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10 CFR 50
10 CFR 51
10 CFR 54

December 7, 2011

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

Limerick Generating Station, Units 1 and 2
Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: Response to NRC Request for additional information, dated November 18, 2011

Reference: 1. Exelon Generation Company, LLC letter from Michael P. Gallagher to NRC Document Control Desk, "Application for Renewed Operating Licenses", dated June 22, 2011.
2. Letter from Robert F. Kuntz (NRC) to Michael P. Gallagher (Exelon), "Requests for Additional Information for the review of the Limerick Generating Station License Renewal Application (TAC Nos. ME6555, ME6556)", dated November 18, 2011.

In the reference 1 letter, Exelon Generation Company, LLC (Exelon) submitted the License Renewal Application (LRA) for the Limerick Generating Station, Units 1 and 2. In the reference 2 letter, the NRC requested additional information to support the staffs' review of the LRA. Enclosed are the responses to these requests for additional information.

This letter and its enclosures contain no regulatory commitments.

If you have any questions, please contact Mr. Al Fulvio, Manager, Exelon License Renewal, at 610-765-5936.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 12-7-2011

Respectfully,

Michael P. Gallagher
Vice President - License Renewal Projects
Exelon Generation Company, LLC

Enclosures: A: Responses to Request for Additional Information
B: Updates to affected Limerick LRA sections

cc: Regional Administrator – NRC Region I
NRC Project Manager (Safety Review), NRR-DLR
NRC Project Manager (Environmental Review), NRR-DLR
NRC Project Manager, NRR-Limerick Generating Station
NRC Senior Resident Inspector, Limerick Generating Station
R. R. Janati, Commonwealth of Pennsylvania

Enclosure A

Responses to Request for Additional Information related to various sections of the Limerick Generating Station, Units 1 and 2, License Renewal Application (LRA)

RAI B.2.1.4-1
RAI B.2.1.7-1
RAI B.2.1.8-1
RAI B.2.1.8-2
RAI B.2.1.24-1
RAI B.2.1.24-2
RAI B.3.1-1

RAI B.2.1.4-1

Background
The license renewal application (LRA), Section B.2.1.4, states that the boiling water reactor (BWR) Vessel Inside Diameter (ID) Attachment Welds Program is an existing condition monitoring program that manages the effects of cracking of reactor vessel internal attachment welds. The program also manages the effects of loss of material due to wear of the steam dryer support brackets. The LRA states that the program incorporates the inspection and evaluation recommendations of BWR Vessels Internal Program (BWRVIP)-48-A. The Generic Aging Lessons Learned (GALL) Report aging management program (AMP) XI.M4 indicates that the program is focused on managing the effects of cracking.

Issue
During its audit, the staff noted that the applicant manages the effects of loss of material due to wear of the steam dryer support brackets by using a VT-3 inspection as part of the BWR Vessel ID Attachment Welds Program. The staff noted that loss of material is not addressed in GALL Report AMP XI.M4 or BWRVIP-48-A. Therefore, it is not clear to the staff whether the VT-3 inspection is an appropriate and effective inspection method to identify loss of material of the steam dryer support brackets.

The staff noted that since BWRVIP-48-A does not manage loss of material, the applicant has not identified the acceptance criteria for the inspections of steam dryer support brackets and associated corrective actions if the acceptance criteria are not met. Furthermore, the staff noted that the applicant's plant-specific implementation procedure for the BWR Vessel ID Attachment Welds Program does not include the inspection of steam dryer support brackets.

Request
1) Justify that a VT-3 inspection is an appropriate and effective inspection method to identify loss of material due to wear for the steam dryer support brackets.

2) Identify the acceptance criteria for the inspection of the steam dryer support brackets and justify that it ensures the intended functions of these components are maintained. Describe and justify the associated corrective actions if the acceptance criteria are not met.

3) Confirm that the implementation procedure for this program will be revised to include the use of a VT-3 inspection, and the associated acceptance criteria and corrective actions for the steam dryer support brackets.

4) Revise Updated Final Safety Analysis Report (UFSAR) Supplement in LRA Section A.2.1.4 to include a description of how this program manages the effects of loss of material due to wear of the steam dryer support brackets.

Exelon Response

1) Inspection of the steam dryer support bracket attachment welds for cracking is by EVT-1 examination; inspection of the bracket for loss of material due to wear is by VT-3 examination. ASME Code Section XI, IWA-2213(a) states that "VT-3 examination is conducted to determine the general mechanical and structural condition of components and their supports by verifying parameters such as clearances, settings, and physical displacements; to detect discontinuities and imperfections, such as loss of integrity at bolted or welded connections, loose or missing parts, debris, corrosion, wear, or erosion; and to

detect conditions that could affect operability or functional adequacy of snubbers and constant load and spring-type supports." Therefore, VT-3 examination is the appropriate examination method to identify the aging effect of loss of material due to wear for the steam dryer support brackets.

2) VT-3 examinations are currently being performed on the steam dryer support brackets as a result of wear being identified on a Unit 1 steam dryer support bracket in 2004. BWRVIP-48-A refers to ASME Code Section XI, Subsection IWB-3520 for acceptance criteria. ASME Code Section XI, Subsection IWB-3520.2 provides acceptance criteria for Visual Examination, VT-3 for Category B-N-2 components, and will be used for examination of the steam dryer support brackets. Applying acceptance criteria from ASME Code Section XI for the examination method and the component type being examined assures the intended functions of the steam dryer support brackets are maintained.

   Corrective actions for wear conditions are in accordance with ASME Code Section XI, Subsection IWB-3140. Corrective actions that have been performed to date for the wear conditions identified on the steam dryer support brackets include performing follow-up inspections during subsequent Unit 1 outages to monitor and trend the wear condition in accordance with the Corrective Action Program, performance of extent of condition examinations for wear on Unit 2, and completion of engineering evaluations.

3) A Corrective Action Program Issue Report has been initiated to revise the implementing procedure to provide the programmatic elements including use of VT-3 inspection, acceptance criteria, and corrective actions related to inspection of steam dryer support brackets to manage loss of material due to wear. Action to revise the procedure as described above is being tracked within the Corrective Action Program.

4) The UFSAR Supplement in LRA Section A.2.1.4 is revised to include a description of how this program manages the effects of loss of material due to wear of the steam dryer support brackets as shown in Enclosure B.

RAI B.2.1.7-1

Background
GALL Report AMP XI.M7 states that NUREG-0313, Revision 2 and NRC Generic Letter (GL) 88-01 delineate the guidance for selection of resistant materials and processes that provide resistance to inter granular stress corrosion cracking (IGSCC) such as solution heat treatment and stress improvement processes. LRA Section B.2.1.7 states that this program implements the program delineated in NUREG-0313, Revision 2, GL 88-01 and it's Supplement 1.

During the audit, the staff noted that the applicant's inservice inspection program plan indicates that the following welds of Limerick Generating Station (LGS) Units 1 and 2 are made of Alloy 182 with Alloy 182 weld butter: (1) recirculation outlet nozzle to safe end welds for Loops A and B, (2) jet pump instrumentation nozzle to safe end welds for Loops A and B, and (3) control rod drive retune nozzle to cap welds. Based on the guidance in GL 88-01, Attachment A, "Staff Position on Materials," the Alloy 182 welds of LGS Units 1 and 2 are not resistant to IGSCC.

In addition, the applicant's inservice inspection program plan described above indicates that ultrasonic examinations of Alloy 182 reactor pressure vessel nozzle to safe end welds (i.e., welds incorporating Alloy 182 welds and/or weld butters) at several BWR facilities have resulted

in the detection of cracking, which appears to have initiated as IGSCC in the Alloy 182 weld butter.

During the audit of the onsite documentation, the staff noted that the onsite documentation indicates that the Alloy 182 welds of LGS Unit 1 are categorized to IGSCC Category C, consistent with the GL 88-01 guidance that Alloy 182 is not a resistant material (Category A). By contrast, the absence of the LGS Unit 2 Alloy 182 welds in the applicant's list for the IGSCC Category-B-through-G welds suggests that these welds are categorized to IGSCC Category A (resistant material).

Issue
The IGSCC categories of the welds in the BWR Stress Corrosion Cracking Program are used to determine the inspection extent and frequency in accordance with GL 88-01 and BWRVIP-75-A. However, the applicant's program basis document and onsite documentation indicate that the Alloy 182 welds of LGS Unit 2 are categorized to IGSCC Category A (resistant material), which is inconsistent with GL 88-01. The staff found a need to further clarify the following items regarding the Alloy 182 welds of LGS Unit 2: (1) the proper IGSCC categories of these welds, (2) the basis of the applicant's categorization of these welds, and (3) consistency of the applicant's categorization with GL 88-01 and the IGSCC categorization of the LGS Unit 1 Alloy 182 welds.

Request
1) Describe the IGSCC categories of the LGS Unit 2 Alloy 182 welds listed in the inservice inspection plan.

2) Provide the basis for the IGSCC categorization of the LGS Unit 2 Alloy 182 welds. As part of the response, if any of these LGS Unit 2 Alloy 182 welds is categorized as Category A, further clarify why the welds are categorized as IGSCC resistant welds, inconsistent with GL 88-01 and the weld categorization of the LGS Unit 1 Alloy 182 welds to IGSCC Category C.

Exelon Response

1) The Unit 1 and 2 Alloy 182 welds are listed within the procedure for augmented ISI of Alloy 182 nozzle weldments. During the AMP audit the weld descriptions provided in this procedure were identified as incorrect for five Unit 2 welds. The following Unit 2 welds have an Alloy 82 inlay installed over the Alloy 182 Weld/ Weld Butter since prior to initial power operations, such that the Alloy 182 material has not been in contact with reactor coolant:

    a. VRR-2RS-2A N1A
    b. VRR-2RS-2B N1B
    c. RPV-2IN N8A
    d. RPV-2IN N8B
    e. RPV-2IN N9

    These five Unit 2 welds are therefore not required to be within the scope of the augmented ISI program for inspection of Alloy 182 nozzle weldments, and should not have been listed in the procedure. These welds were correctly classified as IGSCC Category A, in accordance with NUREG -0313, Revision 2 and have been within the scope of the Limerick Augmented ISI program for USNRC Generic Letter 88-01. IGSCC Category A is

appropriate since the Alloy 82 inlay material is considered resistant to IGSCC and is applied to prevent reactor coolant from contacting the Alloy 182 material. All Unit 2 welds with Alloy 182 at the reactor coolant interface are classified as IGSCC Category B. All Unit 1 welds with Alloy 182 at the reactor coolant interface are classified as IGSCC Category C.

A Corrective Action Program Issue Report has been initiated and the procedure for the augmented ISI inspection of Alloy 182 nozzle weldments was revised to correctly indicate that the five Unit 2 welds listed above are not within the scope of that program. This error in the procedure only existed within that procedure. These welds were properly classified in the ISI Program with the proper IGSCC category description. There are no welds with Alloy 182 at the reactor coolant interface that are classified as IGSCC Category A.

2) As discussed in item 1 of this response, Unit 2 Alloy 182 welds that are categorized as IGSCC Category A have an IGSCC resistant Alloy 82 inlay applied to prevent reactor coolant from contacting the Alloy 182 material. All Unit 2 welds with Alloy 182 at the reactor coolant interface that are listed in the procedure for augmented ISI inspection of Alloy 182 nozzle weldments are classified as IGSCC Category B because Alloy 182 is a material considered non-resistant to IGSCC and Mechanical Stress Improvement Process was performed on the weld within two years after plant operation. All LGS Unit 1 and 2 Alloy 182 welds are categorized consistent with NRC GL 88-01 and NUREG-0313 Revision 2 as described above.

RAI B.2.1.8-1

Background
The "parameters monitored/inspected" program element of GALL Report AMP XI.M8, "BWR Penetrations," states that the program manages the effects of cracking due to stress corrosion cracking (SCC) and IGSCC of the BWR instrumentation nozzles, control rod drive (CRD) housing and incore-monitoring housing (ICMH) penetrations, and BWR standby liquid control (SLC) nozzles/Core ΔP nozzles. The GALL Report also states that the program accomplishes this through inspection for cracks in accordance with the guidelines of BWRVIP-49-A, BWRVIP 47-A or BWRVIP-27-A, and the requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI, Table IWB 2500-1.

The BWR Penetrations Program basis document states that the program monitors the effects of cracking due to SCC and IGSCC by performing inspections of the instrumentation nozzles and CRD housing and incore-monitoring housing penetrations as part of the inservice Inspection program. The program basis document also states that currently, BWRVIP-47-A does not require additional inspections of the CRD housing and incore-monitoring housing penetrations.

Section 3.2.5, "Other Inspections," of BWRVIP-47-A indicates that the BWRVIP has determined that removing or dismantling of internal components for the purpose of performing inspections is not warranted to assure safe operation; however, on occasion, utilities may have access to the lower plenum due to maintenance activities not part of normal refueling outage activities. BWRVIP-47-A also states that in such cases, utilities will perform a visual inspection to the extent practical and the results of the inspection will be reported to the BWRVIP, who will report these results to the NRC.

In addition, the NRC's final safety evaluation of BWRVIP-47, as enclosed in NRC letter dated

October 13, 1999, indicates that by letter dated June 1, 1999, the BWRVIP stated that in addition, as access is provided for components in the lower plenum region, visual examination will be performed to the extent practical. The staff noted that this response of the BWRVIP is consistent with the guidance in Section 3.2.5, "Other Inspections," of BWRVIP-47-A.

Issue
In contrast with the guidance in Section 3.25 of BWRVIP-47-A, the applicant's program does not require additional inspections for the lower head penetrations (including stub tubes and their associated welds). In addition, it is not clear to the staff whether or not the results of the inspections performed in accordance with Section 3.2.5 of BWRVIP-47-A are consistent with the applicant's conclusion that the aging effects will be adequately managed.

Request
1) Justify why the "parameters monitored/inspected" program element of the BWR Penetrations program indicates that BWRVIP-47-A does not require additional inspections for the CRD housing and incore-monitoring housing penetrations (including the stub tubes and their associated welds) in addition to the requirements of ASME Code Section XI.

   If it cannot be justified, revise the program basis document, consistent with BWRVIP-47 A, and describe the revision made to the program basis document.

2) Describe and discuss, if any, the results of the inspections performed in accordance with Section 3.2.5 of BWRVIP-47-A in order to confirm that the inspection results are consistent with the conclusion that the aging effects will be adequately managed.

Exelon Response

1) BWRVIP-47-A, Section 3.2.5 states that when access is available to the lower plenum due to maintenance activities which are not part of normal refueling activities, a visual inspection of components managed by the BWR Penetrations program will be performed to the extent practical. The requirement to perform these inspections is included as part of the current Reactor Vessel Internals program and implementing procedures, and is included in the BWR Penetrations aging management program.

   The BWR Penetrations Program Bases Document, Element 3.3 Parameters Monitored, first paragraph will be revised to delete the last sentence which indicated that currently the BWRVIP-47-A does not require additional inspections of the CRD housing and incore monitoring housing penetrations.

   This change to the BWR Penetrations Program Basis Document is tracked in the License Renewal Change Request Process, used for tracking outstanding changes to documents required for Limerick License Renewal.

2) The following results are from inspections of lower plenum components performed in accordance with BWRVIP-47-A, Section 3.2.5 when access was available due to maintenance activities which were not part of normal refueling activities. Visual inspections of components managed by the BWR Penetrations program were performed to the extent practical.

   During the Unit 2 refueling outage in 2007, nine CRD housing to stub tube welds were examined when they were made accessible during maintenance of jet pumps. No

recordable indications were identified. Reference Letter from C. Mudrick to USNRC, LGS Unit 2 Summary Report for Inservice Inspections (2R09), dated 7/3/2007 (ML072550231). During the Unit 1 refueling outage in 2010, eight CRD housing to stub tube welds, eight CRD stub tube to RPV welds, and four in-core monitor housing to RPV penetration welds were examined when they were made accessible during cleaning of the RPV bottom head drain. No recordable indications were identified. Reference Letter from W. Maguire to USNRC, LGS Unit 1 Summary Report for Inservice Inspections (1R13), dated 7/9/2010 (ML101970123). These results confirm that the inspection results are consistent with the conclusion that the aging effects will be adequately managed.

RAI B.2.1.8-2

Background
The "parameters monitored/inspected" program element of GALL Report AMP XI,M8, "BWR Penetrations" states that the program manages the effects of cracking due to SCC and IGSCC of the BWR instrumentation nozzles, control rod drive (CRD) housing and incore-monitoring housing (ICMH) penetrations, and BWR standby liquid control (SLC) nozzles/Core ΔP nozzles. The GALL Report also states that the program accomplishes this by inspection for cracks in accordance with the guidelines of approved BWRVIP-49-A, BWRVIP-47-A or BWRVIP-27-A and the requirements of the ASME Code, Section XI, Table IWB 2500-1.

BWRVIP-47-A, which is referenced in LRA Section B.2.1.8 for the applicant's BWR Penetrations Program, includes the CRD stud tubes welded to the reactor head lower head. Section 3.2, "BWRVIP Inspection Guidelines," of BWRVIP-47-A indicates that if there is bottom head access as a result of normal refueling outage activities, ASME Code, Section XI, requires that visual inspection of accessible areas in the region be performed.

The LGS onsite procedure indicates that on April 30, 2008, the NRC approved an in-service inspection program relief request. The approval for the relief request authorized the use of the BWRVIP Inspection and Evaluation Guidelines in lieu of ASME Code required inspections and flaw evaluations for ASME Code, Section XI, B-N-1 and B-N-2 category components. More specifically, the LGS onsite procedure indicates that the relief request is applied to ASME Code, Section XI, B-N-2, Item Number B13.30 for the interior attachments beyond the beltline includes "CRD stub tube to vessel attachments (inaccessible)." This procedure also indicates that the relief request is applied to ASME Code, Section XI, B-N-2 Item Number B13.40 for integrally welded core support structures includes "CRD Housing to stub tube welds (inaccessible)."

The LGS inspection results describe the previous results of the VT-1 and VT-3 inspections for the CRD stub tube to vessel welds and stub tube to housing welds. Furthermore, the staff noted that Attachment 1 to the NRC safety evaluation, dated April 30, 2008, of the applicant's relief request indicates that BWRVIP-47-A is not included in the authorized alternative BWRVIP reports for the relief of the requirements of ASME Code Item Numbers B13.30 and B13.40. The staff also noted that the CRD stub tubes or related welds are not listed as components for which applicant's relief request was approved in the staff's safety evaluation.

Issue
The applicant's procedure indicates that the NRC approval for a relief request allows the use of the BWRVIP guidance in lieu of the requirements of ASME Code Section XI, Table IWB-2500-1, Item Numbers B13.30 and B13.40. The procedure also indicates that the CRD stub tubes or

related welds are the components, for which the relief request was approved to use the BWRVIP guidance.

By contrast, Attachment 1 to the staff's safety evaluation, dated April 30, 2008, of the relief request does not list CRD stub tubes or related welds for which the relief request was approved. Therefore, the staff needs to further clarify why the applicant's implementing procedure related to the BWR Penetrations Program includes this discrepancy with respect to the staff evaluation of the applicant's relief request. In addition, the staff needs further clarification about when the CRD stub tube to vessel attachments and CRD housing to stub tube welds are accessible for inspections.

Request
Justify why the implementing procedure for the BWR Penetrations Program has the aforementioned discrepancy with respect to the staff's evaluation of the applicant's relief request.

In addition, as part of the response, clarify when the CRD stub tube to vessel welds and stub tube to housing welds are accessible for inspections.

Exelon Response

The implementing procedure is incorrect in stating that the ISI Program Relief Request applies to examination of the CRD stub tube to vessel welds and CRD housing to stub tube welds. These welds are not ASME Code Section XI Category B-N-2 integral attachment welds, but are partial penetration welds and are examined under ASME Code Category B-P per the ISI program. In addition, a visual examination is performed for these locations in accordance with BWRVIP-47-A when they are made accessible. A Corrective Action Program Issue Report has been initiated to revise the procedure to delete reference to the ISI Program Relief Request relative to these welds. Examinations of these locations have been performed per ASME Code Section XI requirements and BWRVIP-47-A, and will continue per the BWR Penetrations aging management program.

The CRD stub tube to vessel welds and CRD housing to stub tube welds are located in the lower plenum region of the RPV and are only accessible for inspections during certain maintenance activities which are not part of normal refueling activities. Access to the lower plenum region of the RPV can be through disassembled jet pumps or through the core plate following removal of control rod guide tubes. Examples of the types of maintenance activities that result in access to these components to perform inspections include maintenance to the jet pumps and cleaning of the RPV bottom head drain. The response to RAI B.2.1.8-1 includes recent examples of inspections performed on LGS CRD stub tube to vessel welds, CRD housing to stub tube welds, and incore monitor housing to vessel welds when these components were made accessible by maintenance activities.

RAI B.2.1.24-1

Background
GALL Report AMP XI,M35, "One-Time Inspection of ASME Code Class 1 Small Bore-Piping," provides specific guidance regarding sampling for small-bore piping inspections. Based on the

LGS plant-specific operating experience, the GALL Report recommends that inspection sampling should include ten percent of the weld population or a maximum of 25 welds of each type (e.g., butt welds and socket welds) using a methodology to select the most susceptible and risk-significant welds.

The license renewal application (LRA) Section B.2.1.24, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping," provides specific sample size as recommended by GALL Report AMP XI, M35 for ASME Code Class 1 small-bore piping.

Issue
The LRA states that 25 socket welds will be volumetrically examined at each unit. However, the LRA further stated that the number of welds examined represents "38 percent of the high and medium consequence ranked socket welds." It is not clear to the staff how this percentage was calculated. In addition, the staff is not clear on the total population of ASME Code Class 1 butt welds and socket welds at each unit that is within the scope of the program.

Request
Describe the total population of Class 1 butt welds and socket welds at each unit that are within the scope of the program. In addition, clarify the inspection sample size for socket welds in terms of the percentage of the weld population. Consistent with this response revise the UFSAR supplement.

Exelon Response

There are 77 butt welds within the population small-bore ASME Code Class 1 piping welds on Unit 1. Eight Unit 1 butt welds will be inspected by the program, which corresponds to greater than 10 percent of that population. There are also 85 socket welds on Unit 1 that are greater than NPS 1-inch and less than NPS 4-inches, and an estimated several hundred socket welds that are equal to NPS 1-inch.

There are 84 butt welds within the population of small-bore ASME Code Class 1 piping welds on Unit 2. Nine Unit 2 butt welds will be inspected by the program, which corresponds to greater than 10 percent of that population. There are also 83 socket welds on Unit 2 that are greater than NPS 1-inch and less than NPS 4-inches, and an estimated several hundred socket welds that are equal to NPS 1-inch.

Based on a review of drawings that show ASME Code Class 1 piping runs within the scope of the program, it is estimated that there are several hundred NPS 1-inch socket welds on each unit that are within the scope of the program. Weld locations are not provided on many of the ASME Code Class 1 piping isometric drawings for Class 1 piping equal to NPS 1-inch and, as a result, extensive plant walkdowns in high radiation areas of the plant would be required to determine how many socket welds are installed that are equal to NPS 1-inch. Therefore, the inspection sample size for socket welds in terms of the percentage of the weld population cannot be reasonably determined. The number of socket welds to be inspected by the program for each LGS unit is 25. This corresponds to the maximum number of socket welds recommended for inspection by NUREG-1801 program, XI.M35, for One-Time Inspection of ASME Code Class 1 Small-Bore Piping.

LRA Appendix B, Section B.2.1.24 Program Description is revised to clarify the total population of ASME Code Class 1 butt welds and socket welds at each unit that are within the scope of the

program and the number of welds to be inspected, consistent with the revised LRA UFSAR Supplement, Section A.2.1.24. Section B.2.1.24 Program Description is also revised to delete: "This represents more than 10 percent of the total population of small-bore piping butt welds and more than 38 percent of the high and medium consequence ranked socket welds" since this statement can lead to confusion relative to the population of welds being inspected. The LRA Appendix B description for the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is revised as shown in Enclosure B.

Consistent with this response, the UFSAR Supplement for the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is revised as shown in Enclosure B.

RAI B.2.1.24-2

Background
Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR), Revision 2, Table 3.0-1 addresses the content of the UFSAR supplement summary description for GALL AMP XI.M35. The table states that, "Should evidence of cracking be revealed by a one-time inspection, periodic inspection is also proposed, as managed by a plant-specific AMP."

Issue
LRA Section B.2.1.24 states that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program includes controls to implement an alternate plant-specific periodic inspection program should evidence of ASME Code Class 1 small-bore piping cracking be revealed by the examinations performed as part of the program. However, the applicant's UFSAR supplement for the program, as described in LRA Section A 1.24, does not include any statement regarding corrective actions to be taken in the event that evidence of cracking is revealed by the program.

Request
Amend the UFSAR supplement for the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program to reflect that, if evidence of cracking is revealed by the program, periodic inspections will be initiated under a plant-specific AMP.

Exelon Response

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping aging management program includes the requirement to implement a plant specific periodic inspection aging management program should evidence of ASME Class 1 small-bore piping cracking caused by intergranular stress corrosion cracking (IGSCC) or fatigue be revealed by review of LGS operating experience prior to the period of extended operation, or by the examinations performed as part of this program.

The UFSAR Supplement for the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is revised as shown in Enclosure B to reflect that if evidence of cracking caused by IGSCC or fatigue is revealed, periodic inspections will be initiated under a plant-specific aging management program.

RAI B.3.1-1

Background
LRA Section 4.3.1 states that each transient projection was trended to determine if recent rates of occurrence could be higher than the overall average rate of occurrence and the trending shows that recent transient occurrence rates are bounded by the average occurrence rates. Therefore, in order to assure that this conclusion and basis remains valid, the Fatigue Monitoring Program will be used to monitor and track transient cycle occurrences through the end of the period of extended operation to ensure that these limits are not exceeded.
The time-limited aging analysis (TLAA) evaluations in LRA Sections 4.3.4, 4.3.5, 4.6.5 and 4.6.7 are dispositioned in accordance with 10 CFR 54.21(c)(1)(i), the analysis remains valid for the period of extended operation, and rely on the 60-year projections that were discussed in LRA Section 4.3.1.

The "monitoring and trending" program element of GALL Report AMP X.M1 recommends that trending is assessed to ensure that the fatigue usage factor remains below the design limit during the period of extended operation.

Issue
During its audit, the staff noted that the "monitoring and trending" program element of the LRA AMP states that the Fatigue Monitoring Program will continue to monitor and track transient cycles against the cycle limits throughout the period of extended operation to assure that the 60-year projections are valid.

The staff noted that the use of 60-year projections to demonstrate an analysis remains valid for the period of extended operation is consistent with the SRP-LR; however it is not clear to the staff if the validity of these analyses will be confirmed if the Fatigue Monitoring Program determines that a transient cycle count reaches a cycle limit.

Request
Confirm that implementing procedures or corrective actions of the Fatigue Monitoring Program ensures that the TLAAs, that rely on 60-year projections and disposition in accordance with 10 CFR 54.21 (c)(1)(i), will be evaluated if a cycle count reaches a cycle limit.

If not, justify that the 60-year projections can be relied upon to disposition these TLAAs in accordance with 10 CFR 54.21 (c)(1)(i).

Exelon Response

Each of the components with fatigue TLAAs dispositioned in accordance with 10 CFR 54.21 (c)(1)(i) are within the scope of the Fatigue Monitoring program, including the Reactor Vessel Internals (LRA Section 4.3.4), High Energy Line Break (HELB) Analyses Based Upon Fatigue (LRA Section 4.3.5), the Jet Pump Auxiliary Spring Wedge Assembly (LRA Section 4.6.5), and the Refueling Bellows (LRA Section 4.6.7). These fatigue analyses are based on the same set of design transients that are monitored and trended in the Fatigue Monitoring program.

If the cumulative number of cycles for any of these transients exceeds 80 percent of the allowable cycle limit, the Fatigue Monitoring program implementing procedures trigger corrective actions to prevent exceeding the cycle count limit. These procedures require the Fatigue Monitoring Engineer to initiate an action in the Corrective Action Program to perform an

engineering evaluation of the condition and determine the corrective action. Acceptable corrective actions include: reanalysis of the component to demonstrate that the design code limit will not be exceeded prior to or during the period of extended operation; repair of the component; replacement of the component, or other methods approved by the NRC. Therefore, the Fatigue Monitoring program implementing procedures ensure that the analyses dispositioned in accordance with 10 CFR 54.21 (c)(1)(i) in LRA Chapter 4 will be evaluated if a cycle count reaches a cycle limit.

During evaluation of this RAI, a typographical error was identified in Appendix B, Section B.3.1.1, Fatigue Monitoring, regarding the program elements affected changing "Corrective Action (Element 6)" to "Acceptance Criteria (Element 6)." The LRA Appendix B description for the Fatigue Monitoring program is revised as shown in Enclosure B.

Enclosure B

Limerick Generating Station Units 1 and 2
License Renewal Application Updates

Note: To facilitate understanding, portions of the original LRA have been repeated in this Enclosure, with revisions indicated. Existing LRA text is shown in normal font. Changes are highlighted with bolded italics for inserted text and strikethroughs for deleted text.

As a result of the response to RAI B.2.1.4-1 provided in Enclosure A of this letter, the BWR Vessel ID Attachment Welds aging management program, UFSAR Supplement, Section A.2.1.4 of the LRA, is revised as shown below:

A.2.1.4 BWR Vessel ID Attachment Welds

The BWR Vessel ID Attachment Welds aging management program is an existing aging management program that incorporates the inspection and evaluation recommendations of BWRVIP-48-A, and the recommendations described in the Water Chemistry (A.2.1.2) program. The program is implemented through station procedures that provide for mitigation of cracking through management of reactor water chemistry and monitoring for cracking through in-vessel examinations of the reactor vessel internal attachment welds***. The program also manages loss of material due to wear on the steam dryer support brackets via in-vessel examinations***. ~~Reactor vessel attachment weld inspections~~***Examinations performed under this program*** are implemented ***via*** ~~through station procedures that are part of~~ augmented inservice inspection requirements.

As a result of the responses to RAI B.2.1.24-1 and RAI B.2.1.24-2 provided in Enclosure A of this letter, the One-Time Inspection of ASME Code Class 1 Small-Bore Piping aging management program, UFSAR Supplement, Section A.2.1.24 of the LRA, is revised as shown below:

A.2.1.24 One-Time Inspection of ASME Code Class 1 Small-Bore Piping

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping aging management program is a new condition monitoring program that will manage the aging effect of cracking in ASME Code Class 1 small-bore piping that is less than nominal pipe size (NPS) 4-inches, and greater than or equal to NPS 1-inch. The program implements one-time inspection of ***a sample of*** piping full penetration (butt) and partial penetration (socket) welds ***that are susceptible to cracking*** using volumetric examinations. ***The inspection sample size will include at least 10 percent of the butt welds and 25 socket welds within the population of program welds on each LGS unit.*** Inspection of socket welds will be performed by volumetric examination technique demonstrated to be capable of detecting cracking. If such a volumetric technique is not available by the time of the inspections, the examination method will be by destructive examination. Inspections required by the program will augment ASME Code, Section XI requirements.

Cracking of ASME Code Class 1 small-bore piping due to stress corrosion cracking, cyclical (including thermal, mechanical, and vibration fatigue) loading, thermal stratification or thermal turbulence has not been experienced at LGS Units 1 and 2. Therefore, this one-time inspection program is applicable and adequate to manage this aging effect during the period of extended operation. ***A plant specific periodic inspection program will be implemented if evidence of cracking caused by IGSCC or fatigue is revealed in ASME Class 1 small-bore piping.***

As a result of the response to RAI B.2.1.24-1 provided in Enclosure A of this letter, the One-Time Inspection of ASME Code Class 1 Small-Bore Piping aging management Program Description for Section B.2.1.24 of Appendix B, LRA page B-100, is revised as shown below:

LGS Units 1 and 2 have been operating for more than 25 years and 21 years, respectively, (less than 30 years) at the time of the license renewal application submittal, and have not experienced cracking of ASME Code Class 1 small-bore piping due to stress corrosion, cyclical (including thermal, mechanical, and vibration fatigue) loading, or thermal stratification and thermal turbulence. Therefore, ***the inspection sample size will include at least 10 percent of the butt welds and 25 socket welds within the population of program welds on each LGS unit. A*** ~~a~~ sample size of ~~8~~***eight*** butt welds on Unit 1~~,~~ ***and*** ~~9~~***nine*** butt welds on Unit 2~~,~~ is chosen for one-time inspection. ~~This represents more than 10 percent of the total population of small-bore piping butt welds and more than 38 percent of the high and medium consequence ranked socket welds.~~This ensures an adequate sample size to provide confidence that the aging effect of cracking is not an issue at LGS. Sample locations will be selected based on susceptibility for cracking due to stress corrosion cracking and fatigue, consequence of failure, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small-bore piping locations. Technical justification of the methodology and sample size used for selecting components is documented in a technical sample basis document.

As a result of the response to **RAI B.3.1-1** provided in Enclosure A of this letter, the Fatigue Monitoring program for Section B.3.1.1 of Appendix B, LRA page B-171, is revised as shown below:

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program elements:

1. Monitor additional plant transients that are significant contributors to fatigue usage and impose administrative transient cycle limits corresponding to the limiting numbers of cycles analyzed in the environmental fatigue calculations. **Program Elements Affected: Preventive Action (Element 2), Parameters Monitored / Affected (Element 3), and ~~Corrective Action~~ *Acceptance Criteria* (Element 6)**