UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

October 30, 1990

NRC INFORMATION NOTICE NO. 90-68: STRESS CORROSION CRACKING OF REACTOR COOLANT PUMP BOLTS

Addressees:

All holders of operating licenses or construction permits for pressurized water reactors (PWRs).

Purpose:

This information notice is intended to alert addressees of a significant event which occurred at a foreign reactor. The event involves the use of a material sensitive to intergranular stress corrosion cracking (IGSCC) in the fabrication of the bolts fastening the turning vanes of the reactor coolant pumps. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

The U.S. Nuclear Regulatory Commission (NRC) has received information concerning cracking of the bolts fastening the turning vanes of the reactor coolant pumps at a foreign reactor plant. There are 23 bolts fastening the turning vanes in each of three reactor coolant pumps. Five of these bolts had experienced stress corrosion cracking. The bolts were made of a stainless steel alloy which is designated by the American Society for Testing and Materials as A453 grade 660. The material is commonly described commercially as alloy A-286. The reactor coolant pumps are similar in design to those manufactured by the Westinghouse Electric Company.

Considerable information has previously been available regarding the susceptibility of alloy A-286 to IGSCC. For example, licensees of U.S. reactors designed by Babcock and Wilcox (B&W) have noted stress corrosion cracking of bolts fabricated of alloy A-286. Specifically, bolts fastening the B&W reactor internals, including the core barrel and lower thermal shield, were fabricated of alloy A-286. Between 1981 and 1984, bolt cracking and indication of cracking were documented at Oconee, Rancho Seco, Crystal River and Arkansas Unit 1. In response, the B&W owners group formed a special task force to study the internal bolts of the reactor vessel. This task force documented its conclusions in BAW-1842, "The B&W Owners Group Evaluation of Internals Bolting Concerns in 177 FA Plants," August 1984. The task force concluded that bolts fabricated

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of alloy A-286 are subject to IGSCC at peak stresses above 100 ksi. The occurrence of IGSCC also appeared to be a function of chromium content, fabrication practice and environment. As a result of the task force findings, the design of the reactor internal bolts was modified at B&W plants to use fastener materials that are less sensitive to IGSCC than alloy A-286 or to reduce the maximum stress loadings of bolts fabricated of alloy A-286 to less than 100 ksi.

In addition, the Brookhaven National Laboratory (BNL) performed an extensive study of bolting which is documented in NUREG/CR-3604, "Bolting Applications," May 1984. The report discusses the direct relationship between loading and IGSCC of bolts fabricated of alloy A-286. In this report, BNL recommended that alloy A-286 not be used as a reactor structural material because of its susceptibility to IGSCC.

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Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contacts: Clifford Sellers, NRR
(301) 492-0703

Walton Jensen, NRR
(301) 492-1157

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
90-67	Potential Security Equipment Weaknesses	10/29/90	All holders of OLs or CPs for nuclear power reactors and Category I fuel facilities.
90-66	Incomplete Draining and Drying of Shipping Casks	10/25/90	All holders of OLs for nuclear power reactors and all registered users of NRC approved waste shipping packages.
88-63, Supp. 1	High Radiation Hazards From Irradiated Incore Detectors and Cables	10/5/90	All holders of OLs or CPs for nuclear power reactors.
90-65	Recent Orifice Plate Problems	10/5/90	All holders of OLs or CPs for nuclear power reactors.
90-64	Potential for Common-Mode Failure Of High Pressure Safety Injection Pumps or Release of Reactor Coolant Outside Containment During A Loss-Of-Coolant Accident	10/4/90	All holders of OLs or CPs for pressurized-water reactors.
90-63	Management Attention to the Establishment and Maintenance of A Nuclear Criticality Safety Program	10/3/90	All fuel cycle licensees possessing more than critical mass quantities of special nuclear material.

OL = Operating License
CP = Construction Permit

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Original Signed by
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*SEE PREVIOUS CONCURRENCE

NRR:EAB	NRR:EAB	TECH ED	GPA:IP	NRR:EMCB
*WJensen	*NPKadambi		*KBurke	*CSellers
08/01/90	08/13/90	07/27/90	08/21/90	08/10/90
NRR:EMCB	NRR:DET	NRR:EAB	NRR:GCB	NRR:DOEA
*CYCheng	*JRichardson	*PBaranowsky	*CBerlinger	CRossi
08/27/90	08/27/90	09/06/90	10/19/90	10/25/90

DOCUMENT NAME: IN 90-68

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08/27/90	08/27/90	09/06/90	NPK for 10/19/90	09/ /90

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DISTRIBUTION:

CRossi	DOEA r/f
WJensen	EAB r/f
NPKadambi	Central Files
CSellers	JRichardson
PBaranowsky	CBerlinger

* Discussed removal of name of Contact with K. Burke 10/24/90 CERossi

*SEE PREVIOUS CONCURRENCE

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NPK (Recd. 10/19/90)

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CYCheng	JRichardson	PBaranowsky	for CBerlinger	CRossi
08/27/90	08/27/90	09/6/90	(Correction of minor typos discussed with Walt) 10/19/90.	

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