

UNITED STATES
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OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

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December 28, 1979

IE Information Notice No. 79-37

CRACKING IN LOW PRESSURE TURBINE DISCS

Description of Circumstances:

An anonymous letter was received by the Director of the Office of Inspection and Enforcement, on November 17, 1979 which alleged possible violation of Part 10 CFR 50.55e and/or 10 CFR 21 Regulations concerning reportability of recently discovered stress corrosion cracking in Westinghouse 1800 rpm low pressure turbine discs. Westinghouse had made a presentation on the turbine disc cracking to electric utility executives on October 30, 1979.

Telephone discussions between the NRC staff and Westinghouse's Turbine Division on November 20, 1979 established that cracking, attributed to stress corrosion phenomena, had been found in the keyway areas of several LP turbine discs at operating plants and that inservice inspection techniques (i.e., in situ ultrasonic examination) for crack detection have been developed and are being implemented in the field. The Office of Inspection and Enforcement was also notified on November 20, 1979 that during the current overhaul of Commonwealth Edison's Zion Unit 1 LP turbine, ultrasonic examination revealed embedded cracks located on the inlet side on the disc bore area where no cracks had been previously observed. Ultrasonic measurements indicate this disc bore cracking is of greater depth than the keyway cracks found to date. According to Westinghouse, these bore cracks have been metallurgically examined and preliminary findings show them not to be typical of classical stress corrosion cracking observed in the keyways. The probable cracking mechanism and impact on disc integrity is being further evaluated by Westinghouse.

A meeting was held on December 17, 1979 between the NRC staff, Westinghouse and utility representatives to discuss the disc cracking problem, repair alternatives, turbine missile evaluation, inspection techniques and plant inspection priorities. In response to the staffs' request, Westinghouse provided the staff an updated report on December 21, 1979 regarding the current field inspection program that included a list of nuclear power plants already inspected, recommended inspection schedules and pertinent information related to LP turbines where cracks have been observed. Inspections to date have identified turbine disc cracks at Surry Unit 2, Point Beach Unit 2, Palisades, Indian Point Unit 3 and Zion Unit 1. All units except Point Beach Unit 2 will make repairs before the plants return to power. Point Beach returned to power on December 23, 1979 with a small crack in the No. 2 disc of LP Turbine No. 2. An analysis by Westinghouse indicated that the observed crack will not attain critical dimensions during 28 additional months of turbine operation. The NRC staff is evaluating the turbine inspection results and analysis by Westinghouse.

Westinghouse also notified the staff that extrapolation of information obtained from Indian Point Unit 3 inspection and analysis indicates that disc cracking could be significant at Indian Point Unit 2 and the turbines should be inspected sooner than the spring outage of 1980. The NRC staff is currently reviewing Consolidated Edison's plans for prompt evaluation of this potential problem at this unit.

Enclosure 1 lists the PWR plants having Westinghouse 1500/1800 rpm turbines. The AA category represents those turbines which appear to have the earliest need for inspection. With the exception of Yankee Rowe, Westinghouse has recommended to utilities that inspection of these machines be completed by the Spring 1980 outage period. The Rowe unit is uninspectable by the present ultrasonic techniques due to its design. Westinghouse has recommended the remaining machines of the Category A plants be inspected as their service periods approach five years or in the event significant corrosion problems become evident during this time. The NRC staff is currently reviewing the need for inspection of those PWR plants having other interfacing turbine designs shown in Enclosure 2. Changes to the forementioned inspection schedules proposed by Westinghouse may be necessary as new technical information becomes available.

From the information available to the NRC staff at this time it appears that cracking may be more generically widespread in turbine discs (e.g., keyways and bore areas) than previously observed. It is important to note that the UT inspections performed by Westinghouse thus far were essentially limited to the keyways (disc outlet) of selected discs whereas the Zion Unit 1 inspection results indicate that examination of the disc bore section must be taken into account. Also, Westinghouse is currently re-evaluating their previously estimated turbine missile energies based on recent missile test results from model symmetric and non-symmetric missile impact tests. Their preliminary findings, although subject to change, now indicate possible higher missile exit energies in some cases than previously expected.

This Information Notice is provided as an early notification of a possibly significant matter, the allegations and the generic safety implications of which are currently undergoing review by the NRC staff. It is expected that recipients will review the information applicable to their facilities. If NRC evaluations so indicate, further licensee actions may be requested or required. Embedded cracking in keyways and disc bore areas have been observed only in Westinghouse LP turbines thus far. However, the NRC staff believes that turbines of other manufacturers should be included in consideration of this problem.

No written response to this Information Notice is required. If you have any questions regarding this matter, please contact the Director of the appropriate NRC Regional Office.

Enclosures: As stated

Enclosure 1

CATEGORY AA

<u>UTILITY</u>	<u>STATION</u>	<u>UNIT</u>
Florida, P&L	Turkey Point	3
Consolidated ED.	Indian Point	2
PASNY	Indian Point	3
Arkansas P&L	Russellville	1
VEPCO	Surry	1
Carolina P&L	Robinson	2
So. Calif. Ed.	San Onofre	1
Yankee A.P.	Rowe	1
Wisc. Mich. Pwr.	Point Beach	1
Consumers Pwr.	Palisades	1
Commonwealth Ed.	Zion 1	1
Commonwealth Ed.	Zion 2	2
Florida P&L	Turkey Point	4
Nebraska PPD	Cooper	1
Wisc. Mich. Pwr.	Point Beach	2
Maine Yankee	Bailey Point	1
Rochester G&E	Ginna	1
Northern States	Prairie Island	1
Wisc. P.S.	Kewaunee	1

CATEGORY A

<u>UTILITY</u>	<u>STATION</u>	<u>UNIT</u>
Alabama Power	Farley	1
Alabama Power	Farley	2
Baltimore G&L	Calvert Cliffs	2
Carolina P&L	Harris	1
Carolina P&L	Harris	2
Carolina P&L	Harris	3
Carolina P&L	Harris	4
Cincinnati G&E	Zimmer	1
Commonwealth Ed.	Byron	1
Commonwealth Ed.	Byron	2
Commonwealth Ed.	Braidwood	1
Commonwealth Ed.	Braidwood	2
Connecticut Yankee	Haddam Neck	1
Duke Power	McGuire	1
Duke Power	McGuire	2
Duquesne Lt.	Shippingport	1
Duquesne Lt.	Beaver Valley	1
Duquesne Lt.	Beaver Valley	2
Florida Power Corp.	Crystal River	3
Florida Power & Lt.	St. Lucie	1
Florida Power & Lt.	St. Lucie	2
Houston L&P	So. Texas	1
Houston L&P	So. Texas	2
Louisiana P&L	Waterford	3
Metropolitan Ed.	Three Mile Island	2
Northern States Pwr.	Prairie Island	2
Pub. Service E&G	Salem	1
Pub. Service E&G	Salem	2
Pacific G&E	Diablo Canyon	1
Pacific G&E	Diablo Canyon	2

CATEGORY A

<u>UTILITY</u>	<u>STATION</u>	<u>UNIT</u>
P.S. Indiana	Marble Hill	1
P.S. Indiana	Marble Hill	2
Puget Sound P&L	Skagit	1
SMUD.	Rancho Seco	1
TVA	Sequoyah	1
TVA	Sequoyah	2
TVA	Watts Bar	1
TVA	Watts Bar	2
VEPCO	North Anna	1
VEPCO	North Anna	2
VEPCO	North Anna	3
VEPCO	North Anna	4
VEPCO	North Anna	2
WPPSS	Hanford	2
WPPSS	WNPS	1
WPPSS	WNPS	3
WPPSS	WNPS	4
WPPSS	WNPS	5

Enclosure 2

<u>UTILITY</u>	<u>STATION</u>	<u>UNIT</u>
Duke Power Co.	Oconee	1
Duke Power Co.	Oconee	2
Duke Power Co.	Oconee	3
OPPD	Ft. Calhoun	1
Baltimore Electric & Gas	Calvert Cliffs	1
Metropolitan Edison	Three Mile Island	1
Indiana & Michigan Electric	D.C. Cook	1
Indiana & Michigan Electric	D.C. Cook	2
Northeast Utilities	Millstone	2
Portland General Electric	Trojan	1
Toledo Edison	Davis Besse	1
Arkansas Power & Light	Arkansas Nuclear One	2
WPPSS	Hanford	1

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Enclosure

RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date Issued	Issued To
79-37	Cracking in Low Pressure Turbine Discs	12/28/79	All holders of power reactors OLs and CPs
79-36	Computer Code Defect In Stress Analysis of Piping Elbow	12/31/79	All holders of power reactor OLs and CPs
79-35	Control of Maintenance and Essential Equipment	12/31/79	All holders of power reactor OLs and CPs.
79-34	Inadequate Design of Safety-Related Heat Exchangers	12/27/79	All holders of power reactor OLs and CPs
79-33	Improper Closure of Primary Containment Equipment Access Hatches	12/21/79	All holders of power reactor OLs and CPs
79-32	Separation of Electrical Cables for HPCI and ADS	12/21/79	All power reactor facilities holding OLs and CPs
79-31	Use of Incorrect Amplified Response Spectra (ARS)	12/13/79	All power reactor facilities holding OLs and CPs
79-30	Reporting of Defects and Noncompliances, 10 CFR Part 21	12/6/79	All power reactor facilities holding OLs and CPs and vendors inspected by LCVIP
79-29	Loss of NonSafety-Related Reactor Coolant System Instrumentation During Operation	11/16/79	All power reactor facilities holding OLs or CPs
79-28	Overloading of Structural Elements Due to Pipe Support Loads	11/16/79	All power reactor facilities with an OL or CP
79-27	Steam Generator Tube Ruptures At Two PWR Facilities	11/16/79	All power reactor facilities holding OLs and CPs
79-12A	Attempted Damage To New Fuel Assemblies	11/9/79	All Fuel Facilities, research reactors, and power reactors with an OL or CP