

JUN 27 1986

Paul-Munroe
ATTN: Mr. Richard C. Fisher
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Gentlemen:

The Nuclear Regulatory Commission is in the process of preparing an information notice entitled "Repeated Multiple Failures of Steam Generator Hydraulic Snubbers Leads to Unexpected Erratic Thermal Movements of the Pressurizer Surge Line."

A copy of the latest draft of this information notice is enclosed for your review and comment.

Comments, particularly those dealing with the facts presented in the information notice, received by July 25, 1986 will be considered in the final version.

Sincerely,

/s/

Robert L. Baer, Chief
Engineering and Generic
Communications Branch
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Enclosure: Draft IE Information Notice 86-XX

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

July , 1986

IE INFORMATION NOTICE NO. 86-XX: REPEATED MULTIPLE FAILURES OF STEAM
GENERATOR HYDRAULIC SNUBBERS LEAD TO
UNEXPECTED ERRATIC THERMAL MOVEMENTS
OF THE PRESSURIZER SURGE LINE

Addressees:

All pressurized water nuclear power reactor facilities holding an operating license or a construction permit.

Purpose:

This notice is provided to alert recipients of a potentially significant safety problem pertaining to recent events in which the multiple failures of steam generator hydraulic snubbers were found at two consecutive refueling outages and are suspected of having led to the unexpected erratic thermal movement of the pressurizer surge line. It is expected that recipients will review the information for applicability to their facilities. However, suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On January 7, 1986, the Portland General Electric Company reported [Licensee event report (LER) 85-13] multiple snubber failures at their Trojan Nuclear Plant. The report, and its supplement dated April 1, 1986, identified three areas of multiple snubber failures which had been discovered during the 1985 refueling outage of the unit. These snubber failures were discovered as a direct result of the expanded inservice testing program which was instituted in accordance with a recent change to their technical specifications. The prior inservice inspection program had not required the testing of these snubbers.

The sixteen steam generator hydraulic snubbers at Trojan are 900-Kip Anker-Holth units. Following the failure of the first two of the steam generator snubbers to be tested, the remaining fourteen were declared inoperable because of uncertainty regarding the time required to rebuild the snubbers following testing. The snubbers were removed and overhauled. During the overhaul, the snubber seals were found to be degraded and the hydraulic fluid was heavily contaminated with seal material and rust.

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However, an engineering evaluation of the effect of the failed snubbers on the steam generators was not initiated during the 1985 refueling outage because of the belief that they would not have restricted normal thermal growth. This decision was predicated on the licensee's assumption that the foreign material in the hydraulic fluid would not have affected the normal operation of the snubbers because of the relatively large channels through which fluid would flow under thermal growth conditions. However, in the case of a seismic or other severe dynamic event, it was determined that the snubbers would have activated (i.e., locked up*) and the foreign material could have blocked the bleed orifice. Should this have occurred, the snubber would become locked in its current position until a load reversal allowed flow through the main valve and possibly cleared the bleed port.

Note: *Common snubber nomenclature uses the term "lock up" to refer to both (1) that point where the main flow path is closed and all flow is forced through the bleed orifice and (2) the condition where all flow is stopped and the snubber becomes a rigid strut. To eliminate any possibility for confusion between the two meanings, the term "activated" will be used for the first definition.

As a part of their corrective actions, the steam generator snubbers were overhauled. Following overhaul, the snubbers could not meet their safety analysis acceptance criteria of a maximum drag force of 1,000 pounds at a minimum displacement rate of 25 mil/min. This was because the snubber activated each time the velocity approached 25 mil/min. Following consultation with the reactor vendor, the acceptance criteria was revised and the snubbers tested satisfactorily.

In addition to overhauling the steam generator snubbers, the licensee cleaned the snubber hydraulic system and changed the type of hydraulic fluid used in the system. The change in hydraulic fluid was made to standardize the fluid used throughout the plant and to use one with better qualities in a radiation field. The viscosity differences between the two fluids was analyzed and determined to have an insignificant effect on snubber operation.

In what had been (until midway through the 1985-86 fuel cycle) a separate issue, the licensee had been monitoring the unusual pipe movements of the pressurizer surge line since 1982. A walk-down of this line at the beginning of the 1985 refueling outage revealed additional movement had occurred during the last fuel cycle. A consultant was hired to evaluate and analyze these movements, and had determined that none of the previously identified potential causes, whether singly or combined, could have produced the observed movement. However, when he was advised of the possible problems with the steam generator snubbers, his worst case analysis (i.e., all snubbers on one steam generator were locked-up) indicated that locked-up snubbers could have produced the observed movements.

The revised snubber testing technical specifications required testing of each snubber which had failed its test during the previous testing program. Therefore, the sixteen steam generator hydraulic snubbers were again tested during the 1986 refueling outage. The results of this testing indicated eleven

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failures -- four with excessive drag, three with high bleed rates, and four with no bleed rate. The snubbers with excessive drag and no bleed rate cleared themselves upon load reversal.

Discussion:

Because of the re-occurring snubber failures and the suspected linkage to movement of the primary loop, the licensee contracted for a detailed root cause analysis of the snubber failures. This analysis indicated that the extremely low activation velocity (25 mil/min) of the steam generator snubbers caused them to activate at the slightest movement of fluid through the main flow port. This condition was further exacerbated by the increased viscosity of the new "standard" hydraulic fluid. Once the snubber had activated, all flow was forced through the bleed port. Because of its extremely small size, this port acted much like a fine sieve. Apparently the first particle of foreign material would block the port causing the snubber to lock up.

Based on this root cause analysis, the licensee has changed out the control valves on the steam generator snubbers. The new snubber control valves will have a much higher activation velocity (6 to 10 in/min). In addition, in the new design, the bleed orifices are grooves on the main poppet valve. In this way, the bleed orifices tend to be self cleaning whenever the flow reverses itself.

Conversations with Paul-Munroe, who have taken over the support of the Anker-Holth snubbers, indicate that all of the Anker-Holth steam generator snubbers had extremely low activation velocities. Therefore, they are suspected of having the same type of problems as encountered at Trojan. In addition to Trojan, Paul-Munroe indicated that they were aware of three other utilities who have modified their steam generator snubbers so that they have activation velocities in the 6 to 10 in/min range.

However, since the root cause of the problem is the selection of an extremely low activation velocity, as opposed to a design flaw in the snubbers themselves, the problem may not be limited to only the facilities having Anker-Holth steam generator snubbers.

Attachment 1 to this information notice describes other multiple snubber failures found at Trojan during the 1985 refueling outage.

The information herein is being provided as an early notification of a possibly significant matter that is still under consideration by the NRC staff. Recipients should review the information for possible applicability to their facilities, if NRC evaluation so indicates, further licensee actions may be requested.

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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: Richard J. Kiessel
492-8119

Attachments:

1. Other Multiple Snubber Failures
2. List of Recently Issued IE Information Notices

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Other Multiple Snubber Failures

In addition to the steam generator hydraulic snubber failures, the Trojan LER identified two other areas of multiple snubber failures. Although not the subject of this information notice, they are briefly discussed to assist in identifying all the safety-related failures discussed in the LER.

1. The first additional area of multiple snubber failures was a 25 percent overall failure rate of small mechanical snubbers [Pacific Scientific models PSA-1/4 (36 percent failure rate) and PSA-1/2 (17.6 percent failure rate)].
2. The second additional area of multiple snubber failures was the failure of two of the four main steam line hydraulic snubbers (two 70-Kip and two 130-Kip Bergen-Paterson units).

Additional discussions of multiple snubber failures can be found in IE Information Notice 84-67, "Recent Snubber Inservice Testing with High Failure Rates," LER 84-079 for San Onofre Nuclear Generating Station Unit 2 (dated January 25, 1985, and revised March 12, 1985), and LER 85-027 for San Onofre Nuclear Generating Station Unit 3 (dated May 16, 1985).

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