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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Additional Information Supporting Risk-Informed Inservice Inspection Relief Request

References:

1. Letter from D. M. Hoots (Exelon Generation Company, LLC) to U. S. NRC, "Byron Station, Units 1 and 2, Transmittal of Inservice Inspection Program Plan for the Third Ten year Inspection Interval," dated February 14, 2006

2. Letter from R. F. Kuntz (U. S. NRC) to C. M. Crane (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Request for Additional Information Related to Relief Request I3R-02 (TAC Nos. MD3855 and MD3856," dated August 8, 2007

In Reference 1, Exelon Generation Company, LLC (EGC) submitted the third ten-year inspection interval Inservice Inspection Program for Byron Station, Units 1 and 2. Section 8 of the Inservice Inspection Program plan contained alternatives to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inspection and Testing of Components of Light Water Cooled Plants." Relief Request I3R-02 requested NRC approval to continue implementation of alternative risk-informed selection and examination criteria for certain pressure retaining piping welds.

In Reference 2, the NRC requested additional information related to Relief Request I3R-02. In response to this request, EGC is providing the attached information.

There are no regulatory commitments contained in this letter. Should you have any questions related to this letter, please contact Mr. Kenneth M. Nicely at (630) 657-2803.

Respectfully,

Patrick R. Simpson
Manager, Licensing

Attachment: Response to Request for Additional Information

ATTACHMENT
Response to Request for Additional Information

NRC Request 1

It is not clear what is meant by a more refined methodology for implementing additional examinations. How do the alternative criteria for additional examinations contained in Code Case N-578-1 provide a more refined methodology?

Response

Additional examinations are discussed in Section 3.6.6.2 of Electric Power Research Institute (EPRI) TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Revision B-A. This section discusses requirements for additional examinations at a high level, based on service conditions, degradation mechanisms, and the performance of evaluations to determine the scope of additional examinations.

A more specific discussion regarding the requirements for additional examinations is contained within paragraph -2430 of American Society of Mechanical Engineers (ASME) Code Case N-578-1, "Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method B." Exelon Generation Company, LLC's (EGC's) statement that "the alternative criteria for additional examinations contained in Code Case N-578-1 provides a more refined methodology for implementing necessary additional examinations" refers to the additional specificity and clarity discussed within paragraph -2430 of ASME Code Case N-578-1, when compared to the high level discussion in EPRI TR-112657.

NRC Request 2

Please verify that any additional examinations required due to the identification of flaws or relevant conditions will be conducted during the current outage.

Response

While not explicitly specified in paragraph -2430 of Code Case N-578-1, EGC intends to perform additional examinations required due to the identification of flaws or relevant conditions, which exceed the acceptance standards, during the current outage.

NRC Request 3

Discuss how ultrasonic examinations will be performed for each degradation mechanism. What volumes will be examined and what techniques will be used?

Response

Section 4 of EPRI TR-112657 states "Application of RI-ISI uses NDE techniques that are designed to be effective for specific degradation mechanisms and examination locations." Section 4 also identifies methods of examination for each degradation mechanism with the primary method being ultrasonic testing (UT) techniques. However, EPRI TR-112657 does not identify the examination volumes for components without a degradation mechanism. In addition, EPRI TR-112657 does not specify examination volumes and methods for socket welds.

EGC has requested to use the examination methods from Code Case N-578-1 instead of the methods from EPRI TR-112657, except that the volumetric method will be used to examine primary water stress corrosion cracking (PWSCC), as discussed in response to NRC Request 5

below. In addition, the VT-2 examination method will be used to examine socket welds in accordance with the provisions of Code Case N-578-1, Table 1.

The examination figures specified in Section 4 of EPRI TR-112657 will be used to determine the examination volume based on the degradation mechanism and component configuration. Table 1 below provides a comparison of degradation mechanisms, examinations volumes, and examination methods.

Table 1: Applicable Degradation Mechanisms, Examination Volumes, and Examination Methods

DEGRADATION MECHANISM (INITIALS) N-578-1 ITEM NUMBER						
CONFIGURATION	**TR-112657 EXAM FIGURE**	**SECTION XI EXAM FIGURE**	**EXAMINATION VOLUME COMMENTS**	**TR-112657 EXAM METHOD**	**N-578-1 EXAM METHOD**	**EXAMINATION METHOD COMMENTS**
Thermal Fatigue (TF) R1.11						
Butt-welds	4-1 4-2	IWB-2500-8(c) IWC-2500-7(a)	RI-ISI volume increased beyond counterbore, and is applied to smaller piping diameters and thicknesses.	Volumetric	Volumetric	No difference in method.
Sweep-o-Lets	4-3	IWB-2500-9	RI-ISI volume shifted to blend area of branch connection fitting.			
		IWC-2500-11	UT not required for Class 2.			
Weld-o-Lets	4-4	IWB-2500-10	RI-ISI volume increased for thicker materials.			
		IWC-2500-10	UT not required for Class 2.			
Primary Water Stress Corrosion Cracking (PWSCC) R1.15						
Butt-welds	4-9	IWB-2500-8(c)	RI-ISI includes all susceptible base materials in volume requirements. IWB-2500-8(c) volume determined by weld dimensions.	VT-2 or Volumetric	VT-2	Byron has adopted visual and volumetric methods per MRP-139 along with the RI-ISI Program.
Intergranular Stress Corrosion Cracking (IGSCC) R1.16						
Butt-welds	4-10 4-11	IWB-2500-8(c) IWC-2500-7(a)	RI-ISI volume increased beyond counterbore, and is applied to smaller piping diameters and thicknesses.	Volumetric	Volumetric	No difference in method.
Sweep-o-Lets	4-12	IWB-2500-9	RI-ISI volume increased for thicker materials.			
		IWC-2500-11	UT not required for Class 2.			
Weld-o-Lets	4-13	IWB-2500-10	RI-ISI volume increased for thicker materials.			
		IWC-2500-10	UT not required for Class 2.			
Microbiologically-Induced Corrosion (MIC) R1.17						
Butt-Welds	4-15	N/A	Section XI does not address this examination type. Currently, all MIC susceptible components are within the station Service Water Program.	Volumetric or Visual	Volumetric or Visual	No difference in method.

Table 1: Applicable Degradation Mechanisms, Examination Volumes, and Examination Methods						
DEGRADATION MECHANISM (INITIALS) N-578-1 ITEM NUMBER						
CONFIGURATION	**TR-112657 EXAM FIGURE**	**SECTION XI EXAM FIGURE**	**EXAMINATION VOLUME COMMENTS**	**TR-112657 EXAM METHOD**	**N-578-1 EXAM METHOD**	**EXAMINATION METHOD COMMENTS**
Flow Accelerated Corrosion (FAC) R1.18						
Piping Components	4-16 thru 4-22	N/A	Section XI does not address this examination type. Currently, all FAC susceptible components are within the station FAC Program.	Volumetric	Volumetric per FAC program	No difference in method.
No Damage Mechanism R1.20						
Butt-welds	N/A	IWB-2500-8(c) IWC-2500-7(a)	Examination requirements are not identified in TR-112657. Examination figures are taken from N-578-1 and include the expanded exam volume specified in Table 1 Note(1).	N/A	Volumetric	Examination requirements are not identified in TR-112657.
Sweep-o-Lets		IWB-2500-9				
Weld-o-Lets		IWB-2500-10				
All Damage Mechanisms						
Socket Welds	N/A	N/A	No volumetric examination figure specified.	N/A	VT-2	Examination requirements are taken from N-578-1 Table 1 Note (12).

NRC Request 4

Please describe how volumetric examinations will be performed. Will volumetric examinations include the volume required for ASME Section XI examinations? Will ASME Section XI, Appendix VIII qualified examiners and procedures be used for all volumetric exams? Will the examination volume be scanned for both axial and transverse indications for all exams?

Response

In general, EGC plans to use UT techniques for volumetric examinations.

For the components addressed by the Risk Informed Inservice Inspection (RI-ISI) program, ASME Section XI focuses primarily on weld examinations. Risk informed examination volumes also include portions of piping and fitting base materials that are susceptible to particular degradation mechanisms. The examination figures specified in Section 4 of EPRI TR-112657 differ from the examination figures in ASME Section XI for certain component configurations and evaluated degradations. The differences between the examination programs are summarized in Table 1 above. Table 1 is limited to the current degradation mechanisms and component configurations at Byron Station.

The ASME Section XI, Mandatory Appendix I, "Ultrasonic Examinations," specifies that UT examination procedures, equipment, and personnel used to detect and size flaws in piping welds shall be qualified by performance demonstration in accordance with ASME Section XI Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems." The RI-ISI program complies with Appendix VIII for weld examinations. In cases where the examination

requirements cannot be met, EGC will submit a request for relief in accordance with 10 CFR 50.55a, "Codes and standards."

The examination methods are designed to be effective for specific degradation mechanisms and examination locations. The potential directions for flaw propagation are in both the axial and transverse orientations. The volumetric scanning will be in both axial and circumferential directions to detect the flaws in these orientations.

NRC Request 5

How will dissimilar metal welds be addressed? Discuss in detail the technical basis for including alloy 600 pressure-retaining dissimilar metal welds in your risk-informed inservice inspection, rather than a separate augmented program to the RI-ISI program.

Response

All dissimilar metal (DM) welds, as characterized in ASME Section XI IWA-9000, have been evaluated for failure potential and consequence of failure along with the other non-exempt piping. The piping segments containing the DM welds were classified into the appropriate RI-ISI categories, and appropriate elements were selected per the category requirements for examination during the third inspection interval. The examination requirements of the RI-ISI program are applied to the selected components.

EGC intends to perform the mandatory visual and volumetric examinations from MRP-139 throughout the inspection interval as an augmented examination program in parallel with the RI-ISI program. Once during the inspection interval, the volumetric examination scheduled under MRP-139 will also be credited to the RI-ISI program where appropriate. This approach will satisfy the requirements of both the RI-ISI and the MRP-139 programs, and will ensure that the inspection program will address the industry issue regarding PWSCC in Alloy 600 components.

NRC Request 6

Provide information regarding: examinations/system/components/degradation mechanisms/class, etc. similar to that provided in Attachment 1 of the Callaway submittal dated March 28, 2006 (Agencywide Documents Access and Management System Accession No. ML061010704). The information should show a summary of the changes in inspections from the Section XI program and changes from the previous risk informed-inservice inspection (RI-ISI) program to the proposed RI-ISI program.

Response

The requested information is provided in Tables 2 and 3 below.

ATTACHMENT
Response to Request for Additional Information

Table 2: System/Selection Comparisons Between ASME Section XI and Risk Informed Programs for Unit 1

SYSTEM	UNIT 1: 2ND INTERVAL ASME XI (1989 EDITION)			UNIT 1: 2ND INTERVAL RI-ISI (1989 EDITION)							UNIT 1: 3RD INTERVAL RI-ISI (2001 EDITION/2003 ADDENDA)						
	CAT.	WELD COUNT	WELD SEL.	RISK		CONSEQ. RANK	FAILURE POTENTIAL		WELD COUNT	RI-ISI SEL.	RISK		CONSEQ. RANK	FAILURE POTENTIAL		WELD COUNT	RI-ISI SEL.
				CAT.	RANK		DM(s)	RANK			CAT.	RANK		DM(s)	RANK		
AF Note[1]	-	-	-	-	-	-	-	-	-	-	1	H	H	FAC	H	37	-
											2	H	H	TF	M	20	5
											3	H	M	FAC	H	8	-
											4	M	H	None	L	87	9
											6/7	L	-	-	-	16	0
CS	C-F-1	172	12	4	M	H	None	L	172	18	4	M	H	None	L	172	18
CV	B-J	277	118	4	M	H	None	L	192	20	4	M	H	None	L	192	20
				5	M	M	TF	M	153	16	5	M	M	TF	M	153	16
	C-F-1	192	14	6/7	L	-	-	-	124	0	6/7	L	-	-	-	124	0
FW Note[3]	C-F-1	16	2	3	H	M	TF FAC	H	127	32	1	H	H	TF FAC	H	127	32
				3	H	M	FAC	H	33	Note[2]	1	H	H	FAC	H	37	Note[2]
	C-F-2	152	11	6/7	L	-	-	-	8	0	4	M	H	None	L	8	0
MS Note[3]	C-F-2	181	14	3	H	M	FAC	H	8	Note[2]	1	H	H	FAC	H	8	Note[2]
				6/7	-	-	None	-	173	0	4	M	H	None	L	173	17
RC	B-F	16	16	2	H	H	TF IGSCC PWSCC	M	166	42	2	H	H	TF IGSCC PWSCC	M	176	58
				4	M	H	None	L	408	41	4	M	H	None	L	400	66
	B-J	577	133								5	M	M	TF IGSCC	M	3	1
				6/7	L	-	-	-	19	0	6/7	L	-	-	-	14	0
RH	B-J	64	16	4	M	H	None	L	200	20	4	M	H	None	L	200	20
	C-F-1	227	17	6/7	-	-	-	-	91	0	6/7	-	-	-	-	91	0
RY	B-F	6	6	2	H	H	TF PWSCC	M	43	11	2	H	H	TF PWSCC	M	39	16
	B-J	117	39	4	M	H	None	L	80	8	4	M	H	None	L	84	12

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Table 2: System/Selection Comparisons Between ASME Section XI and Risk Informed Programs for Unit 1

SYSTEM	UNIT 1: 2ND INTERVAL ASME XI (1989 EDITION)			UNIT 1: 2ND INTERVAL RI-ISI (1989 EDITION)							UNIT 1: 3RD INTERVAL RI-ISI (2001 EDITION/2003 ADDENDA)						
	CAT.	WELD COUNT	WELD SEL.	RISK CAT.	RISK RANK	CONSEQ. RANK	FAILURE POTENTIAL DM(s)	FAILURE POTENTIAL RANK	WELD COUNT	RI-ISI SEL.	RISK CAT.	RISK RANK	CONSEQ. RANK	FAILURE POTENTIAL DM(s)	FAILURE POTENTIAL RANK	WELD COUNT	RI-ISI SEL.
SI	B-J	522	87	4	M	H	None	L	278	28	4	M	H	None	L	267	27
				5	M	M	TF IGSCC	M	146	17	5	M	M	TF IGSCC	M	254	27
	C-F-1	422	34	6/7	L	-	-	-	520	0	6/7	L	-	-	-	423	0
SX	C-F-2	282	22	2	H	H	MIC PIT	M	282	Note[2]	2	H	H	MIC PIT	M	282	Note[2]
VQ	C-F-1	4	0	6/7	-	-	-	-	24	0	6/7	-	-	-	-	24	0
	C-F-2	20	1														

Table 3: System/Selection Comparisons Between ASME Section XI and Risk Informed Programs for Unit 2

SYSTEM	UNIT 2: 2ND INTERVAL ASME XI (1989 EDITION)			UNIT 2: 2ND INTERVAL RI-ISI (1989 EDITION)							UNIT 2: 3RD INTERVAL RI-ISI (2001 EDITION/2003 ADDENDA)						
	CAT.	WELD COUNT	WELD SEL.	RISK CAT.	RISK RANK	CONSEQ. RANK	FAILURE POTENTIAL DM(s)	FAILURE POTENTIAL RANK	WELD COUNT	RI-ISI SEL.	RISK CAT.	RISK RANK	CONSEQ. RANK	FAILURE POTENTIAL DM(s)	FAILURE POTENTIAL RANK	WELD COUNT	RI-ISI SEL.
AF Note[1]	-	-	-	-	-	-	-	-	-	-	1	H	H	FAC	H	32	Note[2]
											2	H	H	TF	M	20	5
											3	H	M	FAC	H	8	Note[2]
											4	M	H	None	L	88	9
											6/7	L	-	-	-	16	0
CS	C-F-1	164	12	4	M	H	None	L	164	17	4	M	H	None	L	164	17
CV	B-J	272	82	4	M	H	None	L	200	20	4	M	H	None	L	200	20
				5	M	M	TF	M	150	15	5	M	M	TF	M	150	16
	C-F-1	200	16	6/7	L	-	-	-	122	0	6/7	L	-	-	-	122	0
FW Note[3]	C-F-2	274	21	3	H	M	TF FAC	H	242	61	1	H	H	TF FAC	H	242	61
				3	H	M	FAC	H	32	Note[2]	1	H	H	FAC	H	36	Note[2]

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Table 3: System/Selection Comparisons Between ASME Section XI and Risk Informed Programs for Unit 2																
SYSTEM	UNIT 2: 2ND INTERVAL ASME XI (1989 EDITION)			UNIT 2: 2ND INTERVAL RI-ISI (1989 EDITION)							UNIT 2: 3RD INTERVAL RI-ISI (2001 EDITION/2003 ADDENDA)						
	CAT.	WELD COUNT	WELD SEL.	RISK		CONSEQ. RANK	FAILURE POTENTIAL		WELD COUNT	RI-ISI SEL.	RISK		CONSEQ. RANK	FAILURE POTENTIAL		WELD COUNT	RI-ISI SEL.
				CAT.	RANK		DM(s)	RANK			CAT.	RANK		DM(s)	RANK		
MS Note[3]	C-F-2	171	14	3	H	M	FAC	H	8	Note[2]	1	H	H	FAC	H	8	Note[2]
				6/7	-	-	None	-	163	0	4	M	H	None	L	163	16
RC	B-F	16	16	2	H	H	TF IGSCC PWSCC	M	165	42	2	H	H	TF IGSCC PWSCC	M	168	52
				4	M	H	None	L	367	41	4	M	H	None	L	377	41
	B-J	529	125								5	M	M	TF IGSCC	M	2	0
				6/7	L	-	-	-	13	0	6/7	L	-	-	-	8	0
RH	B-J	70	18	4	M	H	None	L	215	22	4	M	H	None	L	215	22
	C-F-1	245	18	6/7	-	-	-	-	100	0	6/7	-	-	-	-	100	0
RY	B-F	6	6	2	H	H	TF PWSCC	M	37	10	2	H	H	TF PWSCC	M	34	13
	B-J	112	30	4	M	H	None	L	81	9	4	M	H	None	L	84	12
SI	B-J	519	126	4	M	H	None	L	262	26	4	M	H	None	L	243	25
				5	M	M	TF IGSCC	M	160	16	5	M	M	TF IGSCC	M	253	26
	C-F-1	413	33	6/7	L	-	-	-	510	0	6/7	L	-	-	-	436	0
SX	C-F-2	294	22	2	H	H	MIC PIT	M	294	Note[2]	2	H	H	MIC PIT	M	294	Note[2]
VQ	C-F-1	4	0	6/7	-	-	-	-	24	0	6/7	-	-	-	-	24	0
	C-F-2	20	1														

Systems:

AF - Auxiliary Feedwater
CS - Containment Spray
CV - Chemical and Volume Control
FW - Main Feedwater
MS - Main Steam
RC - Reactor Coolant
RH - Residual Heat Removal
RY - Pressurizer Piping
SI - Safety Injection
SX - Essential Service Water
VQ - Containment Purge

Abbreviations:

CAT. – Category SEL. – Selection CONSEQ. – Consequence DM – Degradation Mechanism

Ranking:
L – Low M – Medium H – High
Note: Low Risk Categories 6 and 7 do not require examinations. The tables do not show the six possible combinations of Failure Potential and Consequence rankings that result in a Low Risk ranking.

Degradation Mechanisms (Initials) (RI-ISI Item Number) (Name):

PWSCC R1.15 Primary Water Stress Corrosion Cracking
IGSCC R1.16 Intergranular Stress Corrosion Cracking
MIC R1.17 Microbiologically-Induced Corrosion
None R1.20 No Damage Mechanism
FAC R1.18 Flow Accelerated Corrosion
PIT R1.17 Pitting
TF R1.11 Thermal Fatigue (includes TT and TASCS mechanisms)

Note[1]: Auxiliary Feedwater piping nominal pipe size 4" and smaller was previously exempted from examination in the 2nd inspection interval (1989 Edition) by paragraph IWC-1222. In the 3rd inspection interval (2001 Edition through the 2003 Addenda), these piping segments are included in the RI-ISI program and are subject to examination per IWC-1222(b).

Note[2]: Systems or portions of systems that have a degradation mechanism addressed by a separate augmented program are examined under the augmented program for that particular degradation mechanism. If no other degradation mechanism is identified, the element is removed from the RI-ISI element selection population and retained in the appropriate augmented inspection program. The augmented programs are the Flow Accelerated Corrosion program for FAC and the Service Water program for MIC and PIT. If another degradation mechanism is present, which is not addressed by the augmented program, the remaining degradation mechanism is examined as part of the RI-ISI program.

Note[3]: To assist in the comparison between programs, the inclusion of the High Energy Line Break (HELB) Augmented program is not shown. The tables are limited to the non-exempt Class 1 and 2 elements subject to examination under the ASME Section XI program and subsequently incorporated into the RI-ISI program. The merger of the RI-ISI and HELB programs occurred in the third inspection interval using the methods specified in EPRI TR-1006937. This merger involved the addition of welds beyond the Class 2 boundary within the break exclusion area.