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ACCESSION NBR: 9304050241      DOC. DATE: 93/03/31      NOTARIZED: NO      DOCKET #  
 FACIL: 50-389 St. Lucie Plant, Unit 2, Florida Power & Light Co.      05000389  
 AUTH. NAME      AUTHOR AFFILIATION  
 YOUNG, R.J.      Florida Power & Light Co.  
 SAGER, D.A.      Florida Power & Light Co.  
 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 92-008-01: on 921105, discovered digital data process sys calorimetric error due to calibration error. Operations reduced unit power less than 100%, RTDs were examined by laboratories & I&C personnel reviewed test. W/930331 ltr.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 5  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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EXTERNAL:	EG&G BRYCE, J.H	2 2	L ST LOBBY WARD	1 1
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A04

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 TOTAL NUMBER OF COPIES REQUIRED: LTR 32 ENCL 32



March 31, 1993

L-93-052

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

Re: St. Lucie Unit 2  
Docket No. 50-389  
Event: 92-008  
Date of Event: November 5, 1992  
DDPS Calorimetric Error due to  
Instrument Calibration Error

The attached supplemental Licensee Event Report is being submitted voluntarily to provide additional information on the subject event.

Very truly yours,

A handwritten signature in dark ink, appearing to read "D. A. Sager", written in a cursive style.

D. A. Sager  
Vice President  
St. Lucie Plant

DAS/JWH/kw

Attachment

cc: Stewart D. Ebnetter, Regional Administrator, USNRC Region II  
Senior Resident Inspector, USNRC, St. Lucie Plant

DAS/PSL #866-93

9304050241 930331  
PDR ADOCK 05000389  
S PDR

A handwritten signature in dark ink, appearing to read "JE" followed by a vertical line, located in the bottom right corner of the page.

# LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 80.8 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-535), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (P130-0194), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) <b>St. Lucie Unit 2</b>	DOCKET NUMBER (2) <b>0510101011</b>	PAGE (3) <b>1 OF 0 4</b>
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TITLE (4) **Digital Data Process System Calorimetric Error due to Instrument Calibration Error.**

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 NAMES	DOCKET NUMBER(S)
1	1	05	9	2	008	0	3	3	N/A	0151010101
									N/A	0151010101

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR : (Check one or more of the following) (11)							
POWER LEVEL (10)	1   0   0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)	OTHER (Specify in Abstract below and in Text NRC Form 366A)			
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)				
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	X				
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)					
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)					
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)					

LICENSEE CONTACT FOR THIS LER (12)

NAME <b>Robert J. Young, Shift Technical Advisor</b>	TELEPHONE NUMBER
	AREA CODE: <b>4   0   7</b> NUMBER: <b>4   6   5   -   3   5   5   0</b>

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
X	I   O	R   T   D	R   1   3   5	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO
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EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces. i.e. approximately fifteen single-space typewritten lines) (16)

On 5 November 1992, St. Lucie Unit 2 was in mode 1 operating at 100% steady state power. Utility Instrumentation and Control (I&C) personnel were implementing a plant modification to replace six resistance temperature detectors (RTDs) for the main feedwater system. These RTDs provide inputs to the digital data process system (DDPS) and are used in the calorimetric power calculation. Upon installation of the new RTDs the DDPS indicated a power level slightly greater than 100%. Operators reduced power until DDPS indicated less than 100%. It was noted that lower feedwater temperature readings were being obtained from the new RTDs. The original RTDs were subsequently determined to be incorrectly reading main feedwater temperatures.

The root cause of this event was RTD instrument error. Investigations of the failed RTDs by the AMS Corp. revealed that cold working of the platinum sensing element did not cause the calibration shift because annealing processes did not restore the RTDs to calibration. Continued investigations were conducted independently by the RTD Manufacturer (RdF Corp.) and the Florida Power & Light Metallurgical Laboratory. The result of the examination by RdF concluded that a resistance shift occurred internal to the sensing element, in the platinum sensing coil. Examinations conducted by the FPL Lab have not revealed any additional information.

Corrective actions taken were: 1) Operations reduced unit power to less than 100%, 2) I&C personnel determined that the new RTDs were functioning correctly, 3) A review of historical data for St. Lucie Unit 1 from 1982 to present verified that there were no similar instrument errors, 4) At plant management's request FPL Nuclear Engineering performed an evaluation and concluded that St. Lucie Unit 2 was operating within its safety analysis, 5) I & C personnel verified that all other calorimetric DDPS inputs were correct and only the main feedwater RTDs were in error, 6) The failed RTDs were examined by independent laboratories.

This Licensee Event Report is being submitted voluntarily.

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION  
REQUEST: 50.8 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS  
AND REPORTS MANAGEMENT BRANCH (P-303), U.S. NUCLEAR REGULATORY COMMISSION,  
WASHINGTON, DC 20546, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE  
OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  St. Lucie Unit 2	DOCKET NUMBER (2)  0   5   0   0   0   3   8   9	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9   2	--   0   0   8	--   0   1	0   2	OF 0   4

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

DESCRIPTION OF EVENT

On 5 November 1992, St. Lucie Unit 2 was in mode 1 operating at 100% steady state power. Utility Instrumentation and Control (I&C) personnel were replacing six resistance temperature detectors (RTDs) that are inputs to the digital data process system (DDPS) (EII:S:IO) for temperature of the main feedwater system (EII:S:SJ). These inputs are used by the DDPS in the calculation of calorimetric power. Upon installation of the new RTDs the DDPS power indicated approximately 1% greater than 100% power. Utility operators reduced the Unit power level until a DDPS indicated power level less than 100% was obtained.

Plant personnel determined that temperature differences existed between the feedwater temperature inputs to the DDPS before and after the installation of new RTDs. I&C personnel performed a calibration test on the original RTDs and found that five of the six RTDs read high by an average of 5.5 degrees Fahrenheit (One RTD was damaged during removal). The instrument error resulted in a DDPS reactor power calculation that was lower than actual power. I&C compared the calibration data of the new RTDs with the vendor data and concluded that the new RTDs were reading correctly.

CAUSE OF EVENT

The root cause of this event was main feedwater temperature instrument error. A review of historical data for unit 2 since 1984 showed that the feedwater temperature inputs from these RTDs had been slowly increasing but at a very slow rate. Investigations by the AMS Corporation revealed that the most probable cause for error in these RTDs, cold working of the platinum wire, did not occur since normal annealing processes did not restore the RTDs to calibration. Continued investigations were conducted independently by the RTD Manufacturer (RdF Corporation) and the Florida Power & Light Metallurgical Laboratory. Examinations by RdF included a baseline examination (visual, calibration and radiographic) and a teardown analysis. Baseline examinations revealed that a calibration shift (error) had taken place in each sensor. The teardown analysis revealed that the platinum lead wires were almost separated in two places and the cross section was flattened and feathered at the edges, causes unknown. However calibration checks determined that these conditions did not contribute to the calibration shift and that the cause for the RTD error lay in the platinum sensor. Examinations conducted at the Florida Power & Light Metallurgical Laboratory have not revealed any additional information.

Contributing factors to this event included: 1) DDPS instrument limits (deadband or acceptance limits), which are a part of the software package, force the DDPS to accept only those inputs that are within set limits. If the inputs are within these limits then the DDPS considers them believable. The DDPS limits were set at a 10 degrees Fahrenheit input comparison which allowed all of the feedwater temperature inputs to be used for the DDPS calculations even though the RTD inputs had drifted high. 2) The main feedwater temperature instrument loops are periodically calibrated, but their RTDs are not routinely calibrated. This is due to the risk of damaging the RTDs when removing them from their thermowells. These two factors contributed to the inability to detect the slowly increasing instrument error.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUIREMENT: 30.8 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-330), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  St. Lucie Unit 2	DOCKET NUMBER (2)  05000389	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		92	008	01	03	OF 04

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

ANALYSIS OF EVENT

This event is being reported voluntarily for informational purposes.

A representative sample of manual calorimetrics performed as per OP 2-3200020, Primary System Manual Calorimetric, were reviewed. All manual calorimetrics were found to be within the 2% procedural limit when compared with the DDPS calorimetric power. Manual calorimetrics are an independent check of DDPS calorimetric power and are performed using instrument readings on the Reactor Turbine Generator Boards (RTGBs) (EIS:IU) and use a different style of feedwater temperature instruments than the RTDs used to provide input to the DDPS.

FPL Nuclear Engineering evaluated this event using a conservative approach. Calculations performed show that with the observed feedwater RTD error the actual nominal unit power was 101.04% with an additional instrument uncertainty of up to +0.95%. This power level is the worst case since a review of historical data revealed that the RTD error had been increasing at a very slow rate since 1984. From the evaluation it is concluded that St. Lucie Unit 2 was operating within the bounds of its FSAR Chapter 15 safety analysis which assumes a maximum power level of 102% (100% nominal power level plus 2% due to calibration and instrument errors). The Bases for the Technical Specifications also take into account variations due to calibration and instrument error for the Variable High Power Trip.

The health and safety of the public were unaffected by this event.

CORRECTIVE ACTIONS

1. Operations reduced Unit 2 power to maintain DDPS indicated power below 100%.
2. I&C sent the failed RTDs to the AMS Corporation for analysis. Analysis did not reveal the cause of the calibration error but were able to determine that the normal reason for RTD error, cold working of the platinum element, did not happen in this instance.
3. I&C sent two RTDs to the RdF Corporation and the Florida Power & Light Metallurgical Laboratory for further analysis. Results of the RdF examination revealed that the calibration shift took place in the platinum sensing element. Examinations conducted at the FPL Metallurgical Laboratory did not reveal any additional information.
4. I&C personnel reviewed the calibration test data and determined that the newly installed main feedwater RTDs were functioning correctly (the new RTDs are made by a different manufacturer than the original RTDs).

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION  
REQ. IS: 50.2 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS  
AND REPORTS MANAGEMENT BRANCH (P-320), U.S. NUCLEAR REGULATORY COMMISSION,  
WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0164), OFFICE  
OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  St. Lucie Unit 2	DOCKET NUMBER (2)  0   5   0   0   0   3   8   9	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9   2   --	0   0   8	--   0   1	0   4	OF 0   4

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

CORRECTIVE ACTIONS (continued)

5. Plant performance, MWs generated, and MWs expected were examined for St. Lucie Unit 1 to determine if a similar problem existed for that unit. No adverse trends were noted.
6. A historical review of the St. Lucie Unit 1 DDPS feedwater temperature inputs from 1982 to the present verified that no inconsistencies existed to give an erroneous DDPS calorimetric power.
7. An I&C generated calibration curve for the newly installed RTDs was compared to a vendor supplied calibration curve with minimal differences detected. This allows a high degree of confidence in the new RTD curves.
8. At the request of plant management, Nuclear Engineering performed an evaluation, JPN-PSL-SEIS-92-018, and determined that St. Lucie Unit 2 did not operate outside of its FSAR Chapter 15 safety analysis.
9. I&C determined that a tighter instrument deadband of a nominal 5 degrees Fahrenheit should be maintained in the DDPS software for RTD instrument input comparisons and has made the change.
10. I&C determined that RTDs of the same model are not installed in other Unit 1 or Unit 2 systems.
11. I&C determined only the Unit 2 main feedwater RTDs provided erroneous input to the DDPS.
12. I&C has added an additional high feedwater temperature alarm to the DDPS. This alarm will preclude similar drift events from being undetected.

ADDITIONAL INFORMATION

Component Failure

RDF Corporation  
RTD part number 21453

Previous Similar Events

No other LERs pertaining to inaccurate RTDs were identified.