123 Main Street
White Plains, New York 10601
914 681.6950
914 287.3309 (Fax)

NewYorkPower Authority

James Knubel
Senior Vice President and
Chief Nuclear Officer

May 24, 2000
JPN-00-016

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: James A. FitzPatrick Nuclear Power Plant
Docket 50-333
Retransmittal of Complete Revised
Risk-Informed Inservice Inspection (RI-ISI) Program

References:
1. NYPA letter, J. Knubel to USNRC dated October 13, 1999 (JPN-99-034) regarding "Risk-Informed Inservice Inspection (RI-ISI) Program."
2. NYPA letter, J. Knubel to USNRC dated May 8, 2000 (JPN-00-014) regarding "Risk Informed Inservice Inspection (RI-ISI) Program."

Dear Sir:

Attached for the NRC's information and use is a copy of the recently revised "Risk-Informed Inservice Inspection Program" for the Authority's James A. FitzPatrick nuclear power plant. The attached report combines, in one document, the program as originally proposed by the Authority in Reference 1, together with the changes submitted in Reference 2. This provides a single document that includes the recent clarifications and reflects the complete, FitzPatrick RI-ISI program as proposed.

The program is an alternative to current ASME Section XI inspection requirements for review and approval by the NRC pursuant to 10 CFR 50.55a(a)(3).

A047

BGN-001

This letter contains no new commitments. If you have any questions, please contact Ms. C. D. Faison.

Very truly yours,

J. Knubel
Senior Vice President and
Chief Nuclear Officer

Attachment:

I. "Risk Informed Inservice Inspection Program Plan - James A. FitzPatrick," revised May 8, 2000.

cc: Regional Administrator
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Resident Inspector's Office
U.S. Nuclear Regulatory Commission
P.O. Box 337
Buchanan, NY 10511

Office of the Resident Inspector
U.S. Nuclear Regulatory Commission
P.O. Box 136
Lycoming, NY 13093

Mr. Guy Vissing, Project Manager
Project Directorate I
Division of Licensing Project Management
U.S. Nuclear Regulatory Commission
Mail Stop 8C2
Washington, DC 20555

Attachment I to JPN-00-016

RISK INFORMED INSERVICE INSPECTION PROGRAM

Revised May 8, 2000

(Relief Request #20)

NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
DOCKET NO. 50-333
DPR-59

Summary of Changes in this Revision

Section	Description of Change
Section 3.0	This section was updated to reflect the element selection in revised tables 3.5-1, 3.8-1A and 3.8-1B for the Standby Liquid Control (SLC) system.
Section 3.8	This section (entitled "Change is Risk") was replaced in its entirety to better describe the analysis that was performed and the results of the quantitative evaluation.
Table 3.4-1	The title of this table was changed from "Number of Segments by Risk Category" to "Number of Segments by Risk Category Including FAC, IGSCC and MIC."
Table 3.5-1	This table was changed to reflect segment risk ranking without the impact of the FAC, IGSCC and MIC degradation mechanisms.
Table 3.8-1	This was replaced with Tables 3.8-1A and 3.8-1B: • Table 3.8-1A shows the risk ranking results with the impact of the FAC, IGSCC and MIC degradation mechanisms. • Table 3.8-1B shows the risk ranking results without the impact of the FAC, IGSCC and MIC degradation mechanisms.
Table 3.8-2	This table was deleted.
Table 5-1	This was changed to reflect inspection locations as presented in Table 3.8-1B.
Section 6.0	Added reference 6.6.

RISK - INFORMED INSERVICE INSPECTION PROGRAM PLAN - JAMES A. FITZPATRICK

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1. INTRODUCTION

1.1 Relation to NRC Regulatory Guide RG-1.174

Inservice inspections (ISI) are currently performed on piping to the requirements of the ASME Boiler and Pressure Vessel Code Section XI, 1989 Edition as required by 10CFR50.55a. The unit is currently in the third inspection interval as defined by the Code for Program B.

The objective of this submittal is to request a change to the ISI program plan for piping through the use of a risk-informed ISI program. The-risk informed process used in this submittal is described in EPRI TR 112657, Final Report, "Risk-Informed Inservice Inspection Evaluation Procedure."

As a risk-informed application, this submittal meets the intent and principles of Regulatory Guide 1.174. Further information is provided in Section 3.7 relative to defense-in-depth.

1.2 Individual Plant Examination (IPE) Quality

The Fitzpatrick Level 1 and Level 2 IPE model [Revision 1, April 1998] was used to evaluate the consequences of pipe ruptures during operation in Modes 1 and 2.

The base core damage frequency (CDF) and base large, early release frequency (LERF) from this version of the IPE model are 2E-6/yr and 7E-7/yr, respectively.

Revision 1, of the IPE has undergone the BWROG certification process. The results of the certification showed that the IPE "can be effectively used to support Grade 3 applications involving relative risk significance; in addition, absolute risk determination applications can be performed with supporting deterministic analyses."

In addition, the NRC reviewed Revision 0 of the IPE, and the following areas for improvement were identified:

1. Additional candidates for common cause failures.

2. Updates to data base to reflect the most recent plant operating experience.

3. Estimates used for the likelihood of containment failures at vessel breach due to shell melt-through.

The disposition of these items in the IPE update (Revision 1, April 1998) is discussed in Appendix I.

2. PROPOSED ALTERNATIVE TO ASME SECTION XI ISI PROGRAM

2.1 ASME Section XI

ASME Section XI Categories B-F, B-J, C-F-1 and C-F-2 currently contain the requirements for examining (via NDE) piping components. This current program is limited to ASME Class 1 and Class 2 piping. The alternative risk-informed inservice inspection (RI-ISI) program for piping is

described in EPRI TR 112657. The RI-ISI program will be substituted for the current examination program on piping in accordance with 10 CFR 50.55a(a)(3)(i) by alternatively providing an acceptable level of quality and safety. Other non-related portions of the ASME Section XI Code will be unaffected. EPRI TR 112657 provides the requirements defining the relationship between the risk-informed examination program and the remaining unaffected portions of ASME Section XI.

2.2 Augmented Programs

NYPA, together with the BWRVIP and EPRI are investigating operating experience and material performance with respect to the BWR fleet and IGSCC issues. As such, our response to Generic Letter 88-01 (NUREG-0313, Rev 2) and its supplement remains unchanged, at this time. Two other augmented inspection programs (Generic 89-08; Flow Accelerated Corrosion and Generic Letter 89-13; Service Water) are credited in the RI-ISI program but are not changed by the RI-ISI program.

3. RISK-INFORMED ISI PROCESSES

The processes used to develop the RI-ISI program are consistent with the methodology described in EPRI TR 112657.

The process that is being applied, involves the following steps:

- Scope Definition
- Consequence Evaluation
- Failure Assessment
- Risk Evaluation
- Element/NDE Selection
- Implement Program
- Feedback Loop

There were no significant deviations to the process described in EPRI TR-112657.

3.1 Scope of Program

The system(s) included in the risk-informed ISI program are provided in Table 3.1-1. The piping and instrumentation diagrams and additional plant information were used to define system boundaries.

3.2 Consequence Evaluation

The consequence(s) of pressure boundary failures were evaluated and ranked based on their impact on core damage and containment performance (isolation, bypass and large, early release). The impact on these measures due to both direct and indirect effects was considered using the guidance provided in EPRI TR-112657.

3.3 Failure Assessment

Failure potential estimates were generated utilizing industry failure history, plant specific failure history and other relevant information. These failure estimates were determined using the guidance provided in EPRI TR 112657.

Table 3.3-1 summarizes the failure potential assessment by system for each degradation mechanism that was identified as potentially operative.

3.4 Risk Evaluation

In the preceding steps, each run of piping within the scope of the program was evaluated to determine its impact on core damage and containment performance (isolation, bypass, and large, early release) as well as its potential for failure. Given the results of these steps, piping segments are then defined as continuous runs of piping potentially susceptible to the same type(s) of degradation and whose failure will result in similar consequence(s). Segments are then ranked based upon their risk significance as defined in EPRI TR-112657.

The results of these calculations are presented in Table 3.4-1

3.5 Element and NDE Selection

In general, EPRI TR-112657 requires that 25% of the locations in the high risk regions (i.e. risk categories 1, 2 & 3) and 10% of the locations in the medium risk regions (i.e. risk categories 4 & 5) be selected for inspection and appropriate non-destructive examination (NDE) methods tailored to the applicable degradation mechanism be defined for ASME Code Case N578 applications. The results of the selection are presented in Table 3.5-1. Section 4 of EPRI TR-112657 was used as guidance in determining the examination requirements for these locations.

In addition, all in scope piping components, regardless of risk classification, will continue to receive Code required pressure testing, as part of the current ASME Section XI program. VT-2 visual examinations are scheduled in accordance with the existing pressure test program, which remains unaffected by the risk-informed inservice inspection program.

3.6 Additional Examinations

Since the risk-informed inspection program may require examinations on a number of elements constructed to lesser pre-service inspection requirements, the program in all cases will determine through an engineering evaluation the root cause of any unacceptable flaw determined to be service related (i.e., fatigue, wall loss, IGSCC, etc.) or relevant condition found during examination. The evaluation will include the applicable service conditions and degradation mechanisms to establish that the element(s) will still perform their intended safety function during subsequent operation. Elements not meeting this requirement will be repaired or replaced.

The evaluation will include whether other elements on the segment or segments are subject to the same root cause and degradation mechanism. Additional examinations will be performed on these elements up to a number equivalent to the number of elements required to be inspected on the segment or segments initially. If unacceptable flaws determined to be service related or relevant conditions are again found similar to the initial problem, the remaining elements identified as susceptible will be examined. No additional examinations will be

performed if there are no additional elements identified as being susceptible to the same service related root cause conditions or degradation mechanism.

3.7 Program Relief Requests

Alternate methods are specified to ensure structural integrity in cases where examination methods cannot be applied due to limitations such as inaccessibility or radiation exposure hazard.

A minimum of >90% volume coverage (per Code Case N-460) will be provided, when possible, when performing the risk-informed examinations. However, some limitations will not be known until the examination is performed, since some locations may be examined for the first time by the specified techniques.

At this time, all the risk-informed examination locations that have been selected are estimated to exceed >90% volume coverage. In instances where a location may be found at the time of the examination that does not meet >90% coverage, the process outlined in EPRI TR 112657, Final Report will be followed.

All existing relief requests are unaffected and remain in place.

3.8 Change in Risk

The risk-informed ISI program at Fitzpatrick has been conducted in accordance with Regulatory Guide 1.174, and the risk from implementation of this program is expected to remain neutral or decrease when compared to that estimated from current requirements.

This evaluation identified the allocation of segments into High, Medium, and Low risk regions of the EPRI TR-112657 and ASME Code Case N578 risk ranking matrix, and then determined for each of these risk regions what inspection changes are proposed for each of the locations in each segment. The changes include changing the number and location of inspections within the segment and in many cases improving the effectiveness of the inspection to account for the findings of the RI-ISI degradation mechanism assessment. For example, for locations subject to thermal fatigue, inspection locations have an expanded volume and the examination is focused to enhance the probability of detection during the inspection process.

Two types of evaluations have been conducted to support the conclusion that the Fitzpatrick RI-ISI program results in a risk decrease or is risk neutral. Section 3.8-1 provides the qualitative evaluation while section 3.8-2 provides a quantitative evaluation.

3.8-1 Qualitative Evaluation

Table 3.8-1A presents a summary of the proposed RI-ISI program versus the current Section XI program taking into account degradation mechanisms FAC, IGSCC and MIC into the risk ranking process. The risk ranking provided in this table includes the impact of degradation mechanisms associated with and managed by augmented inspection programs (e.g. FAC). These other augmented programs have been defined in TR-112657 as the process for effectively managing the risk associated with these piping segments unless there is the potential for other degradation mechanism (e.g. thermal fatigue) that would not be appropriately managed by these augmented inspections (e.g. FAC). Table 3.8-1B presents similar

information, after performing the risk ranking without the impact of the FAC, IGSCC and MIC degradation mechanisms. The final inspection location selection is based upon Table 3.8-1B.

Tables 3.8-1A and 3.8-1B identify on a per system basis:

- the applicable risk category,
- the number of locations,
- the consequence rank and degradation mechanism which supports the risk category,
- the number of locations inspected by the current section XI program,
- the number of locations proposed for the RI-ISI program, crediting where appropriate, inspections from the augmented inspection programs,
- the increase, decrease or no change in the number of locations inspected. This assessment does not credit inspections required by augmented inspection programs unless these inspections are also credited in the Section XI program
- the number of locations addressed (currently being evaluated) by Augmented Programs (Table 3.8-1A only),
- the number of locations currently being inspected by Augmented Programs,
- the number of locations from Augmented Program Credited in the RI-ISI program (Table 3.8-1B only)
- the risk impact (change in risk) of the RI-ISI program as compared to the Section XI program.

The final column (change in risk) of Table 3.8-1B provides a conclusion as to the impact on risk for the RI-ISI program as compared to the Section XI program. The following discussion explains the terms used in this column.

For locations identified as risk category 6 or 7:

Negligible As discussed in TR-112657 (section 3.7.1) the impact on risk of removing inspections from risk category 6 and 7 locations is negligible. Thus, the risk impact will be "Negligible" for category 6 and 7 locations, whenever there is a reduction in the number of locations inspected.

No Change When there is no change in the number of locations inspected (i.e. the same before, as after), the risk impact will be "No Change."

For locations identified as risk category 1, 2, 3, 4 or 5.

No Change As with risk category 6 and 7 locations, when there is no change in the number of locations inspected (i.e. the same before, as after), the risk impact is classified as "No Change." This will be conservative when the RI-ISI inspection calls for a larger inspection volume with its accompanying increase in probability of detection.

Acceptable This applies to locations, that are identified as potentially susceptible to degradation mechanisms that are being addressed by other (non-Section XI) augmented inspection programs. Per TR-112657, the number, location and frequency of inspection is to be the same as the augmented program. These augmented inspection programs are specifically geared towards finding the mechanism of interest and are the only relevant means of managing the risk associated with these mechanisms. Random Section XI inspections are not geared

toward the mechanism of interest and most likely would not identify the mechanism of interest. As such, reductions in the number of the Section XI inspections for these locations do not impact risk and thus the change in risk is acceptable.

There may be occurrences when the risk ranking shown in Table 3.8-1B requires additional inspection locations beyond the augmented inspection program (e.g. risk category 4). These inspection locations provide an additional level of defense in depth beyond the augmented inspection program.

Improvement When there is an increase in the number of locations being inspected, there is a resultant decrease in the risk associated with piping failure. Thus, whenever the number of RI-ISI locations exceeds the number of Section XI locations inspected, "Improvement" will be found in the Risk Impact column. This conservatively does not credit the added benefit of increased inspection volumes for applicable degradation mechanisms (e.g. thermal fatigue).

Increase When there is a decrease in the number of locations being inspected, there is the potential for a resultant increase in the risk associated with piping failure. Thus, for locations not managed by an augmented inspection program, when the number of Section XI locations exceeds the number of RI-ISI locations inspected, "Increase" will be found in the Risk Impact column.

Because locations that are identified as "Improvement," "Acceptable," "Negligible" or "No Change" do not adversely impact the change in risk assessment, the following discussion is focused on those locations identified as "Increase."

As identified in Table 3.8-1B, there is an overall increase of six inspection locations in the high risk region (i.e. Risk Categories 1, 2, and 3). Also, as identified in this table, there is an overall increase of one location in the medium risk region (i.e. Risk Categories 4 and 5). Not crediting the benefit of increased inspections in the high risk region, there is a net increase of seven inspection locations in the high and medium risk regions.

3.8-2 Quantitative Evaluation

As discussed above, the RI-ISI program at Fitzpatrick has been conducted in accordance with Regulatory Guide 1.174 and the EPRI methodology requirements, and the risk from implementation of this program is expected to remain neutral or decrease when compared to that estimated for current requirements.

Limits are imposed by the EPRI methodology (TR-112657) to ensure that the change in risk of implementing the RI-ISI program meets the requirements of Regulatory Guide 1.174. The quantitative criteria established in TR-112657 require that the cumulative change in core damage frequency (CDF) and large early release frequency (LERF) be less than 1E-7 and 1E-8 per year per system, respectively.

The Authority conducted a risk impact analysis per the requirements of Section 3.7 of EPRI TR-112657. The analysis estimates the net change in risk due to the positive and negative influence of adding and removing locations from the inspection program.
Of the 14 systems analyzed, eight systems passed the qualitative screen. The Authority conducted a risk quantification on the remaining six systems using the "Simplified Risk

Quantification Method" described in Section 3.7.2. The analysis conducted is consistent with References 9 and 14 of TR-112657.

The conditional core damage probability (CCDP) used for high consequence category segments was based on the highest evaluated CCDP (1E-02), whereas, for the medium consequence category segments, bounding estimates of CCDP were used (i.e. 1E-04).
The likelihood of pressure boundary failure (PBF) is determined by the presence of different degradation mechanisms and the rank is based on the relative failure probability (instead of an absolute number). The basic likelihood of PBF for a piping location with no degradation mechanism present is noted as x_0, and is expected to have a value lower than 1E-8. Piping locations identified as medium failure potential (i.e. potentially susceptible to IGSCC, TS, TT or CC) have a likelihood of 20 x_o and piping locations noted as high failure potential have a likelihood of 200 x_o.

In addition, the analysis was performed both with and without taking credit for the benefit of enhanced inspection effectiveness due to an increased probability of detection (POD) from application of the RI-ISI approach. The results of this evaluation are as follows:

System	Passed Qualitative Screen	$\Delta Risk_{CDF}$ Improved POD	$\Delta Risk_{CDF}$ No Improved POD
CRD	Yes	N/R	N/R
CS	No	4.0E-12	2.0E-11
ESW	Yes	N/R	N/R
FW	No	-4.4E-09	4.2E10
FPC	Yes	N/R	N/R
HPCI	Yes	N/R	N/R
MS	No	-3.4E-09	-1.8E-09
INST	Yes	N/R	N/R
RCIC	No	-8.5E-10	-8.5E-10
RWCU	No	1.5E-10	1.5E-10
RWR	No	9.0E-11	9.0E-11
RHR	Yes	N/R	N/R
RHRSW	Yes	N/R	N/R
SLC	Yes	N/R	N/R
Total Quantified Risk		-8.4E-09	-1.9E-09

The results show that implementation of the RI-ISI program at Fitzpatrick, lead to a decrease in the total core damage frequency (with or without crediting an improved POD) and are consistent with the TR-112657 CDF and LERF acceptance criteria.

3.8-3 Summary

In summary, the Fitzpatrick RI-ISI application credits, where appropriate, augmented inspection programs while defining new, additional inspections for those locations potentially susceptible to degradation that are not currently being addressed by the Section XI inspection program. There

is an overall increase in the number of inspection locations in higher risk pipe segments and decrease in the number of locations in lower risk pipe segments.

The impact on risk of the Fitzpatrick RI-ISI application has been assessed qualitatively and quantitatively. In each case, the above evaluations demonstrate that unacceptable risk impacts will not occur, and thus implementation of the RI-ISI program at Fitzpatrick, satisfies the acceptance criteria of Regulatory Guide 1.174 and the EPRI RI-ISI methodology requirements.

4. IMPLEMENTATION AND MONITORING PROGRAM

Upon approval of the RI-ISI program, procedures that comply with the guidelines described in EPRI TR-112657, Final Report will be prepared to implement and monitor the program. The new program will be integrated into the existing ASME Section XI interval. No changes to the Final Safety Analysis Report are necessary for program implementation.

The applicable aspects of the Code not affected by this change would be retained, such as inspection methods, acceptance guidelines, pressure testing, corrective measures, documentation requirements, and quality control requirements. Existing ASME Section XI program implementing procedures would be retained and would be modified to address the RI-ISI process, as appropriate. Additionally the procedures will be modified to include the high safety significant locations in the program requirements regardless of their current ASME class.

The proposed monitoring and corrective action program will contain the following elements:

A. Identify
B. Characterize
C. (1) Evaluate, determine the cause and extent of the condition identified
   (2) Evaluate, develop a corrective action plan or plans
D. Decide
E. Implement
F. Monitor
G. Trend

The RI-ISI program is a living program requiring feedback of new relevant information to ensure the appropriate identification of high safety significant piping locations. As a minimum, risk ranking of piping segments will be reviewed and adjusted on an ASME period basis. In addition, significant changes may require more frequent adjustment as directed by NRC Bulletin or Generic Letter requirements, or by industry and plant specific feedback.

5. PROPOSED ISI PROGRAM PLAN CHANGE

A comparison between the RI-ISI program and the current ASME Section XI program requirements for in-scope piping is given in Table 5-1. An identification of piping segments that are part of plant augmented programs is also included in Table 5-1.

The initial program will be started in the inspection period current at the time of program approval. For example, the second inspection period of the third inspection interval ends on September 28, 2004. If the program is approved such that a refueling outage remains in the second period, 66% of the required remaining examinations will be performed by the end of the inspection interval per the risk-informed inspection program.

6.0 REFERENCES/DOCUMENTATION

6.1 EPRI TR 112657, Final Report, "Revised Risk-Informed Inservice Inspection Evaluation Procedure".

6.2 EPRI TR-106706, Interim Report, "Risk-Informed Inservice Inspection Evaluation procedure."

6.3 Calculation # NSD-016, Revision 2, Degradation Mechanism Evaluation, dated July 1999.

6.4 Calculation # NSD-017, Revision 1, Consequence Evaluation, dated July 1999.

6.5 NFGE 99-0030, Risk Ranking and Element Selection Results for the JAF Risk-Informed ISI (RI-ISI) Program, dated August 3, 1999.

6.6 NFNE 00-0003, Risk Impact Assessment - James A. FitzPatrick, Risk Informed Inservice Inspection Program, May 1, 2000

Table 3.1-1

System Selection and Segment Definition

System Description	Number of Segments
Control Rod Drive (CRD)	4
Core Spray (CS)	25
Emergency Service Water (ESW)	24
Feedwater (FW)	19
Fuel Pool Cooling (FPC)	1
High Pressure Coolant Injection (HPCI)	25
Main Steam (MS)	32
Nuclear Boiler Vessel Instrumentation (INST)	6
Reactor Core Isolation Cooling (RCIC)	15
Reactor Water Cleanup (RWCU)	9
Reactor Water Recirculation (RWR)	60
Residual Heat Removal (RHR)	94
RHR Service Water (RHRSW)	15
Standby Liquid Control (SLC)	4
Total	333

Table 3.3-1 Failure Potential Assessment Summary

SYSTE	Thermal Fatigue		Stress Corrosion Cracking				Local Corrosion			Flow Sensitive	
	TT	TASCS	IGSCC	TGSCC	ECSCC	PWSCC	MIC	Pitting	CC	E-Cav	FAC
CRD			X								
CS		X	X						X		X
ESW							X			X	
FW	X	X							X		X
FPC											
HPCI		X					X				X
MS		X									X
INST		X									
RCIC							X		X		
RWCU		X									X
RWR			X						X		
RHR	X	X	X							X	X
RHRSW							X			X	
SLC		X									

CS – Core Spray, CRD – Control Rod Drive, ESW – Emergency Service Water, FW – Feedwater, FPC – Fuel Pool Cooling, HPCI – High Pressure Coolant Injection, MS – Main Steam, INST – Nuclear Boiler Vessel Instrumentation, RCIC – Reactor Core Isolation Cooling, RWCU – Reactor Water Cleanup, RWR – Reactor Water Recirculation, RHR – Residual Heat Removal, RHRSW – RHR service water and applicable portion of normal service water, SLC – Standby Liquid Control.

TT – Thermal transient, TASCS – Thermal stripping, cycling and stratification, IGSCC – intergranular stress corrosion cracking, TGSCC – transgranular stress corrosion cracking, ECSCC – external chloride stress corrosion cracking, PWSCC – primary water stress corrosion cracking, MIC – microbiologically influenced corrosion, Pitting – pitting, CC – crevice corrosion cracking, E-Cav –cavitation, FAC – flow accelerated corrosion.

Table 3.4-1
Number of Segments by Risk Category Including FAC, IGSCC and MIC

System	***Risk Category 1***	***Risk Category 2***	***Risk Category 3***	***Risk Category 4***	***Risk Category 5***	***Risk Category 6***	***Risk Category 7***
CRD						1	3
CS				4	11	4	6
ESW		4			20		
FW	11		8				
FPC							1
HPCI		1	1	5	6	12	
MS	14		10	1	4	3	
INST					1	3	2
RCIC		1		4	3	6	1
RWCU	1		3	1	3	1	
RWR					40	20	
RHR		4		6	24	34	26
RHRSW		6				9	
SLC				1	1	2	
TOTAL	26	16	22	22	113	95	39

Table 3.5-1
Number of Locations/Inspections by Risk Category w/o FAC, IGSCC and MIC

System	***Risk Category 1***		***Risk Category 2***		***Risk Category 3***		***Risk Category 4***		***Risk Category 5***		***Risk Category 6***		***Risk Category 7***	
	Pop.	Insp.	Pop.	Insp.	Pop.	Insp.	Pop.	Insp.	Pop.	Insp.	Pop.	Insp.	Pop.	Insp.
CRD											3	0	51	0
CS							8	0	10	2	36	0	164	0
ESW (+)			1	1			3	0	15	2*	23	0		
FW			15	4			33	1+1*	11	3	22	0		
FPC (+)													30	0
HPCI			1	1			21	3	13	2	177	0		
MS			5	2			45	4	5	1	85	0	4	0
INST (+)									1	1	4	0	20	0
RCIC			8	2			25	3			72	0	9	0
RWCU							14	2			13	0	9	
RWR									10	1	132	0		
RHR			8	2			48	5	2	1	304	0	525	0
RHRSW (+)			4	1*			7	1*			2	0	24	0
SLC							1	0	2	1	18	0		

Pop. – Population, the number of welds in a particular risk category.
Insp. – Inspected, the number of welds selected for inspection.
(*) Inspections credited from augmented inspection programs.
(+) locations are defined as piping runs versus welds for these systems

TABLE 3.8-1A
(Risk Categories with FAC, IGSCC, and MIC)

SYSTEM	Risk Category (1)	Number of Locations in Risk Category	Consequence Rank	Degradation Mechanism	Locations Inspected (2)		Change in # of Inspec-tions	Number of Locations Addressed by Augmented Programs (3)	Number of Locations Currently Being Inspected in Augmented Programs (4)	Change in Risk
					Current Sect. XI	Proposed RI-ISI				
CRD	6	3	Medium	None	0	0	0			Change in risk is discussed in Table 3.8-1B
	7	50	Low	None	5	0	-5			
	7	1	None	IGSCC	0	0	0	1 / IGSCC	1 / IGSCC (D)	
CS	4	8	High	None	0	0	0			
	5	2	Medium	TS	0	0	0			
	5	6	Medium	TS, IGSCC	2	1	-1	6 / IGSCC	2 / IGSCC (A)	(6)
	5	2	Medium	CC, IGSCC	2	1	-1	2 / IGSCC	2 / IGSCC (1A/1D)	(6)
	5	7	Medium	IGSCC	5	0	-5	7 / IGSCC	5 / IGSCC (A)	
	6	29	Medium	None	2	0	-2			
	5	16	Low	FAC	5	0	-5	16 / FAC		
	7	148	Low	None	11	0	-11			
ESW	2	1	High	E-Cav, MIC	0	1	1	1 / MIC		
	2	3	High	MIC	0	0	0	3 / MIC	1/MIC	
	5	15	Medium	E-Cav, MIC	0	2*	0	15 / MIC	2/MIC	
	5	23	Medium	MIC	0	0	0	23 / MIC	2/MIC	
FW	1	1	High	CC, TS, FAC	0	1	1	1 / FAC		
	1	2	High	CC, TT, FAC	1	2	1	2 / FAC		
	1	3	High	CC, FAC	0	0	0	3 / FAC		Change in risk is discussed in Table 3.8-1B
	1	3	High	TS, FAC	1	1	0	3 / FAC		

TABLE 3.8-1A
(Risk Categories with FAC, IGSCC, and MIC)

SYSTEM	Risk Category (1)	Number of Locations in Risk Category	Consequence Rank	Degradation Mechanism	Locations Inspected (2)		Change in # of Inspec-tions	Number of Locations Addressed by Augmented Programs (3)	Number of Locations Currently Being Inspected in Augmented Programs (4)	Change in Risk
					Current Sect. XI	Proposed RI-ISI				
	1	6	High	TT, FAC	2	0	-2	6 / FAC		
	1	33	High	FAC	9	1+1*	-8	33 / FAC	1/FAC (5)	
	3	2	Medium	CC, TT, FAC	1	1	0	2 / FAC		
	3	3	Medium	TS, FAC	2	2	0	3 / FAC		
	3	6	Medium	TT, FAC	2	0	-2	6 / FAC		
	3	22	Medium	FAC	9	0	-9	22 / FAC		
FPC										
	7	30	Low	None	0	0	0			
HPCI										
	2	1	High	TS	0	1	1			
	4	21	High	None	3	3	0			
	5	13	Medium	TS	0	2	2			
	5	4	Medium	MIC	0	0	0	4 / MIC		
	6	171	Medium	None	13	0	-13			
	3	2	Medium	FAC	0	0	0	2 / FAC		
MS										
	1	5	High	TS, FAC	0	2	2	5 / FAC		
	1	39	High	FAC	7	3	-4	39 / FAC		
	4	6	High	None	2	1	-1			
	3	5	Medium	TS, FAC	0	1	1	5 / FAC		
	3	69	Medium	FAC	17	0	-17	69 / FAC	1/FAC (5)	
	6	16	Medium	None	4	0	-4			Change in risk is discussed in Table 3.8-1B
	5	4	Low	FAC	4	0	-4	4 / FAC		
INST										
	5	1	Medium	TS	0	1	1			
	6	2	Medium	None	0	0	0			

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TABLE 3.8-1A
(Risk Categories with FAC, IGSCC, and MIC)

SYSTEM	Risk Category (1)	Number of Locations in Risk Category	Consequence Rank	Degradation Mechanism	Locations Inspected (2) Current Sect. XI	Locations Inspected (2) Proposed RI-ISI	Change in # of Inspec-tions	Number of Locations Addressed by Augmented Programs (3)	Number of Locations Currently Being Inspected in Augmented Programs (4)	Change in Risk
	6	2	Low	TS	0	0	0			
	7	20	Low	None	0	0	0			
RCIC										
	2	8	High	CC	1	2	1			
	4	25	High	None	6	3	-3			
	6	66	Medium	None	0	0	0			
	5	6	Medium	MIC	0	0	0	6 / MIC		
	7	9	Low	None	0	0	0			
RWCU	1	2	High	FAC	2	0	-2	2 / FAC		
	4	12	High	None	3	2	-1			
	3	8	Medium	FAC	1	0	-1	8 / FAC		
	5	4	Low	TS, FAC	0	0	0	4/ FAC	1/FAC(5)	
	6	1	Medium	None	0	0	0			
	5	9	Low	FAC	2	0	-2	9/ FAC		
RWR	5	10	Medium	CC, IGSCC	10	1	-10	10 / IGSCC	10/IGSCC (D)	(6)
	5	103	Medium	IGSCC	33	0	-33	103 / IGSCC	70/IGSCC (5A/42C/2D/21E)	
	6	29	Medium	None	0	0	0			Change in risk is discussed in Table 3.8-1B
RHR	2	5	High	E-Cav	1	1	0			
	2	3	High	TS	0	1	1			
	4	48	High	None	3	5	2			
	5	2	Medium	TS	0	1	1			
	5	5	Medium	IGSCC	5	0	-5	5 / IGSCC	5/IGSCC (1A/4D)	

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TABLE 3.8-1A
(Risk Categories with FAC, IGSCC, and MIC)

SYSTEM	Risk Category (1)	Number of Locations in Risk Category	Consequence Rank	Degradation Mechanism	Locations Inspected (2)		Change in # of Inspec-tions	Number of Locations Addressed by Augmented Programs (3)	Number of Locations Currently Being Inspected in Augmented Programs (4)	Change in Risk
					Current Sect. XI	Proposed RI-ISI				
	5	9	Low	E-Cav, TS, FAC	1	0	-1	9 / FAC		
	5	8	Low	E-Cav, TT, FAC	0	0	0	8 / FAC		
	5	2	Low	E-CAV, FAC	1	0	-1	2 / FAC		
	5	1	Low	TS, FAC	0	0	0	1 / FAC		
	5	2	Low	TT, FAC	0	0	0	2 / FAC		
	6	36	Medium	None	2	0	-2			
	6	34	Low	E-Cav, TT	0	0	0			
	6	7	Low	E-Cav	1	0	-1			
	6	173	Low	TT	16	0	-16			
	6	27	Low	TS	2	0	-2			
	5	103	Low	FAC	2	0	-2	103 / FAC	1/FAC(5)	
	6	2	Low	IGSCC	2	0	-2	2 / IGSCC	2/IGSCC (D)	
	7	420	Low	None	30	0	-30			
RHRSW	2	4	High	E-Cav, MIC	0	1*	0	4 / MIC	1/MIC	
	2	7	High	MIC	0	1*	0	7 / MIC	1/MIC	
	6	2	Low	E-Cav, MIC	0	0	0	2 / MIC	1/MIC	
	6	24	Low	MIC	0	0	0	24 / MIC	4/MIC	Change in risk is discussed in Table 3.8-1B
SLC	4	1	High	None	0	0	0			
	5	2	Medium	TS	0	1	1			
	6	18	Medium	None	0	0	0			

Notes:

(*) Inspections credited from augmented programs

(1) Risk ranking includes impact of all degradation mechanism (e.g. FAC, IGSCC, MIC)
(2) Excludes surface examinations
(3) Included in programs to address FAC, IGSCC and MIC, as appropriate.
(4) For the IGSCC program the current inspection requirements are: 25% of category "A" welds every 10 years, 100% of category "C" every 10 years, and 100% of category "D" and "E" every 2 refueling cycles. For the FAC and MIC programs locations are evaluated to determine susceptibility and inspection locations and frequency are based on wear predictions and pervious inspection results.
(5) The FAC program includes the portions of FW and MS systems that are outside of the scope of the RI ISI program (i.e. non-code piping). The FW and MS systems (code and non-code piping) are modeled in the Checworks program, which is updated as additional exams are completed.
(6) For these locations, the augmented inspection location and the Section XI inspection location are one in the same. The RI-ISI program requires an additional examination (e.g. increased inspection volume) to capture the identified degradation mechanism (e.g. thermal fatigue).

TABLE 3.8-1B
(Risk Categories without FAC, IGSCC, and MIC)

SYSTEM	Risk Category (1)	Number of Locations in Risk Category	Consequence Rank	Degradation Mechanism	Locations Inspected (2)		Change in # of Inspec-tions	Number of Locations Currently Being Inspected in Augmented Programs (3)	Number of Locations from Augmented Programs Credited in RI ISI (4) (5)	Change in Risk
					Current Sect. XI	Proposed RI-ISI				
CRD	6	3	Medium	None	0	0	0			No Change
	7	50	Low	None	5	0	-5			Negligible
	7	1	None	(IGSCC)	0	0	0	1 / IGSCC (D)		No Change
CS	4	8	High	None	0	0	0			No Change
	5	2	Medium	TS	0	0	0			No Change
	5	6	Medium	TS (IGSCC)	2	1	-1	2 / IGSCC (A)		Acceptable (6)
	5	2	Medium	CC (IGSCC)	2	1	-1	2 / IGSCC (1A/1D)		Acceptable (6)
	6	7	Medium	(IGSCC)	5	0	-5	5 / IGSCC (A)		Negligible
	6	29	Medium	None	2	0	-2			Negligible
	7	16	Low	(FAC)	5	0	-5			Negligible
	7	148	Low	None	11	0	-11			Negligible
ESW	2	1	High	E-Cav (MIC)	0	1	1			Improvement
	4	3	High	(MIC)	0	0	0	1/MIC		No Change
	5	15	Medium	E-Cav (MIC)	0	2*	0	2/MIC	2	No Change
	6	23	Medium	(MIC)	0	0	0	2/MIC		No Change
FW	2	1	High	CC, TS (FAC)	0	1	1			Improvement
	2	2	High	CC, TT (FAC)	1	2	1			Improvement
	2	3	High	CC (FAC)	0	0	0			No Change
	2	3	High	TS (FAC)	1	1	0			No Change

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TABLE 3.8-1B
(Risk Categories without FAC, IGSCC, and MIC)

SYSTEM	Risk Category (1)	Number of Locations in Risk Category	Consequence Rank	Degradation Mechanism	Locations Inspected (2)		Change in # of Inspec-tions	Number of Locations Currently Being Inspected in Augmented Programs (3)	Number of Locations from Augmented Programs Credited in RI ISI (4) (5)	Change in Risk
					Current Sect. XI	Proposed RI-ISI				
	2	6	High	TT (FAC)	2	0	-2			Increase
	4	33	High	(FAC)	9	1+1*	-8	1/FAC	1	Acceptable
	5	2	Medium	CC, TT (FAC)	1	1	0			No Change
	5	3	Medium	TS (FAC)	2	2	0			No Change
	5	6	Medium	TT (FAC)	2	0	-2			Increase
	6	22	Medium	(FAC)	9	0	-9			Negligible
FPC										
	7	30	Low	None	0	0	0			No Change
HPCI										
	2	1	High	TS	0	1	1			Improvement
	4	21	High	None	3	3	0			No Change
	5	13	Medium	TS	0	2	2			Improvement
	6	4	Medium	(MIC)	0	0	0			No Change
	6	171	Medium	None	13	0	-13			Negligible
	6	2	Medium	(FAC)	0	0	0			No Change
MS										
	2	5	High	TS (FAC)	0	2	2			Improvement
	4	39	High	(FAC)	7	3	-4			Acceptable
	4	6	High	None	2	1	-1			Increase
	5	5	Medium	TS (FAC)	0	1	1			Improvement
	6	69	Medium	(FAC)	17	0	-17	1/FAC		Negligible
	6	16	Medium	None	4	0	-4			Negligible
	7	4	Low	(FAC)	4	0	-4			Negligible
INST										
	5	1	Medium	TS	0	1	1			Improvement

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TABLE 3.8-1B
(Risk Categories without FAC, IGSCC, and MIC)

SYSTEM	Risk Category (1)	Number of Locations in Risk Category	Consequence Rank	Degradation Mechanism	Locations Inspected (2)		Change in # of Inspec-tions	Number of Locations Currently Being Inspected in Augmented Programs (3)	Number of Locations from Augmented Programs Credited in RI ISI (4) (5)	Change in Risk
					Current Sect. XI	Proposed RI-ISI				
	6	2	Medium	None	0	0	0			No Change
	6	2	Low	TS	0	0	0			No Change
	7	20	Low	None	0	0	0			No Change
RCIC										
	2	8	High	CC	1	2	1			Improvement
	4	25	High	None	6	3	-3			Increase
	6	66	Medium	None	0	0	0			No Change
	6	6	Medium	(MIC)	0	0	0			No Change
	7	9	Low	None	0	0	0			No Change
RWCU	4	2	High	(FAC)	2	0	-2			Acceptable
	4	12	High	None	3	2	-1			Increase
	6	8	Medium	(FAC)	1	0	-1			Negligible
	6	4	Low	TS (FAC)	0	0	0	1/FAC		No Change
	6	1	Medium	None	0	0	0			No Change
	7	9	Low	(FAC)	2	0	-2			Negligible
RWR	5	10	Medium	CC (IGSCC)	10	1	-10	10/IGSCC (D)		Acceptable (6)
	6	103	Medium	(IGSCC)	33	0	-33	70/IGSCC (5A/42C/2D/21E)		Negligible
	6	29	Medium	None	0	0	0			No Change
RHR	2	5	High	E-Cav	1	1	0			No Change
	2	3	High	TS	0	1	1			Improvement
	4	48	High	None	3	5	2			Improvement

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TABLE 3.8-1B
(Risk Categories without FAC, IGSCC, and MIC)

SYSTEM	Risk Category (1)	Number of Locations in Risk Category	Consequence Rank	Degradation Mechanism	Locations Inspected (2)		Change in # of Inspec-tions	Number of Locations Currently Being Inspected in Augmented Programs (3)	Number of Locations from Augmented Programs Credited in RI ISI (4) (5)	Change in Risk
					Current Sect. XI	Proposed RI-ISI				
	5	2	Medium	TS	0	1	1			Improvement
	6	5	Medium	(IGSCC)	5	0	-5	5/IGSCC (1A/4D)		Negligible
	6	9	Low	E-Cav, TS (FAC)	1	0	-1			Negligible
	6	8	Low	E-Cav, TT (FAC)	0	0	0			No Change
	6	2	Low	E-CAV (FAC)	1	0	-1			Negligible
	6	1	Low	TS (FAC)	0	0	0			No Change
	6	2	Low	TT (FAC)	0	0	0			No Change
	6	36	Medium	None	2	0	-2			Negligible
	6	34	Low	E-Cav, TT	0	0	0			No Change
	6	7	Low	E-Cav	1	0	-1			Negligible
	6	173	Low	TT	16	0	-16			Negligible
	6	27	Low	TS	2	0	-2			Negligible
	7	103	Low	(FAC)	2	0	-2	1/FAC		Negligible
	7	2	Low	(IGSCC)	2	0	-2	2/IGSCC (D)		Negligible
	7	420	Low	None	30	0	-30			Negligible
RHRSW	2	4	High	E-Cav (MIC)	0	1*	0	1/MIC	1	No Change
	4	7	High	(MIC)	0	1*	0	1/MIC	1	No Change
	6	2	Low	E-Cav (MIC)	0	0	0	1/MIC		No Change
	7	24	Low	(MIC)	0	0	0	4/MIC		No Change
SLC	4	1	High	None	0	0	0			No Change
	5	2	Medium	TS	0	1	1			Improvement
	6	18	Medium	None	0	0	0			No Change

Notes:

(*) Inspections credited from augmented programs
(1) Risk ranking excludes impact of degradation mechanism inspected in augmented programs (e.g. FAC, IGSCC, MIC)
(2) Excludes surface examinations
(3) Included in programs to address FAC, IGSCC and MIC, as appropriate.
(4) For the IGSCC program the current inspection requirements are: 25% of category "A" welds every 10 years, 100% of category "C" every 10 years, and 100% of category "D" and "E" every 2 refueling cycles. For the FAC and MIC programs locations are evaluated to determine susceptibility and inspection locations and frequency are based on wear predictions and pervious inspection results.
(5) The FAC program includes the portions of FW and MS systems that are outside of the scope of the RI ISI program (i.e. non-code piping). The FW and MS systems (code and non-code piping) are modeled in the Checworks program, which is updated as additional exams are completed.
(6) For these locations, the augmented inspection location and the Section XI inspection location are one in the same. The RI-ISI program requires an additional examination (e.g. increased inspection volume) to capture the identified degradation mechanism (e.g. thermal fatigue).

Table 3.8-2

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Table 5-1
Inspection Location Selections
Comparison to ASME Section XI 1989 Edition Requirements

System	Number of High/ Medium Risk Region Segments (1)	RI-ISI Inspection Locations (2)				ASME Section XI 1989 Edition Examination Requirements				Number of H/M Segments Credited in Augmented Programs (3)
		Class 1	Class 2	Class 3	NNS	B-F	B-J	C-F-1	C-F-2	
CRD	0/0								5	
CS	0/15	1	1			4	12		11	7
ESW	4/20			1 + 2*						24
FW	19/0	8+1*					27			19
FPC	0/0									
HPCI	2/11	4	2				7		9	1
MS	24/5	7					34			28
INST	0/1	1								
RCIC	1/7	5					7			
RWCU	4/4	2					8			7
RWR	0/40	1				12	31			40
RHR	4/30	3	5			7	11		48	23
RHRSW	6/0			2*						6
SLC	0/2	1								
TOTAL		33 + 1*	8	1 + 4*		23	137		73	

(1) - High risk = categories 1, 2 and 3, Medium risk = categories 4 and 5. Ranking includes impact of all degradation mechanisms (e.g. FAC, IGSCC, TASCS).
(2) - * = inspections credited from augmented inspection programs.
(3) - Includes programs to address Generic Letter 89-08 (FAC), Generic Letter 88-01 (IGSCC in BWRs) and service water reliability (Generic Letter 89-13).

APPENDIX I

DISPOSITION OF THE FINDINGS FROM NRC REVIEW OF REVISION 0 OF THE IPE

Finding #1 - additional candidates for common cause failures (Section 2.2),

Response:

The update to the James A. Fitzpatrick (JAF) Nuclear Power Plant Individual Plant Examination (IPE) was completed in April 1998. The update incorporated additional common cause failure terms including:

- · Common cause equipment failure groups such as fans, check valves, dampers, and transmitters have been included in the analysis.
- · Catastrophic common cause failure of both 125V dc battery control boards 71BCB-2A and 71BCB-2B was included as an initiator, which results in a station blackout with loss of HPCI and RCIC and subsequent core damage.

Finding #2 - Updates to the data base to reflect the most recent plant operating experience (Section 2.3.4)

Response:

The JAF IPE update consisted of the most recent plant operating data:

- · An updated initiating event database, including all scrams that occurred between 7/28/1975 and 12/31/1997.
- · An updated component failure and unavailability database that reflects failures that occurred between 1/1/1986 and 4/30/1995 and current on-line maintenance practices.

Finding # 3 - CPI recommendation for estimates used for the likelihood of containment failure at vessel breach due to shell melt-through

Response:

The IPE analysis performed to estimate the impact of using drywell sprays (CPI recommendation) to reduce the likelihood of drywell (shell) melt-through is as follows:

The operability of drywell sprays during a severe accident can influence both the survivability of the containment and its performance in containing fission products. The IPE contains the following insights:

1. The total probability of containment failure decreases because water on the drywell floor reduces the likelihood of drywell liner melt-through and because the sprays reduce containment pressure making static overpressurization less likely.

2. Containment failure is delayed. The principal cause for this delay is the reduction in the likelihood of drywell liner melt-through. This shift will reduce the radiological source term because natural decontamination mechanisms will have more time to act prior to containment failure.

3. The location of containment failure shifts slightly from the drywell areas to the wetwell. The principal cause for this shift is again the reduction in the likelihood of drywell liner

melt-through. This shift will reduce the radiological source term because the suppression pool will scrub releases from containment.

4. The sprays will provide direct scrubbing of fission product aerosols and increase residence time and so enhance the effectiveness of natural decontamination mechanisms.

These insights have been incorporated in the JAF Emergency Operating Procedures/Severe Accident Operating Guidelines (EOPs/SAOGs). The revised EOPs adequately address the use of Drywell Spray. In the SAOGs, drywell spray operations have been structured for severe accident conditions. Specifically:

- Drywell spray is prioritized relative to RPV injection (SAOG-1)
- Drywell spray initiation is required in the Containment and Radioactivity Release Control Guideline (SAOG-2)
- Drywell Spray initiation is required for high Drywell radiation. This is useful in ensuring Drywell Spray initiation prior to RPV breach.