

Part 21 (PAR)

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NRC Notified by: JAMES GRESHAM	Notifications: CHRISTOPHER CAHILL R1DO
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Emergency Class: NON EMERGENCY	PART 21 GROUP EMAIL
10 CFR Section: 21.21(d)(3)(i) DEFECTS AND NONCOMPLIANCE	

PART 21 REPORT - POTENTIAL FAILURE OF REACTOR COOLANT PUMP TURNING VANE BOLTS

The following was excerpted from a report received via fax from Westinghouse:

This issue concerns the potential failure of certain Westinghouse reactor coolant pump (RCP) turning vane bolts that employs turning vane bolts that are 1.0 inch nominal size, made from A286 material. These bolts hold the turning vane diffuser assembly in place inside the RCP, above the pump impeller. Bolt failures have occurred at on plant such that the running vane-diffuser assembly dropped inside three of the four RCPs and in two of these RCPs the assembly contacted the impeller.

These bolts are part of the model 93A RCPs delivered to Salem Unit 2 and Surry Units 1 and 2.

Name and address of the individual or individuals informing the Commission:

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LTR-NRC-14-46

July 14, 2014

Subject: Notification of the Potential Existence of Defects Pursuant to 10CFR Part 21

The following information is provided pursuant to the requirements of 10CFR Part 21 to report a potential defect that could lead to a substantial safety hazard. This issue concerns potential failure of certain Westinghouse reactor coolant pump (RCP) turning vane bolts. This issue is limited to Westinghouse RCPs that employ turning vane bolts that are 1.0 inch nominal size, made from A286 material. These bolts hold the turning vane-diffuser assembly in place inside the RCP, above the pump impeller. Bolt failures have occurred at one plant such that the turning vane-diffuser assembly dropped inside three of the four RCPs and in two of these RCPs the assembly contacted the impeller.

(i) *Name and address of the individual or individuals informing the Commission.*

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(ii) *Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States which fails to comply or contains a defect.*

The delivered basic components are the RCPs which include turning vane bolts of 1.0 inch nominal size made from A286 material. These bolts are part of the model 93A RCPs delivered to Salem Unit 2 and Surry Units 1 & 2. Each RCP at these units has 20 bolts holding the turning vane-diffuser assembly to the thermal barrier flange.

Other model 93A RCPs and model 93A-1 RCPs have larger turning vane bolts of 1.5 inch diameter, and the bolted assembly uses 23 or 24 bolts. Westinghouse evaluated the RCPs with these bolts and determined that a failure could not result in a substantial safety hazard, even if left uncorrected. The basis for this is the inspection data which shows a very low incidence of bolt failure, likely due to the reduced bolt stress associated with the fastener size and load distribution.

(iii) *Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect.*

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- (iv) *Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.*

The originally supplied turning vane bolts are made of A286 material, and have experienced inter-granular stress corrosion cracking (IGSCC). Inspection of the Salem Unit 2 RCPs revealed that three out of four RCPs had turning vanes which dropped due to failure of the bolts. Of those three, two RCP turning vane diffusers made contact with the impeller because rubbed metal on the impeller and diffuser was observed. One of the impellers had a discrete unworn profile that could be used to estimate the amount of material removed by contact. There was no adverse impact on RCP operation, as reported by the Licensee.

Operating experience from Salem suggests that normal operation of the RCP post-turning vane drop was experienced. In the case of the two Salem RCPs which did experience impeller contact, this contact resulted in some removal of material, which left a smooth finish, with clearance that would have preserved coastdown capability after the clearance was established. If turning vanes have dropped at other plants resulting in establishing clearance between the contacting surfaces, the coastdown capability would not be diminished significantly. Safety analysis of the plant assumes a single Locked Rotor event. It is highly unlikely that one Locked Rotor event could occur, and even more unlikely that more than one would occur simultaneously.

Westinghouse determined in its evaluation that the only scenario that could potentially result in a substantial safety hazard would be if more than one RCP rotor simultaneously "locked" as a result of simultaneous failures of turning vane bolts, and the turning vanes contacting the impellers. However, the possibility of multiple simultaneous locked rotors occurring is extremely unlikely. Since Westinghouse could not establish with certainty that a multiple locked rotor event could not occur, Westinghouse concluded that this deviation could potentially result in a substantial safety hazard if left uncorrected.

- (v) *The date on which the information of such defect or failure to comply was obtained.*

The Westinghouse president was informed of the recommendation of the Westinghouse Safety Review Committee on July 14, 2014.

- (vi) *In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.*

The model 93A RCPs with 1.0 inch turning vane bolts were delivered to Salem Unit 2 and Surry Units 1 & 2.

- (vii) *The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.*

The Salem Unit 2 RCPs have been repaired with 1.0-inch replacement bolts of 316 SST, a material which is more resistant to IGSCC. Later manufactured Model 93A RCPs have the aforementioned 1.5-inch fasteners.

- (viii) *Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.*

Westinghouse believes that close study of RCP seal inlet and outlet temperatures may identify a change condition that would indicate that the turning vane diffuser has dropped. As stated above, continued operation after drop would assure sufficient running clearance and, therefore, coastdown capability.

Additional advisory information will be provided in a subsequent Westinghouse Nuclear Safety Advisory Letter (NSAL) to be issued to affected licensees.

- (ix) *In the case of an early site permit, the entities to whom an early site permit was transferred.*

This issue does not apply to plants licensed under 10 CFR 52.

Very truly yours,



James A. Gresham, Secretary
Westinghouse Safety Review Committee

cc: E. Lenning (NRC MS O-11-F1)

07-14-'14 13:50 FROM-

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LTR-NRC-14-46

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