

Jim McKnight  
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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, DC 20555

December 22, 1994

NRC INFORMATION NOTICE 94-87: UNANTICIPATED CRACK IN A PARTICULAR HEAT OF ALLOY 600 USED FOR WESTINGHOUSE MECHANICAL PLUGS FOR STEAM GENERATOR TUBES

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U. S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to recent operating experience affecting the predicted service life of mechanical tube plugs fabricated from alloy 600 and supplied by Westinghouse. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Background

During the November 1994 refueling outage at St. Lucie Unit 1, licensee personnel found 15 leaking steam generator tube plugs. All the affected plugs were Westinghouse mechanical plugs, fabricated from alloy 600 heat NX-2387, and installed in 1986. When the leaking plugs were removed for replacement, the base of one plug was noted to have a 360 degree circumferential through-wall crack, evidently due to primary water stress corrosion cracking (PWSCC). The crack was located just below the expander and, therefore, outside the effective pressure boundary of the plug. The cause of the leakage for the cracked plug (and for the others, which have no visually detectable cracks) is being investigated. The cracked plug and four others will be sent to Westinghouse for metallurgical examination.

In NRC Bulletin 89-01 and Supplements 1 and 2, the staff discussed the susceptibility to PWSCC of Westinghouse mechanical plugs made from various specific heats of alloy 600. It also discusses the algorithm for determining when a plug of a specific heat should be preventively removed and replaced with a new plug.

Discussion

Although a crack in the location noted above is not in the pressure boundary, its existence raises questions regarding the crack resistance of heat NX-2387. This heat of alloy 600 was previously shown, in special steam tests conducted

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updated on 12/27/94

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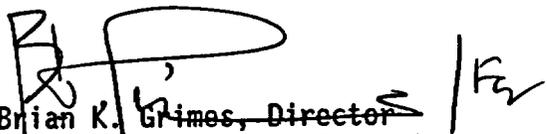
by Westinghouse, to be highly resistant to PWSCC compared to other heats of alloy 600. The algorithm for determining plug life predicted that the recommended repair date for the St. Lucie plugs made from heat NX-2387 would be about 10 years in the future. The recommended repair date is a prediction of when a plug top release could occur due to a circumferential crack through the plug pressure boundary. A pressure boundary crack is one in the portion of the plug above the expander. Cracking below the expander is considered a precursor to cracking above the expander.

Westinghouse is evaluating this event and considering revising the plug life algorithm. The event suggests that the life of alloy 600 tube plugs may be overstated by the current algorithm for all heats of alloy 600, not only for heat NX-2387.

Cracking below the plug pressure boundary could lead to loose parts in the steam generator inlet plenum. The staff is evaluating this issue to determine if further regulatory action is needed.

As further information concerning this matter becomes available, the staff may issue revisions to this information notice.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

  
Brian K. Grimes, Director  
Division of Project Support  
Office of Nuclear Reactor Regulation

Technical contacts: Geoffrey P. Hornseth  
(301) 504-2756

Robert A. Hermann  
(301) 504-2768

Attachment:  
List of Recently Issued NRC Information Notices

*Attachment filed in Jacket*

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-86	Legal Actions Against Thermal Science, Inc., Manufacturer of Thermo-Lag	12/22/94	All holders of OLs or CPs for nuclear power reactors.
94-85	Problems with the Latching Mechanism in Potter and Brumfield R10-E3286-2 Relays	12/21/94	All holders of OLs or CPs for nuclear power reactors.
94-40, Supp. 1	Failure of a Rod Control Cluster Assembly to Fully Insert Following a Reactor Trip at Braidwood Unit 2	12/15/94	All holders of OLs or CPs for nuclear power reactors.
94-84	Air Entrainment in Terry Turbine Lubricating Oil System	12/02/94	All holders of OLs or CPs for nuclear power reactors.
89-25, Rev. 1	Unauthorized Transfer of Ownership or Control of Licensed Activities	12/07/94	All fuel cycle and material licensees.
94-83	Reactor Trip Followed by Unexpected Events	12/06/94	All holders of OLs or CPs for nuclear power reactors.
94-82	Concerns Regarding Essential Chiller Reliability during Periods of Low Cooling Water Temperature	12/05/94	All holders of OLs or CPs for nuclear power reactors.
94-81	Accuracy of Bioassay and Environmental Sampling Results	11/25/94	All U.S. Nuclear Regulatory Commission licensees.
94-80	Inadequate DC Ground Detection in Direct Current Current Distribution Systems	11/25/94	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
 CP = Construction Permit



alloy 600. The algorithm for determining plug life predicted that the recommended repair date for the St. Lucie plugs made from heat NX-2387 would be about 10 years in the future. The recommended repair date is a prediction of when a plug top release could occur due to a circumferential crack through the plug pressure boundary. A pressure boundary crack is one in the portion of the plug above the expander. Cracking below the expander is considered a precursor to cracking above the expander.

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OFFICE	OECEB:DOPS	ADM:PUB	SC/OECEB:DOPS	EMCEB:DE
NAME	RBenedict*	Tech Editor*	EGoodwin*	GHornseth*
DATE	11/30/94	11/29/94	11/30/94	11/30/94
OFFICE	EMCEB:DE	C/EMCEB:DE	D/DE	TA/OECEB:DOPS
NAME	RHermann*	JStrosnider*	BSheron*	RKiessel*
DATE	11/30/94	12/05/94	12/05/94	12/07/94
OFFICE	C/OECEB:DOPS	D/DOPS		
NAME	ACM Fee VSB	BGrimes ATB		
DATE	12/8/94	1/ /94		

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NAME	RHermann*	JStrosnider	BSheron	RKiessel
DATE	11/30/94	12/5/94	12/5/94	12/7/94
OFFICE	C/OECB:DOPS	D/DOPS		
NAME	AChaffee	BGrimes		
DATE	/ /94	/ /94		

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by Westinghouse, to be highly resistant to PWSCC compared to other heats of alloy 600. Currently, the algorithm for determining plug life predicts that plugs made from heat NX-2387 will last for approximately 15 more years before a pressure boundary crack occurs. A pressure boundary crack is one in the portion of the plug above the expander. Cracking below the expander is considered a precursor to cracking above the expander.

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