RISK-INFORMED INSERVICE INSPECTION PROGRAM PLAN - JAMES A FITZPATRICK

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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. The only deviation was in the element selection process for the Standby Liquid Control (SLC) system.

The SLC system had one location in risk category 4 (high consequence, low failure potential; i.e. no degradation mechanism) and two locations in risk category 5 (medium consequence, medium failure potential; i.e. thermal fatigue). It was decided to inspect both locations in risk category 5 (for thermal fatigue) instead of one location in risk category 4 and one location in risk category 5.

The change in risk assessment presented in section 3.8 shows a net reduction in risk with the above taken into consideration.

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 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 classes 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.

Table 3.8-1 presents a summary of the proposed RI-ISI program versus the current Section XI program. This risk ranking is provided with and without the impact of degradation mechanisms associated with and managed by other augmented inspection programs (e.g. FAC). The values provided inside parentheses represent the risk category associated with the augmented inspection program. These other augmented programs effectively manage 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 3.8-1 identifies on a per system basis each applicable risk category. In addition the following is provided:

- the consequence rank and degradation mechanism which supports the risk category,
- the number of locations inspected by the current section XI,
- the number of locations proposed for the RI-ISI program,
- the increase, decrease or no change in the number of inspections,

- for risk categories with a decrease between the section XI and RI-ISI programs, an identification of whether those segments are being managed by an augmented inspection program (e.g. IGSCC), and

- the risk impact of the RI-ISI program as compared to the section XI program.

As can be seen from Table 3.8-1, the only high-risk category, as defined in EPRI TR-112657, is risk category 2. There are seven systems (ESW, FW, HPCI, MS, RCIC, RHR and RHRSW) with risk category 2 segments. In six of the seven systems there is an increase in the number of inspections required by the RI-ISI program over the current section XI program. In the seventh system (FW), while the number of inspections is the same, more of the risk will be captured as the RI-ISI inspection volumes will be greater than that required by the current section XI program. Thus, a positive impact on risk is expected as each system will see either an increase in the number of inspections or inspection volume.

In the medium risk region (i.e. risk categories 4 and 5), there are four systems (FW, MS, RWCU and RWR) where the number of inspections (RI-ISI vs section XI) has decreased but the system is being managed by an augmented inspection program (FAC or IGSCC). These are identified in Table 3.8-1 by either 'FAC' or 'IGSCC' in the 'Augmented Program' column. As such, the impact of the RI-ISI program for these locations is considered negligible as the augmented programs provide any real risk reduction benefit.

The medium risk region consists of risk categories 4 and 5. Risk category 4 occurs in eight systems for the locations not addressed by augmented programs. These are CS, HPCI, MS, RCIC, RWCU, RHR, RHRSW and SLC. Of these, two systems (CS and RHR) have an increased number of inspection (+3), three systems (MS, RCIC and RWCU) have a decrease in the number of inspections (-4) and three systems (HPCI, RHR and SLC) have no change in the number of inspections. Thus, given a reduction in only one inspection location a negligible impact on risk is expected.

Risk category 5 occurs in eight systems for the locations not addressed by augmented programs. These are CS, ESW, FW, HPCI, MS, INST, RHR and SLC. Of these, six systems (ESW, HPCI, MS, INST, RHR and SLC) have an increased number of inspections (+9) and two systems (CS and FW) have a decreased number of inspections (-6). Thus, given a net gain of three inspections, a risk neutral to positive impact is expected.

As discussed in EPRI TR-112657, the contribution to risk from risk category 6 and 7 locations is negligible.

In summary and as depicted in Table 3.8-2, there is an increase of seven inspection locations and four expanded inspection volumes in the high risk region (i.e. risk category 2). There is an increase of two inspection locations in the medium risk region (i.e. risk categories 4 and 5). Thus, there is a risk neutral to positive impact due to the RI-ISI program as compared to the current section XI program, taking into account the existing augmented programs outside of the scope of the section XI program.

Defense-In-Depth

The intent of the inspections mandated by ASME Section XI for piping welds is to identify conditions such as flaws or indications that may be precursors to leaks or ruptures in a system's pressure boundary. Currently, the process for picking inspection locations is based upon structural discontinuity and stress analysis results. As depicted in ASME White Paper 92-01-01 Rev. 1, "Evaluation of Inservice Inspection Requirements for Class 1, Category B-J Pressure Retaining Welds", this method has been ineffective in identifying leaks or failures. EPRI TR-112657 and Code Case N578 provide a more robust selection process founded on actual service experience with nuclear plant piping failure data.

This process has two key independent ingredients, that is, a determination of each location's susceptibility to degradation and secondly, an independent assessment of the consequence of the piping failure. These two ingredients assure defense in depth is maintained. First off, by evaluating a location's susceptibility to degradation, the likelihood of finding flaws or indications that may be precursors to leak or ruptures is increased. Secondly, the consequence assessment effort has a single failure criterion. As such, no matter how unlikely a failure scenario is, it is ranked High in the consequence assessment, and at worst Medium in the risk assessment (i.e., Risk Category 4), if as a result of the failure there is no mitigative equipment available to respond to the event. In addition, the consequence assessment takes into account equipment reliability, and less credit is given to less reliable equipment.

As a result of the above process, the number of inspections has been increased in the high-risk categories in all systems with high-risk segments (only in one system the number of inspections in high category is unchanged), as can be seen in Table 3.7-1. The main reduction in number of inspections occurs in low risk categories. All locations within the reactor coolant pressure boundary will continue to receive a system pressure test and visual VT-2 examination as currently required by the Code regardless of its risk classification.

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.

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

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

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	1	33	1 (1)	29	0	148	0
ESW (2)			4	1					38	2 (3)				
FW	48	4 (4)			33	2 (4)								
FPC (2)													30	0
HPCI			1	1	2	0 (5)	21	3	17	2	171	0		
MS	44	2 (4)			74	1 (4)	6	1	4	0 (5)	16	0		
INST (2)									1	1	4	0	20	0
RCIC			8	2			25	4	6	0 (6)	66	0	9	0
RWCU	2	0 (5)			8	0 (5)	12	2 (4)	13	1 (4)	1	0		
RWR									113	1 (7)	29	0		
RHR			8	2			48	5	132	1 (1)	279	0	420	0
RHRSW (2)			11	4							26	0		
SLC							1	0 (8)	2	2	18	0		

Pop. – Population, the number of welds in a particular risk category.
Insp. – Inspected, the number of welds selected for inspection.

(1) This inspection is in addition to the 31 (CS system) and 130 (RHR system) locations addressed by IGSCC/FAC augmented inspection programs.

(2) locations are defined as piping runs vs welds for these systems

(3) 15 of the 38 piping runs were identified as potentially susceptible to erosion-cavitation and hence the two inspection locations, the remaining locations were identified as potentially susceptible to MIC and are addressed by the service water reliability program.

(4) This inspection(s) is in addition to the inspections required by the FAC augmented inspection program which cover all locations in this risk category.

(5) Addressed by FAC augmented inspection program.
(6) Addressed by service water reliability program.
(7) This inspection(s) is in addition to the inspections required by the IGSCC augmented inspection program which cover all locations in this risk category.
(8) Two locations were chosen in risk category 5 (instead one each in risk category 4 and 5) to inspect for thermal fatigue as opposed to no degradation mechanism in risk category 4.

TABLE 3.8-1

SYSTEM	Risk Category [1]	Consequence Rank	Degradation Mechanism	Locations Inspected [2]		Delta Inspections	Augmented Programs	CDF Impact [3]
				Current SXI	RI-ISI			
CRD	5	Medium	None	0	0	0		No Change
	7	Low	None	5	0	-5		Negligible
	7 (7)	None	None (IGSCC)	0	0	0	IGSCC	Negligible
CS	4	High	None	0	1	1		Improvement
	5	Medium	TS	0	0	0		Negligible
	5 (5)	Medium	TS, (IGSCC)	2	1	-1	IGSCC	Acceptable
	5 (5)	Medium	CC, (IGSCC)	2	0	-2	IGSCC	Acceptable
	6 (5)	Medium	None (IGSCC)	5	0	-5	IGSCC	Negligible
	6	Medium	None	2	0	-2		Negligible
	7 (5)	Low	None (FAC)	5	0	-5	FAC	No Change
	7	Low	None	11	0	-11		Negligible
ESW	2 (2)	High	E-Cav (MIC)	0	1	1	MIC	Improvement
	4 (2)	High	None (MIC)	0	0	0	MIC	No Change
	5 (5)	Medium	E-Cav (MIC)	0	2	2	MIC	Improvement
	6 (5)	Medium	None (MIC)	0	0	0	MIC	No Change
FW	2 (1)	High	CC, TS (FAC)	0	1	1	FAC	Improvement
	2 (1)	High	CC, TT (FAC)	1	2	1	FAC	Improvement
	2 (1)	High	CC (FAC)	0	0	0	FAC	No Change
	2 (1)	High	TS (FAC)	1	1	0	FAC	No Change
	2 (1)	High	TT (FAC)	2	0	-2	FAC	Acceptable
	4 (1)	High	None (FAC)	9	0	-9	FAC	Acceptable
	5 (3)	Medium	CC, TT (FAC)	1	0	-1	FAC	Acceptable

TABLE 3.8-1

SYSTEM	Risk Category [(1)]	Consequence Rank	Degradation Mechanism	Locations Inspected [(2)]		Delta Inspections	Augmented Programs	CDF Impact [(3)]
				Current SXI	RI-ISI			
	5 (3)	Medium	TS (FAC)	2	2	0	FAC	No Change
	5 (3)	Medium	TT (FAC)	2	0	-2	FAC	Acceptable
	6 (3)	Medium	None (FAC)	9	0	-9	FAC	Negligible
FPC	7	Low	None	0	0	0		No Change
HPCI	2	High	TS	0	1	1		Improvement
	4	High	None	3	3	0		No Change
	5	Medium	TS	0	2	2		Improvement
	6 (5)	Medium	None (MIC)	0	0	0	MIC	Negligible
	6	Medium	None	13	0	-13		Negligible
MS	2 (1)	High	TS (FAC)	0	2	2	FAC	Improvement
	4 (1)	High	None (FAC)	7	0	-7	FAC	Acceptable
	4	High	None	2	1	-1		Acceptable
	5 (3)	Medium	TS (FAC)	0	1	1	FAC	Improvement
	6 (3)	Medium	None (FAC)	17	0	-17	FAC	Negligible
	6	Medium	None	4	0	-4		Negligible
	7 (5)	Low	None (FAC)	4	0	-4	FAC	Negligible
INST	5	Medium	TS	0	1	1		Improvement
	6	Medium	None	0	0	0		No Change
	6	Low	TS	0	0	0		No Change
	7	Low	None	0	0	0		No Change
RCIC	2	High	CC	1	2	1		Improvement
	4	High	None	6	4	-2		Acceptable
	6	Medium	None	0	0	0		No Change

TABLE 3.8-1

SYSTEM	Risk Category [1]	Consequence Rank	Degradation Mechanism	Locations Inspected [2]		Delta Inspections	Augmented Programs	CDF Impact [3]
				Current SXI	RI-ISI			
	6 (5)	Medium	None (MIC)	0	0	0	MIC	No Change
	7	Low	None	0	0	0		No Change
RWCU	4 (1)	High	None (FAC)	2	0	-2	FAC	Acceptable
	4	High	None	3	2	-1		Acceptable
	6 (3)	Medium	None (FAC)	1	0	-1	FAC	Negligible
	6 (5)	Low	TS (FAC)	0	1	1	FAC	Negligible
	6	Medium	None	0	0	0		Negligible
	7 (6)	Low	None (FAC)	2	0	-2	FAC	Negligible
RWR	5 (5)	Medium	CC (IGSCC)	10	1	-9	IGSCC	Acceptable
	6 (5)	Medium	None (IGSCC)	33	0	-33	IGSCC	Negligible
	6	Medium	None	0	0	0		Negligible
RHR	2	High	E-Cav	1	1	0		No Change
	2	High	TS	0	1	1		Improvement
	4	High	None	3	5	2		Improvement
	5	Medium	TS	0	1	1		Improvement
	6 (5)	Medium	None (IGSCC)	5	0	-5	IGSCC	Negligible
	6 (5)	Low	E-Cav, TS (FAC)	1	0	-1	FAC	Negligible
	6 (5)	Low	E-Cav, TT (FAC)	0	0	0	FAC	Negligible
	6 (5)	Low	E-CAV (FAC)	1	0	-1	FAC	Negligible
	6 (5)	Low	TS (FAC)	0	0	0	FAC	Negligible
	6 (5)	Low	TT (FAC)	0	0	0	FAC	Negligible
	6	Medium	None	2	0	-2		Negligible

TABLE 3.8-1

SYSTEM	Risk Category [1]	Consequence Rank	Degradation Mechanism	Locations Inspected [2]		Delta Inspections	Augmented Programs	CDF Impact [3]
				Current SXI	RI-ISI			
	6	Low	E-Cav, TT	0	0	0		Negligible
	6	Low	E-Cav	1	0	-1		Negligible
	6	Low	TT	16	0	-16		Negligible
	6	Low	TS	2	0	-2		Negligible
	7 (5)	Low	None (FAC)	2	0	-2	FAC	Negligible
	7 (6)	Low	None (IGSCC)	2	0	-2	IGSCC	Negligible
	7	Low	None	30	0	-30		Negligible
RHRSW	2 (2)	High	E-Cav (MIC)	0	4	4	MIC	Improvement
	4 (2)	High	None (MIC)	0	0	0	MIC	No Change
	6 (6)	Low	E-Cav (MIC)	0	0	0	MIC	Negligible
	7 (6)	Low	None (MIC)	0	0	0	MIC	Negligible
SLC	4	High	None	0	0	0		No change
	5	Medium	TS	0	2	2		Improvement
	6	Medium	None	0	0	0		Negligible

(1) Values inside parentheses represent risk ranking with the inclusion of FAC, IGSCC and/or MIC, as appropriate.
(2) Excludes surface examinations
(3) For those changes in risk deemed as acceptable, see Section 3.8.

Table 3.8-2
Change In Inspection Summary

Risk Region	Risk Category	System	INSPECTIONS			Expanded Volume
			Added	Deleted	Change	
High	2	ESW	1		1	
	2	FW			0	4
	2	HPCI	1		1	
	2	MS	2		2	
	2	RCIC	1		1	
	2	RHR	1		1	
	2	RHRSW	1		1	
High	**2**	**Total**			**+7**	**+4**
Medium	4	CS	1		1	
	4	HPCI			0	
	4	MS		1	-1	
	4	RCIC		2	-2	
	4	RWCU		1	-1	
	4	RHR	2		2	
	4	RHRSW			0	
	4	SLC			0	
	4	*Subtotal*			-1	
	5	CS		3	-3	
	5	ESW	2		2	
	5	FW		3	-3	
	5	HPCI	2		2	
	5	MS	1		1	
	5	INST	1		1	
	5	RHR	1		1	
	5	SLC	2		2	
	5	*Subtotal*			+3	
Medium	**4 & 5**	**Total**			**+2**	

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			3						24
FW	19/0	6					27			19
FPC	0/0									
HPCI	2/11	4	2				7		9	1
MS	24/5	4					34			28
INST	0/1	1								
RCIC	1/7	6					7			
RWCU	4/4	3					8			7
RWR	0/40	1				12	31			40
RHR	4/30	3	5			7	11		48	23
RHRSW	6/0			4						6
SLC	0/2	1								
TOTAL		30	8	7		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) - Does not include inspections from service water reliability program.

(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.