UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 17, 1985

TO ALL PWR LICENSEES OF OPERATING REACTORS, APPLICANTS FOR OPERATING LICENSES, AND HOLDERS OF CONSTRUCTION PERMITS, AND FT. ST. VRAIN

Gentlemen:

SUBJECT: STAFF RECOMMENDED ACTIONS STEMMING FROM NRC INTEGRATED PROGRAM FOR THE RESOLUTION OF UNRESOLVED SAFETY ISSUES REGARDING STEAM GENERATOR TUBE INTEGRITY (GENERIC LETTER 85-02)

The Commission has recently approved issuance of this generic letter to all nuclear power plants utilizing steam generators, to obtain information on their overall program for steam generator tube integrity and steam generator tube rupture mitigation. This information will allow the staff to assess the areas of concern addressed by the staff's recommended actions (see Enclosure 1) which were developed as part of the integrated program for the resolution of Unresolved Safety Issues A-3, A-4 and A-5 regarding steam generator tube integrity. The staff's program report, NUREG-0844 (draft report for comment), is provided as Enclosure 3. NUREG-0844 will be issued in final form following a 90-day period for public comment.

Steam generator tube integrity was designated an unresolved safety issue (USI) in 1978 and Task Action Plans (TAP) A-3, A-4 and A-5 were established to evaluate the safety significance of degradation in Westinghouse, Combustion Engineering and Babcock & Wilcox steam generators, respectively. These studies were later combined into one effort due to the similarity of many problems among the PWR vendors.

Staff concerns relative to steam generator tube degradation stem from the fact that the steam generator tubes are a part of the reactor coolant system (RCS) boundary and that tube ruptures allow primary coolant into the secondary system where its isolation from the environment is not fully ensured. The leakage of primary coolant into the secondary system has two potential safety implications which were considered. The first is the direct release of radioactive fission products to the environment; and the second is the loss of primary coolant water which is needed to prevent core damage. An extended, uncontrolled loss of coolant outside of containment could result in the depletion of the initial RCS water inventory and ECCS water without the capability to recirculate the water.

An integrated program was initiated by the staff in May 1982 to consider initial recommendations from the USI effort, and to assess the lessons which could be learned from the four domestic SGTR events; Point Beach 1 in 1975; Surry 2 in 1976; Prairie Island 1 in 1979; and Ginna in 1982. A number of potential requirements for industry were identified and subjected to a value impact evaluation.

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These analyses indicate that: the probability of core melt from events involving steam generator tube ruptures is not a major contributor to total core melt risk; that steam generator tube ruptures are an important contributor to the probability of significant non-core melt releases; and that steam generator tube degradation is a major contributor to occupational radiation exposure at PWR's.

Based upon the results of the staff's integrated program, the staff has developed recommended actions in the following areas:

1. Prevention and Detection of Loose Parts and Foreign Objects
2. Steam Generator Tube Inservice Inspection
3. Secondary Water Chemistry Program
4. Condenser Inservice Inspection Program
5. Primary to Secondary Leakage Limit
6. Coolant Iodine Activity Limit
7. Safety Injection Signal Reset

The staff's recommended actions have been found to be effective measures on a plant specific basis for significantly reducing (1) the incidence of tube degradation, (2) the frequency of tube ruptures and the corresponding potential for significant non-core melt releases, and (3) occupational exposures, and are consistent with good operating and engineering practices.

Accordingly, operating reactor licensees and applicants for an operating license (this letter is for information only for those utilities that have not applied for an operating license) are requested to furnish to the Director, Division of Licensing, Office of Nuclear Reactor Regulation, no later than 60 days from the date of this letter, a description of their overall programs for assuring steam generator tube integrity and for steam generator tube rupture mitigation. The description of the plant specific programs should be sufficiently detailed to allow the staff to compare these actions with the staff recommended actions as presented in Enclosure 1.

The staff recommended actions above do not address supplemental tube sample inspections for the case where Category C-2 results are obtained during initial sample inspections. The staff initially considered a proposed upgrading of existing Technical Specification requirements in this area (see Section 2.2.1 of the enclosed draft NUREG-0844), and this proposal was commented upon extensively by industry. The staff has concluded that the particular proposal considered was not warranted as a generic staff position or recommendation. However, as part of the information requested by this letter, licensees and applicants are requested to describe practices they employ to ensure adequate inspection samples are taken in the event that Category C-2 results are obtained during initial sampling. The information requested is described in additional detail in Enclosure 2.

The staff will review each response from licensees and applicants, and evaluate the overall effectiveness of plant-specific programs to prevent and mitigate the occurrence of steam generator tube ruptures. The staff recognizes, however, that plants specific programs may differ from the staff recommended actions, and still be adequately effective. The results of the staff review will be reported directly to the Commission. The Commission has specifically requested that the staff include in its report the number and quality of the responses, noting in particular any utilities delinquent in providing the requested information and any recommended corrective actions.

The staff will continue to monitor licensees' commitments and programs relative to steam generator integrity and SGTR mitigation to determine if they are being effectively implemented. As has been true in the past, additional actions may become necessary in plant specific instances of extensive or severe degradation.

This request for information was approved by the Office of Management and Budget under clearance number 3150-0011 which expires April 30, 1985. Comments on burden and duplication may be directed to the Office of Management and Budget, Report Management Room 3208, New Executive Office Building, Washington, D. C. 20503.

Mr. Emmett Murphy, Operating Reactors Assessment Branch, will be the point of contact. If you have questions or desire additional information, he can be reached on (301) 492-7457.

Sincerely,

Original Signed by
Hugh L. Thompson, Jr.

Hugh L. Thompson, Jr., Director
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosures:
1. Staff Recommended Actions Stemming from NRC Integrated Program for the Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity
2. Request for Information Concerning Category C-2 Steam Generator Tube Inspections
3. NUREG-0844 (Draft Report For Comment), NRC Integrated Program for the Resolution of Unresolved Safety Issues

*PREVIOUS CONCURRENCE SEE DATE

ORAB:DL*	C/ORAB:DL*	CHEB:DL*	D/DE*	AD/SA:DL*	D/DL*	D/DL
EMurphy:dm	GHolahan	CMcCracken	JKnight	DCrutchfield	FMiraglia	HThompson
2/05/85	2/05/85	2/07/85	2/07/85	2/07/85	2/07/85	4/9/85

ENCLOSURE 1

STAFF RECOMMENDED ACTIONS AND REVIEW GUIDELINES

STEMMING FROM NRC INTEGRATED PROGRAM

FOR THE RESOLUTION OF UNRESOLVED SAFETY ISSUES

REGARDING STEAM GENERATOR TUBE INTEGRITY

1.a PREVENTION AND DETECTION OF LOOSE PARTS (INSPECTIONS)

Staff Recommended Action

Visual inspections should be performed on the steam generator secondary side in the vicinity of the tube sheet, both along the entire periphery of the tube bundle and along the tube lane, for purposes of identifying loose parts or foreign objects on the tubesheet, and external damage to peripheral tubes just above the tubesheet. An appropriate optical device should be used (e.g., mini-TV camera, fiber optics). Loose parts or foreign objects which are found should be removed from the steam generators. Tubes observed to have visual damage should be eddy current inspected and plugged if found to be defective.

These visual inspections should be performed: (1) for all steam generators at each plant at the next planned outage for eddy current testing, (2) after any secondary side modifications, or repairs, to steam generator internals, and (3) when eddy current indications are found in the free span portion of peripheral tubes, unless it has been established that the indication did not result from damage by a loose part or foreign object.

For PWR OL applicants, such inspections should be part of the preservice inspection.

For steam generator models where certain segments of the peripheral region can be shown not to be accessible to an appropriate optical device, licensees and applicants should implement alternative actions to address these inaccessible areas, as appropriate.

Licensees should take appropriate precautions to minimize the potential for corrosion while the tube bundle is exposed to air. The presence of chemical species such as sulfur may aggravate this potential, and may make exposure to the atmosphere inadvisable until appropriate remedial measures are taken.

Reference

Section 2.1 of NUREG-0844.

1.b PREVENTION AND DETECTION OF LOOSE PARTS (QUALITY ASSURANCE)

Staff Recommended Action

Quality assurance/quality control procedures for steam generators should be reviewed and revised as necessary to ensure that an effective system exists to preclude introduction of foreign objects into either the primary or secondary side of the steam generator whenever it is opened (e.g., for maintenance, sludge lancing, repairs, inspection operations, modifications). As a minimum, such procedures should include: (1) detailed accountability procedures for all tools and equipment used during an operation, (2) appropriate controls on foreign objects such as eye glasses and film badges, (3) cleanliness requirements, and (4) accountability procedures for components and parts removed from the internals of major components (e.g., reassembly of cut and removed components).

Reference

Section 2.1 of NUREG-0844.

2.a INSERVICE INSPECTION PROGRAM (FULL LENGTH TUBE INSPECTION)

Staff Recommended Action

The Standard Technical Specifications (STS) and Regulatory Guide 1.83, Part C.2.f, currently define a U-tube inspection as meaning an inspection of the steam generator tube from the point of entry on the hot-leg side completely around the U-bend to the top support of the cold-leg side. The staff recommends that tube inspections should include an inspection of the entire length of the tube (tube end to tube end) including the hot leg side, U-bend, and cold leg side.

This recommended action does not mean that the hot leg inspection sample and the cold leg inspection sample should necessarily involve the same tubes. That is, it does not preclude making separate entries from the hot and cold leg sides and selecting different tubes on the hot and cold leg sides to meet the minimum sampling requirements for inspection.

Consistent with the current STS requirement, supplemental sample inspections (after the initial 3% sample) under this staff recommended action may be limited to a partial length inspection provided the inspection includes those portions of the tube length where degradation was found during initial sampling.

Reference

Section 2.2.2 of NUREG-0844.

2.b INSERVICE INSPECTION PROGRAM (INSPECTION INTERVAL)

Staff Recommended Action

The maximum allowable time between eddy current inspections of an individual steam generator should be limited in a manner consistent with Section 4.4.5.3 of the Standard Technical Specifications, and in addition should not extend beyond 72 months.

Reference

Section 2.2.4 of NUREG-0844.

3.a SECONDARY WATER CHEMISTRY PROGRAM

Staff Recommended Action

Licensees and applicants should have a secondary water chemistry program (SWCP) to minimize steam generator tube degradation.

The specific plant program should incorporate the secondary water chemistry guidelines in SGOG Special Report EPRI-NP-2704, "PWR Secondary Water Chemistry Guidelines," October 1982, and should address measures taken to minimize steam generator corrosion, including materials selection, chemistry limits, and control methods. In addition, the specific plant procedures should include progressively more stringent corrective actions for out-of-specification water chemistry conditions. These corrective actions should include power reductions and shutdowns, as appropriate, when excessively corrosive conditions exist. Specific functional individuals should be identified as having the responsibility/authority to interpret plant water chemistry information and initiate appropriate plant actions to adjust chemistry, as necessary.

The referenced SGOG guidelines above were prepared by the Steam Generator Owners Group Water Chemistry Guidelines Committee and represent and consensus opinion of a significant portion of the industry for state-of-the-art secondary water chemistry control.

Reference

Section 2.5 of NUREG-0844.

3.b CONDENSER INSERVICE INSPECTION PROGRAM

Staff Recommended Action

Licensees should implement a condenser inservice inspection program. The program should be defined in plant specific safety-related procedures and include:

1. Procedures to implement a condenser inservice inspection program that will be initiated if condenser leakage is of such a magnitude that a power reduction corrective action is required more than once per three month period; and

2. Identification and location of leakage source(s), either water or air;

3. Methods of repair of leakage;

4. Methodology for determining the cause(s) of leakage;

5. A preventive maintenance program.

Reference

Section 2.6 of NUREG-0844.

4. PRIMARY TO SECONDARY LEAKAGE LIMIT

Staff Recommended Action

All PWRs that have Technical Specifications limits for primary to secondary leakage rates which are less restrictive than the Standard Technical Specifications (STS) limits should implement the STS limits.

Reference

Section 2.8 of NUREG-0844.

5. COOLANT IODINE ACTIVITY LIMIT

Staff Recommended Action

PWRs that have Technical Specifications limits and surveillance for coolant iodine activity that are less restrictive than the Standard Technical Specification (STS) should implement the STS limits. Those plants identified above that also have low head high pressure safety injection pumps should either: (1) implement iodine limits which are 20% of the STS values, or (2) implement reactor coolant pump trip criteria which will ensure that if offsite power is retained, no loss of forced reactor coolant system flow will occur for steam generator tube rupture events up to and including the design basis double-ended break of a single steam generator tube, and implement iodine limits consistent with the STS.

Reference

Section 2.9 of NUREG-0844.

6. SAFETY INJECTION SIGNAL RESET

Staff Recommended Action

The control logic associated with the safety injection pump suction flow path should be reviewed and modified as necessary, by licensees, to minimize the loss of safety function associated with safety injection reset during an SGTR event. Automatic switchover of safety injection pump suction from the boric acid storage tanks (BAST) to the refueling water storage tanks should be evaluated with respect to whether the switchover should be made on the basis of low BAST level alone without consideration of the condition of the SI signal.

Reference

Section 2.11 of NUREG-0844.

ENCLOSURE 2

REQUEST FOR INFORMATION CONCERNING CATEGORY C-2

STEAM GENERATOR TUBE INSPECTIONS

Information Requested

The enclosed draft NUREG-0844 Section 2.2.1.2 describes certain limitations which the staff believes to be inherent in the present Technical Specification steam generator ISI requirements pertaining to Category C-2 inspection results. Licensees and applicants are requested to provide a description of their current policy and actions relative to this issue and any recommendations they have concerning how existing Technical Specification steam generator ISI requirements pertaining to Catetory C-2 inspection results could be improved to better ensure that adequate inspections will be performed. This description should include a response to the following questions:

1. What factors do, or would, the licensee or applicant consider in determining (a) whether additional tubes should be inspected beyond what is required by the Technical Specifications, (b) whether all steam generators should be included in the inspection program, and (c) when the steam generators should be reinspected.

2. To what extent do these factors include consideration of the degradation mechanism itself and its potential for causing a tube to be vulnerable to rupture during severe transients or postulated accident before rupture or leakage of that tube occurs during normal operation.

Reference

Section 2.2 of NUREG-0844.

LIST OF RECENTLY ISSUED GENERIC LETTERS

GENERIC LETTER NO.	SUBJECT	DATE
84-15	Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability	7/2/84
84-16	Adequacy of On-Shift Operating Experience for Applicants	6/27/84
84-17	Annual Meeting to Discuss Recent Developments Regarding Operator Training, Qualifications and Examinations	7/3/84
84-18	Filing of Applications for Licenses and Amendments	7/6/84
84-19	Availability of Supplement 1 to NUREG-0933 "A Prioritization of Generic Safety Issues"	8/6/84
84-20	Scheduling Guidance for Licensee Submittals of Reloads that Involve Unreviewed Safety Questions	8/20/84
84-21	Long Term Low Power Operation in PWR's	10/16/84
84-22	Not used	
84-23	Reactor Vessel Water Level Instrumentation in BWRs	10/26/84
84-24	Clarification of Compliance to 10 CFR 50.49 Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants	12/27/84
85-01	Fire Protection Policy Steering Committee Report	1/9/85
85-02	Staff Recommended Actions Stemming From NRC Integrated Program for the Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity	4/15/85
85-03	Clarification of Equivalent Control Capacity For Standby Liquid Control Systems	1/28/85
85-04	Operator Licensing Examinations	1/29/85
85-05	Inadvertent Boron Dilution Events	1/31/85

The staff will review each response from licensees and applicants, and evaluate the overall effectiveness of plant-specific programs to prevent and mitigate the occurrence of steam generator tube ruptures. The staff recognizes, however, that plants specific programs may differ from the staff recommended actions, and still be adequately effective. The results of the staff review will be reported directly to the Commission. The Commission has specifically requested that the staff include in its report the number and quality of the responses, noting in particular any utilities delinquent in providing the requested information and any recommended corrective actions.

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Sincerely,

Hugh L. Thompson, Jr., Director
Division of Licensing
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Sincerely,

Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

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