

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9104120246 DOC. DATE: 91/04/05 NOTARIZED: NO DOCKET #  
 FACIL: 50-250 Turkey Point Plant, Unit 3, Florida Power and Light Co 05000250  
 AUTH. NAME AUTHOR AFFILIATION  
 POWELL, D.R. Florida Power & Light Co.  
 PLUNKETT, T.F. Florida Power & Light Co.  
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 91-004-00: on 910103, material discrepancy re 3C component cooling water heat exchanger tubes occurred. Caused by rise of inlet velocities. Brass tubes replaced & removed & Quality revised. W/910405 ltr.

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P.O. Box 029100, Miami, FL, 33102-9100

APR 05 1991

L-91-071  
10 CFR 50.73

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

Gentlemen:

Re: Turkey Point Unit 3  
Docket No. 50-250  
Reportable Event: 91-001-00  
Date of Event: January 3, 1991  
Material Discrepancy Involving the 3C Component Cooling  
Water Heat Exchanger Tubes

The attached voluntary Licensee Event Report 250-91-001-00 is being provided for information purposes only following the guidance provided by NUREG 1022, Supplement 1, Item 19.1.

Very truly yours,

T. F. Plunkett  
Vice President  
Turkey Point Plant Nuclear

TFP/DRP/MKA/mka

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

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## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)										DOCKET NUMBER (2)										PAGE 3	
Turkey Point Unit 3										0 5 0 0 0 2 5 0										1 of 10 5	
TITLE (4)																					
Material Discrepancy Involving the 3C Component Cooling Water Heat Exchanger Tubes																					
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)								
0	1	0	3	9	1	9	1	0	0	1	0	0	4	0	5	9	1	0 5 0 0 0 0			
OPERATING MODE (9)				THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 2. Check one or more of the following: (11)																	
H/A				20.402(b)				20.406(a)				50.73(a)(2)(iv)				73.71(b)					
POWER LEVEL (10)				0 0 0				20.406(a)(1)(i)				50.73(a)(2)(v)				73.71(c)					
				20.406(a)(1)(ii)				50.73(a)(2)(vi)				X OTHER (Specify in Abstract below and in Test NRC Form 368A)									
				20.406(a)(1)(iii)				50.73(a)(2)(vii)				50.73(a)(2)(viii)									
				20.406(a)(1)(iv)				50.73(a)(2)(ix)				50.73(a)(2)(x)									
				20.406(a)(1)(v)				50.73(a)(2)(xi)				50.73(a)(2)(xii)									
				20.406(a)(1)(vi)				50.73(a)(2)(xiii)				50.73(a)(2)(xiv)									
LICENSEE CONTACT FOR THIS LER (12)																					
NAME												TELEPHONE NUMBER									
David R. Powell, Licensing Superintendent												AREA CODE 3 0 5 2 4 6 - 6 5 5 9									
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																					
CAUSE	SYSTEM	COMPONENT	MANUFAC	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFAC	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFAC	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFAC	REPORTABLE TO NRC		
B	C	B	H	X																	
SUPPLEMENTAL REPORT EXPECTED (14)																					
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## ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (16)

On January 3, 1991, with Turkey Point Unit 3 shutdown and defueled, a loss of water inventory in the surge tank for the Component Cooling Water (CCW) System was detected. Inspection of the 3C CCW Heat Exchanger (HX) found two tubes which exhibited through-wall erosion corrosion characteristics. The defects were present at the inlet end of the tubes where Intake Cooling Water (ICW) enters the HX. The through-wall erosion corrosion resulted in a leak path being created between the CCW system and the ICW system. Records reviewed established that the two through-wall erosion corrosion tubes were installed in March 1990. Material testing on the two tubes determined that they were made of admiralty brass and not aluminum brass as specified for the HX. The most significant performance characteristic difference between admiralty brass and aluminum brass is that admiralty brass has a lower maximum recommended flow velocity of 4-6 ft/sec compared to 8 ft/sec for aluminum brass. The average operating flow velocity through the HX is approximately 5 ft/sec; however, inlet velocities could be higher due to water entry patterns. Both admiralty brass tubes were replaced.



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMS NO. 3180-0104

EXPIRES: 8/31/88

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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TEXT (If more space is required, use additional NRC Form 308A's) (17)

I DESCRIPTION OF EVENT

On January 3, 1991, with Turkey Point Unit 3 shutdown and defueled, a loss of water inventory in the surge tank for the Component Cooling Water (CCW) System was detected. The CCW surge tank serves as a makeup water source for the CCW system when out-leakage develops. The rate of water loss was determined to be approximately one gallon per minute. An investigation identified the 3C CCW Heat Exchanger (HX) (EIIIS:CB, Component:HX) as the source of the leakage. Inspection of the HX found two tubes which exhibited through-wall erosion corrosion. The HX tubes carry Intake Cooling Water (ICW) flow. The shell side of the HX carries Component Cooling Water (CCW) flow. The defects occurred at the inlet end where ICW flow enters the heat HX. The through-wall erosion corrosion resulted in a leak path being created between the CCW system and the ICW system. Since the CCW system is at a higher pressure than the ICW system, the leakage was detected by a decrease in CCW surge tank level. The tubes were replaced. All other tubes contained only minor signs of erosion beginning at the tube inlet and are fully contained within the tubesheet area.

A records review established that the two tubes exhibiting through-wall erosion corrosion were installed in HX 3C in March 1990 along with 78 other tubes. The retubing effort was undertaken to replace tubes which had exhibited cracking. Material testing on the two leaking tubes determined that they were made of admiralty brass and not aluminum brass as specified for the HXs. A document search was conducted to determine if any 16 foot long, 0.75 inch outside diameter admiralty brass tube stock had ever been ordered for use at Turkey Point. No admiralty brass tube order was identified in the purchasing records. The purchase order used to acquire the 16 foot tubes found that they were purchased as a lot of 800 tubes from Wolverine Tube Company (WTC) in 1988. The purchase order specified aluminum brass as the tube material.

Quality Assurance reviewed the documentation which purchased, stored, issued and installed the aluminum brass tubes supplied by WTC under the purchase order. Following completion of the review, no evidence was found that indicated the PTN stores warehouse material controls associated with the receipt, identification and storage of the subject tubes was a factor in the installation of the nonconforming material. Additionally, the work controls for installation of the Unit 3 CCW HXs replacement tubes were found to be satisfactory. A trip to the vendor's site was made which allowed the vendor's process to be directly reviewed by QA and Engineering. The process appeared fundamentally sound and capable



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TEXT (If more space is required, use additional NRC Form 305A's) (17)

of consistently delivering a quality product.

It was noted that the vendor's overview of the process varied with the purchase order requirements for heat traceability as allowed by the code for this size of tube. The purchase order used to procure the 800 CCW tubes had no requirements for certified materials test reports (CMTRs) traceable to the heats of material used in the furnished tubes. As such, lesser vendor QC coverage was in effect for the subject run. There is no clear evidence to indicate breakdowns in either the vendor's or the utility's quality programs.

A search was commenced to determine if any other admiralty brass tubes were present in the lot of 800 supplied under the purchase order. Tubes from this lot were used exclusively for replacements in the 3A, 3B, and 3C HXs with the exception of a few that were sectioned for chemical injection testing. The remainder of the tubes acquired under the purchase order are located in the stores warehouse. Tube replacement mapping records will be used to locate and test replacement tubes in the HXs. Only one of the 607 tubes that remained in the stores warehouse, was identified as admiralty brass. The tube was segregated. Because some Turbine Plant Cooling Water HX tubes were procured under the same purchase order and specification, a 100% inspection of these tubes (also located in the stores warehouse) was carried out. The TPCW tubes were confirmed to be aluminum brass.

## II CAUSE OF EVENT

Material testing of the two leaking tubes identified them as admiralty brass and not aluminum brass. The service period for the tubes was 10 months. Admiralty brass contains tin. Admiralty brass is a common and acceptable HX tube material. Admiralty brass is acceptable for salt water use and has good heat transfer properties. The most significant performance characteristic difference is its lower maximum recommended flow velocity of 4-6 ft/sec compared to 8 ft/sec for aluminum brass.

Average operating velocity through the HXs is approximately 5 ft/sec; however, inlet velocities were slightly higher in localized areas due to water entry patterns. Because the resultant velocities at the inlet of the HX were in excess of the 4 to 6 ft/sec velocity limit this caused the through wall erosion experienced by the admiralty brass tubes.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 305A's) (17)

Based on investigation of FPL and WTC material handling practices, it was concluded that the admiralty brass tubes were inadvertently "mixed" with the aluminum brass tubes in the 1988 purchase order by the manufacturer prior to shipment.

### III ANALYSIS OF EVENT

Three counterflow CCW HXs support each nuclear unit at Turkey Point. The function of these HXs is to remove heat during normal plant operation, plant cool down, and during post-accident conditions. Only two CCW HXs are required under the Design Basis Analysis. Heat removed by the CCW system is transferred to the ICW system. The CCW system also serves as an intermediate system between radioactive fluid systems and the ICW system. CCW runs through the shell side of the HX in one direction with ICW flow going through the tube side in the counter direction.

During the current Turkey Point Emergency Power System Enhancement Project outage, the CCW HXs perform a quality related function. They are used to remove heat loads from the spent fuel pool. Temporary Procedure (TP) - 645, "Defueled Operation Without Emergency Diesel Generators," controls the plant configuration during the outage. The procedure requires two CCW HXs during this phase. Because HXs 3A and 3B were in service when the 3C HX was taken out of service, Unit 3 was still in compliance with TP-645. No degradation in the required heat removal capability occurred.

The through wall erosion experienced by the admiralty brass heat exchanger tubes resulted in minor leakage which was quickly detected by a gradual decrease in inventory in the CCW surge tank. The through wall erosion occurred at the tube inlet where flow velocities are greatest. Leakage in this area tends to be small since the tubes are tightly held within the tubesheet. CCW makeup water from the surge tank was capable of handling the expected leakage. Catastrophic tube failure with loss of HX function is not expected for this corrosion erosion failure mechanism.

### IV CORRECTIVE ACTIONS

- 1) Both through wall leaking admiralty brass tubes were replaced. This was completed by January 21, 1991.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 302A's) (17)

- 2) All CCW tubes installed from the suspect tube lot during the past Unit 3 outage's will be examined for identification of admiralty brass tubes. Any admiralty brass tubes found will be removed and replaced. This action will be completed prior to Unit 3 entering Mode 6.
- 3) Quality Assurance has revised the Approved Supplier List (ASL) for Wolverine to require 100% physical verification of material composition for all future Turkey Point tube orders. This FPL receipt inspection has also been incorporated into the catalog listing for CCW heat exchanger tubes at Turkey Point. These actions were completed by February 25, 1991.

V ADDITIONAL INFORMATION

On March 6, 1991, FPL transmitted Operating Experience (OE) Entry 4435 informing all INPO Nuclear Network members of the subject event.

Component Identification

CCW Heat Exchanger Manufacture: Engineers & Fabricators, Inc..  
CCW Heat Exchanger Type: Shell and straight tube  
Number of tubes per CCW Heat Exchanger: 1625

Previous Similar Events

No similar LERs of this nature have been identified.