U.S. NUL								CLEAR REGULATORY COMMISSION APPROVED OMB NO. 3150-0104 EXPIRES. 8/31/86							
ILITY NAME (1)									OCKET NUMBER	(2)		PA	GE (3)		
Waterford S	team El	lectric	Station	n Unit	3				0   5   0   0	0   0   3   8   2 1 OF O K					
Loose Steam	Genera	ator Tub	e Plugs	s Due	to I	nadeo	uate	Installat	ion						
EVENT DATE (5)		ER NUMBER (6	))	REPO	ORT DAT	E (7)		OTHER	FACILITIES INVO	LVED (	0				
NTH DAY YEAR	YEAR	SEQUENTIAL	REVISION	MONTH	DAY	YEAR		FACILITY NAM	AES	DOCK	T NUMBER	R(S)			
					-			N/A		0 15	1010	101	11		
2 1 1 8 6	8 6 -	0 2 8	- 0 1	0 2	10	8 7		N/A		0 15	1010	101	11		
OPERATING	THIS REPOR	T IS SUBMITTED	D PURSUANT	TO THE RE	QUIREME	NTS OF 10	CFR \$: 10	heck one or more o	of the following) (1	1)					
MODE (9) 6	20.4020	6)		20.405(c)	)		_	50.73(a)(2)(iv)			73.71(b)				
LEVEL OLO LO	20.405	<pre>#)(1)(i) </pre>	-	50.36(c)(	1)			50.73(s)(2)(v)		-	73.71(c)				
101010	20.406	<pre>#)(1)(iii)</pre>	-	50.73(a)(	2)(1)		H	50.73(a)(2)(vii)	41	X	DIMEN (Sp below and in 186A)	n Text, NA	IC Form		
	20.405	a)(1)(iv)	-	60.73(a)(	2)(1)			50.73(a)(2)(viii)(	8)	JOGA					
	20.405	a)(1)(v)		50.73(a)(	2)(iii)			60.73(e)(2)(x)		R.	G. 1.	133			
			1	ICENSEE C	ONTACT	FOR THIS	LER (12)								
ME									AREA CODE	TELEPH	IONE NUM	BER			
Van McAdam	s. Read	tor Eng	ineerir	ng and	Per	forma	nce Si	upervisor	E LE LO LA	1					
		COMPLETE	ONE LINE FOR	EACH CO	MPONENT	FAILURE	DESCRIBE	D IN THIS REPOR	15 10 14 IT (13)	1410	0 4 -	1311	12 10		
AUSE SYSTEM COMP	ONENT	MANUFAC. TURER	REPORTABLE TO NPRDS			CAUSE	SYSTEM	CCMPONENT	MANUFAC TURER	REPO	NPROS				
			NTAL BERORT	EVALOTE	0 (14)						Tuon	I nev	TYEAR		
		BOFFLEME	ATAL HEFORT	EAFECTER					EXPECT SUBMISS	ED	MONTH	DAT	TEAR		
YES Ill yes, complete &	XPECTED SUB	MISSION DATE		X	NO			DATE	151	1	1				
On December refueling ma plugs instal area below is and one plug It is likely tool used do December, 19 These plugs secondary lo Since no def shown that	11, 199 ode when lled in the cord g was ro y that y that ining in 086 usin were in eakage of tectable	86 at 16 n an ins number e was ex ecovered the plug nitial i ng equip nstalled due to t	500 hour spection 1 Stear camined 1. 35 loose Installa oment wi 1 as a p cube weat	rs Wat n was n Gene durir ened h ation. hich w precau ar by econda	cerfo comp erato ng fu becau Al verif ition the ary 1	rd St leted r col el sh se of l sim ied p to r steam eakag	eam E whic d leg uffle inad ilar roper educe gene e exi	lectric S h revealed in Augus using a equate In tube plug torque w the proh rator "ba sts and a	Station U ed five m st 1985 w remote c ubrication gs were r vas appli pability atwing" t a safety	Init mecha are amen on of e-ro led t of p ube anal	3 was mical missi a the lled to the primar suppo	roll in tub roll in too rts. has	e The ing 1.		

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NRC Form 366 (9-83)

LICENSEE	EVENT	REPORT	(LER)	TEXT	CONTINUATION
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U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104 EXPIRES: 8/31/88

FACILITY NAME (1)	000	KET	NUN	ABER	(2)						LE	RN	MBER	(6)					PAGE (3)			
									YE	AR		SEO	UENTI	AL		REVI	SION					
Waterford Steam																						
Electric Station Unit 3	0	5	0	0	0	3	18	12	8	6	-	0	21	3	-	0	1	0	2	OF	0	14
TEXT // more space is required use additional NBC Form 2054/s1/171		-	-	-			-															-

On December 11, 1986 at 1600 hours Waterford Steam Electric Station Unit 3 was in refueling mode preparing for eddy current examination of Steam Generator (EIIS Identification Code AB) tubes when a visual inspection of the Steam Generator tubesheets was completed. This inspection revealed that five mechanical tube plugs which were installed in the number 1 Steam Generator outlet plenum tubesheet in August, 1985 were no longer in place. Combustion Engineering mechanical tube plugs are approximately five inches long, with a solid nose and tubular lower end. They are secured in place by a rolling tool which applies a radial force to the inside of the plug, pressing it against the inside of the steam generator tube.

Prior to commencement of the fuel shuffle, selected fuel assemblies were removed and a special camera and lighting were used to inspect the bottom of the reactor vessel. No plugs were located. As each assembly was removed during the fuel shuffle, its location was inspected and one of the missing plugs was located and retrieved. No significant deformation or fracture of the plug was noted.

Based on information from other plants which have used identical plugs and a review of documentation available from initial installation of the plugs at Waterford, it is likely that the reason the plugs loosened and fell from the tubesheet was inadequate lubrication of the rolling tool which may have occurred when a large number of plugs were installed sequentially. This would have resulted in a reduction of the torque applied to the head of the tool, and therefore, a reduction in the radial force which seals the plug against the tube wall. In order to prevent recurrence of this problem, all remaining Combustion Engineering mechanical plugs in the Waterford 3 Steam Generators (total of 591 plugs) were re-rolled in December, 1986 using equipment which produces a trace of the torque applied to the tool. These torque traces were compared against specified acceptance criteria to ensure proper installation. Additionally, the procedure now requires that no more than fifty plugs may be installed before the rolling tool is removed for refurbishment. Testing conducted by the vendor on a full scale mockup has demonstrated a high level of assurance that this procedure will result in satisfactory seating of the plugs. The five locations with missing plugs were plugged using Westinghouse mechanical tube plugs.

NRC Form 366A

NRC Form 366A (9-83)	U.S.	APPRO	AR REG	ULATOR MB NO. 3	150-0	104				
FACILITY NAME (1)		DOCKET NUMBER (2)	LE	R NUMBER (6)			PAGE (3)			
Waterford Steam			YEAR		SEQUENTIAL NUMBER	RENU	VISION		Π	
Electric Station	Unit 3	0 15 10 0 0 3 8 2	8 8 6	-	01218	- 0	11	0 3	OF	0 4

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

All of the Combustion Engineering mechanical tube plugs were installed as a precaution to reduce the probability of primary to secondary leakage due to tube wear caused by the steam generator "batwing" tube supports. An evaluation of the effects of loose tube plugs has shown that potential flow blockage from missing plugs is not expected to degrade core DNB performance in either steady state or transient/accident conditions. Since no plug that falls from the tubesheet can enter the core intact, the worst flow restriction that could be caused by an intact plug would result from one or more plugs becoming lodged against the Lower End Fitting (LEF) flowplate. Flow blockage tests which bound this condition have demonstrated no significant effect on DNB performance. If a plug should break into fragments small enough to pass through the 0.422" flowholes in the Lower End Fitting flowplate the fragments would be too small to affect flow distribution significantly, but the debris could pass into the active region of the core and could induce fretting failure of some fuel rods over time. These fretting failures would be apparent in high coolant activity levels. The probability of such a failure is considered extremely small.

An analysis of the flow conditions to which the plugs have been and will be subjected indicates the most probable location of the remaining plugs is in the low flow region at the intersection of the flow skirt at the bottom of the Reactor Vessel and the vessel wall. It is also likely that the plugs will remain in this location until the vessel internals are removed at the 10 year inservice inspection. Since these plugs weigh only two ounces and would be traveling at coolant flow velocity of eight to nine feet per second if in motion, their impact kinetic energy would be approximately .16 ft-1b. Since this is well below the 0.5 ft-1b detection threshold of the Loose Parts Monitoring System no indication of plug movement is anticipated, nor has any such indication been noted to date.

Other potential problems considered were Reactor Coolant Pump impeller impact, impact on other RCS components, plug interference with structural components, CEA interference, reactor vessel cladding abrasion, and long term radiation effects. In each instance the physical properties of the tube plugs were found to be such that no significant hazard was identified.

(9-83) LICENSEE EVENT	U.S	U.S. NUCLEAR REGULATORY COMMISSION APPROVED OMB NO. 3150-0104 EXPIRES: 8/31/88							
FACILITY NAME (1)	DOCKET NUMBER (2)		LER NUMBER (6	)	PA	GE (3)			
Waterford Steam Electric Station Unit 3	0  5   0   0   0   3   8   2	YEAR 8 6 -	OI28		014	OF (	0   4		

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

Since no increases in coolant activity have been observed and no detectable primary to secondary leakage exists, this event in no way degraded public health and safety. No further action is planned other than removal of the remaining four loose plugs when they can be retrieved, most likely during the 10 year inservice inspection of the Reactor Vessel internals. This event is reported in accordance with the requirements of Regulatory Guide 1.133, "Loose-part Detection Program for the Primary System of Light-Water-Cooled Reactors."

## SIMILAR EVENTS

No similar events have been reported.

## PLANT CONTACT

Van McAdams, Reactor Engineering and Performance Supervisor, 504-464-3126.



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February 10, 1987

W3A87-0026 A4.05 QA

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

SUBJECT: Waterford 3 SES Docket No. 50-382 License No. NPF-38 Reporting of Licensee Event Report

Attached is Licensee Event Report Number LER-86-028-01 for Waterford 3. This Licensee Event Report is submitted per Regulatory Guide 1.133.

Very truly yours,

nsam

N.S. Carns Plant Manager - Nuclear

NSC/DEB:rk

Attachment

cc: R.D. Martin, NRC Resident Inspectors Office, INPO Records Center (J.T. Wheelock), E.L. Blake, W.M. Stevenson