SSINS No.: 6835
IN 87-44

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

September 16, 1987

NRC INFORMATION NOTICE NO. 87-44: THIMBLE TUBE THINNING IN WESTINGHOUSE REACTORS

Addressees:

All pressurized water reactor facilities employing a Westinghouse nuclear steam supply system (NSSS) holding an operating license or a construction permit.

Purpose:

This information notice is being provided to alert addressees to potential problems resulting from thimble tube thinning in Westinghouse reactors. It is expected that recipients will review the information for applicability to their facilities and consider actions, if appropriate, to avoid similar problems. However, suggestions contained in this information notice do not constitute NRC requirements; therefore no specific action or written response is required.

Description of Circumstances:

During the recent refueling outage at North Anna Unit 1, eddy current (EC) testing identified wall thinning on approximately 23 out of 50 thimble tubes. The wall degradation occurred on the thimble tubes just above the lower core plate, between the lower core plate and the fuel assembly guide tubes. Several thimble tubes with greater than 35% wall thinning were identified, with one thimble tube thinned as much as 49%.

Discussion:

The movable incore neutron detectors travel within retractable thimble tubes. The thimble tubes normally extend (as indicated in Attachment 1) from a 10-path transfer device, through the seal table, through the bottom of the reactor vessel, and into selected fuel assemblies. The thimble tubes are supported by guide tubes within the lower vessel region and the fuel assemblies, and by high-pressure conduits between the reactor vessel and the seal table.

The thimble tubes are sealed at the leading (reactor) end, but are open at the 10-path transfer device to allow insertion of an incore neutron detector.

Mechanical high-pressure seals, located at the seal table, are used to seal the area between the thimble tube and the high-pressure conduit. This seal serves as a reactor coolant system (RCS) pressure boundary since the area between the thimble tube and the high pressure conduit is at RCS pressure. Consequently, a leak in a thimble tube results in degradation of the RCS pressure boundary by creating a path for reactor coolant to bypass the mechanical seal. In order to halt the flow of leaking reactor coolant, the manual isolation valve must be closed.

As indicated, the thimble tubes are supported over most of their length. However, a small portion of the thimble tube is directly exposed to RCS flow. This exposed portion is between the top of the lower core plate and the bottom of the fuel assembly. This region is approximately 18.4 to 34.8 mm in length, depending on the reactor type. It is believed that flow-induced vibration on this exposed portion causes fretting at the adjacent guide tubes.

Undetected thinning of a thimble tube could lead to the development of a non-isolable leak and a corresponding loss of reactor coolant. As discussed previously, the manual isolation valve would have to be closed to halt the flow of leaking reactor coolant. The leaking coolant may create an environment in the vicinity of the isolation valves too hazardous for personnel to enter.

Leaking thimble tubes could result in degradation of the incore neutron monitoring system. If not isolated, reactor coolant from leaking thimble tubes can flow into the 10-path transfer device, allowing coolant to flood the other thimble tubes originating from that device. This could result in rendering inoperable more than just the leaking tube.

In addition to North Anna Unit 1, incore thimble tube thinning and leakage has been detected at facilities in France and Belgium. In this country, leaks in thimble tubes are known to have occurred at Salem Unit 1. In Licensee Event Report (LER) 81-028, Public Service Electric & Gas Co. (PSE&G) reported that three incore thimble tubes were known to have developed leaks because of fretting. One of these leaks resulted in the flooding of all six 10-path transfer devices, partially or completely flooding all the thimble tubes in the reactor. In addition, thinning has been detected on the Farley thimble tubes.

At North Anna Unit 1, the proposed corrective action was to retract selected thimble tubes approximately 2 inches. This would move the thinned area out of the region of high turbulence. In addition, the thimble tube that experienced the most degradation will be taken out of service by closing the corresponding isolation valve.

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.

Charles E. Rossi

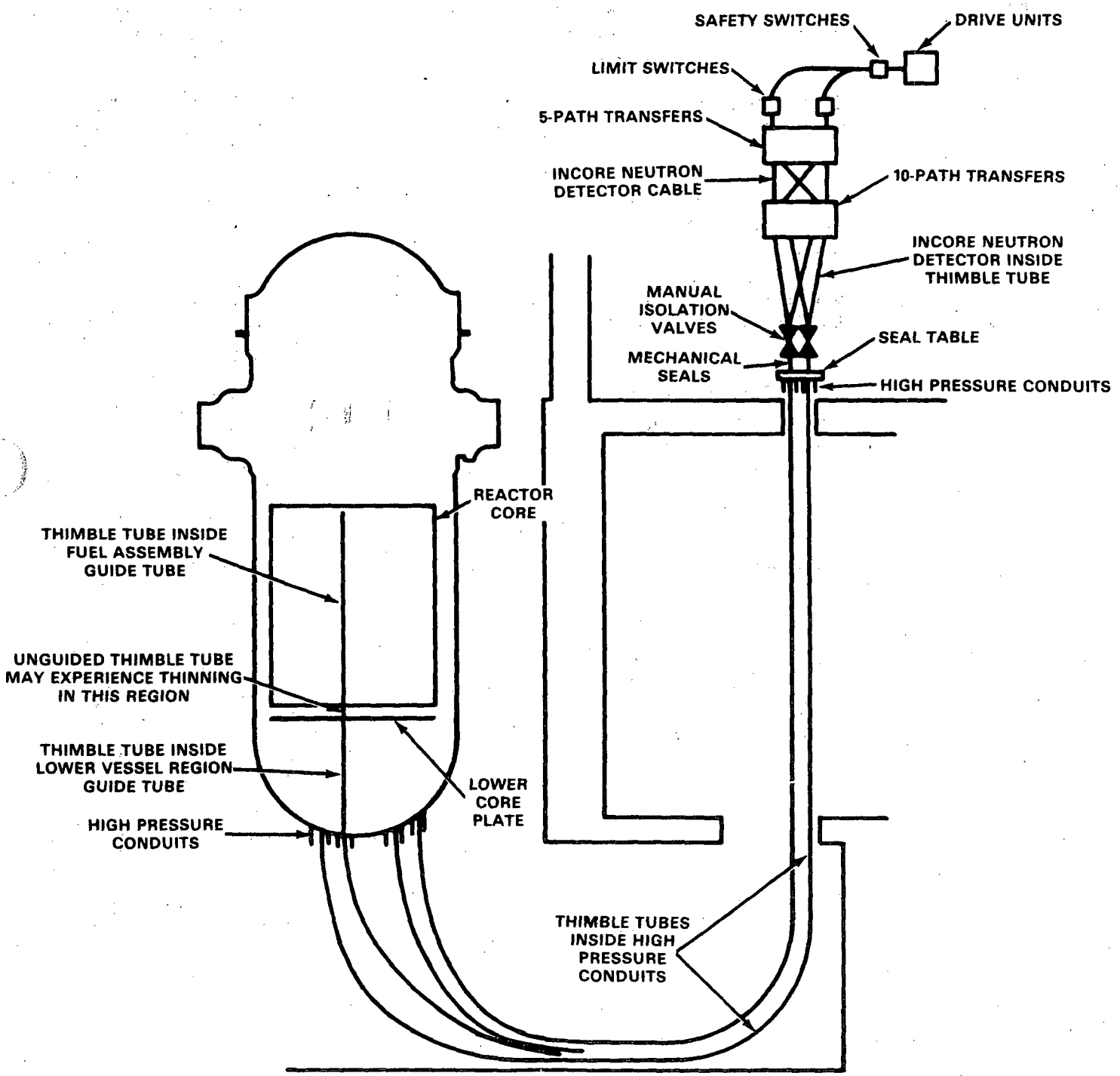
Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contact: Jack Ramsey, NRR
(301) 492-9081

Attachments:
1. Typical Westinghouse Incore Neutron Monitoring System
2. List of Recently Issued NRC Information Notices

Attachment 1

TYPICAL WESTINGHOUSE INCORE NEUTRON MONITORING SYSTEM



LIST OF RECENTLY ISSUED
INFORMATION NOTICES 1987

Information Notice No.	Subject	Date of Issuance	Issued to
87-43	Gaps in Neutron-Absorbing Material in High-Density Spent Fuel Storage Racks	9/8/87	All nuclear power reactor facilities holding an OL or CP.
87-42	Diesel Generator Fuse Contacts	9/4/87	All nuclear power reactor facilities holding an OL or CP.
87-41	Failures of Certain Brown Boveri Electric Circuit Breakers	8/31/87	All nuclear power reactor facilities holding an OL or CP.
87-40	Backseating Valves Routinely to Prevent Packing Leakage	8/31/87	All nuclear power reactor facilities holding an OL or CP.
87-39	Control of Hot Particle Contamination at Nuclear Power Plants	8/21/87	All nuclear power reactor facilities and spent fuel storage facilities holding an NRC license or CP.
87-38	Inadequate or Inadvertent Blocking of Valve Movement	8/17/87	All nuclear power reactor facilities holding an OL or CP.
87-37	Compliance with the General License Provisions of 10 CFR Part 31	8/10/87	All persons specifically licensed to manufacture or to initially transfer devices containing radioactive material to general licensees, as defined in 10 CFR Part 31.
87-36	Significant Unexpected Erosion of Feedwater Lines	8/4/87	All nuclear power reactor facilities holding an OL or CP.

OL = Operating License
CP = Construction Permit