Exelon Generation®

4300 Winfield Road
Warrenville, IL 60555

www.exeloncorp.com

RS-16-167

10 CFR 50.55a(z)

October 6, 2016

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

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

Subject: Supplemental Information for the Byron Station Fourth Inservice Inspection Interval Relief Request I4R-01

References:

(1) Letter from D. M. Gullott (Exelon Generation Company, LLC (EGC)) to NRC, "Relief Requests Associated with the Fourth Inservice Inspection Interval," dated April 15, 2016

(2) Email from J. S. Wiebe (NRC) to M. A. Mathews (EGC), "Request for Additional Information Regarding Relief Request I4R-01," dated August 3, 2016

(3) Email from J. S. Wiebe (NRC) to M. A. Mathews (EGC), "Request for Additional Information Regarding Relief Request I4R-01," dated August 25, 2016

In Reference 1, EGC submitted relief requests associated with the fourth inservice inspection (ISI) interval for Byron Station, Units 1 and 2. During the NRC's review, the NRC found that additional information is required to support its review of Relief Request I4R-01, as discussed in References 2 and 3. The requested information is provided in the attachment to this letter.

There are no regulatory commitments contained within this letter. Should you have any questions concerning this letter, please contact Mr. Mitchel A. Mathews at (630) 657-2819.

Respectfully,

David M. Gullott
Manager – Licensing
Exelon Generation Company, LLC

Attachment: Response to NRC Request for Additional Information for Byron Station, Units 1 and 2 10 CFR 50.55a Request I4R-01

ATTACHMENT
Response to NRC Request for Additional Information for
Byron Station, Units 1 and 2 10 CFR 50.55a Request I4R-01

Following are the NRC's requests for additional information in bold italicized font followed by Exelon Generation Company LLC's (EGC's) responses:

In reviewing the Exelon Generation Company, LLC (Exelon's) submittal dated April 15, 2016 (Agencywide Documents and Access Management System Accession No. ML16106A116), related to relief request I4R-01, for Byron Station, Unit Nos. 1 and 2, the NRC staff has determined that the following information is needed in order to complete its review:

> ***Provide information regarding: Examinations/system/components/degradation mechanisms/class, etc. similar to that provided in Tables 2 and 3 of your letter dated September 7, 2007 (Agencywide Documents Access and Management System Accession No. ML072530024). 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 (3rd ISI interval) to the proposed RI-ISI program (4th ISI interval). The information should also provide a summary of any deviations from the planned inspections for the previous RI-ISI program (3rd ISI interval) and the reasons for those changes.***

EGC Response:

The requested information is provided in Tables 1 through 3 and the responses to the NRC's Probabilistic Risk Assessment Licensing Branch (APLA) requests below.

ATTACHMENT
Response to NRC Request for Additional Information for
Byron Station, Units 1 and 2 10 CFR 50.55a Request I4R-01

TABLE 1: Byron Station, Unit 1 System/Selection Comparisons Between ASME Section XI Code and Risk Informed Programs

SYSTEM	3RD INTERVAL RI-ISI (START)							3RD INTERVAL RI-ISI (FINISH)							4TH INTERVAL RI-ISI (START)						
	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED
	CATEGORY	RANK		DEGRAD. MECH(s)	RANK			CATEGORY	RANK		DEGRAD. MECH(s)	RANK			CATEGORY	RANK		DEGRAD. MECH(s)	RANK		
AF	1	H	H	FAC	H	33	*A*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	H	H	TF	M	20	5	5	M	M	TF	M	20	2	5	M	M	TF	M	20	2
	3	H	M	FAC	H	8	*A*	3	H	M	FAC	H	41	*A*	3	H	M	FAC	H	41	*A*
	4	M	H	None	L	87	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/7	L	-	-	-	16	0	6/7	L	-	-	-	109	0	6/7	L	-	-	-	109	0
CS	4	M	H	None	L	172	18	4	M	H	None	L	172	18	4	M	H	None	L	172	18
CV	4	M	H	None	L	192	20	4	M	H	None	L	197	20	4	M	H	None	L	197	20
	5	M	M	TF	M	153	16	5	M	M	TF	M	131	14	5	M	M	TF	M	131	14
	6/7	L	-	-	-	124	0	6/7	L	-	-	-	146	0	6/7	L	-	-	-	146	0
FW *B*	1	H	H	TF, FAC	H	127	32	3	H	M	TF, FAC	H	128	32	3	H	M	TF, FAC	H	128	32
	1	H	H	FAC	H	37	*A*	3	H	M	FAC	H	37	*A*	3	H	M	FAC	H	37	*A*
	4	M	H	None	L	8	0	6/7	L	-	-	-	8	0	6/7	L	-	-	-	8	0
MS *B*	1	H	H	FAC	H	8	*A*	3	H	M	FAC	H	8	*A*	3	H	M	FAC	H	8	*A*
	4	M	H	None	L	178	18	6/7	L	-	-	-	178	0	6/7	L	-	-	-	178	0
RC *C*	2	H	H	TF, IGSCC, PWSCC	M	176	58	2	H	H	TF, IGSCC *D*	M	168	42	2	H	H	TF, IGSCC *D*	M	168	43
	4	M	H	None	L	400	66	4	M	H	None	L	408	42	4	M	H	None	L	408	38
	5	M	M	TF, IGSCC	M	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ATTACHMENT
Response to NRC Request for Additional Information for
Byron Station, Units 1 and 2 10 CFR 50.55a Request I4R-01

TABLE 1: Byron Station, Unit 1 System/Selection Comparisons Between ASME Section XI Code and Risk Informed Programs

SYSTEM	3RD INTERVAL RI-ISI (START)							3RD INTERVAL RI-ISI (FINISH)							4TH INTERVAL RI-ISI (START)						
	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED
	CATEGORY	RANK		DEGRAD. MECH(s)	RANK			CATEGORY	RANK		DEGRAD. MECH(s)	RANK			CATEGORY	RANK		DEGRAD. MECH(s)	RANK		
	6/7	L	-	-	-	14	0	6/7	L	-	-	-	17	0	6/7	L	-	-	-	17	0
RH	4	M	H	None	L	200	20	4	M	H	None	L	200	20	4	M	H	None	L	200	20
	6/7	L	-	-	-	91	0	6/7	L	-	-	-	91	0	6/7	L	-	-	-	91	0
RY *C*	2	H	H	TF, PWSCC	M	39	16	2	H	H	TF, *D*	M	35	9	2	H	H	TF, *D*	M	31	7
	4	M	H	None	L	84	12	4	M	H	None	L	88	11	4	M	H	None	L	80	11
SD	6/7	L	-	-	-	4	0	6/7	L	-	-	-	4	0	6/7	L	-	-	-	4	0
SI	4	M	H	None	L	267	27	4	M	H	None	L	249	25	4	M	H	None	L	249	25
	5	M	M	TF, IGSCC	M	254	27	5	M	M	TF, IGSCC	M	170	17	5	M	M	TF, IGSCC	M	170	17
	6/7	L	-	-	-	423	0	6/7	L	-	-	-	533	0	6/7	L	-	-	-	533	0
SX	2	H	H	MIC, PIT	M	282	*A*	2	H	H	MIC, PIT	M	282	*A*	2	H	H	MIC, PIT	M	282	*A*
VQ	6/7	L	-	-	-	24	0	6/7	L	-	-	-	24	0	6/7	L	-	-	-	24	0

TABLE 2: Byron Station, Unit 2 System/Selection Comparisons Between ASME Section XI Code and Risk Informed Programs

SYSTEM	3RD INTERVAL RI-ISI (START)							3RD INTERVAL RI-ISI (FINISH)							4TH INTERVAL RI-ISI (START)						
	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED
	CATEGORY	RANK		DEGRAD. MECH(s)	RANK			CATEGORY	RANK		DEGRAD. MECH(s)	RANK			CATEGORY	RANK		DEGRAD. MECH(s)	RANK		
AF	1	H	H	FAC	H	32	*A*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	H	H	TF	M	20	5	5	M	M	TF	M	20	2	5	M	M	TF	M	20	2
	3	H	M	FAC	H	8	*A*	3	H	M	FAC	H	40	*A*	3	H	M	FAC	H	40	*A*
	4	M	H	None	L	88	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/7	L	-	-	-	16	0	6/7	L	-	-	-	112	0	6/7	L	-	-	-	112	0
CS	4	M	H	None	L	164	17	4	M	H	None	L	164	17	4	M	H	None	L	164	17
CV	4	M	H	None	L	200	20	4	M	H	None	L	203	20	4	M	H	None	L	203	21
	5	M	M	TF	M	150	16	5	M	M	TF	M	127	13	5	M	M	TF	M	127	13
	6/7	L	-	-	-	122	0	6/7	L	-	-	-	145	0	6/7	L	-	-	-	145	0
FW *B*	1	H	H	TF, FAC	H	242	61	3	H	M	TF, FAC	H	242	61	3	H	M	TF, FAC	H	242	61
	1	H	H	FAC	H	36	*A*	3	H	M	FAC	H	36	*A*	3	H	M	FAC	H	36	*A*
MS *B*	1	H	H	FAC	H	8	*A*	3	H	M	FAC	H	8	*A*	3	H	M	FAC	H	8	*A*
	4	M	H	None	L	169	17	6/7	L	-	-	-	169	0	6/7	L	-	-	-	169	0
RC *C*	2	H	H	TF, IGSCC, PWSCC	M	168	52	2	H	H	TF, IGSCC *D*	M	168	52	2	H	H	TF, IGSCC *D*	M	160	40
	4	M	H	None	L	377	41	4	M	H	None	L	385	39	4	M	H	None	L	385	39
	5	M	M	TF, IGSCC	M	2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/7	L	-	-	-	8	0	6/7	L	-	-	-	10	0	6/7	L	-	-	-	10	0

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Byron Station, Units 1 and 2 10 CFR 50.55a Request I4R-01

TABLE 2: Byron Station, Unit 2 System/Selection Comparisons Between ASME Section XI Code and Risk Informed Programs

SYSTEM	3RD INTERVAL RI-ISI (START)							3RD INTERVAL RI-ISI (FINISH)							4TH INTERVAL RI-ISI (START)						
	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED	RISK		CONSEQUENCE RANK	FAILURE POTENTIAL		WELD POPULATION	RI-ISI SELECTED
	CATEGORY	RANK		DEGRAD. MECH(s)	RANK			CATEGORY	RANK		DEGRAD. MECH(s)	RANK			CATEGORY	RANK		DEGRAD. MECH(s)	RANK		
RH	4	M	H	None	L	215	22	4	M	H	None	L	215	22	4	M	H	None	L	215	22
	6/7	I	-	-	-	100	0	6/7	I	-	-	-	100	0	6/7	I	-	-	-	100	0
RY *C*	2	H	H	TF, PWSCC	M	34	13	2	H	H	TF *D*	M	30	8	2	H	H	TF *D*	M	26	8
	4	M	H	None	L	84	12	4	M	H	None	L	88	12	4	M	H	None	L	80	8
SI	4	M	H	None	L	243	25	4	M	H	None	L	241	24	4	M	H	None	L	241	25
	5	M	M	TF, IGSCC	M	253	26	5	M	M	TF, IGSCC	M	159	16	5	M	M	TF, IGSCC	M	159	16
	6/7	L	-	-	-	436	0	6/7	L	-	-	-	546	0	6/7	L	-	-	-	546	0
SX	2	H	H	MIC/PIT	M	294	*A*	2	H	H	MIC/PIT	M	294	*A*	2	H	H	MIC/PIT	M	294	*A*
VQ	6/7	-	-	-	-	24	0	6/7	-	-	-	-	24	0	6/7	-	-	-	-	24	0

Table 3: Abbreviations and Notes for Tables 1 and 2

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:

DEGRAD. MECH(s) - Degradation Mechanism(s)

POTENT. - Potential

Rankings: L - Low; M - Medium; H - High

Note: Risk Categories 6 and 7 do not require examinations. The tables do not show the Failure Potential and Consequence rankings that result in a Low Risk ranking.

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

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

NOTES

A	Systems or portions of systems that have a degradation mechanism addressed by separate augmented program are examined under the augmented program for that particular degradation mechanism. If no other damage mechanism (DM) is identified, the element is removed from the risk informed inservice inspection (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 DM is present, which is not addressed by the augmented program, the remaining DM is examined as part of the RI-ISI program.
B	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 occurred in the 3rd inservice inspection (ISI) interval using the methods specified in Electric Power Research Institute (EPRI) TR-1006937. This merger involved the addition of welds beyond the Class 2 boundary within the break exclusion area.
C	For the 4th ISI interval, the contiguous RC and RY systems were combined into a single RC/RY RI-ISI system. They are shown here as separate systems for comparison with previous intervals. For Unit 1, the combined Risk Category 2 welds results in 50 total examinations out of a total population 199 welds. The combined Risk Category 4 welds results in 49 total examinations out of a total population 488 welds. For Unit 2, the combined Risk Category 2 welds results in 48 total examinations out of a total population 186 welds. The combined Risk Category 4 welds results in 47 total examinations out of a total population 465 welds.
D	During the 3rd ISI interval, Alloy 600 welds were mitigated using mechanical stress improvement and full-structural weld overlay methods to reduce the likelihood of PWSCC. Per the requirements in ASME Code Case N-770-1, Note 11(c), the previous classification of these welds as PWSCC (R1.15) was changed to None (R1.20).

In reviewing the Exelon Generation Company, LLC (Exelon's) submittal dated April 15, 2016 (Agencywide Documents and Access Management System Accession No. ML16106A116), related to relief request I4R-01, for the Byron Station, Unit Nos. 1 and 2, the NRC staff has determined that the following information is needed in order to complete its review:

APLA Request No. 1. ***The fourth paragraph on page 3 of 15 of relief request I4R-01 states that "Therefore, with the exception of specific weld locations that may have changed due to maintenance or modification activities (e.g., Fukushima FLEX modification) and the addition of an Alloy 600 Augmented Examination Program, the proposed alternative RI-ISI program for the fourth ISI interval is the same program methodology as approved in Reference 6 for the third ISI interval." Provide the results of the complete living program steps under the Byron Station RI-ISI program that resulted from the newer selection of piping segment elements that were changed in the proposed RI-ISI program due to the identified maintenance and modifications and also other activities that may not have been identified in the submittal.***

EGC Response:

The Risk-Informed Inservice Inspection (RI-ISI) Program is required to and has been maintained as a "living program" assessing component and configuration changes and major probabilistic risk assessment (PRA) model revisions throughout the 3rd inservice inspection (ISI) interval. As a "living program," the RI-ISI program methodology requires on-going revisions due to changes that occur after the original implementation. As part of the 4th ISI interval update process, the consequence and degradation assignments and resultant component risk rankings have been confirmed or updated, element selections have been adjusted, and the risk impact assessment has been revised. The final RI-ISI evaluation for the previous 3rd ISI interval was Revision 6 dated September 2013. The latest evaluation, Revision 7, dated April 2016, is the current evaluation developed as part of the new 4th ISI interval RI-ISI program. The changes in inspections by Risk Category significance from the initial 3rd interval RI-ISI program (i.e., Revision 5 dated April 2006) to the new 4th interval RI-ISI program are summarized in Tables 4 and 5 below.

The following three items describe situations where the initially selected welds were replaced, added, or deleted due to changes in the RI-ISI program, or where unacceptable scanning limitations were determined at the time of the weld examination.

Limited Examination Coverage - Changes in selection due to limited access to the examination surface:

Weld configurations, such as pipe-to-valve or adjacent obstructions, may present limited coverage under the examination requirements of Appendix VIII. Reselection of some initial examination locations where greater than 90% coverage could not be obtained were made to optimize code coverage.

Plant/Component Modifications - Changes in selection due to plant and component modifications:

As discussed above, the RI-ISI program has been maintained throughout the 3rd ISI interval as a "living program". Various plant modifications were installed throughout the interval and were evaluated for impact to the RI-ISI program, and when applicable, changes to the RI-ISI scope and element selections were made. (A listing of modifications activities made during the 3rd ISI Interval affecting the RI-ISI program is shown below after the Units 1 and 2 Selection Summary Tables.)

RI-ISI Category Reclassification/PRA Model Revisions - Changes in selection due to reclassification into different RI-ISI categories per PRA model revisions:

The Byron Station PRA model applicable to the initial 4th ISI interval RI-ISI program was revised in September 2012 and issued as Model BB011b. This revision of the model was incorporated into Revision 6 of the RI-ISI program in September 2013. As the model is updated throughout the interval, impact on the RI-ISI program is assessed and the program is updated as necessary. Revision of the RI-ISI program to incorporate the PRA models is the driver of many of the segments being reclassified into different RI-ISI categories.

The following tables provide a summary of the changes to RI-ISI inspection population for Byron Station, Units 1 and 2.

Table 4: Unit 1 Selection Summary

UNIT 1			
RISK CATEGORY	**EXAMS (RI-ISI REV. 5)**	**EXAMS (RI-ISI REV. 7)**	**ITEMS AFFECTING CHANGES**
High	111	82	▪ Plant/Component Modifications ▪ RI-ISI Category Reclassification/PRA Model Revisions[1]
Medium	221	166	▪ Plant/Component Modifications ▪ RI-ISI Category Reclassification/PRA Model Revisions[1]
Total	**332**	**248**	
[1] The latest incorporated revision is PRA Model BB011b			

Table 5: Unit 2 Selection Summary

UNIT 2			
RISK CATEGORY	**EXAMS (RI-ISI REV. 5)**	**EXAMS (RI-ISI REV. 7)**	**ITEMS AFFECTING CHANGES**
High	127	109	▪ Plant/Component Modifications ▪ RI-ISI Category Reclassification/PRA Model Revisions[1]
Medium	191	163	▪ Plant/Component Modifications ▪ RI-ISI Category Reclassification/PRA Model Revisions[1]
Total	**318**	**272**	
[1] The latest incorporated revision is PRA Model BB011b			

Plant/Component Modification Summary:
The majority of the modification activities that occurred during the 3rd ISI interval were small-bore valve replacements that did not increase the weld population due to simple one-for-one weld replacements. A portion of Unit 1 feedwater (FW) system piping was replaced due to FAC induced wall thinning and this increased the weld population by one weld. One safety injection (SI) system valve was replaced that increased the weld population by two welds. These replacements did not alter the degradation and consequence assessment for the affected piping elements and the RI-ISI program was essentially unchanged.

The modification activities that had the largest impact to the RI-ISI weld populations were the Margin-to-Overfill and FLEX modifications.

Units 1 and 2 Margin-to-Overfill Modification in the SI System:
For Unit 1, nine welds were deleted and 13 welds were added with the piping configuration change for an increase of four welds to the weld population. For the 4th ISI interval, four welds are selected within this modified population to replace four welds selected previously under Risk Category 4. For Unit 2, nine welds were deleted and 15 welds were added with the piping configuration change for an increase of six welds to the weld population. For the 4th ISI interval, one weld is selected within this modified population to replace one weld selected previously under Risk Category 4.

Units 1 and 2 FLEX Modification SI System:
For Unit 1, two welds were deleted and six welds were added with the piping configuration change for an increase of four welds to the weld population. For the 4th ISI interval, no welds are selected within this modified population as no welds were selected previously under Risk Category 4. For Unit 2, no welds were deleted and six welds were added with the piping configuration change for an increase of six welds to the weld population. For the 4th ISI interval, no welds are selected within this modified population as no welds were selected previously under Risk Category 4.

Units 1 and 2 FLEX Modification Chemical Volume Control (CV) System:
For Unit 1, no welds were deleted and 5 welds were added with the piping configuration change. For the 4th ISI interval, no welds are selected within this modified population as no welds in this location were selected previously under Risk Category 4. For Unit 2, no welds were deleted and three welds were added with the piping configuration change. For the 4th ISI Interval, no welds are selected within this modified population as no welds in this location were selected previously under Risk Category 4.

Units 1 and 2 FLEX Modification Auxiliary Feedwater (AF) System:
For Unit 1, no welds were deleted and six welds were added with the piping configuration change. For the 4th ISI Interval, no welds are selected within this modified population as these piping segments are under Risk Category 6 that does not require examinations. For Unit 2, no welds were deleted and eight welds were added with the piping configuration change. For the 4th ISI interval, no welds are selected within this modified population as these piping segments are under Risk Category 6 that does not require examinations.

APLA Request No. 2. ***The table on page 4 of 15 of relief request I4R-01 shows the estimated total plant-level change in risk to the proposed fourth interval RI-ISI program. Provide: (1) the plant-level base CDF and base LERF for Unit 1 and Unit 2 based on the third interval of RI-ISI program; (2) provide the estimated risk change for system-level based on the proposed fourth interval RI-ISI program; and (3) explain the asymmetry between the delta-CDF and delta-LERF estimates for the two units, especially the fact that there are increases at Unit 1 but decreases at Unit 2.***

EGC Response:

1. The Byron Station PRA model version BB011b (i.e., Reference 1), used in support of the submittal, base CDF and LERF for each unit for the fourth RI-ISI interval are as follows.

Metric	Unit 1	Unit 2
CDF	3.82E-05	3.97E-05
LERF	3.19E-06	2.55E-06

2. The system level change in risk for the proposed fourth interval program is as follows. Unit 1 is provided in Table 6 and Unit 2 is provided in Table 7.

Table 6: Impact of RI-ISI and No Inspections on CDF and LERF Due to Pipe Ruptures for Byron Station, Unit 1

System	ΔCDF			ΔLERF		
	No Inspection	RI-ISI	Acceptance Criterion	No Inspection	RI-ISI	Acceptance Criterion
AF	1.82E-11	-7.06E-11	1.00E-07	4.54E-13	-1.77E-12	1.00E-08
CS	1.06E-10	-5.28E-11	1.00E-07	1.76E-12	-8.81E-13	1.00E-08
CV	3.86E-09	-1.87E-08	1.00E-07	6.34E-11	-3.14E-10	1.00E-08
FW	5.76E-09	1.01E-09	1.00E-07	1.56E-10	2.23E-13	1.00E-08
MS	4.78E-10	4.78E-10	1.00E-07	1.24E-11	1.24E-11	1.00E-08
RC	1.13E-07	3.88E-08	1.00E-07	9.72E-10	3.32E-10	1.00E-08
RH	1.80E-10	-2.97E-11	1.00E-07	5.76E-12	2.27E-12	1.00E-08
SI	6.64E-09	-4.08E-09	1.00E-07	1.13E-10	-6.75E-11	1.00E-08
SX	4.32E-10	4.32E-10	1.00E-07	4.32E-10	4.32E-10	1.00E-08
Total	1.31E-07	1.77E-08	1.00E-06	1.76E-09	3.95E-10	1.00E-07

Table 7: Impact of RI-ISI and No Inspections on CDF and LERF Due to Pipe Ruptures for Byron Station, Unit 2

System	ΔCDF			ΔLERF		
	No Inspection	RI-ISI	Acceptance Criteria	No Inspection	RI-ISI	Acceptance Criteria
AF	2.42E-11	-6.46E-11	1.00E-07	6.05E-13	-1.61E-12	1.00E-08
CS	1.06E-10	-4.40E-11	1.00E-07	1.76E-12	-7.34E-13	1.00E-08
CV	3.84E-09	-3.78E-08	1.00E-07	6.25E-11	-6.31E-10	1.00E-08
FW	4.77E-09	-4.50E-09	1.00E-07	1.48E-10	-1.72E-10	1.00E-08
MS	4.61E-10	4.61E-10	1.00E-07	1.21E-11	1.21E-11	1.00E-08
RC	1.01E-07	2.93E-08	1.00E-07	8.69E-10	2.51E-10	1.00E-08
RH	2.11E-10	-1.92E-11	1.00E-07	6.29E-12	2.45E-12	1.00E-08
SI	7.77E-09	-2.95E-09	1.00E-07	1.34E-10	-4.71E-11	1.00E-08
SX	4.32E-10	4.32E-10	1.00E-07	4.32E-10	4.32E-10	1.00E-08
Total	1.19E-07	-1.52E-08	1.00E-06	1.67E-09	-1.54E-10	1.00E-07

3. In general, the reason for Unit 2 having a negative delta-risk as compared to Unit 1 is that at Unit 1 only 247 welds are selected for risk-informed inspection while on Unit 2, 272 welds are selected. Furthermore, the welds that yield the greatest risk-benefit, or negative change in risk values, are those that have been selected for risk-informed inspections but were not selected under the previous ASME Section XI program. For Unit 1 these welds number 122 and at Unit 2 the number is greater at 130 welds.

   Looking at the delta-risk at the system level can also explain the difference between units. As shown in Tables 6 and 7 the biggest difference between the two units is the delta-risk

estimate for the chemical and volume control (CV) system. On Unit 2, there is a larger risk benefit coming from the CV system. The reason for this is there are 2 welds on Unit 2 with a high delta-risk benefit while there is only one weld on Unit 1. These particular welds have a large risk benefit coming from two factors: 1) the welds were not previously selected for inspection in the previous ASME Section XI program; and 2) there are high CCDP and CLERP values for these welds. Since the CCDP and CLERP values are high, there is a greater benefit to risk by selecting these welds for inspection.

There is also a minor additional risk benefit from feedwater (FW). For Unit 1 there are only 32 welds selected for risk-informed inspection while on Unit 2 there are 61 welds. The FW welds have lower CCDP and CLERP values compared to the CV welds so, as a consequence, their risk benefit is about an order of magnitude lower.

APLA Request No. 3. ***Confirm whether or not new piping segment locations were identified in the proposed RI-ISI program? In accordance with the EPRI RI-ISI methodology, the upper bound for all break locations that fall within the high consequence rank is based on the conditional core damage probability (CCDP) value obtained. If the upper bound estimate was used for these new locations, demonstrate how you determined that the delta risk did not exceed the acceptance criterion for delta-CDF and Delta-LERF as established by compliance with the intent of RG 1.174 and the methodology used in EPRI TR-112657.***

EGC Response:

EGC's response to APLA Request No. 1 above provides additional information regarding new piping locations that were incorporated into the proposed RI-ISI program throughout the third interval. These locations were evaluated as part of the living RI-ISI program including the risk impact assessment. The EGC RI-ISI Programs do not utilize the upper bound estimate criteria. In accordance with Section 3.7.2 of the EPRI RI-ISI Topical Report, the Markov piping reliability analysis method (i.e., Reference 6) was used to estimate the change in risk due to adding and removing locations from the inspection program. The actual CCDP and CLERP values calculated for each element in the consequence assessment was used in the risk impact calculation.

APLA Request No. 4. ***In Table 1, for Supporting Requirements (SRs) DA-C5 and C6, do both the base and adjusted cases used to estimate the risk increase include the same degree of conservatism indicated by failing to meet the SR requirements, such that the risk increase is not underestimated?***

EGC Response:

Yes, neither the base nor the adjusted model was altered to address the not-met Capability Category (CC) for SRs DA-C5 and DA-C6 during the RI-ISI delta-risk calculations. The conservatism is present in both models and associated cases used to estimate the risk increases.

APLA Request No. 5. ***In Table 1, for SR IE-A7, even if the initiating frequency is the same in the difference calculation, it appears that it doesn't "cancel out" when the difference is calculated for CDF or LERF, but rather remains as a multiplier on the difference in the CCDP resulting from the change. If any "other-than-at-power" potential initiators that could apply at-power are excluded, provide a quantitative justification that the effect of excluding these has negligible impact on the delta-CDF and LERF calculations.***

EGC Response:

The EGC risk management process ensures that the applicable PRA model remains an accurate reflection of the as-built and as-operated plants. This process is defined in the EGC Risk Management program, which consists of a governing procedure (ER-AA-600, "Risk Management") and subordinate implementation procedures. EGC procedure ER-AA-600-1015, "FPIE PRA Model Update," delineates the responsibilities and guidelines for updating the full power internal events PRA models at all operating EGC nuclear generation sites. Consequently, the Byron Station FPIE PRA has been undergoing a full maintenance update this year. As part of the update, SR IE-A7 has been addressed and plant events taking place at times other than at power where collected, reviewed and considered for applicability to initiating events at power. A review of those plant events found none that would be applicable to the modeled at power initiating events, nor would they contribute to any new initiating events (i.e., Reference 2).

APLA Request No. 6. ***In Table 1, for SRs LE-F1 and - G3, confirm whether or not the significant contributors to large early release were identified (i.e., were they available for review by the peer reviewers even if not formally documented?).***

EGC Response:

Yes, significant contributors to LERF were identified and made available to the reviewers, but they were not specifically documented and available to the reviewers by accident class. Having failed to provide the LERF results by accident class resulted in the reviewers' conclusion that the SRs were not met. However, significant contributors to LERF were provided to the reviewers from other perspectives such as release category and initiating event.

APLA Request No. 7. ***The NRC SE on EPRI TR 1021467-A requires that SRs AS-A9 and SC-B2 achieve Capability Category (CC)-II, i.e., (1) realistic (from similar plants) T-H analyses be used to determine accident progression parameters and (2) expert judgment not be used except where information is lacking on the condition or response of a modeled SSC, or there is a lack of analytical methods upon which to base prediction of SSC condition or response. Confirm whether or not both of these SRs achieved CC-II, either by the peer review itself or as a result of disposition of a peer review Fact and Observation (F&O). If the latter, provide both the F&O and the disposition.***

EGC Response:

Both SRs, AS-A9 and SC-B2, achieved CC-II or better from the July 2013 Byron Station peer review (Reference 3).

References:

1. BB PRA-014, "Quantification Notebook, Byron and Braidwood Stations," Rev BB011b, dated September 2012.
2. BB PRA-001, "Initiating Event Analysis," draft in progress, expected to be signed October 2016.
3. LTR-RAM-II-13-067-NP, Rev. 0, "Byron / Braidwood Nuclear Plants RG 1.200 Internal Events and Internal Flooding PRA Peer Review Report," dated November 12, 2013