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SUBJECT: Responds to Generic Ltr 85-02 re staff-recommended actions for resolution of unresolved safety issues involving steam generator tube integrity.Response to draft NUREG-0844, 2.2.1.2 questions encl.

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WISCONSIN PUBLIC SERVICE CORPORATION Public Service

P.O. Box 700, Green Bay, Wisconsin 54305

June 17, 1985

Director, Office of Nuclear Reactor Regulation
Attention: Mr. H. L. Thompson Jr., Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Response to Staff Recommended Actions Regarding Steam Generator Tube Integrity
(Generic Letter 85-02)

On April 17, 1985 the Staff issued Generic Letter 85-02, Staff Recommended Actions Stemming From NRC Integrated Program for the Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity.

WPSC management holds high regard for the issue of steam generator tube integrity and generally agrees with the staff recommended actions in Generic Letter 85-02.

WPSC's integrated program for assuring steam generator tube integrity is addressed in the attachment to this letter. WPSC's program is described in the framework of the Staff's recommended actions along with a discussion on WPSC's steam generator eddy current inspection philosophy.

Very truly yours,

D. C. Hintz
Manager - Nuclear Power

GWH/js
Attach.
cc - Mr. S. A. Varga, US NRC
Mr. Robert Nelson, US NRC

A058 1/1

Response to Generic Letter 85-02

Regarding Steam Generator Tube Integrity

I. Prevention and Detection of Loose Parts

   a. Visual Inspection of Secondary Side
   b. Quality Assurance Work Procedures

II. Steam Generator Tube Inservice Inspection

   a. Full Length Inspections
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V. Primary to Secondary Leakage Limit

VI. Coolant Iodine Activity Limit

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VIII. Information Concerning Category C-2 Steam Generator Tube Inspections

I. Prevention and Detection of Loose Parts

a. Detection

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.

WPSC Response:

The steam generator (S/G) secondary side visual inspection is termed 'annular search' at the Kewaunee Nuclear Power Plant (KNPP). An annular search has been performed on both of Kewaunee's, Westinghouse, model 51 S/G's during each of the past three refueling outages. The annular search is conducted on top of the tube sheet along the periphery of the tube bundle and through the tube lane.

During the past three refueling outages the annular search has been performed after sludge removal and prior to eddy current examination. Performance in this sequence provides a measure of sludge removal effectiveness as well as locating foreign objects and identifying gross wear in the periphery of the tube bundle.

WPSC foresees the annular search program to continue at intervals consistent with refueling outages. As a minimum, annular searches will be performed following S/G secondary side modifications. An annular search would also be initiated if WPSC chose to forgo the search prior to eddy current and unexplainable eddy current indications were present in the peripheral tubes near the tubesheet.

Annular searches are performed in an expeditious manner, minimizing the time that the secondary side of the S/G is open to atmosphere. Because the steam generators are QA 1, their maintenance is covered under the nuclear safety related quality assurance program. Ingress of reactive chemical species during the annular search is unlikely as there are significant quality controls during these evolutions, such as procedural sign-offs requiring accountability of all tools and equipment entering the manways or hand holes and QC hold points for critical evolutions.

b. Prevention

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).

WPSC Response:

Most of the maintenance on Kewaunee's steam generators is performed by contractors under WPSC management control. Accountability of foreign objects brought into the primary and secondary sides of the steam generators is satisfied by management control over vendor procedures.

The steam generators at Kewaunee are QA 1, hence their maintenance is covered by WPSC's nuclear safety related QA program. Steam generator maintenance procedures must be reviewed by the Plant Operations Review Committee (PORC) and approved by the plant manager prior to implementation.

QC controls implemented in these procedures include taping, or securing with lanyards, all loose particles or objects to the person making a steam generator entry. These controls also include accountability sheets for each and every piece of material or tool entering and exiting the steam generator. QC hold points are appropriately placed in procedures requiring QC inspections for general cleanliness and loose parts.

When actual work is not being performed, such as during the 4 hours between the night and day shift during refueling, all openings are covered and taped shut to prevent inadvertent ingress of foreign materials. To date, no major modifications requiring cutting and removal of parts from the steam generators has been necessary. Should it be required in the future, the appropriate controls similar to those mentioned above would be implemented prior to commencing work.

II. Steam Generator Tube Inservice Inspection

a. Full Length Inspections

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.

WPSC Response:

WPSC agrees that full length tube inspections are warranted from past plant operating experiences. In 1983 WPSC inspected all accessible steam generator tubes; 18% full length, 32% through the U-bend, and 50% to the first support plate. During the 1984 and 1985 refueling outages WPSC performed a full length eddy current inspection of all accessible steam generator tubes in both generators.

As long as future inspections yield results similar to the past 3 years, it is likely that WPSC will continue full length eddy current inspections of all accessible steam generator tubes, in both generators. WPSC management feels the expense incurred from this expanded inspection program is far outweighed by the added assurance that plant operation will not be affected by a steam generator tube leak or rupture.

WPSC agrees that if a minimum sample size were chosen it should include hot and cold leg inspections, not necessarily in the same tube. WPSC also agrees that supplemental sample inspections (after an initial 3% sample) could be limited to part length provided those portions of the tube length where degradation was found during previous examinations are included.

b. <u>Steam Generator Inservice Inspection Interval</u>

<u>Staff Recommended Action</u>

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.

<u>WPSC Response</u>:

The tubes in Kewaunee's steam generators have been eddy current inspected during refueling outages of 1976, 1977, 1980, 1983, 1984 and 1985. As long as the present steam generator tube degradation continues it is likely that steam generator eddy current inspections will continue yearly. Inspecting the steam generators annually is an integral part of Management's commitment to assure plant operation is not affected by a S/G tube leak or rupture.

The inservice inspection intervals for steam generator eddy current testing in the KNPP Technical Specifications are consistent with Standard Technical Specifications in NUREG 0452.

Presently both steam generators at Kewaunee must be inspected every 24 months, as they are in the C-2 category and have been shown not to perform in a like manner. The inspection frequency could be extended to both S/G's every 40 months if two consecutive inspections yield C-1 results or two consecutive inspections demonstrate degradation has not continued and no additional degradation has occurred.

The above constraints assure the interval between inspections of an individual steam generator will not exceed 80 months.

III. 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.

WPSC Response:

By letter dated August 1, 1979 the NRC requested that WPSC propose a license condition requiring implementation of a secondary water chemistry monitoring and control program. WPSC addressed each of the points in the NRC's request and concluded a license condition was inappropriate.

On November 29, 1982 the staff reiterated their August 1, 1979 request that WPSC propose a license amendment requiring implementation of a secondary water chemistry program (SWCP).

WPSC responded to the November 29, 1982 request with a license amendment proposing the following:

> "The Licensee shall implement a secondary water chemistry monitoring program. The intent of this program will be to control corrosion, thereby inhibiting steam generator tube degradation. The secondary water chemistry program shall act as a guide for the chemistry group in their routine as well as nonroutine activities."

The proposed license amendment was approved as submitted.

Kewaunee's SWCP was formalized into the following procedures:

1) Steam Generator Failure Mechanisms
2) Control Philosophy for Secondary Water Chemistry
3) Secondary Chemistry Sample Locations
4) Secondary Chemistry Sample Specifications
5) Secondary Chemistry Analysis Methods
6) Secondary Chemistry Corrective Actions
7) Secondary Chemistry Data Management
8) Secondary Chemistry Equivalent Inleakage Rate

The S/G Failure Mechanism procedure describes various modes of degradation in Westinghouse feedring S/G's. Mitigation and prevention of these failure mechanisms forms the basis of Kewaunee's SWCP. This procedure discusses various failure modes including antivibration bar fretting, row 1 and row 2 U-bend problems, tube support plate denting, cold leg thinning, sludge pile attack, and crevice attack. The procedure concludes with a discussion of various means to mitigate these failure modes.

The Control Philosophy for Secondary Water Chemistry procedure reiterates the importance of establishing and maintaining appropriate water chemistry conditions in the secondary plant. Control philosophies are discussed based on operating practices developed from field histories, laboratory data, and actual in-plant experiences. pH control, cation conductivity control, Oxygen control and makeup water control philosophies are presented along with their interrelations and expected behaviors with contaminant ingress.

The Secondary Chemistry Sample Location procedure includes a flow diagram illustrating various sample points in the condensate and feed train.

The Secondary Chemistry Sample Specification procedure specifies the minimum sample frequency, parameters to be monitored, and limits for full power operation to minimize secondary plant corrosion at power. The parameter limits include control ranges and action levels.

The Secondary Chemistry Analysis Methods procedure specifies the methods used for analysis of secondary chemistry.

The Secondary Chemistry Corrective Actions procedure specifies the corrective actions when specific action levels are exceeded. There are action levels on S/G pH, S/G Sodium, S/G Chloride, S/G Silica, feedwater pH, feedwater dissolved Oxygen, and condensate dissolved Oxygen. Whenever these action levels are exceeded the procedure indicates that the Chemistry Supervisor will be informed and direct all corrective actions. The procedure also indicates that power reductions for condenser leak searches will be required if S/G Sodium, S/G Chloride, or S/G Silica exceed their action levels and the contaminant ingress is shown to be through the condenser.

The Secondary Chemistry Data Management procedure specifies the administrative control of secondary chemistry data. The procedure requires data to be logged daily along with analysis notes and changes in operating conditions. This procedure also requires that the laboratory personnel keep the Chemistry Supervisor informed of all abnormal chemistry conditions. Also, parameter and parameter relationships are to be trended, as appropriate, by the Chemistry Supervisor. In addition this procedure requires distribution of each month's chemistry data to the

Chemistry Supervisor, Westinghouse Chemistry Group, Hartford Insurance, Corporate Nuclear Engineering, and the Nuclear Fuels Group.

The Secondary Chemistry Equivalent Inleakage Rate procedure provides a consistent method of converting secondary water chemistry data to meaningful information for use by those outside the chemistry group. With certain assumptions, this procedure relates S/G Sodium concentration or cation conductivity to equivalent Lake Michigan water inleakage.

The staff has recommended that plants incorporate the secondary water chemistry guidelines stated in SGOG Special Report EPRI-NP-2704. The secondary chemistry guidelines in Kewaunee's procedure, Secondary Chemistry Sample Specifications, are at least as restrictive as the SGOG guidelines for full power operation except for cation conductivity. It is presently felt that organic intrusion, through the makeup system, is responsible for the inability to achieve low cation conductivity levels. This problem is presently being addressed through modifications to the makeup system. Also, a blowdown recovery system has been budgeted which will take a considerable load off of the makeup system, allowing finer tuned performance.

The SGOG also provides guidelines for Cold Shutdown and Hot Standby modes. KNPP's Cold Shutdown and Hot Standby chemistry is administratively controlled at levels which allow meeting WPSC's formalized full power guidelines.

During the 1985 refueling outage samples were taken from the steam generators while they were in wet layup. As a result, several flushes of the S/G's inventory were performed. This type of program will be expanded during future shutdowns as the 1985-1986 construction budget includes approval for sludge lance/wet layup recirculation equipment. This equipment will allow stricter control of S/G chemistry during wet layup conditions.

During power ascention, after refueling, there is an administrative hold at 40% until S/G blowdown Sodium concentration is less than 0.05 ppm. It has been shown at KNPP that below 40% power the phenomena termed 'hide-out' has not yet occurred. Without this chemistry hold certain contaminants could concentrate in the sludge pile with subsequent attack on the hot leg tubes. Attaining Sodium levels less than 0.05 ppm prior to power escalation above 40% also aids in meeting the full power secondary chemistry guidelines.

The staff recommends that a plant specific SWCP include measures for material selection. WPSC management has a high level of awareness of the importance of secondary plant materials of construction. An ongoing effort to eliminate Copper alloy heat exchange equipment has already included replacement of the main condenser heat exchange tubes. The high pressure feedwater heaters will be replaced during the 1986 or 1987 refueling outage, and it is planned to replace the balance of the feed-water heaters during the next several years. In addition to removing copper from the feed train a large portion of low carbon steel bleed steam piping has been replaced with stainless steel. This was more an erosion concern than a chemistry concern although it illustrates Management's awareness of secondary plant materials.

WPSC realizes that the SGOG Special Report, EPRI-NP-2704, describes a 'state of the art' secondary water chemistry program. WPSC has not been party to the discussions involved in developing that report, nor has WPSC had access to any of the supporting documentation or test programs that were generated as precursors to that report. The SGOG report serves as an excellent reference to guide the SWCP at Kewaunee and point out areas needing improvement. However, WPSC is not prepared to accept, in detail, the program described by the SGOG.

Improvements are being made at Kewaunee with the ultimate goal of controlling secondary water chemistry within the guidelines specified by Westinghouse.

IV. 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.

WPSC Response:

Kewaunee's main condenser was retubed during the 1985 refueling outage. The previous tubes were made of admirality brass, and the new tubes are

439 stainless steel. One of the major reasons for retubing the condenser was the indication from the ISI program on the previous condenser tubes that, with their present rate of degradation, capacity would soon be affected. Also, the previous condenser tubes were being plugged, mainly as a result of O.D. attack and the resulting copper was concentrating in the steam generator's sludge pile.

The condenser ISI program was begun in 1981 with an eddy current exam including approximately 10% of the condenser tubes. Prior to restart from the 1981 refueling outage 1,764 of 28,800 condenser tubes were plugged. During the course of the 1981-1982 operating cycle, nine power reductions were necessary to plug leaky condenser tubes (see Table 1). During the 1982 refueling outage all accessible plugged condenser tubes were unplugged and all accessible tubes were cleaned and eddy current examined. Prior to restart from the 1982 refueling outage 1,852 condenser tubes had been plugged. Condenser ISI inspections of 1983 and 1984 included cleaning 100% of the active tubes and eddy current inspection of approximately 10% of the tubes. Condenser tube plugging was performed during 1983 and 1984 refueling outages with 1,919 tubes plugged following the 1983 inspection and 2,054 tubes plugged after the 1984 refueling outage. From the end of the 1982 refueling outage up to the beginning of the 1985 outage only one power reduction was necessary, and this was to repair an air leak in a temporarily installed instrument tube in the main condenser (see Table 1).

The results of the ISI program on the previous condenser tubes, and replacement of the old tubes, clearly illustrates the success of Management's commitment to preserve condenser integrity. History has shown our past commitment to condenser tube integrity which assuredly will continue in the future as WPSC recognizes its importance in maintaining steam generator tube integrity.

Those elements recommended by the staff for a successful condenser inservice inspection program:

(1) identification and location of leakage sources (water or air)

(2) methods of repair of leakage

(3) methodology for determining the causes of leakage, and

(4) a preventative maintenance program

comprise Kewaunee's program responsible for maintaining condenser integrity.

Table 1

Power Reductions
Due to Condenser Leaks
1981 to Current

Date	Power Reduced To	Time Down	No. of Tubes Plugged
2/11/81	210 MW	1 day	1
6/21/81	221 MW	1 day	5
6/23/81	221 MW	1 day	3
10/3/81	225 MW	1 day	2
10/31/81	225 MW	1 day	1
11/21/81	225 MW	less than 1 day	2
1/6/82	221 MW	1 day	1
2/12/82	236 MW	1 day	1
2/16/82	236 MW	1 day	2
6/2/84	231 MW	less than 1 day	---

V. Primary to Secondary Leakage Limits

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.

WPSC Response:

Kewaunee's Technical Specifications limiting primary to secondary leakage are consistent with Standard Technical Specifications for a Westinghouse, 2-loop, PWR.

VI. Reactor Coolant Iodine Activity Limits

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.

WPSC Response:

The Kewaunee Nuclear Power Plant is a high head, high pressure safety injection plant,[1] which does not have an explicit Technical Specification Limit on primary coolant Iodine concentrations.

Kewaunee has not experienced any discernible fuel failures and historically has had extremely low concentrations of Iodine in the primary coolant. The Iodine concentrations in Kewaunee's primary coolant are typically 3 orders of magnitude less than Standard Technical Specifications (STS). As a result of maintaining fuel integrity Iodine spikes are also several orders of magnitude below STS limits.

Kewaunee's Technical Specification limit on primary coolant specific activity, $A \leq 91/E$ uCi/cc, can be shown to limit the Dose Equivalent I-131 concentration to approximately 3.4 uCi/cc. This Dose Equivalent I-131 concentration is based on the assumption that the primary coolant isotopic mixture is consistent with the mixture described in the KNPP

[1]RCS pressure 2235 psig, SI pump design pressure 2485 psig, SI pump shutoff head 2210 psig.

USAR for 1% defective fuel cladding (Table D.4.1). STS limit Dose Equivalent I-131 from 80% to 100% reactor power to 1 uCi/cc, allowing 60 uCi/cc for a 48 hour period not to exceed 800 hours in one year. From 26% to 80% reactor power, STS allow Dose Equivalent Iodine concentrations in proportion to reactor power ranging from 275 uCi/cc to 60 uCi/cc.

The staff states (NUREG 0844) that their basis for recommending that all PWR's adopt STS in regards to Iodine monitoring is to provide reasonable assurance that coolant activity will not contribute unacceptably to off-site doses following a design basis SGTR. The KNPP USAR analysis of a design basis SGTR, based on 1% defective fuel clad at the time of the rupture, concludes that, "the complete failure of a steam generator tube preceded by a long-term leak history prior to its failure would present no undue hazard to public health and safety."

The staff also states in their basis for initial consideration that, at plants with limits only on total gamma activity, the total primary coolant activity might remain substantially below the total Technical Specification activity shutdown value while actual radioiodine values could be very high. The KNPP USAR does not support this particular presumption. Table D.4.1 in the KNPP USAR lists the expected isotopic mixture in equilibrium with the primary coolant where 1% of the fuel cladding is defective. It can be shown that, with the isotopic mixture in Table D.4.1, when total specific activity of the primary coolant exceeds its Technical Specification limit, 91/E, Dose Equivalent I-131 is 3.4 uCi/cc. This value is certainly not 'very high' compared to the concentrations allowed by STS.

The staff concludes their basis for initially considering imposing STS Iodine limits on all PWR's with the statement that, "Because plants without coolant Technical Specifications may not monitor Iodine concentrations on a consistent basis, surveillance to ensure compliance is necessary. At KNPP, on a daily basis, primary coolant I-131, I-132, I-133, I-134, and I-135 concentrations are determined in the process of meeting the surveillance on total specific activity. The isotopic analysis data is distributed to Reactor Engineering, Fuel Management, Chemistry, Corporate Nuclear Engineering, and others in order to monitor fuel conditions throughout the cycle.

It is WPSC's position that primary coolant Iodine concentrations at Kewaunee are thoroughly monitored, adequately limited, and historically low such that additional Technical Specifications are unwarranted.

VII. 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.

WPSC Response:

Resetting the safety injection signal at Kewaunee does not reposition any valves or equipment. The function of resetting SI is to allow the operators to operate equipment, as necessary, while recovering from a safety injection sequence.

The switchover of safety injection pump suction from the BAST to the RWST is made on the basis of low BAST level alone, regardless of the status of the SI signal.

TABLE 2

SUMMARY OF EXTENT OF
STEAM GENERATOR TUBE INSPECTIONS TO DATE

YEAR	TYPE	EXTENT	S/G A HOT/COLD	S/G B HOT/COLD	RESULTING CATEGORY
1976	400 kHz	1st support	936/468	468/0	C-1
	400 kHz	7th support	144/72	72/0	
	400 kHz	U-bend	173/0	121/0	
	100 kHz	1st support	108/0	0/0	
	25 kHz	1st support	144/108	120/0	
RESULTING TUBES PLUGGED			0	0	
1977	400 kHz	U-bend	146/0	123/0	C-1
	400 kHz	1st support	936/468	396/468	
	400 kHz	2nd support	0/0	0/28	
	400 kHz	4th support	0/1	0/0	
	400 kHz	6th support	0/0	4/0	
	400 kHz	7th support	8/0	0/0	
	25 kHz	1st support	143/144	145/144	
RESULTING TUBES PLUGGED			0	0	
1980	multi Hz	row 1&2 U-bends	176/0	176/0	C-1
	multi Hz	U-bend	137/0	132/0	
	multi Hz	7th support	10/602	11/0	
RESULTING TUBES PLUGGED			0	0	
1983	400 kHz	full length	620	582/0	C-2
	400 kHz	U-bend	763/0	1426/0	
	400 kHz	1st support	1994/0	1380/0	
RESULTING TUBES PLUGGED			23	49	
1984	multi Hz	full length	3100	3142	C-2
	multi Hz	U-bend	174/0	187/0	
	multi Hz	7th support	87/0	0/0	
	multi Hz	1st support	0/0	1/0	
RESULTING TUBES PLUGGED			8	17	
1985	multi Hz	full length	3178/1	3129	C-2
	multi Hz	U-bend	174/0	188/0	
	multi Hz	1st support	4/10	4/9	
	multi Hz	7th support	0/0	1/1	
	multi Hz	2nd support	0/0	0/2	
RESULTING TUBES PLUGGED			27	22	

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 tn he inherent in the prevent 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 Category C-2 inspection results could be improved to better ensure that adequate inspections will be performed.

WPSC Response:

The Kewaunee Nuclear Power Plant (KNPP) steam generators (S/G) have been eddy current (E/C) inspected during refueling outages in the years of 1976, 1977, 1980, 1983, 1984 and 1985. Table 2 summarizes the extent of those inspections. As is illustrated in Table 2, KNPP's S/G tube inspections have always included more than the minimum required sample.

In 1976, 77, and 1980 additional tubes were inspected in those areas where degradation had been identified in similar generators.

In 1983 identification of a defective tube in the 1A S/G necessitated the first inspection program expansion, as required by the Technical Specifications. When more data become available from both generators, management decided to inspect 100% of the tubes in both generators. The extent of inspection in each tube was determined by the relative position of the tube in the generator and probable degradation mode of that tube.

In 1984 and 1985 full length eddy current inspections were performed on all accessible steam generator tubes. Management opted for 100%, full length, inspections notwithstanding the added burden, to ensure a tube leak or rupture would not result from progressing degradation.

As long as future steam generator inspections yield results similar to the past 3 years, WPSC intends to perform full length inspections of all accessible steam generator tubes during annual refueling outages. However, WPSC management is committed to mitigate and ideally arrest the present steam generator tube degradation, and reduced eddy current examinations may be justified in future years.

Following the first tube plugging at KNPP, 1983, WPSC Management initiated the Steam Cycle Working Group (SCWG). The SCWG's membership includes the Chemistry Supervisor, Systems/Reliability Supervisor, Plant Chemist, ISI Engineer, Operations Engineer, and a Nuclear Engineer. The SCWG was developed to study, evaluate, and implement steps to mitigate and possibly arrest tube degradation in the steam generators. Some of the major accomplishments supported by the SCWG include condenser retubing in 1985, improved analytical chemistry instruments, modifications enhancing makeup water system operation, budgeting a blowdown recovery system, second level review of eddy current data, and preliminary work on developing a secondary plant performance monitoring program.

Through past practices WPSC Management has demonstrated their ability to recognize adverse conditions in the steam generators and take positive action alleviating immediate concern with the intent of providing long-term solutions. Management's response to this situation illustrates the emphasis placed on steam generator tube integrity at the Kewaunee Nuclear Power Plant.

WPSC is concerned that the present flexibility in determining the inspection sample size be maintained as it is now in the KNPP Technical Specifications.

WPSC agrees with the staff[2] that the potential for further reducing the baseline SGTR frequency based on 100% inspections for C-2 category results is minimal compared to the reductions which can be achieved through QA for loose parts, improved secondary water chemistry, and condenser inservice inspections.

[2] NUREG 0844 Draft