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

July 9, 1987

NRC BULLETIN NO. 87-01: THINNING OF PIPE WALLS IN NUCLEAR POWER PLANTS

Addressees:

All licensees for nuclear power plants holding an operating license or a construction permit.

Purpose:

The purpose of this bulletin is to request that licensees submit information concerning their programs for monitoring the thickness of pipe walls in high-energy single-phase and two-phase carbon steel piping systems.

Description of Circumstances:

On December 9, 1986, Unit 2 at the Surry Power Station experienced a catastrophic failure of a main feedwater pipe, which resulted in fatal injuries to four workers. This event was reported in IE Information Notice (TN) 86-1069 "Feedwater Line Break," on December 16, 1986; IN 86-106, Supplement I., on February 13, 1987; and TN 86-106, Supplement 2, on March

18, 1987. The licensee submitted Licensee Event Report (LER) 86-020-00 on January 8, 1987; Revision 1, LER 86-020-01, on January 14, 1987; and Revision 2, LER 86-020-02, on March 31, 1987. A comprehensive report entitled "Surry Unit 2 Reactor Trip and Feedwater Pipe Failure Report," was attached to the updated LER, Revisions 1 and 2. The findings of NRC's Augmented Inspection Team were issued on February 10, 1987, in IE Inspection Report Nos. 50-280/86-42 and 50-281/86-42.

Investigation of the accident and examination of data by the licensee, NRC, and others led to the conclusion that failure of the piping was caused by erosion/corrosion of the carbon steel pipe wall. Although erosion/corrosion pipe failures have occurred in other carbon steel systems, particularly in small diameter piping in two-phase systems and in water systems containing suspended solids, there have been few previously reported failures in large diameter systems containing high-purity water. Consistent with general industry practice, the licensee did not have in place an inspection program for examining the thickness of the walls of feedwater and condensate piping.

Main feedwater systems, as well as other power conversion systems, are important to safe operation. Failures of active components in these systems, for example, valves or pumps, or of passive components such as piping, can result in undesirable challenges to plant safety systems required for safe shutdown and accident mitigation. Failure of high-energy piping, such as feedwater

system piping, can result in complex challenges to operating staff and the plant because of potential systems interactions of high-energy steam and water with other systems, such as electrical distribution, fire protection, and security systems. All licensees have either explicitly or implicitly committed to maintain the functional capability of high-energy piping systems that are a part of the licensing basis for the facility. An important part of this commitment is that piping will be maintained within allowable thickness values.

Actions Requested:

Within 60 days from the receipt of this bulletin, licensees are requested to provide the following information concerning their programs for monitoring the wall thickness of pipes in condensate, feedwater, steam, and connected high-energy piping systems, including all safety-related and non-safety-related piping systems fabricated of carbon steel:

1. Identify the codes or standards to which the piping was designed and fabricated.

2. Describe the scope and extent of your programs for ensuring that pipe wall thicknesses are not reduced below the minimum allowable thickness. Include in the description the criteria that you have established for:

   a. selecting points at which to make thickness measurements

b. determining how frequently to make thickness measurements
c. selecting the methods used to make thickness measurements
d. making replacement/repair decisions

3. For liquid-phase systems, state specifically whether the following factors have been considered in establishing your criteria for selecting points at which to monitor piping thickness (Item 2a):

   a. piping material (e.g., chromium content)
   b. piping configuration (e.g., fittings less than 10 pipe diameters part
   c. pH of water in the system (e.g., pm less than 10)
   d. system temperature (e.g., between 190 and 500 F)
   e. fluid bulk velocity (greater than 10 ft/s)
   f. oxygen content in the system (e.g., oxygen content less than 50 ppb)

4. Chronologically list and summarize the results of all inspections that have been performed, which were specifically conducted for the purpose of identifying pipe wall thinning, whether or not pipe wall thinning was discovered, and any other inspections where pipe wall thinning was discovered even though that was not the purpose of that inspection.

   a. Briefly describe the inspection program and indicate whether it was specifically intended to measure wall thickness or whether wall thickness measurements were an incidental determination.

   b. Describe what piping was examined and how (e.g., describe the inspection, instrument(s), test method, reference thickness, locations examined, means for locating measurement point(s) in subsequent inspections).

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   c. Report thickness measurement results and note those that were identified as unacceptable and why.

   d. Describe actions already taken or planned for piping that has been found to have a nonconforming wall thickness. If you have performed a failure analysis, include the results of that analysis. Indicate whether the actions involve repair or replacement, including any change of materials.

5. Describe any plans either for revising the present or for developing new or additional programs for monitoring pipe wall thickness.

The written report shall be submitted to the appropriate Regional Administrator under oath or affirmation under provisions of Section 182a, Atomic Energy Act of 1954, as amended. In addition, the original of the cover letter and a copy of the report shall be transmitted to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555 for reproduction and distribution.

This request for information was approved by the Office of Management and

Budget under blanket clearance number 3150-0011. Comments on burden and duplication may be directed to the Office of Management and Budget, Reports Management, Room 3208, New Executive Office Building, Washington, D.C. 20503.

NRC intends to summarize the information collected under this bulletin and study it to help determine if additional actions are required by the staff and/or industry. The information will be analyzed and placed in the PDR.

If you have any questions about this matter, please contact the Regional Administrator of the appropriate NRC regional office or the technical contacts listed below.

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Attachment: List of Recently Issued Bulletins

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