

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9205260165      DOC. DATE: 92/05/20      NOTARIZED: NO      DOCKET # 05000389  
 FACIL: 50-389 St. Lucie Plant, Unit 2, Florida Power & Light Co.  
 AUTH. NAME      AUTHOR AFFILIATION  
 YOUNG, R.J.      Florida Power & Light Co.  
 SAGER, D.A.      Florida Power & Light Co.  
 RECIPIENT AFFILIATION

SUBJECT: LER 92-001-00: on 920421, reactor manually tripped when difficulties encountered in maintaining neutron flux axial shape index limits. Caused by inadequacy in index mgt guidelines. Procedures & design changed. W/920520 ltr.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 5  
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May 20, 1992

L-92-154  
10 CFR 50.73

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

Re: St. Lucie Unit 2  
Docket No. 50-389  
Reportable Event: 92-001  
Date of Event: April 21, 1992  
Manual Reactor Trip Due to  
Local Power Density Control

The attached Licensee Event Report is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,

A handwritten signature in dark ink, appearing to read "D. A. Sager", is written over the typed name.

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 #703-92

9205260165 920520  
PDR ADOCK 05000389  
S PDR

# LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) <b>St. Lucie Unit 2</b>	DOCKET NUMBER (2) <b>0510103891</b>	PAGE (3) <b>1 OF 4</b>
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TITLE (4) **Manual Reactor Trip due to Local Power Density Control Difficulty Caused by Axial Shape Index Guideline Deficiencies**

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)
04	21	92	92	001	00	05	20	92	N/A		0151010111
									N/A		0151010111

OPERATING MODE (9) <b>1</b>	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR : (Check one or more of the following) (11)										
POWER LEVEL (10) <b>015</b>	20.402(b)			20.405(c)			<input checked="" type="checkbox"/>	50.73(a)(2)(iv)		73.71(b)	
	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)		OTHER (Specify in Abstract below and in Text NRC Form 366A)	
	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>407</b>
	<b>465-3550</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

SUPPLEMENTAL REPORT EXPECTED (14)

<input checked="" type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH <b>07</b>	DAY <b>01</b>	YEAR <b>92</b>
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ABSTRACT (Limit to 1400 spaces. i.e. approximately fifteen single-space typewritten lines) (16)

On 21 April 1992, with Unit 2 in Mode 1, a plant shutdown was in progress for a scheduled refueling outage. Difficulty in maintaining Axial Shape Index within limits was expected during the downpower. When reactor power reached approximately 15% three of four local power density pre-trips in the reactor protection system alarmed. The nuclear plant supervisor directed a manual reactor trip at 0238. On the manual reactor trip the turbine did not trip automatically, but remained tied to the system grid carrying approximately 90 megawatts. Several attempts were made to trip the turbine from the manual pushbuttons in the control room. The turbine was tripped locally at the front standard using the emergency trip lever at 0241. "Standard Post Trip Actions" were performed as per EOP-1 and the plant was stabilized in Mode 3, Hot Standby.

The root cause of the reactor trip was inadequacy in the core Axial Shape Index management guidelines. The root cause of the failure of the turbine to trip either automatically or manually is being investigated by a multi-disciplined team. The results of this investigation will be reported in a follow-up Licensee Event Report.

Corrective actions for this event: Procedural changes which provide additional guidance on Axial Shape Index control and additional guidance in EOP-1 on actions to take for a reactor trip with no subsequent turbine trip will be implemented. A design change to the local power density pre-trip setpoint will also be implemented. Additional corrective actions including any necessary design changes will be specified in the followup Licensee Event Report for the turbine trip failure upon completion of the turbine trip failure analysis.

**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-308), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0194), 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	001	00	02	OF 04

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

**DESCRIPTION OF THE EVENT**

On 21 April, 1992, with Unit 2 in Mode 1, a plant shutdown was in progress for a scheduled refueling outage. The unit had just completed a lengthy continuous run (502 days) and as a precaution, an extra senior reactor operator was assigned to the control room shift. As expected, difficulties in maintaining neutron flux axial shape index (ASI) within limits during the downpower were encountered. Maintaining ASI within limits became increasingly difficult since reactor power, reactor coolant system (RCS) (EIS: AB) temperature and Xenon buildup were each affecting ASI. With reactor power at approximately 15%, control rod (EIS: AA) insertion on lead control bank #5 was no longer having any effect on controlling ASI. Three of four local power density (LPD) pre-trips in the reactor protection system (RPS) (EIS: JC) actuated. At 0238 the nuclear plant supervisor (NPS) directed the reactor control operator (RCO) to manually trip the reactor. On the manual reactor trip the turbine (EIS: TA) did not trip automatically, but remained tied to the system grid carrying approximately 90 megawatts. Several attempts were made to trip the turbine from the manual turbine trip pushbuttons (EIS: JJ) on the control room console. In addition, the main steam isolation valves (MSIVs)(EIS: SB) were closed, the digital electro-hydraulic control (DEH) (EIS: TG) pumps were secured and the nuclear watch engineer (NWE) was directed to trip the turbine locally with the emergency trip lever at the front standard of the turbine. The turbine was tripped locally at 0241 with all turbine valves indicating closed. The lowest RCS temperature reached was 525 degrees Fahrenheit. "Standard Post Trip Actions" were performed as per EOP-1 and the plant was stabilized in Mode 3, Hot Standby.

**CAUSE OF EVENT**

**Manual Reactor Trip:**

Difficulties in controlling ASI were expected due to the high degree of core burnup. This had been discussed prior to the shutdown by operations department supervision and a decision made to trip the reactor manually if ASI control could not be maintained throughout the downpower. The shutdown of the reactor was performed in a slow and conservative manner. As expected, during the downpower ASI became more negative. ASI was being compensated through control rod insertion on group #5, the lead group. At approximately 15% reactor power and 85 inches withdrawn on group #5, control rod insertion was no longer providing the desired effect on ASI. The reactor was tripped as per previous decisions. The event has been evaluated by Nuclear Fuels and Reactor Engineering personnel and procedural enhancements for ASI control are being developed and reviewed.

**Turbine Trip Failure:**

The cause for the failure of the automatic and manual turbine trips is being investigated by a multi-disciplined team. A key component to the event has been sent to an independent laboratory for further root cause analysis and the results will be reported in a follow-up Licensee Event Report. Preliminary Internal Problem Reports on the turbine trip failure analysis were submitted to the Nuclear Regulatory Commission on 4/24/92 and 5/14/92.

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION  
REQUEST: 26.8 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS  
AND REPORTS MANAGEMENT BRANCH (P-803), U.S. NUCLEAR REGULATORY COMMISSION,  
WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0184), 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   1	-   0   0	0   3	OF 0   4

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

**ANALYSIS OF EVENT**

This event is reportable under 10 CFR 50.73.a.2.iv. as "Any event or condition that resulted in manual or automatic actuation of any engineered safety feature, including the reactor protection system." The NPS decided to manually trip the reactor upon the receipt of the third LPD pre-trip in anticipation of an automatic RPS actuation.

The turbine did not trip automatically or manually and was locally tripped approximately three minutes after the reactor trip. The MSIVs were closed by the RCO at 0239 which terminated the event. The plant response to this event is bounded by section 15.1.5 of the PSL Unit 2 Final Safety Analysis Report (FSAR), "Increased Heat Removal by the Secondary System" as further described below:

1) With a reactor trip at 15% power and with no operator actions taking place, the MSIVs will automatically close when the pressure in a steam generator reaches 600 psia and the cooldown event will be terminated. This cooldown rate is bounded by the limiting FSAR cooldown event.

2) With a reactor trip at 100% power and with no operator actions taking place, there will be a safety injection actuation signal (SIAS) (EISS: BQ) received but there will be no actual injection. The MSIVs will automatically close when the pressure in a steam generator reaches 600 psia and the cooldown event will be terminated. The cooldown rate is bounded by the FSAR cooldown event as confirmed by in-house RETRAN analysis.

3) With a reactor trip at 100% power in an FSAR Chapter 15 Accident Scenario (ie. Excess Steam Demand with single failure of the turbine stop valves to close), with operator action, the safe shutdown of the reactor will be achieved because operators are trained to handle Design Basis Accidents. Multiple failures are procedurally addressed by Emergency Operating Procedures.

**CORRECTIVE ACTIONS**

1. Nuclear Fuels Department personnel are evaluating the plant shutdown and additional procedural guidance will be implemented on ASI control.
2. Procedural changes will be implemented to provide additional guidance in EOP-1 on actions to take for a reactor trip with no subsequent turbine trip.
3. A design change to the local power density pre-trip setpoint will be implemented during this refueling outage.
4. Additional corrective actions including any necessary design changes will be specified in the followup Licensee Event Report for the turbine trip failure upon completion of the turbine trip failure analysis.

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION  
REQUEST: 88.8 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS  
AND REPORTS MANAGEMENT BRANCH (P-2535), 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)  05000389	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		92	001	00	04	OF 04

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

**ADDITIONAL INFORMATION**

**Component Failures**

To be detailed in the follow-up Licensee Event Report.

**Previous Similar Events**

The only similar event for a reactor trip caused by local power density is described in Licensee Event Report 389-86-001. This event was an automatic trip, during power ascension, caused by personnel error. There have not been any previous events where the turbine failed to trip following a reactor trip.

