SSINS No.: 6835
IN 85-65

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

July 31, 1985

IE INFORMATION NOTICE NO. 85-65: CRACK GROWTH IN STEAM GENERATOR GIRTH WELDS

Addressees:

All nuclear power pressurized water reactor (PWR) facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

This information notice is provided to alert recipients of a potentially significant problem pertaining to the growth in indications in steam generator circumferential welds. Ultrasonic examination had determined previously that the welds were acceptable. It is suggested that recipients review the information for applicability to their facilities and consider actions, if appropriate, to preclude a similar problem occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

The NRC is continuing to evaluate pertinent information. An additional notification will be made if specific actions are determined to be required.

Description of Circumstances:

In 1982 Indian Point Station Unit 3 had a leak at weld No. 6 on one of their steam generators (see Information Notice 82-37). Weld No. 6 is a full-penetration circumferential weld located in the transition zone between the tube bundle and steam dryer areas, below the feedwater nozzles, and subject to thermal cycling. The crack was started by corrosion and operating temperature fluctuations caused it to grow through the wall because of low-cycle fatigue. The repair method reduced the defects to an acceptable level. Ultrasonic examinations have been performed during outages since 1982 and in the summer of 1985. Previously known indications that appear to have grown in size are being evaluated.

In 1983 Surry Power Station Unit 2 performed ultrasonic examinations of the No. 6 welds. The original construction weld at Unit 2 is 6 inches above the weld that attached the lower portion of all three replacement steam generators in 1980 (see attached sketch). The examination showed widespread indications of discontinuities on the inside surface of this weld in the "A" steam generator. None of the indications seemed large enough to be rejected and it was

decided that they were surface blemishes of reflections from weld geometry. In March 1985, an ultrasonic reexamination was performed on the original construction weld at Surry and larger, but acceptable, discontinuities were found in the same locations. The inside surface of the weld in generator A was visually examined, but no defects were seen. However, when magnetic particle testing was performed at the request of the NRC, closely spaced linear cracks were found over a large portion of the circumference. The appearance of these cracks was similar to those at Indian Point. The safety significance is that substantial loss of secondary coolant could occur without warning if cracking degradation continued undetected.

The cracks in generator A were in a narrow band at the upper edge of the weld and covered almost the entire inside diameter. The cracks were as deep as 1/2 inch and were covered by the surface oxide, which obscured detection by visual examination. Generators B and C had numerous, smaller, circumferential cracks in the same location. To complicate matters, there were 10 unacceptable subsurface indications in generator B, based on the requirements of ASME Section XI, IWB-3511. After a fracture and fatigue evaluation, these subsurface indications were accepted by ASME IWB-3600. The surface cracks in all three generators were removed by grinding; repair welding was not necessary.

Weld No. 6 was made on-site and had high residual stresses as a result of the low preheat and postweld heat treatment temperatures. The steel in the vicinity of the weld pitted when the secondary water contained high oxygen concentrations (higher than 25 ppb) and contaminants such as chlorides and copper ions. In addition to internal pressure, this portion of the steam generator has a change in cross-section and undergoes thermal cycling. Heat treatment of the nearby replacement weld in 1980 reduced the residual stresses, but could not undo any existing damage to the original construction weld. The cracks ran from pit to pit and grew to an unacceptable size in less than one inspection period.

At the next outage, the No. 6 welds in all three steam generators at Surry Unit 2 will be partially examined by magnetic particle testing. The subsurface indications in generator B also will be examined by ultrasonic methods. Slow growing corrosion cracks are irregular in length and depth. When the cracks are located in the fusion line between the weld and the base metal, evaluation is very difficult by ultrasonic methods alone. Magnetic particle testing is more sensitive than visual examination and supplements ultrasonic examinations where there is a possibility of surface defects. ASME Section XI specifies the maximum allowable planar indications and the methods of examination, but these methods may not be sufficient to identify indications and defects in all cases. Additional surface preparation, calibration notches, personnel training, and smaller ultrasonic probes may result in a better understanding of the ultrasonic indications.

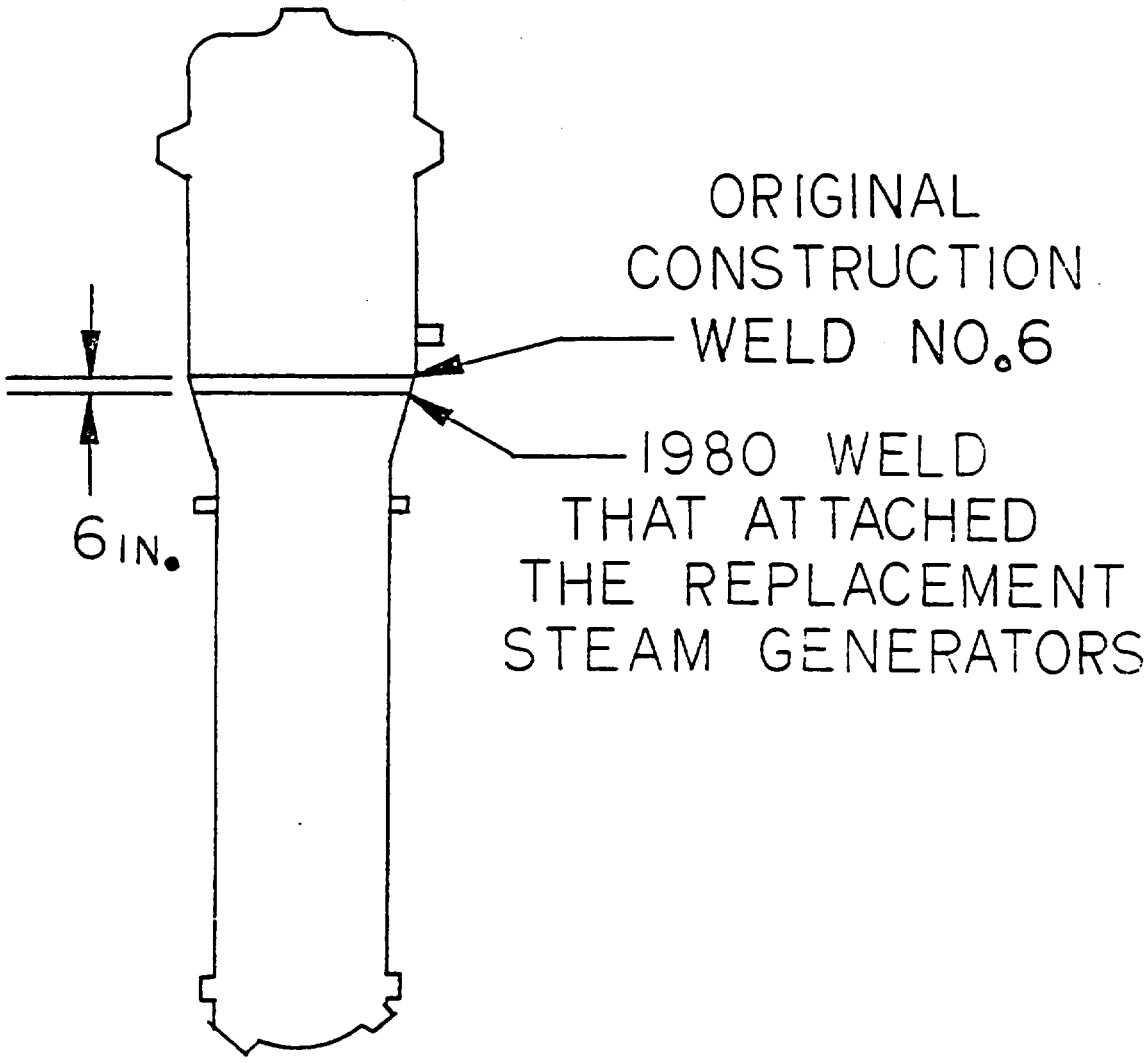
No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the Regional Administrator of the appropriate regional office or this office.

Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact: P. Cortland, IE
(301) 492-4175

Attachments:
1. Sketch of Steam Generator
2. List of Recently Issued IE Information Notices

Sketch Showing Steam Generator A



Attachment 2
IN 85-65
July 31, 1985

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-64	BBC Brown Boveri Low-Voltage K-Line Circuit Breakers, With Deficient Overcurrent Trip Devices Models OD-4 and 5	7/26/85	All power reactor facilities holding an OL or CP
85-63	Potential for Common-Mode Failure of Standby Gas Treatment System on Loss of Off-Site Power	7/25/85	All power reactor facilities holding an OL or CP
85-62	Backup Telephone Numbers to the NRC Operations Center	7/23/85	All power reactor facilities holding an OL and certain fuel facilities
85-61	Misadministrations to Patients Undergoing Thyroid Scans	7/22/85	All power reactor facilities holding an OL and certain fuel facilities
85-60	Defective Negative Pressure Air-Purifying, Fuel Facepiece Respirators	7/17/85	All power reactor facilities holding an OL or CP
85-59	Valve Stem Corrosion Failures	7/17/85	All power reactor facilities holding an OL or CP
85-58	Failure Of A General Electric Type AK-2-25 Reactor Trip Breaker	7/17/85	All power reactor facilities designed by B&W and CE holding an OL or CP
85-57	Lost Iridium-192 Source Resulting In The Death Of Eight Persons In Morocco	7/16/85	All power reactor facilities holding an OL or CP; fuel facilities; and material licensees
85-56	Inadequate Environment Control For Components And Systems In Extended Storage Or Layup	7/15/85	All power reactor facilities holding an OL or CP

OL = Operating License
CP = Construction Permit