linear power at 100 percent reactor power then adjusting the general bias of the subject detectors if necessary to account for cycle core design differences.

When this condition was discovered, Technical Specification 3.3.3.5, "Remote Shutdown Instrumentation," was entered which requires the restoration of at least two of the four channels within 7 days. Technical Specification 3.3.1, "Reactor Protective Instrumentation," which applies to the Log Power Trip, is applicable only in MODES 2 through 4. Waterford 3 was in MODE 1 at 100 percent power.

(Refer to Attachment A) The actual trip bistable for the Plant Protection System log power trip is set inside the PPS at 0.257 percent power (or 7.109 vDC). Adding a Periodic Test Error Value of 0.038 vDC to this gives the Technical Specification Allowable Value of 0.281 percent power (or 7.147 vDC). The resulting low reading discovered would make the indicated power lower than actual by 0.5236 vDC (5.236 percent of scale) for the 'A' channel. Instead of the trip actuating at 0.257 percent actual power, the trip would have occurred at 0.858 percent (or 7.6326 vDC for channel 'A'). Channels 'B, 'C', and 'D' were similarly affected and would have tripped at: channel 'B', 7.6318 vDC; channel 'C', 7.3542 vDC; and channel 'D', 7.355 vDC. Each of these values exceeds the Technical Specification 3.3.1 allowable value of 7.147 vDC.

The Analytical Limit supplied by Combustion Engineering (CE) for the Log Power Trip is 2.6 percent power (8.114 vDC). A loop uncertainty of 0.925 vDC is applied at the bistable. Accounting for the full instrument uncertainty in the conservative direction

would place all four channels above the Analytical Limit of 8.114 vDC or 2.6 percent power. Without being able to immediately quantify the effects of a trip beyond the Analytical Limit, a conservative 4-hour call to the NRC was made on 1/30/96 per 10CFR50.72(b)(2)(iii)(D) as a condition which could have prevented the fulfillment of a safety function. This Licensee Event Report is submitted in accordance with 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(v).

INITIAL CONDITIONS

At the time this condition was identified, Waterford 3 was operating in MODE 1 at approximately 100 percent power. There was no major equipment out of service specific to this event and no Technical Specification Limiting Conditions for Operation (LCOs) were in effect specific to this event at the time this condition was discovered.

EVENT DESCRIPTION

(Refer to Attachment A) Each safety channel uses three vertically stacked fission chambers mounted in symmetrically located wells (thimbles) surrounding the reactor vessel.

The safety channels provide a wide range logarithmic power level signal to the PPS over the range of 2E-8 percent through 200 percent power. This wide range information is extracted from the middle fission chamber in each channel and is a pulse signal which is amplified and transmitted to the remote safety channel in the PPS cabinet. The use of pulse-type information in the wide range channel allows for gamma discrimination at lower power levels. The logarithmic power channels provide the following functions:

- Plant Protection System High Log Power Trip and Pretrip bistable

- 1E-4 bistable, which permits manual bypassing of the High Log Power Trip and Pretrip above 1E-4 percent power. When power decreases below 1E-4 percent the bypass is automatically removed
- 1E-4 percent bistable permits manual bypassing of the Low DNBR and High LPD Trips below 1E-4 percent power. Bypass is automatically removed when power increases above 1E-4 percent
- 1E-4 percent bistable automatically bypasses all Core Protection Calculator generated Control Element Assembly (CEA) Withdrawal Prohibit (CWP) signals below 1E-4 percent power. Bypass is automatically removed when power increases above 1E-4 percent
- Permissive to bypass Low Steam Generator RCS Flow Trip when below 8.5E-5 percent power
- Removing and reinstating high voltage to the startup channel detectors at 1E-6 percent power. The bistable is OFF above 1E-6 percent and ON below 1E-6 percent power
- Control room Indicators

The System Engineer, along with an Instrument & Control (I & C) Foreman, determined that the Plant Protection System (PPS) Logarithmic (Log) power channel 'A' input signal was reading low by approximately 5.236 percent of scale (0.5236 vDC on a 0 to 10 vDC range). Subsequent investigation later revealed that channels 'B', 'C', and 'D' were also reading low ('B' was 5.228 percent, 'C' was 2.452 percent, and 'D' was 2.460 percent of scale). The low readings were affecting Log power level signals to the Plant Protection System, and control room indications.

(Refer to Attachment B) The actual trip bistable for the Plant Protection System Log power trip is set at 0.257 percent Log power (or 7.109 vDC). The discovered low reading would make the indicated power lower than actual by 0.5236 vDC for 'A' channel. This would result in the plant protection trip actuating at 0.858 percent (or 7.6326 vDC) instead of the normal 0.257 percent actual power. Channels 'B', 'C', and 'D' were similarly affected and would have tripped above the maximum trip value. The maximum trip value contained in design calculation EC-I92-019 is 0.309 percent power

(or 7.189 vDC). The Analytical Limit supplied by ABB\CE is 2.6 percent power (or 8.114 vDC). The maximum trip value is derived by taking the Analytical Limit and subtracting the instrument loop uncertainties (8.114 vDC - 0.925 vDC uncertainty = 7.189 vDC maximum trip value).

Over time, the Log power signal is affected by variations in flux, and the detector sensitivity. Flux variations measured by the detector occur as result of reactor power variations, and changes in core design and configuration. Changes in the flux ratio, which occur from cycle to cycle, may require a bias adjustment to make the measured Log power indication match actual power. The flux ratio is a calculation of the new cycle core divided by the previous cycle core.

To compensate for these flux variations, the Nuclear Instrumentation (NI) drawer is equipped with a bias adjustment (known as the General Bias). This adjustment provides an overall bias adjustment to compensate for the decrease in signals due to core design and detector sensitivity. The flux factor should be used to adjust the detector bias so that the analytical setpoint and calculated instrument uncertainty remain bounding. Further fine tuning adjustments can be made at 100 percent power so that log power matches actual power.

These General Bias adjustments to compensate for the flux ratio variations from cycle to cycle were made for the linear power channels at Waterford. However, the adjustments were not made for the Log power channels. This fact was determined by review of the I&C procedures which contained the original test values for the Log Calibrate switch. The present test values agreed with the "Ideal Voltage" readings in the technical manual. At the beginning of cycle 2 the core flux ratio was 0.890, meaning that the Refuel 2 core flux as seen by the detectors is 89 percent of the cycle 1 core. The present cycle 8 core flux ratio from the cycle 1 core is 0.459 or 45.9 percent of the cycle 1 core. Without making the necessary bias adjustment, the changes in the flux ratio caused the Log signal to gradually decrease with the flux ratio over time, so that in Cycle 8, Log power was reading approximately 45 percent of the actual full reactor power.

No approved Engineering, Maintenance or Operations procedures existed that describe the need for making the General Bias adjustment to the log channel signals. The NI technical manual does not contain information detailing when it would be necessary to make the bias adjustment. The manual only contains a procedure to make an adjustment if a General Bias voltage adjustment is needed.

(Refer to Attachment C) Engineering Calculation EC-I95-019 contains the loop uncertainties for each of the instrument output indications. The Log power channel output is from 2E-8 percent to 200 percent power or ten decades of power. The output signals to the indicating devices were found to be low by approximately the same amount as seen by the flux ratio change from cycle 1 to the present. The 'A' Log channel was reading approximately 50 percent power with the plant at 100 percent. This deviation on a log scale meter with a 4.5 inch measurement distance, was an approximate 0.14 inch deviation of the pointer or a 3 percent of scale deviation. Calculation EC-I95-019 indicated that the uncertainty of the control indications at the time of calibration can be expected to be as much as 4.96 percent of scale. The small deviation seen on all four output instrument channels was an acceptable amount of deviation in accordance with EC-I95-019. This small amount of indicator deviation was a contributor to the problem going undetected by routine channel observations.

During investigation of the problem, it was identified that cycle core design differences that result in lower flux reaching the excore detectors for a given power level were not accounted for in the Log Power instrument calibration. In discussing the calibration of the Log Power channels to Linear Power and ultimately to the Secondary Calorimetric at 100 percent power, Waterford 3 personnel realized that the protective action of the High Log Power Trip was credited for plant conditions significantly different from the 100 percent power calibration point. The difference in core conditions result in several factors that are potential sources of decalibration of the Log Power channels at the lower power levels, where the High Log Power Trip is needed. Waterford 3 contacted ABB/CE to obtain information on the effect of these decalibration factors. The newly

identified factors are: Power Roll due to Power Level, Power Roll due to Differing CEA Insertion, Temperature Shadowing, and Changes in Boron Concentration.

Summary of Events:

Saturday, January 20, 1996, a Condition Identification (CI 301153) was initiated on the 'A' Log channel due to out-of-tolerance indications found by Operations personnel during the performance of OP-903-102, Safety Channel Nuclear Instrumentation Functional Test.

On Monday, January 22, I&C Maintenance began troubleshooting the Log channel 'A' and on Tuesday, January 23, during the performance of procedure MI-003-102, NI Log Power Channel Calibration for Log channel 'A', I&C found that the "Log calibrate" switch position '1' was out-of-tolerance and in need of adjustment. Since the calibration procedure contained steps for adjusting this switch position, adjustments were attempted, but with unsatisfactory results. Position '1' continued to read low out-of-tolerance.

Friday, January 26, after unsuccessful troubleshooting, it was determined by the system engineer, in consultation with another Entergy plant, that the General Bias may need to be adjusted to increase the "Log Calibrate" switch position '1' to within tolerance. A procedure was provided with additional instructions for adjusting the General Bias on the Log channels. I&C Maintenance performed the instructions for determining the amount of bias needed and successfully adjusted the General Bias which caused the 'A' channel output indication readings to return to 100 percent.

Mid morning on Monday January 29, 1996, the I&C Supervisor and system engineer determined that in addition to the Log channel output indications, the Log Power signals to the Plant Protection System were affected. Condition Report (CR) 96-0116 was immediately written and the Shift Supervisor and Superintendent, System Engineering-Electrical were notified. By mid-day, I&C Design Engineering began providing assistance in determining the extent of impact for the out-of-tolerance bias condition.

I&C Maintenance returned to the field to determine the amount of bias needed for Log channels 'B', 'C', and 'D'. With information from I&C Maintenance, the system engineer calculated the new General Bias voltage values to be used for each "Log Calibrate" switch. After the specific test values were determined, new Channel Calibration limits were prepared for procedure OP-903-102, Safety Channel Nuclear Instrumentation Functional Test.

On Wednesday, January 31, meetings were held to inform the appropriate personnel of event and system status.

On Thursday, February 1, 1996, ABB\CE was questioned about the method being used to determine the General Bias. ABB\CE agreed that the best place to determine the amount of bias offset is with the plant operating at 100 percent power. The resulting calibration slope and alignment would be unaffected by the bias adjustment.

During investigation it was identified that the cycle core design differences which result in a lower flux reaching the excore detectors for a given power level were not fully factored into the Log Power instrument calibration.

During discussions of the proposed calibration at 100 percent power, Waterford 3 engineers determined that calibration at 100 percent power could cause several, potentially decalibrating, effects due to the difference between 100 percent power core conditions and low power core conditions, where the High Logarithmic Power Level Trip protection is needed (i.e., at or below 0.257 percent power). ABB/CE was then contacted to obtain information on the different core conditions at low power that could introduce additional errors relative to the full power conditions.

The Plant Operations Review Committee (PORC) reviewed and recommended approval of a Work Authorization (WA #01144191) Engineering Input which determined the amount of Bias needed, an I&C procedure change to MI-003-102 for

instrumentation adjustment, an operating procedure change to OP-903-102 for the new channel functional test limits, and the associated 50.59 evaluation.

On Monday, ABB\CE confirmed that the protective action of the High Log Power Trip was credited for plant conditions significantly different from the 100 percent calibration point. The difference in core conditions results in several sources of decalibration in the response of the Log Power signals. The newly identified factors affecting the Log Power signal are: Power Roll due to power level and CEA position, Temperature Shadowing, and Changes in Boron Concentration.

On Friday, February 9, ABB\CE provided operating instructions and data for a Plant Protection System setpoint change for the high Log Power trip. This new High Log Power trip setpoint will assure the results of the Design Basis Event (DBE) remain within the bounds of the safety analysis.

CAUSAL FACTORS

The errant Log channel signals were determined to be caused by not periodically cross-correlating the log power to linear power at 100 percent reactor power, then adjusting (if necessary) the detector's signal bias which is used to compensate for changes in reactor core conditions from cycle to cycle.

No Engineering, Maintenance, or Operations procedures or processes were in place for compensating the Log power excore detector signals for the flux ratio and detector sensitivity changes. Test requirements did not include performing a calorimetric comparison of the detector signal output to actual plant power then adjusting, if necessary, the Log General Bias.

Plant personnel relied on the existing maintenance and operations procedures to identify uncalibrated Log power conditions. Plant personnel also relied on observation and channel checks of the Log channel indicators to detect the out-of-tolerance

conditions. This did not assure the accuracy of the Log channel output to the Plant Protection System.

There was also insufficient information available regarding the Log power General Bias adjustment and the assumptions used in the Log power trip calculation. The Technical Manual was not clear in its explanation of the General Bias and when adjustments should be made. The technical manual vendor communicated part of the needed information but the information was not clearly understood by the customer.

IMMEDIATE CORRECTIVE MEASURES

To correct the immediate problem, an Engineering Input (WA #01144191) was provided for I&C Maintenance to calculate and reset the bias, and for resetting the six position Log calibrate switch to the new bias curve. New channel functional test limits were calculated for Operations Surveillance procedure OP-903-102. The 'A', B', 'C', and 'D' channels were recalibrated with the correct bias.

Since the high log power trip is not required to be operable at Mode 1 conditions, there is no immediate operability concern as long as Mode 1 is maintained. However, Waterford 3 has changed the current 0.257 percent High Log Power PPS Trip setpoint from 0.257 percent (7.109 vDC) to 0.0257 percent (6.109 vDC) to conservatively compensate for the newly identified decalibrating factors of Power Roll, Temperature Shadowing, and Changes in Boron Concentration. Based on estimates from ABB/CE of the magnitude of the decalibrating factors, this reduction in the setpoint is expected to bound the effect and ensure that safety limits are not exceeded. The pre-trip will remain the same at 0.001 percent (4.699 vDC).

MI-005-563, Plant Protection System Bistable Calibration, and OP-903-107, Plant Protection System Channel 'A', 'B', 'C', 'D' Functional Test were revised to include the new High Log Power Trip settings.

Additionally, Waterford 3 will inform the industry of the details of this event via the Nuclear network.

ACTIONS TO PREVENT RECURRENCE

The long term corrective action for adjustment of the General Bias will incorporate the change in flux ratio between core reloads into a procedure or process for resetting the General Bias, if necessary. Each time the bias is reset, new OP-903-102 Channel Functional Test limits will be calculated and forwarded to operations.

The long term corrective action for the newly identified factors is being addressed by ABB\CE and Waterford 3 personnel. An evaluation is currently being performed by ABB/CE to more realistically quantify the potential decalibration and identify offsetting margins and conservatism in the safety analysis to offset such decalibration. It is anticipated that this work will allow the equipment setpoints to be restored to their original values and will demonstrate that applicable safety analysis criteria would not have been exceeded should a CEA withdrawal event have occurred in past cycles while the Log Power channels were decalibrated. The results of this evaluation will be reported in a Supplement to this LER.

Information on the Log channel General Bias and process errors due to non linear flux effects at changing power levels will be forwarded to the training department for incorporation into the Nuclear Instrumentation system description (SD-NI). This incident will also be covered in the Continuing Training program. This incident will be covered in the Continuing Training program.

The Technical Manual will be updated with information on the General Bias purpose and the need for adjusting the bias.

Appropriate Engineering, Maintenance, and Operations will be revised or specific procedurescreated to address the General Bias adjustment.

SAFETY SIGNIFICANCE

The error on the log channel was found to affect the following systems or components.

- Plant Protection System High Log Power Trip and Pretrip bistable
- 1E-4 bistable, which permits manual bypassing of the High Log Power Trip and Pretrip above 1E-4 percent power. When power decreases below 1E-4 percent the bypass is automatically removed
- 1E-4 percent bistable permits manual bypassing of the Low DNBR and High LPD Trips below 1E-4 percent power. Bypass is automatically removed when power increases above 1E-4 percent
- 1E-4 percent bistable automatically bypasses all Core Protection Calculator generated Control Element Assembly (CEA) Withdrawal Prohibit (CWP) signals below 1E-4 percent power. Bypass is automatically removed when power increases above 1E-4 percent
- Permissive to bypass Low Steam Generator RCS Flow Trip when below 8.5E-5 percent power
- Removing and reinstating high voltage to the startup channel detectors at 1E-6 percent power. The bistable is OFF above 1E-6 percent and ON below 1E-6 percent power
- Control room Indicators

Of these, only the action of the Core Protection Calculator (CPC) Bypass Removal and the High Log Power Trip are explicitly credited in the safety analysis. The analysis of concern is the CEA bank withdrawal from subcritical conditions (i.e., less than 1E-4 percent power). CPC bypass removal protects against large reactivity additions due to withdrawal of major banks, such as shutdown banks, by generating a reactor trip signal when these banks are not fully withdrawn prior to reaching 1E-4 percent power. The High Log Power trip protects against withdrawal of CEA regulating banks allowed by CPC and initiated below 1E-4 percent power. CEA withdrawals initiated from above

1E-4 percent power are protected b, the variable overpower trip function. Thus, there is a relatively small range of conditions that impact the safety function of the high log power trip.

Due to the magnitude of the discrepancy, operations declared the Log Power Channels inoperable and entered the action statement of Technical Specification(T.S.) 3.3.3.5, "Remote Shutdown Instrumentation," which requires the restoration of at least two of the four channels within 7 days. Technical Specification 3.3.1, "Reactor Protective Instrumentation," which requires the Log Power Trip to be operable is only applicable in MODES 2 through 4. Waterford 3 was in MODE 1 at 100 percent power.

For the purposes of the Remote Shutdown Monitoring System, the intent of the operability of Log Power indication is to identify to the operators a decrease in subcriticality and an impending return to power. This is provided by trending of the log power indication which is not affected by the decalibration. Thus, the Operator has sufficient information to meet the operability requirements for indication of log power. This is because there are very large changes in the neutron flux level as the core goes from a highly subcritical condition to a state relatively close to the critical conditions. As an example, due to a change in K-eff from 0.95 to 0.995 during a postulated approach to critical, the neutron flux will increase by a factor of 10. A flux increase of this magnitude is easily detectable even with the level of decalibration which was determined to be present in the Log Power channels.

There have been no documented cases of a need for the Log Power trip to have actuated during reactor startup conditions. Therefore having the Log Power level trip misadjusted has not created a condition which has challenged the trip's safety function.

There is no present operability or plant safety concern. The Hi Log Power Trip is only required during startup conditions, and the remote indication of Log Power for accident monitoring has been, and is currently, operable.

It is expected that much, if not all, of the bias and decalibration effect can be offset by conservatism that exists in the current safety analysis for the limiting CEA withdrawal event. Components of the overall instrument loop uncertainty value are available to account for some of the bias. The analysis also uses some conservative parameter values that bound the actual values for individual cycles so that the analysis remains valid for many cycles and the reanalysis effort is minimized. For example, values used for the delayed neutron fraction, reactivity addition rate, and 3-D peaking factor are all more adverse than typical individual cycle values. CEA withdrawal analyses done with more realistic input values would result in less severe consequences. Furthermore, there is also some margin between the current analysis results and the acceptance criteria for fuel centerline melt and DNBR.

An evaluation is currently being performed by ABB/CE to more realistically quantify the potential decalibration and identify offsetting margins and conservatism in the safety analysis to offset such decalibration. It is anticipated that this work will allow the equipment setpoints to be restored to their original values and will demonstrate that applicable safety analysis criteria would not have been exceeded should a CEA withdrawal event have occurred in past cycles while the Log Power channels were decalibrated. The results of this evaluation will be reported in a Supplement to this LER.

This event did not compromise the health and safety of the general public.

SIMILAR EVENTS

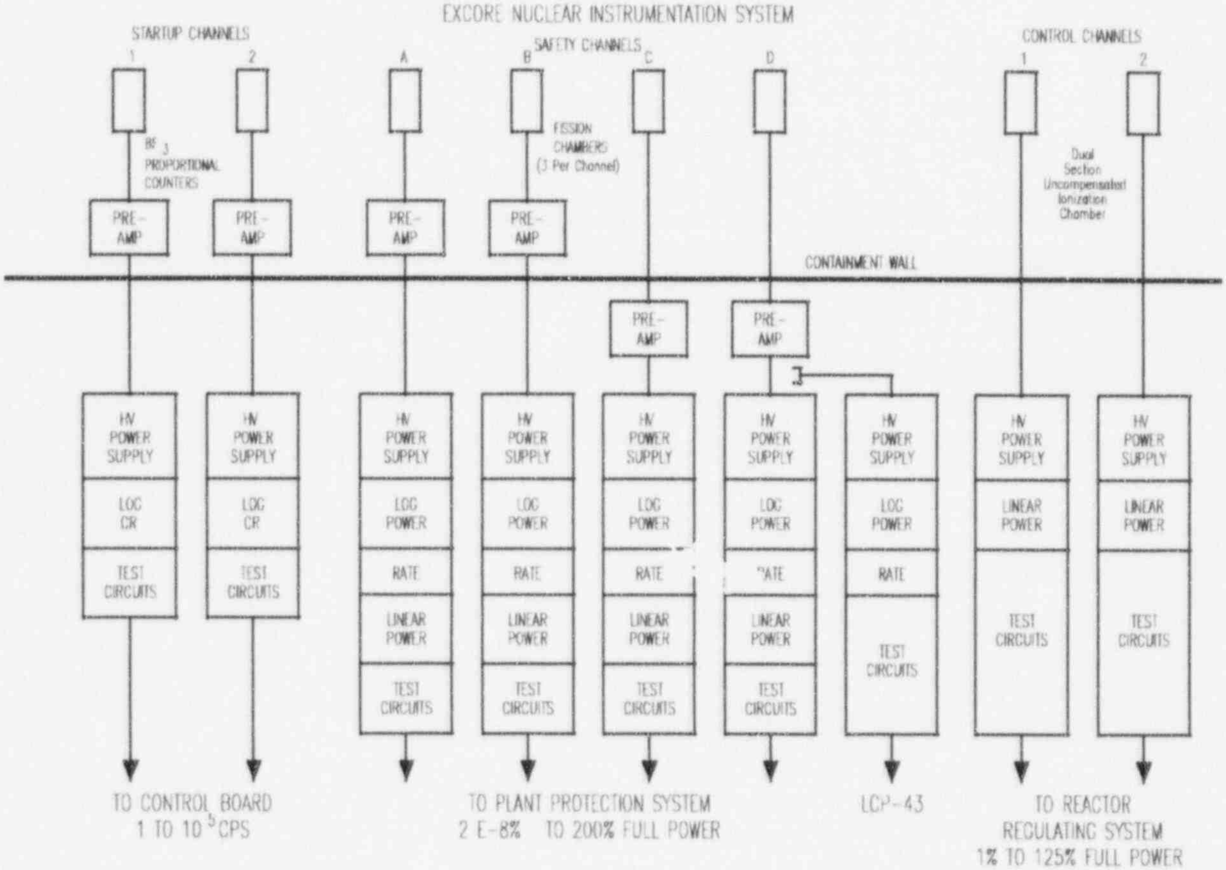
There have been no similar event reported as LERs at Waterford.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

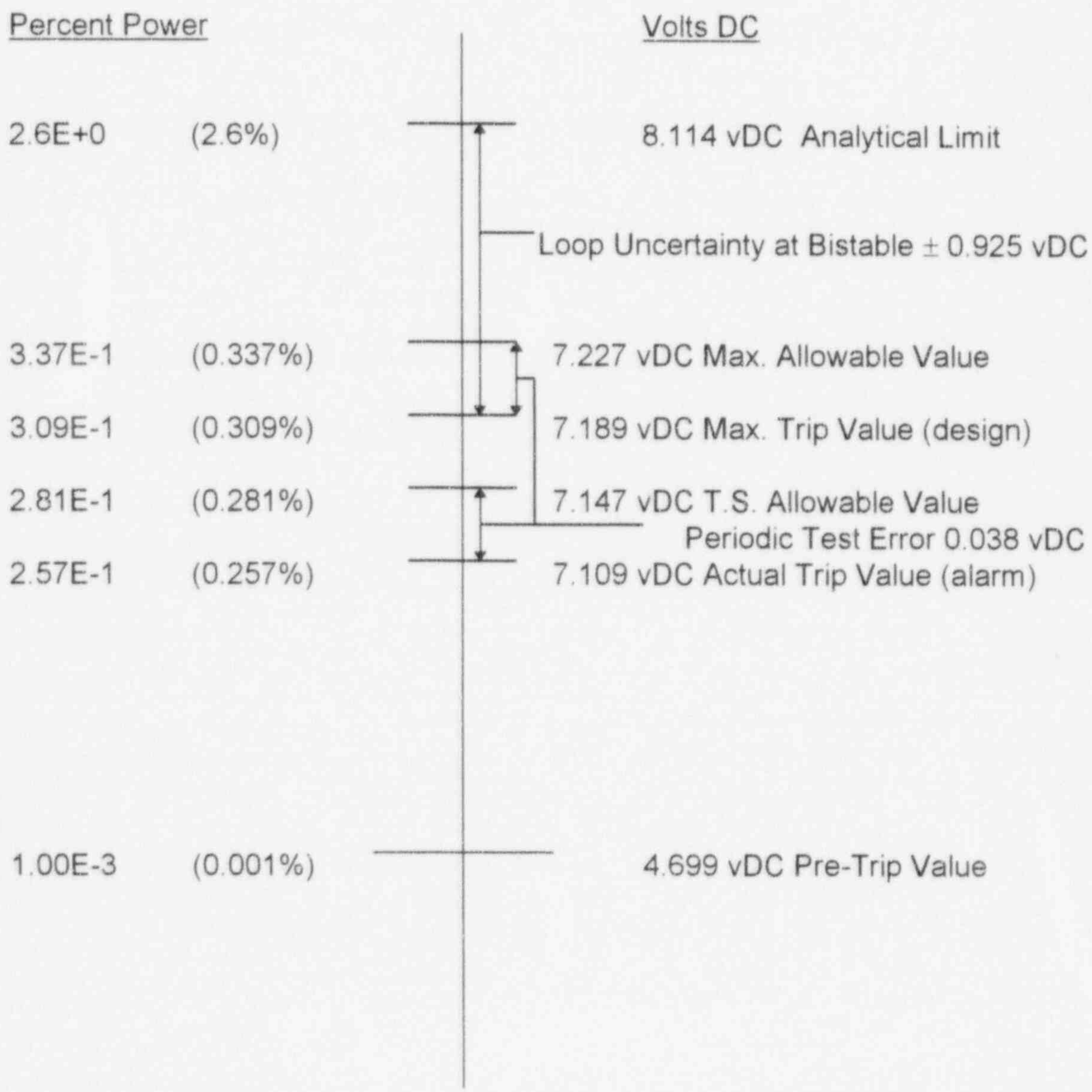
FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
WATERFORD STEAM ELECTRIC STATION UNIT 3	05000 382	96	-- 003 --	00	15 OF 17

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

ATTACHMENT A
EXCORE NUCLEAR INSTRUMENTATION SYSTEM



ATTACHMENT B



ATTACHMENT C