

# CATEGORY 1

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9703270101    DOC. DATE: 97/03/21    NOTARIZED: NO    DOCKET #  
FACIL: 50-335 St. Lucie Plant, Unit 1, Florida Power & Light Co.    05000335  
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RECIP. NAME    RECIPIENT AFFILIATION

SUBJECT: LER 97-002-00: on 970221, operation in excess of max Rated Thermal Power occurred by failure to implement effective configuration for Digital Data Processing Sys computer

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Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

MAR 21 1997

L-97-081  
10 CFR 50.73

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

Re: St. Lucie Unit 1  
Docket 50-335  
Reportable Event : 97-002  
Date of Event: February 21, 1997  
Operation in Excess of Maximum Rated Thermal Power  
Due to Digital Data Processor Calorimetric Error

The attached Licensee Event Report is a voluntary report submitted to provide notification of the subject event.

Very truly yours,

J.A. Stall  
Vice President  
St. Lucie Plant

JAS/RLD

Attachment

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

IE221

9703270101 970321  
PDR ADCK 05000335  
S PDR



**LICENSEE EVENT REPORT (LER)**

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (IT-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20565-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

ST. LUCIE UNIT 1

DOCKET NUMBER (2)

05000335

PAGE (3)

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TITLE (4)

Operation in Excess of Maximum Rated Thermal Power Due to Digital Data Processor Calorimetric 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 NAME	DOCKET NUMBER
02	21	97	97	002	00	03	21	97	N/A	
									N/A	

  

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)				
1	100	20.2201(b)		20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(vii)
		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)(iii)		20.2203(a)(4)	50.73(a)(2)(iv)	X OTHER
		20.2203(a)(2)(iii)		50.36(c)(1)	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

R.L. DIETZ, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

(561) 467-7157

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)

YES (If yes, complete EXPECTED SUBMISSION DATE): X NO

EXPECTED SUBMISSION DATE (15)

MONTH DAY YEAR

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

This LER is a voluntary report.

On February 21, 1997, St. Lucie Unit 1 was operating at a steady-state power level of 100% Rated Thermal Power (RTP) as determined from the Digital Data Processing System (DDPS) display. While performing a feed water flow instrument loop calibration, maintenance personnel determined that proper scaling constants were not being used for the feed water flow input signals to the DDPS. This condition caused the DDPS calorimetric calculation of reactor core thermal power to be non-conservative in that facility steady-state operation with the DDPS indicating 100% RTP resulted in actual reactor power at 100.43% RTP. Plant operation was limited to not more than 99% RTP (indicated) while the problem was thoroughly investigated and corrected. On March 1, 1997, St. Lucie Unit 1 was returned to 100% RTP.

The cause of this event was failure to implement effective configuration controls for the DDPS computer software. Corrective actions include: 1) Acceptable performance of all critical DDPS functions was verified prior to restoration of full power operations. 2) Review of accountabilities for software modifications and identification of program improvements. 3) Development of verification and validation requirements that challenge all critical attributes for software changes within the DDPS. 4) Development of controlled operating procedures to address DDPS operation. 5) Use of the St. Lucie Total Equipment Data Base or controlled procedures to ensure configuration control of critical DDPS constants. 6) Modification of the software vendor blanket purchase order to clarify that compliance with FPL administrative procedures is required.



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		YEAR  97	SEQUENTIAL  002	REVISION  00	

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

**DESCRIPTION OF THE EVENT**

On February 21, 1997, St. Lucie Unit 1 was operating at a steady-state power level of 100% Rated Thermal Power (RTP) as determined from the Digital Data Processing System (DDPS) [EIS:IO] display. Utility Instrumentation and Control (I&C) personnel were performing a feed water flow instrument loop calibration following maintenance on a feed water flow transmitter [EIS:SJ:PDT]. During this calibration, it was discovered that scaling constants for all six of the feed water flow input signals to the DDPS computer [EIS:IO:CPU] were incorrect, i.e., the input signal range of 4 - 20 milliamperes corresponded to a flow venturi [EIS:SJ:FE] differential pressure span of approximately 0 - 790 inches of water rather than the correct span of 0 - 800 inches of water. Since the DDPS uses the feed water flow parameter in calorimetric calculations of reactor [EIS:RCT] core thermal power, this discrepancy was non-conservative in that scaling constants corresponding to less than the full range of flow venturi differential pressures result in a calculated value of power that is less than the actual reactor output. Control room operators were notified by I&C personnel that the reactor was operating at a core thermal power level approximately 0.6% RTP greater than the value displayed on the DDPS, and action was promptly initiated to reduce power. At 17:55 EST on February 21, 1997, St. Lucie Unit 1 was stabilized at a conservative value of 99% RTP (indicated). The unit was returned to 100% RTP at 05:45 EST on March 1, 1997.

**CAUSE OF THE EVENT**

In June, 1994, feed water flow scaling constants were revised in accordance with approved plant procedures. These scaling constants were properly installed into the operating DDPS software, but were not updated in the control room DDPS data reference manual. In 1996, the software was modified by the vendor using the vendor's version of the source code to accommodate installation of a new core performance monitor that interfaces with the DDPS. When this modification was loaded into the DDPS computer during the 1996 refueling outage, the proper scaling constants were overwritten and replaced with the pre-1994 values based on the control room DDPS data reference manual. This condition was not discovered until the instrument loop calibration was performed on February 21, 1997.

The cause of this event was failure to implement effective configuration controls for the DDPS computer software.

**ANALYSIS OF THE EVENT**

In June 1994, a change to the span/static shift adjustment for each of the six DDPS feed water flow transmitters was implemented in accordance with an approved plant work order. To be compatible with the span adjustments, the existing feed water flow scaling constants corresponding to a span of 0 - 790.6 inches of water differential pressure were revised to correspond to a span of 0 - 800 inches of water differential pressure. The new scaling constants were loaded into the correct DDPS operating software locations, but were not recorded in the control room DDPS data reference manual which is maintained at the DDPS console.



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**ANALYSIS OF THE EVENT (continued)**

The DDPS software is considered quality related. At the time the 1994 revision was made to the feed water flow scaling constants, QI 2-PR/PSL-3, Revision 0, Control of Computer Software, provided generic administrative controls for computer software in which the output is used for safety related and quality related purposes. Significant revisions to strengthen this procedure have been made since 1994.

During the refueling outage of April - July, 1996, an on-line core performance monitoring system which interfaces with the DDPS was installed in accordance with an approved Plant Change/Modification (PC/M). The DDPS software changes needed to accommodate this new installation were developed by the vendor using the vendor's version of the source code (which did not contain the 1994 revised scaling constants). Upon loading the modified software into the DDPS computer, the correct feed water flow constants were overwritten with those corresponding to a range of 0 - 790.6 inches of water differential pressure.

Administrative Procedure (AP) 4000060, Maintenance Departmental Control of Computer Software, was implemented February 26, 1996, to provide the methodology by which the maintenance department and support groups control the procurement, development, and revision of software to comply with QI 2-PR/PSL-3. The validation and verification (V & V) method that was used to confirm the DDPS proper software configuration following modifications to accommodate the 1996 PC/M was selected from this procedure, but did not V & V other functions of the software, such as the calorimetric calculation, that were not related to the modification.

During post modification testing (PMT) for the 1996 PC/M, the control room copy of the DDPS data reference manual was used to perform a verification of each DDPS input constant. However, this manual is not a controlled document and had not been updated to reflect the 1994 revision to the feed water flow scaling constants. This prevented discovery of the problem at that time, i.e., the values used to verify the feed water flow scaling constants were the same pre-1994 values as those residing in the software that had been loaded into the DDPS computer from the vendor source code.

The feed water flow scaling constant error was determined to be non-conservative by 0.63% RTP. Two additional discrepancies, unrelated to the 1996 modification, were also discovered in the calorimetric calibration and were determined to result in a combined conservative error of 0.2% RTP. Therefore, the net calorimetric error was 0.43% non-conservative.

**Assessment of Safety Significance**

An operability assessment was performed which determined that the feed water flow scaling discrepancy combined with the calorimetric measurement uncertainty was less than the required overall calorimetric accuracy requirement of 2% at maximum rated thermal power. In addition, reactor protection, core physics, and reactor fuel parameters impacted by the calorimetric error were evaluated to ensure that assumptions made in the plant safety analysis provided sufficient margin to bound this event. This evaluation concluded that the existing plant safety analysis remains valid. Therefore, the health and safety of the public were not adversely affected by this event.

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**CORRECTIVE ACTIONS**

- 1) Facility operation was limited to a conservative value of 99% RTP until the problem was thoroughly investigated and corrected. Primary system manual calorimetric calculations were performed to verify reactor power remained below 100% RTP.
- 2) The correct feed water flow scaling constants were entered into both the on-line and the back-up DDPS computers, and other calorimetric constants were verified to be correct using information from the plant Total Equipment Data Base (TEDB). The increase in calculated calorimetric power shown on the DDPS display was verified to be as predicted. A primary system manual calorimetric calculation was performed and results were within 0.2% of DDPS indicated power.
- 3) The correct feed water flow scaling constants were documented, and master/backup copies of the upgraded system were filed in accordance with an approved St. Lucie Plant Software Configuration/Change Control, Computer Software Change Request (Administrative Procedure 4000060, Revision 2).
- 4) Acceptable performance of other critical DDPS functions was verified to ensure that other inadvertent software changes had not been made, and surveillances were performed for other plant systems whose calibrations can be influenced by DDPS calculated calorimetric power to ensure that these system calibrations had not been compromised.
- 5) I & C performed a three point calibration of all DDPS calorimetric inputs to verify the proper scaling constants and input circuit operation. Minor discrepancies were identified in the feed water Resistance Temperature Detector and Reactor Coolant Pump KW scaling curves that were not related to the event reported in this LER. Engineering determined that these discrepancies accounted for a combined conservative error of 0.2%. FPL will revise the software to correct these errors in the St. Lucie Unit 1 DDPS. The scaling curves for these components were also verified in the St. Lucie Unit 2 DDPS to ensure that similar discrepancies did not exist.
- 6) To ensure adequate post modification testing is performed, FPL will review software modification accountabilities and identify program improvements to be made.
- 7) FPL will develop generic V & V requirements to challenge all critical attributes within both St. Lucie Unit 1 and Unit 2 DDPS for all software changes.
- 8) Controlled operating procedures will be developed to address both St. Lucie Unit 1 and Unit 2 DDPS operation and identify specific point identification and locations.
- 9) FPL will ensure configuration control for all critical St. Lucie Unit 1 and Unit 2 DDPS constants by entering them into the TEDB or ensuring they are documented in a controlled procedure.
- 10) FPL's blanket purchase order with the software vendor has been modified to clarify that development of new software and upgrading/changing existing software shall be per FPL's Administrative Procedure AP-4000060.



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**ADDITIONAL INFORMATION**

Component Failures

None

Previous Similar Events

LER 335/86-005, St. Lucie Unit 1, Technical Specification Deviation Due to Personnel Error, 07/21/86.

LER 389/92-008, St. Lucie Unit 2, Digital Data Process System Calorimetric Error due to Instrument Calibration Error, Revision 1, 03/31/93.

