



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

December 15, 2003

L-2003-311
10 CFR § 50.73

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

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 2003-004-00
Date of Event: October 16, 2003
Improper Sampling Techniques Led to
Operation of NaOH Tank Outside Tech Spec Limits

The attached Licensee Event Report 2003-004 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 black ink, appearing to read 'WJ', is written over the typed name and title.

William Jefferson, Jr.
Vice President
St. Lucie Nuclear Plant

WJ/GRM
Attachment

IE22

NRC FORM 366 (7-2001)		U.S. NUCLEAR REGULATORY COM		APPROVED BY OMB NO. 3150-0104		EXPIRES 7-31-2004			
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 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If 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.					
FACILITY NAME (1) St. Lucie Unit 1				DOCKET NUMBER (2) 05000335		PAGE (3) Page 1 of 5			
TITLE (4) Improper Sampling Techniques Led to Operation of NaOH Tank Outside Tech Spec Limits									
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	
10	16	2003	2003	- 004	- 00	12	15	2003	
OPERATING MODE (9) 1			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)						
POWER LEVEL (10) 100			20.2201(b)			20.2203(a)(3)(ii)			
			20.2201(d)			20.2203(a)(4)			
			20.2203(a)(1)			50.36(c)(1)(i)(A)			
			20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			
			20.2203(a)(2)(ii)			50.36(c)(2)			
			20.2203(a)(2)(iii)			50.46(a)(3)(ii)			
			20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			
			20.2203(a)(2)(v)			50.73(a)(2)(i)(B)			
20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			Specify in Abstract below or in NRC Form 366A			
20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)						
50.73(a)(2)(ii)(B)			50.73(a)(2)(ix)(A)			50.73(a)(2)(x)			
50.73(a)(2)(iii)			50.73(a)(2)(iv)(A)			73.71(a)(4)			
50.73(a)(2)(v)(A)			50.73(a)(2)(v)(B)			73.71(a)(5)			
50.73(a)(2)(v)(C)			50.73(a)(2)(v)(D)			OTHER			
50.73(a)(2)(vii)			50.73(a)(2)(viii)(A)			50.73(a)(2)(viii)(B)			
LICENSEE CONTACT FOR THIS LER (12)									
NAME George Madden, Principal Engineer						TELEPHONE NUMBER (Include Area Code) (772) 467 - 7155			
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
D	BE	TK	-	NO	A	BE	TK	-	NO
SUPPLEMENTAL REPORT EXPECTED (14)						EXPECTED SUBMISSION DATE (15)			
YES (If yes, complete EXPECTED SUBMISSION DATE).						MONTH DAY YEAR			
X NO									
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)									
<p>On October 16, 2003, St. Lucie Unit 1 was in Mode 1 at 100 percent reactor power. Chemistry personnel completed their investigation into an out-of-specification low sodium hydroxide (NaOH) sample result of September 19, 2003, and determined that the low concentration condition most probably existed for a time period in excess of the Technical Specification allowed outage time.</p> <p>The event was caused by inadequate mixing as a result of sampling procedures that failed to account for operational and hardware changes to the NaOH tank that had removed the continuous nitrogen sparging of the tank. Contributing to the event, there were several human performance errors including inadequate administrative controls of NaOH tank concentration in the TS surveillance test, and operations and chemistry personnel did not properly ensure that sparging was in operation prior to sampling. Procedural issues that were identified during this event were corrected as part of the corrective actions for this event. The NaOH tank was restored to TS concentration levels on September 20, 2003.</p> <p>This event had no impact on the health and safety of the public because the NaOH tank contained enough chemicals to meet the analysis requirements for pH control.</p>									

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Description of the Event

On October 16, 2003, St. Lucie Unit 1 was in Mode 1 at 100 percent reactor power. Previously, between September 16-19, 2003, while the plant chemistry personnel were preparing to perform the 6-month surveillance test on the containment spray (CS) system sodium hydroxide (NaOH) tank [EIIS:BE:TK] concentration, it was identified to plant management that the last three surveillance test results were at or near the TS minimum value. The tank was mixed in preparation for sampling. On September 19, 2003 at 0900 hours, sample results for the NaOH tank were out-of-specification low at 27.9 percent by weight. Technical Specification (TS) 3.6.2.2 requires that the spray additive tank contain between 4010 and 5000 gallons of NaOH solution between 28.5 and 30.5 percent by weight. The TS allowed outage time (AOT) for the restoration of the spray additive system is 72 hours. NaOH solution was added to the tank and a satisfactory sample was obtained at 0015 hours on September 20, 2003.

On October 16, 2003, chemistry personnel completed their investigation into the out-of-specification NaOH sample result of September 19, 2003. The conclusion ruled out mechanisms that could have resulted in a NaOH concentration step-change (e.g., dilution events). Accordingly, the out-of-specification condition most probably existed for a period in excess of the 72-hour AOT and based on this conclusion the event was determined to be reportable. FPL established the time of discovery as the time when the determination was made that the AOT had been exceeded.

Cause of the Event

This event was caused by inadequate tank mixing prior to sampling. Additionally, there were a number of human performance errors such as, inadequate administrative controls for responding to NaOH tank concentration before it reached TS limits, the false assumption that the tank concentration was stable, and the assumption that the tank was continuously sparged. These human errors significantly contributed to this event. When interviewed, several of the chemistry technicians were not aware that a modification had stopped continuous sparging (mixing) of the tank.

The NaOH tank is provided with nitrogen cover gas. The nitrogen cover gas is used to minimize the deterioration of NaOH due to interaction with carbon dioxide in air. The nitrogen is introduced at the bottom of the tank via a sparge header. In early 1999, the system operation was changed to stop the continuous nitrogen supply to the NaOH tank. This change was implemented because it was believed that the sparging had caused sticking vacuum check valves by causing NaOH crystals to plate out in the valve internals. This operational change required manual alignment of the nitrogen supply to mix the tank (i.e., sparge or pump recirculation) prior to sampling, however, no changes were made to the NaOH sampling procedure to reflect the change. In 2000, the NaOH tank design was modified to install a water loop seal to maintain the tank nitrogen cover gas at atmospheric pressure and provide vacuum protection. The modification also updated drawings to reflect the closed position of the continuous nitrogen supply valve to the NaOH tank. The modification was reviewed for procedural impact by the operations, chemistry, and the training staff, but the need to change the NaOH sampling procedure and the need to provide specific training were not identified during these reviews. The breakdown in the configuration management process is being investigated under a separate condition report.

The modification to the loop seal was primarily intended to ensure that a nitrogen blanket could be maintained on the tank. Prior to this modification there were frequent additions of NaOH. Since the modification was completed the concentration

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of NaOH appeared to be stable which was the expected effect of maintaining the loop seal. Accordingly, when the sample results in February 2002 showed a value of 28.5 percent concentration, no action was taken partially due to the assumption that the nitrogen blanket was ensuring a stable condition. Another factor that may have contributed to this event was the fact that due to the severe caustic nature and personnel hazards associated with handling sodium hydroxide concentrate, the chemistry department management failed to deal with NaOH tank issues unless it was actually found out-of-specification.

The existing sampling procedure included a note to ensure that nitrogen is supplied to the tank for mixing, however, between operations and chemistry this action was not completed. The procedure did not provide detailed instructions for aligning nitrogen for sparging purposes, nor did it provide instructions for restoring the tank loop seal after sampling. The tank may not have been properly mixed on prior samples. Another procedural inadequacy was that there was no verification sign-offs required for the valve manipulations performed by the procedure. The procedure also failed to include administrative limits or pre-job planning for contingencies. The post-analysis section of the procedures had inadequate notification requirements, insufficient supervisory review of the results, and failed to provide conservative administrative control bands for the NaOH TS requirements. Procedure changes have been implemented to correct the identified procedural deficiencies. The planned frequency of the surveillance test has been temporarily increased to quarterly. The first quarterly sample was taken and found to be in specification, and had not deviated from the previous sample taken approximately three months ago.

A human performance assessment of the event was conducted and the Chemistry Department has implemented a plan to address the underlying human performance issues. This assessment identified the following areas for improvement. Strengthen the sampling procedure to add administrative limits that are more conservative than the TS limits and strengthen the review and reporting process when limits are approached. Develop a line of communication between Chemistry and System Engineering to share data concerning applicable chemistry parameters for the engineer's respective systems. Provide training to the chemistry technicians regarding the sensitivity of TS surveillance results, stress the attributes of a questioning attitude, and encourage use of other vehicles available to advocate resolution of persistent problems. Communicate key chemistry indicators to senior management. Utilize the work management process for chemistry activities. Evaluate the benefits of sampling NaOH tank on a quarterly basis. Review and provide input to the five week and two week look ahead schedules involving chemistry support activities.

Analysis of the Event

This event is reportable under 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by TSs because there is firm evidence that the low out-of-specification NaOH concentration existed for a time period greater than the TS AOT.

Analysis of Safety Significance

The NaOH tank is part of the iodine removal system (IRS). The IRS consists of a nitrogen-capped NaOH tank, solenoid isolation valves, eductors and a restriction orifice. The sodium hydroxide is stored in the NaOH storage tank and is drawn into the suction of the containment spray pumps through the use of eductors.

Upon receipt of the containment spray actuation signal (CSAS), isolation valves open to allow flow of the caustic solution to commence. The NaOH injection rate is set to

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adjust the pH of the spray water. Upon reaching low-low level in the NaOH storage tank, the caustic line isolation valves automatically close to isolate the NaOH storage tank, thereby ending injection of sodium hydroxide and preventing induction of nitrogen or air into the CS system.

The NaOH tank is provided with a nitrogen gas cover to limit deterioration of the NaOH solution. The tank is provided with an atmospheric vent with loop seal to provide overpressure protection and vacuum protection.

Sodium hydroxide was chosen as the spray additive based on its ability to enhance iodine removal while maintaining an acceptable pH for equipment required to operate in the containment environment following a design basis accident. The NaOH is added to the containment spray to control pH. The purpose of controlling pH is to increase the absorption of iodine and minimize the effect of stress corrosion cracking of wetted components.

FPL evaluated the effects of the out-of-specification low NaOH tank sample results. The amount of NaOH in the tank can be determined as a function of the tank volume and the NaOH solution concentration. Although the NaOH concentration was less than allowed by TS, a lower NaOH concentration with a higher NaOH tank level may contain more NaOH than a tank maintained at TS minimum volume and concentration. At the September 19, 2003 volume of 4,460 gallons and NaOH concentration of 27.9 percent by weight, the tank contained 13,467 pounds of NaOH. With the NaOH tank maintained at minimum allowed TS volume (4010 gallons) and concentration (28.5 percent), the amount of NaOH in the tank is 12,308 pounds. The as-found NaOH tank condition contained more NaOH than the minimum amount assumed in the analysis, therefore, pH requirements would not have been adversely affected. A review of operator logs covering the period of time from when the modification was implemented until September 19, 2003, confirmed that the tank had been maintained at this same volume. Accordingly, the IRS was always available to meet design basis pH values.

Although the NaOH tank sample results were outside TS requirements, the ability to remove iodine and minimize stress corrosion cracking would have been maintained by this condition. Therefore, the health and safety of the public were not adversely affected by this event.

The St. Lucie Unit 2 IRS uses hydrazine (N₂H₄) instead of NaOH as the spray additive for iodine removal. As part of the generic implications of this event, all chemistry TS surveillance requirements were reviewed to determine if any other systems lacked administrative control bands in their surveillance procedures. Only one, IRS hydrazine, was noted for Unit 2. A condition report was generated to address the inclusion of administrative limits in the hydrazine tank surveillance procedure. No other issues were identified.

Corrective Actions

1. The NaOH tank was restored within the TS required band on September 20, 2003.
2. Chemistry procedure 1-COP-2.06, "Determination of Unit 1 Sodium Hydroxide Percent Weight," has been revised to ensure proper tank mixing prior to sampling, and post-sampling restoration of the nitrogen cover gas. The procedure now requires a specific sign-off for sparging the tank prior to sampling.
3. Chemistry procedure COP-05.04, "Chemistry Department Surveillances and Parameters," has been revised to include the sodium hydroxide tank parameters and specifications. The procedure changes included justification for parameters and

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values, and lists control chemicals, conservative administrative limits, and TS limits. The frequency of the test has been temporarily increased to quarterly.

4. A communication meeting and training were conducted for all the chemistry technicians and supervisors on this event and the human performance errors identified in the assessment.
5. Key Chemistry Department indicators and trends are presented to the senior management team daily.
6. The Chemistry Department now participates in work management meetings and provides schedule input to the Work Control Department.
7. A human performance assessment of the event was conducted and the Chemistry Department has implemented a plan to address the underlying human performance issues.
8. As a result of the generic implication investigation, CR 03-3422 was initiated to document the need for conservative administrative control bands in chemistry procedure 2-COP-02.07, "Maintaining Level and Percent Hydrazine in the Hydrazine Storage Tank."
9. Condition Report 03-4374 was initiated to investigate the less than adequate procedural and training impact reviews performed for the modification of the NaOH tank. This condition report will specifically address the operations/chemistry interface.

Additional Information

None

Failed Components Identified

None

Similar Events

None