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10 CFR 54

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March 25, 2004

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-001

Dresden Nuclear Power Station, Units 2 and 3
Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket No. 50-237 and 50-249

Quad Cities Nuclear Power Station, Units 1 and 2
Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Additional Information for the Review of the License Renewal Applications for Dresden Nuclear Power Station, Units 2 and 3 and Quad Cities Nuclear Power Station, Units 1 and 2

References:

(1) Letter from J. A. Benjamin (Exelon Generation Company, LLC) to U. S. NRC, "Application for Renewed Operating Licenses," dated January 3, 2003

(2) Letter from Tae Kim (U.S. NRC) to John Skolds (Exelon Generation Company, LLC), "Follow-up of an Inspection Open Item Related to the Dresden Nuclear Power Station, Units 2 and 3 and Quad Cities Nuclear Power Station, Units 1 and 2, License Renewal Application," dated October 20, 2003

(3) Letter from Patrick Simpson (Exelon Generation Company, LLC) to U. S. NRC, "Additional Information for the Review of the License Renewal Applications for Dresden Nuclear Power Station, Units 2 and 3 and Quad Cities Nuclear Power Station, Units 1 and 2," dated December 12, 2003

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(4) Letter from Patrick Simpson (Exelon Generation Company, LLC) to U. S. NRC, "Additional Information for the Review of the License Renewal Applications for Dresden Nuclear Power Station, Units 2 and 3 and Quad Cities Nuclear Power Station, Units 1 and 2," dated December 22, 2003

Exelon Generation Company, LLC (EGC) is submitting the additional information requested in Reference 2 and in email requests sent by Tae Kim (NRC) to EGC on November 4 and 10, 2003 and on December 15 and 16, 2003. This additional information provides a response to questions regarding Sections 2.1, 3.3, 3.5, 4.2 and the Aging Management Programs sections of Reference 1. In addition, EGC is revising the responses to RAI B.1.25 that was submitted in Reference 3, and RAI B.1.2 that was submitted in Reference 4.

Should you have any questions, please contact Al Fulvio at 610-765-5936.

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

Respectfully,

3/25/04
Executed on

Patrick R. Simpson
Patrick R. Simpson
Manager – Licensing

Attachment : Response to Request for Additional Information – LRA Sections 2.1, 3.3, 3.5, 4.2 and Aging Management Programs

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station
NRC Senior Resident Inspector – Dresden Nuclear Power Station
Illinois Emergency Management Agency – Division of Nuclear Safety

Attachment

Response to Request for Additional Information

LRA Sections 2.1, 3.3, 3.5, 4.2 and Aging Management Programs

RAI 2.1-2a Supplemental Information Request

A related issue was identified during the Regional scoping and screening inspection documented in NRC Inspection Report Nos. 50-237/03-04(DRS); 50-249/03-04(DRS); 50-254/03-04(DRS); 50-265/03-04 (DRS), dated September 15, 2003. During that inspection, the inspectors questioned the applicant's definition of an equivalent anchor as used to determine the extent of nonsafety-related attached to safety-related systems that was included within the scope of the license renewal. Specifically, the applicant included nonsafety-related piping attached to safety-related pipe up to the point where the nonsafety-related piping was restrained in three orthogonal directions. In a letter dated October 20, 2003, the staff requested the applicant to clarify whether or not this methodology was consistent with the applicable plants' current licensing basis (CLB). Additionally, the staff requested justification that would demonstrate that failure of the nonsafety-related piping that was potentially excluded from the scope of license renewal would not adversely impact the safety-related portion of the piping system in accordance with 10 CFR 54.4(a)(2). This issue is identified as Open Item (50-237; 50-249; 50-254; 50-265/03-04-01).

The subject open item is described below:

The applicant's methodology for establishing system boundaries where nonsafety-related piping was attached to safety-related piping was not consistent with the guidance provided by the NRC staff in the interim staff guidance letter. Specifically, the applicant developed the concept of an "equivalent anchor" which included restraints at multiple locations rather than the traditional definition of an "anchor" as a three dimensional, six degrees of freedom restraint (pipe displacements and pipe rotations) at the same physical location. This was considered an open item pending evaluation by the Office of Nuclear Reactor Regulation technical staff.

Please clarify whether or not the subject methodology is consistent with the applicable plants' current licensing basis (CLB). In your response, please identify the applicable CLB. If the methodology is not supported by the plants' CLB, then provide justification and/or references to demonstrate that failure of the nonsafety-related piping that was excluded from the scope of license renewal will not adversely impact the safety-related portion of the piping system in accordance with 10 CFR 54.4(a)(2).

Response

Piping at Dresden and Quad Cities was originally designed in accordance with USAS B31.1 Code, 1967 Edition. In addition, all piping from the reactor vessel up to the first isolation or stop valve was under the jurisdiction of ASME Section I, 1965 Edition, Winter 1966 Addenda. Nuclear code cases N-1, N-2, N-3, N-4, N-7, N-8, N-9, N-10, and N-11 were also used.

For the original seismic analysis of Class I piping systems at Quad Cities, modal analysis was performed for piping 10 inches in diameter or greater. Force-deflection curves were applied to 8 inches and smaller in diameter. Lateral deflection and force evaluation curves for piping systems were developed by John A. Blume and Associates for Class I piping 8 inches and smaller based on the natural period of the piping system as a function of pipe size (diameter and schedule) and span. The curves provided guidelines for the evaluation of the lateral supports in a piping system.

Current licensing basis (CLB) documentation for Dresden and Quad Cities states that the boundaries of the piping system model used in the seismic analysis extended well beyond the stress analysis boundaries set by the first normally closed valves. However, the CLB does not provide any detail concerning how far the seismic analysis extended beyond the first normally closed valve. The original piping design remained as described above until the late 1970's when regulatory questions arose concerning seismic analysis of safety related piping systems.

The following discussion provides a comparison of both plants' current licensing basis (CLB) against the scoping methodology utilized by Exelon concerning non-safety related piping attached to safety related pipe. The discussion is divided between large bore pipe (10 inches or larger) and small bore pipe (less than 10 inches).

Piping Analysis of Large Bore Pipe (10 inches or larger)

As stated above, the CLB for Dresden and Quad Cities states that the boundaries of the piping system model used in the original seismic analysis extended well beyond the stress analysis boundaries set by the first normally closed valves. However, the CLB does not provide any detail concerning how much of the non-safety related piping beyond the first normally closed valve was included in the analysis. A review of current licensing basis (CLB) documents was performed to determine the criteria used when analyzing non-safety related piping attached to large bore (10 inches or larger) safety related pipe. The review included major design efforts to upgrade the seismic design of safety related piping at each site. These included upgrades associated with IE. Bulletin 79-14, upgrades to the Mark I Primary Containment design to include new loads related to postulated LOCAs and safety relief valve operation, Extended Power Uprate related modifications to main steam and torus attached piping, and reactor recirculation piping replacement (Dresden Unit 3 only).

The CLB review did not identify any specific documentation concerning the methodology followed when analyzing non-safety related pipe for impact on attached safety related pipe. However, the documentation search did include a review of several isometric drawings for non-safety related piping created in response to IE Bulletin 79-14 effort. The isometric drawings imply that non-safety related piping attached to safety related pipe was included in the analysis and that the boundary most likely included two levels of support in each orthogonal direction on the non-safety related line. In several instances, the non-safety related piping included in the seismic analysis extended to the point where the piping was anchored by a large piece of equipment.

The methodology utilized by Exelon to scope non-safety related large bore pipe for license renewal did not take into consideration two levels of support in each orthogonal direction. Those portions of non-safety related large bore pipe attached to safety related pipe falling within the scope of license renewal includes all pipe and components up to a single level of support in each orthogonal direction. As such, Exelon performed a review of all boundary diagrams to identify the non-safety related large bore pipe that was included within the scope of license renewal. Once identified, the pipe isometric drawings were reviewed and the boundary of each system involved was expanded until two levels of support were achieved in each orthogonal direction. Additional piping added to the scope of license renewal as a result of this effort are shown below for each site.

Site	Systems Affected	Pipe Line #	Boundary Diagram
Dresden	Condensate & Condensate Storage	2-3316A-20"-L, 2-3316B-20"-L, 2-3316-24"-L	LR-DRE-M-35-1
Dresden	Condensate & Condensate Storage	20" line connecting 20x14 and 20x12 reducers (incoming lines are 2-3316B-14"-L and 2-3316A-12"-L)	LR-DRE-M-35-1
Dresden	Condensate & Condensate Storage	20" line connected to 2-3317B-12"-L (The boundary diagram does not have a line number for this line)	LR-DRE-M-35-1
Dresden	Condensate & Condensate Storage	2/3-1935-6"-L 2-1935-6"-L 3-1935-6"-L	LR-DRE-M-35-1 LR-DRE-M-31 LR-DRE-M-362
Dresden	High Pressure Coolant Injection	2/3-2342-18"-K	LR-DRE-M-35-1
Dresden	Condensate & Condensate Storage	3-3316-24"-L, 3-3316-20"-L, 3-3316A-20"-L	LR-DRE-M-366
Quad Cities	Reactor Building Closed Cooling Water	1-3748F-4"-L, 1-3715E-4"-L, 1-3748E-4"-L, 1-3715F-4"-L	LR-QDC-M-33-2
Quad Cities	Reactor Building Closed Cooling Water	1-3701-16"-L	LR-QDC-M-33-1
Quad Cities	Service Water	2-4407-42"-L	LR-QDC-M-69-1
Quad Cities	Residual Heat Removal	1-1910-8"-H, 1-1910A-6"-H, 1-1910B-6"-H	LR-QDC-M-38
Quad Cities	High Pressure Coolant Injection	1/2-2342-18"-L ½-2342-18-AG	LR-QDC-M-46-1
Quad Cities	Reactor Building Closed Cooling Water	2-3701-8"-L	LR-QDC-M-75-1
Quad Cities	Residual Heat Removal	2-1910-8"-H, 2-1910-A-6"-L, 2-1910B-6"-L	LR-QDC-M-80
Quad Cities	Residual Heat Removal	2-2029-12"-L, 2-4891-8"-L, 2-4827-8"-L, 2-4812-8"-L, 2-4811-8"-L	LR-QDC-M-85
Quad Cities	Reactor Recirculation	2-0220-8"-L	LR-QDC-M-85

Piping Analysis of Small Bore Pipe (less than 10 inches)

For the line sizes 2-1/2-inch to 8-inch, the safety-related piping for Dresden and Quad Cities was qualified with a static analysis using lateral deflection and force evaluation curves (Blume curves). A search of the CLB did not identify any specific documentation of how non-safety related piping attached to safety-related piping was handled in qualifying the small bore safety-related piping. However, similar to the discussion concerning large bore pipe, the documentation search did include a review of several isometric drawings for non-safety related piping created in response to IE Bulletin 79-14 effort. The isometric drawings imply that non-safety related piping attached to safety related pipe was included in the analysis and that the boundary most likely included two levels of support in each orthogonal direction on the non-safety related line. In several instances, the non-safety related piping included in the seismic analysis extended to the point where the piping was anchored by a large piece of equipment.

The methodology utilized by Exelon to scope non-safety related small bore pipe for license renewal did not take into consideration two levels of support in each orthogonal direction. Those portions of non-safety related small bore pipe attached to safety related pipe falling within the scope of license renewal includes all pipe and components up to a single level of support in each orthogonal direction.

As such, Exelon performed a review of all boundary diagrams to identify those non-safety related small bore lines that were included within the scope of license renewal. Once identified, the pipe isometric drawings were reviewed and the boundary of each system involved was expanded until two levels of support were achieved in each orthogonal direction. The original scoping of small bore pipe typically included the entire line with no pipe remaining to add within the scope of license renewal. However, some additional small bore piping was added to the scope of license renewal as a result of this effort. These additional small bore piping is included in the table below for each site.

Site	Systems Affected	Pipe Line #	Boundary Diagram
Dresden	Reactor Building Closed Cooling Water	2-3747A-6"-L, 2-3747B-6"-L, 2-3769A-6"-L, 2-3769B-6"-L	LR-DRE-M-20
Dresden	Isolation Condenser	2-4808-6"-LX	LR-DRE-M-39
Dresden	Nuclear Boiler Instrumentation	2-0222A-8"-LX	LR-DRE-M-39
Dresden	Control Rod Drive Hydraulic	2-4812-8"-LX, 2-4827-8"-LX, 2-4827-8"-L, 2-4891-8"-LX, 2-4898-6"-LX,	LR-DRE-M-39
Dresden	Isolation Condenser	2-3319-6"-L	LR-DRE-M-35-1
Dresden	High Pressure Coolant Injection	2-4901F-8"-L, 2-2323-1"-H	LR-DRE-M-40

Site	Systems Affected	Pipe Line #	Boundary Diagram
Dresden	Nuclear Boiler Instrumentation	3-0222A-8"-LX	LR-DRE-DRE-369
Dresden	Control Rod Drive Hydraulic	3-4808-6"-LX, 3-4898-6"-LX, 3-4827-4"-LX, 3-4844-3"-L, 3-4824-3"-LX, 3-4811-8"-LX	LR-DRE-DRE-369
Quad Cities	Containment Isolation Components & Primary Containment Piping System	1-47380A-1/2"-HA & 1-47120A/D-1"-H	LR-QDC-M-24-13
Quad Cities	Condensate & Condensate Storage	2-33445-4"-L, 1-3384-1 ½"-L, & 1-33128-4"-L	LR-QDC-M-16-5
Quad Cities	Diesel Generator Cooling Water	1-3961-3"-O, 1-3968-8"-L, 1-3968-8"-O, 1-3962-4"-O	LR-QDC-M-22-5
Quad Cities	Containment Isolation Components and Primary Containment Piping	1-4636-2"-O	LR-QDC-M-25-1
Quad Cities	Reactor Recirculation	1-0220-8"-L, 1-0220A-2 ½"-L	LR-QDC-M-43
Quad Cities	Residual Heat Removal	1-2029-12"-L, 1-4891-8"-L, 1-4827-8"-L, 1-4812-8"-L, 1-4811-8"-L	LR-QDC-M-43
Quad Cities	Residual Heat Removal	1-1034-3"-RWC	LR-QDC-M-39-3
Quad Cities	Standby Liquid Control	1-1115-1"-L	LR-QDC-M-40
Quad Cities	Control Rod Drive Hydraulic Piping	1-0314A-1/2"-A, 1-0314B-1/2"-A	LR-QDC-M-41-1
Quad Cities	Diesel Generator Cooling Water	2-3966-4"-O, 2-3968-8"-O, 2-3951-8"-O, 2-3968-6"-O	LR-QDC-M-69-5
Quad Cities	Containment Isolation	2-47120A/D-1"-H, 2-47380A-1/2"-H	LR-QDC-M-71-8
Quad Cities	Residual Heat Removal	2-1033-3"-DX, 2-1034-3"-RWC	LR-QDC-M-81-3
Quad Cities	Standby Liquid Control	2-1115-1"-L	LR-QDC-M-82
Quad Cities	Control Rod Drive Hydraulic Piping	2-0314A-1/2"-A, 2-0314B-1/2"-A	LR-QDC-M-83-1

Aging Management

All of the components included on the large bore and small bore lines listed in the tables above are included within the scope license renewal. While additional components have been added to the scope of license renewal for each system, the components are comprised of the same materials and experience the same environments as other components within the system. As such, there are no new aging management programs required. Each of the components added to the scope of license renewal will be included in the same aging management programs applied to other components within that system.

The following LRA Chapter 2 tables require revision.

LRA Table 2.3.2-1 Component Groups Requiring Aging Management Review – High Pressure Coolant Injection System is revised to read as follows. Note: Added Aging Management references.

Component	Component Intended Function	Aging Management Ref
Piping and Fittings (attached support)	Structural Integrity (Attached)	3.2.1.13, 3.2.2.10, 3.2.2.14, 3.2.2.22, 3.2.2.56, 3.2.2.57, 3.2.2.137
Valves (attached support)	Structural Integrity (Attached)	3.2.2.10, 3.2.2.100, 3.2.2.104, 3.2.2.107, 3.2.2.137

LRA Table 2.3.3-17 Component Groups Requiring Aging Management Review – Reactor Building Closed Cooling Water System is revised to read as follows. Note: Removed "(Quad Cities Only)."

Component	Component Intended Function	Aging Management Ref
Piping and Fittings (attached support)	Structural Integrity (Attached)	3.3.1.5, 3.3.1.13, 3.3.2.40
Valves (attached support)	Structural Integrity (Attached)	3.3.1.5, 3.3.1.13, 3.3.2.40

LRA Table 2.3.4-3 Component Groups Requiring Aging Management Review – Condensate and Condensate Storage System is revised to read as follows. Note: Removed "(Quad Cities Only)."

Component	Component Intended Function	Aging Management Ref
Piping and Fittings (attached support)	Structural Integrity (Attached)	3.4.1.2, 3.4.1.3, 3.4.1.4
Valves (attached support)	Structural Integrity (Attached)	3.4.1.2, 3.4.1.3, 3.4.1.4

RAI 3.3.2.4.11 Supplemental Information Request

Loss of material due to selective leaching is a plausible aging effect for cast iron components in moist air and humidity environment, especially when there is water condensation on the surfaces of these components. However, in LRA Table 3.3-2, Ref No 55, loss of material due to selective leaching was not identified as a plausible aging effect for cast iron components in moist air. By letter dated August 4, 2003, the staff issued RAI 3.3.2.4.11(a) requesting the applicant to provide technical basis for excluding this aging effect from aging management review. In its response dated October 3, 2003, the applicant stated that the cast iron material components referenced in LRA section 3.3.2.55 are not installed in areas where water or condensation would be expected to pool or where there would be prolonged exposure to water; therefore, the applicant concludes that selective leaching is not considered an aging mechanism for Dresden and Quad Cities applications. Clarification Item: Exelon needs to clarify, with justification, what is considered a prolonged period to support the conclusion that selective leaching is not considered an applicable aging mechanism.

Response

LRA Table 3.3-2 reference 3.3.2.55 addresses cast iron filter/strainers with an internal environment of "moist air." All of the components in reference 3.3.2.55 are cast iron Y-strainers installed in the emergency diesel generator (EDG) and station blackout diesel generator (SBO DG) air start piping downstream of the air start pressure regulators. The external environment for these Y-strainers is addressed in LRA Table 3.3-2, reference 3.3.2.300, "Air, moisture, and humidity <100°C (212°F)." LRA Table 2.3.3-6, Component Group of "Filter/Strainers," and with a Component Intended Function of "Pressure Boundary," should have provided a reference to 3.3.2.300.

The EDG and SBO DG air supply is stored in receivers until needed. The receivers are blown down by operators periodically while the EDGs and SBO DGs are in standby operation. Additionally, the SBO DG air start systems contain moisture separators and air dryers between the compressors and receivers. The only time the EDG and SBO DG strainer internals are exposed to this supply of air is during the EDG and SBO DG start sequence, which occurs about 10-20 seconds, once a month. Therefore the strainer internals are not installed in an area where water or condensation would be expected to pool or where there would be prolonged exposure to water.

Likewise, the strainers are not installed in an area where water or condensation would be expected to pool on their externals, or where there would be prolonged exposure of the externals to water. These strainers are located in the EDG rooms and SBO DG buildings, in an indoor (sheltered)ambient environment. The environment, "Air, moisture, and humidity <100°C (212°F)," is considered general plant environmental conditions, and is the same as NUREG-1801, reference VII.I.1-b. Neither the internal process nor the external environment could cause external wetting of these components. The statement, "not exposed to water for prolonged periods," refers to the fact that the only potential source of wetting would be exposure from leaks from other systems. Since these strainers are located in the EDG rooms and SBO DG buildings, these leaks would be detected by operators during their rounds and corrected. Operator rounds in the EDG rooms and SBO DG buildings are performed at least once per day, so the duration of wetting would at most be a few days, assuming, the leakage starts small, and would be detected in a few days.

In conclusion, therefore, the cast iron Y-strainers installed in the EDG and SBO DG air start piping are not subject to an aggressive wetted environment, either internally or externally, conducive to promoting a loss of material due to selective leaching.

RAI 3.5-7 Supplemental Information Request

Given the inaccessibility of the radial beam seats, the staff considers the applicant's approach to be an acceptable alternative to direct inspection, provided no degradation of the torus saddle support lubrite baseplates is discovered in the one-time inspection. The applicant has not addressed what action will be taken if degradation is discovered in the one-time inspection. This issue needs to be addressed by the applicant before the staff can complete its evaluation. This is Open Item 3.5.2.2.2.1-1.

Part (a) of the applicant's response to RAI 3.5-7 indicates that "The torus saddle support lubrite baseplates have not been inspected to date and are currently not included in the ASME Section XI, Subsection IWF aging management program." It is not clear to the staff (1) whether the other components of the torus supports are currently inspected, and (2) if they are, whether they are inspected in accordance with IWF. The staff has a number of questions, arising from several different RAI responses, about current and future inspection of Class MC supports and the commitment to IWF as the aging management program. In order to expedite their resolution, all questions related to aging management of Class MC supports and the implementation of IWF are included in Open Item 3.5.2.3.2.2-1, as part of the evaluation of AMP B.1.27 - IWF.

Response

The response to RAI B.1.27 Supplemental Information Request provides the background and present status of the Dresden and Quad Cities Containment Inservice Inspection Programs relating to Class MC component supports. However, to address questions (1) and (2) above concerning torus (suppression Chamber) supports:

(1) Class MC component supports, including the suppression chamber supports, are not currently being inspected.

(2) As stated in the response to RAI B.1.27 Supplemental Information Request, prior to the end of the current term of operation the IWF program will be augmented to cover the following suppression chamber supports:

    (a) Suppression Chamber Ring Girder Vertical Supports and Base Plates - These supports are not currently inspected. However, prior to the end of the current term of operation the IWF program will be augmented to cover these Class MC supports.

    (b) Suppression Chamber Saddle Supports and Base Plates - These supports are not currently inspected. However, prior to the end of the current term of operation the IWF program will be augmented to cover these Class MC supports.

    (c) Suppression Chamber Seismic Restraints and Base Plates - These supports are not currently inspected. However, prior to the end of the current term of operation the IWF program will be augmented to cover these Class MC supports.

RAI 4.2.2 Supplemental Information Request

A comparison of the mean RT_{NDT} value of 91°C for the Clinton axial weld from Table 4.2-1 with the Dresden and Quad Cities value of 19°C (67°F) shows that the NRC analysis of the Clinton axial welds bounds the Dresden and Quad Cities welds. The applicant should confirm that Quad Cities, Units 1 and 2 has a mean of 19°C (67°F) and address this TLAA analysis of the axial welds for Quad Cities in the UFSAR Supplement.

Response

The mean RT_{NDT} 54 EFPY values for Quad Cities do not qualify as a TLAA because the topic does not satisfy TLAA criteria 6, "Are contained or incorporated by reference in the CLB." However, Table 4.2.7-1 compares the limiting axial weld 54 EFPY properties for Quad Cities Units 1 and 2 against the values taken from Table 2.6-5 found in the NRC SER for BWRVIP-05 and associated supplement to the SER. The SER supplement required the limiting axial weld to be compared with data found in Table 3 of the document. For Quad Cities, the comparison was made to the Clinton plant information. The supplemental SER stated that the axial welds for the Clinton plant are the limiting welds for the BWR fleet and vessel failure probability calculations determined for Clinton should bound those for the BWR fleet.

The limiting axial welds at Quad Cities are all electroslag welds with similar chemistry. The Quad Cities limiting weld chemistry, chemistry factor (CF), and 54 EFPY mean RT +values are within the limits of the values assumed in the analysis performed by the NRC staff in the March 7, 2000 BWRVIP-05 SER supplement and the 64 EFPY limits and values obtained from Table 2.6.5 of the SER.

Table 4.2.7-1, Effects for Irradiation on RPV Axial Weld Properties Quad Cities Units 1 & 2

Parameter Description	B&W 64 EFPY	SER Supplement (Clinton)	QCNPS Unit 1 Parameters at 54 EFPY (Electroslag)	QCNPS Unit 2 Parameters at 54 EFPY (Electroslag)
Copper, wt. %	0.25	0.10	0.24	0.24
Nickel, wt %	0.35	1.08	0.37	0.37
Chemistry Factor	142.5	---	141	141
End of Life Inside Diameter Fluence, X 10^{19} n/cm^2	0.25	0.69	0.057	0.057
ΔRT_{NDT}, °F	88.9	121	44	44
$\Delta RT_{NDT(U)}$, °F (w/o margin)	10	-30	23	23
Mean RT_{NDT}, °F	98.9	91	67	67
P(FIE) NRC	1.87×10^{-1}	2.73×10^{-3}	2.08×10^{-7}	5.27×10^{-7}
P(FIE) BWRVIP	---	1.52×10^{-3}	---	---

RAI B.1.2-01a Supplemental Information Request

B.1.2 response #2) indicates that the applicant will perform four UT inspections in the four SBLC tank quadrants near the bottom to identify SCC. The applicant needs to provide additional details regarding the scope of UT inspections. Further the applicant needs to identify if the UT inspections will also be used to identify loss of material.

Response

As stated in the response to RAI B.1.2, Exelon will eliminate the one time inspection of the Dresden standby liquid control (SBLC) pump discharge valve and replace it with a UT inspection of a Dresden SBLC storage tank containing sodium pentaborate. The UT examinations of the SBLC tank will be used to identify potential stress corrosion cracking as well as loss of material due to general corrosion or pitting. The size of the SBLC tank is relatively small (less than 10 feet in diameter and 12 feet in height). For this reason, Exelon will only perform one UT examination in each quadrant of the SBLC storage tank at the most susceptible locations which are considered near the bottom of the tank. Exelon will inspect approximately two linear feet of the tank vertical seam weld near the tank bottom in one quadrant. UT measurements will be taken of the tank shell or circumferential welds (if accessible) in the remaining three quadrants near the bottom of the tank. These inspections will be performed in accordance with Exelon approved NDE procedures.

The corrective action program requires an extent of condition review. Consistent with the other one-time inspection programs, an engineering evaluation will be performed to analyze the inspection results and determine if further inspections are appropriate.

RAI B.1.23 Supplemental Information Request

1) The applicant stated that a review of Dresden and Quad Cities operating experience identified component failures that may be related to the effects of age related degradation in selected Plant Heating System components that are exposed to an environment of Saturated Steam/Condensate. The applicant believes that periodic inspections are necessary to provide adequate management of the aging effects during the extended period of operation. Therefore using processes based on Aging Management Program B.1.23, components in the Dresden and Quad Cities Plant Heating Systems will be inspected before the end of the current operating term and periodically at intervals of approximately every 5 years during the period of extended operation. Since the aging mechanisms will require periodic examination, AMP B.1.23 would not be the appropriate AMP for these components. The applicant needs to include these components in the appropriate AMP addressed in NUREG-1801 and a prepare a separate AMP these components consistent with the requirements in NUREG-1800 for aging management programs not addressed in NUREG-1801.

2) The applicant stated that a few of the Aging Management References listed in part (a) of RAI B.1.23-2 correspond to an environment that (1) varies with normal plant operations, (2) is impractical to monitor or control routinely, and (3) is similar to the environments associated with the Aging Management References listed in part (b) of RAI B.1.23-2. Please provide additional explanation of what is meant by items (1), (2),

and (3) and when they are used as a basis for managing aging mechanisms by one time inspection.

Response

Note:
The Exelon response to supplemental RAI B.1.23-2.5 provides additional information to the response contained in part 1 below.

1) Exelon has developed a separate Aging Management Program, AMP B.2.8, Periodic Inspection of Plant Heating System. This is a plant-specific aging management program that is not identified in NUREG-1801. A ten-element review of this Aging Management Program is provided as attachment to this response and will be included in Appendix B of the LRA. Also attached is a new Appendix A section, A.2.8 Periodic Inspection of Plant Heating System.

   There are no changes required to LRA Table 2.3.3-24 (Component Groups Requiring Aging Management Review – Plant Heating System). However, as a result of this change the following Aging Management References in LRA Table 3.3-2 (Aging management review results for the auxiliary systems that are not addressed in NUREG-1801) will be changed: 3.3.2.2; 3.3.2.57; 3.3.2.142; 3.3.2.181; 3.3.2.197; 3.3.2.214; 3.3.2.229; 3.3.2.243; 3.3.2.252; 3.3.2.263; 3.3.2.271 and 3.3.2.282. All of these Aging Management Reference lines will be changed to identify the applicable Aging Management Program as "Periodic Inspection of Plant Heating System, (B.2.8)".

Note:
The Exelon response to supplemental RAI B.1.23-2.6 provides additional information to the response contained in part 2 below.

2) Items (1), (2) and (3) are characteristics of environments that depend in part on ambient conditions and in part of system or plant operating mode. The environments with these characteristics contained in Part (a) of the RAI are "Air and steam", "Moist air", "Saturated air", "Warm, moist air" and "Moist containment atmosphere, steam or demineralized water." The environments contained in Part (b) of the RAI are "Air, moisture, humidity, and leaking fluid", "Wet gas", "Warm, moist air", "Air and steam", " Internal: occasional exposure to moist air; external: ambient plant air environment", "Dry gas", "Moist air", "Saturated air", and "Hot diesel engine exhaust gases containing moisture and particulates." These environments are dependent on the ambient atmosphere (ambient-related) or vary with normal changes in system operation (mixed environments). The ambient-related or mixed environments are difficult to monitor and control.

   Based on the materials used and the environment characteristics of the ambient-related and mixed environments Exelon believes either (a) an aging effect is not expected to occur but there is insufficient data to completely rule it out, or (b) an aging effect is expected to progress very slowly. For these cases, the NUREG 1801 XI.M32, One-Time Inspection Program is used to confirm that either the aging effect is not occurring, or the aging effect is occurring very slowly as not to affect the component's or structure's intended function. A one-time inspection of the subject component or structure is an acceptable option for this verification.

The following are updates to Appendix A, Updated Final Safety Analysis Report (UFSAR) Supplement and Appendix B, Aging Management Programs of the Dresden and Quad Cities License Renewal Application.

A.2.8 Periodic Inspection of Plant Heating System (Dresden)

The periodic inspection of plant heating system aging management program provides for routine inspections of selected components in the plant heating system. Prior to the period of extended operation, a new program for periodic inspection of selected components in the plant heating system will be implemented. The selected components will be inspected to ensure they are free of cracking, loss of material and leakage. The inspection will consist of a visual inspection for the presence of general, crevice, galvanic, and pitting corrosion. The inspection will be performed in accordance with ASME Code requirements. Certified NDE examiners will conduct a VT-3 visual inspection.

A.2.8 Periodic Inspection of Plant Heating System (Quad Cities)

The periodic inspection of plant heating system aging management program provides for routine inspections of selected components in the plant heating system. Prior to the period of extended operation, a new program for periodic inspection of selected components in the plant heating system will be implemented. The selected components will be inspected to ensure they are free of cracking, loss of material and leakage. The inspection will consist of a visual inspection for the presence of general, crevice, galvanic, and pitting corrosion. The inspection will be performed in accordance with ASME Code requirements. Certified NDE examiners will conduct a VT-3 visual inspection.

B.2.8 Periodic Inspection of Plant Heating System Program Description

The periodic inspection of plant heating system inspects selected components in the Dresden and Quad Cities Plant Heating Systems exposed to an environment of Saturated Steam/Condensate once before the end of the current operating term and periodically at intervals of approximately every 5 years during the period of extended operation.

The program will include inspections for cracking, loss of material, or other evidence of aging of plant heating system components that are within the scope of license renewal.

Evaluation And Technical Basis

(1) ***Scope of Activity:*** Inspection of plant heating system components within the scope of LR will manage aging degradation of the Filter/Strainer Housings, Piping and Fittings, Pump Casings, Sight Glasses, Tanks, Thermowells, Traps, Tubing and Valves

(2) ***Preventive Actions:*** The plant heating system periodic inspections do not provide any preventative actions. The inspections provide for condition monitoring to detect degradation prior to a loss of function.

(3) ***Parameters Monitored/Inspected:*** Dresden and Quad Cities perform visual inspections of a representative sample of brass or bronze valves, carbon steel piping and fittings, cast iron filter housings, pump casings and valves, and stainless steel thermowells and tubing used in plant heating systems to determine if aging degradation is occurring. The components are inspected to ensure they are free of cracking, loss of material and leakage. The inspection will consist of a visual inspection for the presence of general, crevice, galvanic, and pitting corrosion. The inspection will be performed in accordance with ASME Code requirements. Certified NDE examiners will conduct a VT-3 visual inspection.

(4) ***Detection of Aging Effects:*** The plant heating inspections are performed at periodic intervals, and they detect aging prior to the equipment leaking so as to result in spatial interaction with safety-related equipment. Dresden and Quad Cities have experienced leakage and deterioration of plant heating components within the scope of LR.

(5) ***Monitoring and Trending:*** The condition of the components used in plant heating systems are monitored, but not trended. Components are replaced if damage or unacceptable leakage is detected.

(6) ***Acceptance Criteria:*** Components are inspected for cracking, loss of material, and leakage. The components are replaced if a degraded condition is found.

(7) ***Corrective Actions:*** Evaluations are performed for inspection results that do not satisfy established criteria and a condition report is initiated to document the concern in accordance with plant administrative procedures. The corrective actions program ensures that the conditions adverse to quality are promptly corrected. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude repetition.

(8) ***Confirmation Process:*** Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B.

(9) ***Administrative Controls:*** See Item 8 above.

(10) ***Operating Experience:*** Dresden and Quad Cities have experienced leaks of plant heating systems that resulted in the replacement of components. These plant heating system leaks were found and corrected in a timely manner and did not result in a loss of function of any safety-related systems, structures or components (SSCs).

Conclusion

The program for periodic inspection of plant heating system provides assurance that plant heating system components are routinely inspected for deterioration and leakage, and will adequately manage the components aging effects. The program provides reasonable assurance that intended functions are maintained consistent with the current licensing basis during the period of extended operation.

RAI B.1.23-02.6 Supplemental Information Request

In RAI B.1.23-2 Supplemental Information Request, staff questioned the basis for using a one-time inspection in an environment that 1) varies with normal plant conditions, 2) is impractical to monitor or control routinely, and 3) is similar to the environments associated with the Aging Management References listed in part b of RAI B.1.23-2. The applicant responded that environments with these characteristics are air and steam; moist air; saturated air; warm moist air; moist containment atmosphere; steam or demineralized water; internal: occasional exposure to moist air; external; ambient plant air environment; dry gas; and hot diesel engine exhaust gases containing moisture and particulates. Based on the material used and the environment characteristics of the environments, the applicant believes that the aging effect is not expected to occur or is expected to progress slowly such that a one-time inspection is adequate to manage the aging effects. For carbon steel, cast iron, alloy steel, elastomers, and neoprene components in these environments, staff does not consider a one-time inspection adequate since aging effects are likely to occur in these material/environment combinations. Staff considers periodic inspections or a one-time inspection used to verify the adequacy of another AMP more appropriate to manage these components. The applicant is requested to provide additional information on the environmental conditions and the operating experience in order to justify the use of a one-time inspection, or provide periodic inspections for these components.

Response

The components included in this category are exposed to environments such as air and steam; moist air; saturated air; warm moist air; moist containment atmosphere; steam or demineralized water; internal: occasional exposure to moist air; external; ambient plant air environment; dry gas; and hot diesel engine exhaust gases containing moisture and particulates. In the response to RAI B.1.23-2, Exelon stated that either an aging effect was not expected to occur for components experiencing these environments or an aging effect was expected to progress very slowly. For these cases, a one time inspection was proposed to provide a confirmation that either the aging effect is not occurring or the aging effect is occurring very slowly as not to affect the component or structure intended function.

Upon further review of the maintenance history for all of the components included in this category, Exelon believes that it would be appropriate to include some of the components in this population in a periodic inspection aging management program. These components are those located in environments comprised of gaseous mixtures that contain some level of moisture. For this reason, Exelon has developed a new aging management program, B.2.9, Periodic Inspection of Components Subject to Moist Air Environments to manage the aging for this population of components. Specifically, Exelon will perform periodic inspection on a representative sample of components normally exposed to air or containment atmosphere environments that are subject to wetting conditions based on system operation. Components in this category are exposed to environments including air and steam; moist air; saturated air; warm moist air; moist containment atmosphere; steam or demineralized water; and hot diesel engine exhaust gases containing moisture and particulates. A complete description of aging management program B.2.9, Periodic Inspection of Components Subject to Moist Air Environments, is provided in the LRA Appendix B changes attached to this response.

Exelon believes that a one-time inspection for the components not included in aging management program B.2.9 is appropriate. Specifically, one-time inspections for components with an internal environment of "occasional exposure to moist air" and an external environment of "ambient plant air environment" or "warm moist air" is appropriate for the reasons stated in response to RAI B.1.23-02. As requested by the NRC staff, Exelon has provided additional information concerning the environmental conditions and the operating experience for this group of components in order to justify the use of a one-time inspection. These components are associated with the Standby Gas Treatment System and various HVAC systems. Exelon has provided the environment(s), materials of construction, component types involved, components sample population selected for one time inspection, expansion criteria in the event that degradation is detected, and operating experience for components associated with the environments described.

One-time Inspection of components associated with the Standby Gas Treatment System and various HVAC systems.

Environments:	Internal: occasional exposure to moist air External: ambient plant air environment, Warm, moist air
Materials	Cast Iron Carbon Steel Brass or Bronze Stainless Steel Copper
Components	Doors, Closure Bolts, Equip Frames Piping and Fittings Valves Duct Filters
Basis	The operating experience for these ventilation systems was considered in selecting the component population for one-time inspections. A review of operating experience determined only four instances in the last fifteen years that could indicate potential age-related degradation due to loss of material. None of these occurrences indicated general wide-spread corrosion in the affected system. Based on this favorable operating history, a limited number of components were selected as representative of the ventilation systems. These components rely on 'worse-case' one-time inspections of more susceptible materials in potentially more aggressive environments to manage the effects of aging. The selected sample for ventilation system one-time inspections will include the following: Two inspection locations are specified at the air intake ductwork of the Standby Gas Treatment (SBGT) System. These locations were selected as 'worse case' components for the SBGT System since they are constructed of thin gauge carbon steel material which is more susceptible to aging degradation than stainless steel or

brass/bronze materials used as drain piping and valves. In addition, the air environment for the air intake ductwork may contain higher concentrations of various contaminants not expected in the other system components located downstream of the filter trains. Therefore, the intake ductwork is considered a limiting location for the aging effects of concern. The one-time inspections will consist of visual inspections (VT-3) for loss of material due to corrosion.

Four locations will be inspected (two per site) of Main Control Room HVAC ductwork components. Two locations of air intake ductwork will be inspected and two locations of ductwork immediately downstream of the humidifier will be inspected. The ductwork is constructed of carbon steel.

Two locations will be inspected (one per site) of Emergency Diesel Generator HVAC air intake ductwork. The ductwork is constructed of carbon steel.

Two locations will be inspected (one per site) of Reactor Building HVAC ductwork downstream of the steam coils and chilled water cooling coils. The ductwork is constructed of carbon steel.

Two locations will be inspected (one per site) of the Main Control Room HVAC drip pan and drainpipe. The drip pan and drainpipes are constructed of carbon steel.

The ten ductwork inspection locations and two drip pan/piping locations discussed above were selected as 'worst case' components for aging degradation to occur due to either a more susceptible material or exposure to an aggressive environment resulting from high moisture content or the potential presence of pollutants and contaminants.

Ductwork material is constructed of thin gauge carbon steel which is more susceptible to aging degradation than the stainless steel or brass/bronze materials that are mostly used for HVAC system drain piping and valves. In addition, the air environment for the air intake ductwork is essentially the same as outside air which may contain higher concentrations of various pollutants and contaminants not expected in the other system components. Similarly, the ductwork downstream of the humidifiers and heating/cooling coils would be of a higher moisture content and hence a potentially more aggressive environment. The Main Control Room HVAC drip pan and drainpipes are the only HVAC drains constructed of carbon steel and therefore more susceptible to aging degradation. The one-time inspections will consist of visual inspections (VT-3) for loss of material due to corrosion. Due to the possibility of standing water in the drip pan, these areas will also be inspected for the presence of MIC.

Expansion Criteria:

If the one-time inspection detects corrosion resulting in material loss, results of the examinations will be evaluated by engineering to determine the rate at which the material is being lost. The results will be evaluated against predetermined limits such as design minimum wall thickness. Unacceptable results will be documented in the corrective action program. An extent of condition review is an integral part of the corrective action program.

An engineering evaluation will be performed to assess the ventilation system inspection results and determine the applicability of the inspection results to the other ventilation system components. The evaluation will determine the effectiveness of the ventilation systems one-time inspection program and the need for additional inspections as applicable.

Operating Experience:

As part of the aging management review of operating experience, Dresden and Quad Cities problem identification forms and work orders extending back for approximately fifteen years were reviewed. This review identified a total of 136 problem identification forms or work orders associated with the Dresden and Quad Cities Standby Gas Treatment System or various HVAC systems. Of these 136 problem identification forms and work orders, only four (4) were related to indications of local corrosion on the ductwork. In each case corrective action included local cleaning, since there was no indication of general age-related corrosion of the Standby Gas Treatment and HVAC systems duct work.

Required Changes to LRA for AMP B.2.9

The following are the LRA changes required to incorporate the use of the new aging management program B.2.9 (Periodic Inspection of Components Subject to Moist Air Environments).

Chapter 3.1

Aging Management References 3.1.2.22, 3.1.2.42, 3.1.2.48, and 3.1.2.51 in LRA Table 3.2-1 (Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG- 1801) will be changed to identify the applicable Aging Management Program as "Periodic Inspection of Components Subject to Moist Air Environments, (B.2.9)"

Chapter 3.2

Section 3.2.1.1.3 (Loss of Material due to General Corrosion (NUREG-1800, Section 3.2.2.2.2.2) – The first and second paragraphs and the associated table will be revised to read as follows.

An inspection in accordance with One-Time Inspection (B.1.23) of standby gas treatment system (SGTS) ducts and components will be performed. The one-time inspection will provide assurance that corrosion of SGTS components is not occurring at an unacceptable rate. The inspection will consist of VT-3 visual inspections for the presence of general corrosion in selected standby gas treatment components.

Periodic inspections of a sample of piping and components in accordance with Periodic Inspection of Components Subject to Moist Air Environments (B.2.9) will be performed. The sample population will include components considered most likely to experience a loss of material due to general corrosion, pitting, and crevice corrosion.

The inspections will consist of either ultrasonic examinations or visual inspections, depending on the component. An evaluation of the inspection results will be performed to determine that there is no unacceptable loss of material for the selected piping and components. The selection of components will be made from the component categories listed in the following table for periodic inspection.

Components Requiring Aging Management for Loss of Material due to General Corrosion

Component Group	Aging Management Program		
	One-Time Inspection (B.1.23) Ventilation and SBGT Systems	**Periodic Inspection B.2.9 Components Subject to Moist Air Environments**	**10 CFR 50, Appendix J (B.1.28)**
Duct & Fittings, Access Doors, Closure Bolts, and Equipment Frames	X		
Fan Housings	X		
Filter Housing and Supports	X		
Isolation Barriers		X	X
Piping and Fittings		X	
Rupture Discs		X	
Thermowells		X	
Vacuum Breakers		X	

The following changes will be made to Table 3.2-2 (Aging management review results for the engineered safety features that are not addressed in NUREG-1801):

Aging Management References 3.2.2.2, 3.2.2.7, 3.2.2.30, 3.2.2.34, 3.2.2.35, 3.2.2.36, 3.2.2.37, 3.2.2.62, 3.2.2.67, 3.2.2.74, 3.2.2.87, 3.2.2.91, 3.2.2.98, 3.2.2.99, 3.2.2.105, 3.2.2.107, 3.2.2.112, 3.2.2.113, 3.2.2.117, 3.2.2.123, 3.2.2.124, 3.2.2.125, 3.2.2.126, 3.2.2.128, 3.2.2.129, 3.2.2.130, 3.2.2.131, 3.2.2.132, 3.2.2.133, and 3.2.2.135 in LRA Table 3.2-2 (Aging management review results for the engineered safety features that are not addressed in NUREG- 1801) will be changed to identify the applicable Aging Management Program as "Periodic Inspection of Components Subject to Moist Air Environments, (B.2.9)"

Chapter 3.3

3.3.1.1.7 Loss of Material due to General, Microbiologically Influenced, Pitting, and Crevice Corrosion (NUREG-1800, Section 3.3.2.2.5) – The fourth paragraph and the associated table will be revised to read as follows:

Emergency diesel generator and station blackout diesel combustion air, and exhaust air, diesel fuel oil, drywell nitrogen inerting (nitrogen storage tank and outdoor components), and nitrogen containment atmosphere dilution external surface aging management of components in outdoor ambient conditions will be managed with system engineer walkdowns performed by Bolting Integrity (B.1.12). Emergency diesel generator and station blackout diesel combustion air, starting air, and exhaust air interior air environments will be managed with Periodic Inspection of Components Subject to Moist Air Environments (B.2.9).

Component Group	Aging Management Program						
	Buried Piping and Tanks Inspect-ion (B.1.25)	Bolting Integrity (B.1.12)	Structural Monitorin g (B.1.30)	Fire Protection (B.1.18)	Periodic Inspection B.2.9 Components Subject to Moist Air Environ-ment	One-Time Inspec-tion Ventila-tion Systems (B.1.23)	Air Handler Cooling Coil AMPs (See Note 1)
Air Accumulator Vessels					X		
Air Handler Heating/Cooling Coils							X
Carbon Steel Components (See Note 2)		X	X	X			
Doors, Closure Bolts, Equipment Frames						X	X
Filter/Strainers					X		
Flame Arrestors					X		
Housing and Supports						X	
Lubricators					X		
Mufflers					X		
Piping and Fittings	X	X			X		
Turbine Casings					X		
Valves					X		

The following changes will be made to Table 3.3-2 (Aging management review results for the auxiliary systems that are not addressed in NUREG-1801):

Aging Management References 3.3.2.6, 3.3.2.55, 3.3.2.58, 3.3.2.64, 3.3.2.65, 3.3.2.66, 3.3.2.67, 3.3.2.126, 3.3.2.132, 3.3.2.146, 3.3.2.149, 3.3.2.163, 3.3.2.167, 3.3.2.192, 3.3.2.193, 3.3.2.195, 3.3.2.199, 3.3.2.216, 3.3.2.228, 3.3.2.230, 3.3.2.232, 3.3.2.241, 3.3.2.250, 3.3.2.255, 3.3.2.256, 3.3.2.261, 3.3.2.274, 3.3.2.291, 3.3.2.296, 3.3.2.299 and in LRA Table 3.3-2 (Aging management review results for the auxiliary systems that are not addressed in NUREG-1801) will be changed to identify the applicable Aging Management Program as "Periodic Inspection of Components Subject to Moist Air Environments, (B.2.9)"

Chapter 3.4

Aging Management References 3.4.2.19 in LRA Table 3.3.4 (Aging management review results for the steam and power conversion system that are not addressed in NUREG-1801) will be changed to identify the applicable Aging Management Program as "Periodic Inspection of Components Subject to Moist Air Environments, (B.2.9)"

Appendix B

The following will be added to the LRA Appendix B.

B.2.9 Periodic Inspection of Components Subject to Moist Air Environments

Description

The periodic inspection of components subject to moist air environments inspects selected components at Dresden and Quad Cities that are normally exposed to moist air environments and are subject to wetting conditions based on system operation. This aging management program manages loss of material aging degradation of stainless steel, carbon steel, cast iron, aluminum, copper, and brass and bronze components. The periodic inspections will be performed once before the end of the current operating term and at intervals of approximately every 10 years during the period of extended operation, which is consistent with plant operation of approximately 2 years between refueling outages.

The program inspects for loss of material due to corrosion of selected carbon steel and cast iron components within the scope of license renewal that are normally exposed to moist air environments and are subject to wetting conditions based on system operation. Carbon steel and cast iron component were selected because carbon steel and cast iron have greater susceptibility to loss of material aging degradation than the other listed materials when exposed to moist air environments subject to wetting conditions.

In addition, the program inspects flexible hoses for age-related degradation in order to detect such degradation prior to loss of function. This periodic inspection will also be performed once before the end of the current operating term and at intervals of approximately every 10 years during the period of extended operation.

Evaluation And Technical Basis

(1) ***Scope of Activity:*** Periodic inspection of the selected components normally exposed to moist air environments within the scope of LR will manage aging degradation of Piping and Fittings, Valves, Turbine Casings, Flexible Hoses, Filter/Strainers, Air Accumulator Vessels, and Mufflers.

(2) ***Preventive Actions:*** The periodic inspections of the selected components exposed to moist air environments do not provide any preventative actions. These inspections provide for condition monitoring to detect degradation prior to a loss of function.

(3) ***Parameters Monitored/Inspected:*** Dresden and Quad Cities perform periodic thickness measurements (UT) of a representative sample of steel piping and fittings and air accumulator vessels, and periodic visual inspections (VT-3) of a representative sample of valves, filters/strainers and mufflers to determine if aging degradation is occurring. The components are inspected to ensure they are free of unacceptable loss of material due to general corrosion, pitting and crevice corrosion. The inspection will be performed in accordance with ASME Code requirements. Certified NDE examiners will conduct the UT and VT-3 inspections.

Dresden and Quad Cities perform visual inspection of flexible hoses to determine the presence of age-related degradation prior to loss of function.

(4) ***Detection of Aging Effects:*** Periodic thickness measurements of the selected components will determine if loss of material aging degradation is occurring to the normally inaccessible interior surfaces of selected components subject to moist air environments. Visual inspection of the selected components will determine if loss of material aging degradation is occurring to interior surfaces of the components normally exposed to a moist air environment. The visual inspection of the flexible hoses will determine any age-related degradation of the flexible hose. If the hoses exhibit such degradation, they will be replaced.

(5) ***Monitoring and Trending:*** The condition of the components subject to moist air environments are monitored, but not trended. Periodic inspections once before the end of the current operating term and at intervals of approximately every 10 years during the period of extended operation provide timely detection of loss of material prior to loss of function. Periodic visual inspection of the selected components during routine maintenance activities provides timely detection of loss of material due to corrosion. The visual inspection of flexible hoses provides timely detection of aging degradation prior to loss of function. Unacceptable inspection results will require that additional hoses be inspected to determine the extent of the condition.

(6) ***Acceptance Criteria:*** Engineering will determine the component thickness measurement acceptance criteria prior to conducting the examinations. Thickness measurements will be conducted in accordance with approved plant procedures and will be consistent with ASME Code requirements. Results of the UT examinations and abnormal corrosion or pitting found during visual inspections will be evaluated by engineering to determine if loss of material aging is occurring, and if so, the rate at which

the material is being lost. Engineering evaluations of the test or inspection results will determine the need for follow-up examinations to monitor the progression of aging degradation, and identify appropriate corrective actions to mitigate any excessive rates of loss of material discovered. Corrective actions, if necessary, would expand to include other components. Any degradation (such as elastomer hardening or cracking) found during the inspection of flexible hoses requires an Engineering evaluation to determine acceptance criteria. Corrective actions will include replacement and, if necessary, inspection of additional hoses.

(7) ***Corrective Actions:*** Evaluations are performed for inspection results that do not satisfy established criteria and a condition report is initiated to document the concern in accordance with plant administrative procedures. The corrective actions program ensures that the conditions adverse to quality are promptly corrected. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude repetition.

(8) ***Confirmation Process:*** Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B.

(9) ***Administrative Controls:*** See Item 8 above.

(10) ***Operating Experience:*** Dresden and Quad Cities have experienced age-related degradation of components exposed to moist air environments. The degradation was found during routine maintenance activities, corrected in a timely manner and did not result in a loss of function of any safety-related systems, structures or components (SSCs).

Conclusion

Periodic inspections of selected components exposed to alternate wetting and drying conditions are representative of the population of components normally exposed to moist air environments. This periodic inspection program provides reasonable assurance that the components are routinely inspected for deterioration and corrective action is taken to maintain the intended functions consistent with the current licensing basis during the period of extended operation.

Appendix A

The following will be added to the LRA Appendix A.

A.2.9 Periodic Inspection of Components Subject to Moist Air Environments (Dresden)

The periodic inspection of components subject to moist air environments aging management program provides for periodic inspections of selected components exposed to moist air environments and subject to wetting conditions based on system operation. Prior to the period of extended operation, a new program for periodic inspection of selected components will be implemented. The inspection will consist of UT examinations of components with interior surfaces that are inaccessible and visual inspection (VT-3) of components with accessible interior surfaces for the presence of loss of material due to general corrosion, pitting and crevice corrosion. The inspection will be performed in accordance with ASME Code requirements. Certified NDE examiners will conduct the UT and VT-3 visual inspection. In addition, visual inspection of flexible hoses will determine any age-related degradation prior to loss of function.

A.2.9 Periodic Inspection of Components Subject to Moist Air Environments (Quad Cities)

The periodic inspection of components subject to moist air environments aging management program provides for periodic inspections of selected components exposed to moist air environments and subject to wetting conditions based on system operation. Prior to the period of extended operation, a new program for periodic inspection of selected components will be implemented. The inspection will consist of UT examinations of components with interior surfaces that are inaccessible and visual inspection (VT-3) of components with accessible interior surfaces for the presence of loss of material due to general corrosion, pitting and crevice corrosion. The inspection will be performed in accordance with ASME Code requirements. Certified NDE examiners will conduct the UT and VT-3 visual inspection. In addition, visual inspection of flexible hoses will determine any age-related degradation prior to loss of function.

The following change will be made to the LRA Appendix A

A.1.23 One-Time Inspection (Dresden)

The one-time inspection aging management program includes inspections of a number of samples of the piping and components listed below. The inspections are scheduled for implementation prior to the period of extended operation to manage aging effects of selected components within the scope of license renewal. The purpose of the inspection is to determine if a specified aging effect is occurring. If the aging effect is occurring, an evaluation is performed to determine the effect it will have on the ability of affected components to perform their intended functions for the period of extended operation, and appropriate corrective action is taken. The program includes the following one-time inspections:

- Volumetric examination of 10% of the high and medium risk butt welds of Class I piping less than four inch nominal pipe size (NPS) exposed to reactor coolant for cracking.
- Inspection of a sample of torus saddle Lubrite baseplates for galvanic corrosion, wear, and lockup to confirm the condition of the inaccessible drywell radial beam Lubrite baseplates.
- Inspection of a sample of spent fuel pool cooling and demineralizer system components for corrosion in stagnant locations to verify effective water chemistry controls.
- Inspection of a sample of condensate and torus water components for corrosion and/or stress corrosion cracking in stagnant locations to verify effective water chemistry control.
- Inspection of a sample of compressed gas system piping components for corrosion.

- Inspection of a sample of lower sections of carbon steel fuel oil and lubricating oil tanks for reduced thickness.

- Inspection of a sample of fuel oil and lubricating oil piping and components for corrosion.

- Inspection of a sample of standby gas treatment and ventilation system components for loss of material.

- Inspection of a sample of stainless steel standby liquid control (SBLC) system components not in the reactor coolant pressure boundary of the SBLC system for cracking, to verify effective water chemistry control.

- Inspection of a sample of HPCI turbine lubricating oil hoses for age-related degradation.

- Inspection of a sample of non-safety related vents and drains including their valves and associated piping, for age-related degradation leading to a loss of structural integrity.

- Inspection of a sample of 10 CFR 54.4(a)(2) components for corrosion for which the component, material, environment, aging effect, or their combination is not specifically identified in NUREG-1801, "Generic Aging Lessons Learned (GALL) Report."

A.1.23 One-Time Inspection (Quad Cities)

The one-time inspection aging management program includes inspections of a number of samples of the piping and components listed below. The inspections are scheduled for implementation prior to the period of extended operation to manage aging effects of selected components within the scope of license renewal. The purpose of the inspection is to determine if a specified aging effect is occurring. If the aging effect is occurring, an evaluation is performed to determine the effect it will have on the ability of affected components to perform their intended functions for the period of extended operation, and appropriate corrective action is taken. The program includes the following one-time inspections:

- Volumetric examination of 10% of the high and medium risk butt welds of Class I piping less than four inch nominal pipe size (NPS) exposed to reactor coolant for cracking.

- Inspection of a sample of torus saddle Lubrite baseplates for galvanic corrosion, wear, and lockup to confirm the condition of the inaccessible drywell radial beam Lubrite baseplates.

- Inspection of a sample of spent fuel pool cooling and demineralizer system components for corrosion in stagnant locations to verify effective water chemistry controls.

- Inspection of a sample of condensate and torus water components for corrosion and/or stress corrosion cracking in stagnant locations to verify effective water chemistry control.

- Inspection of a sample of compressed gas system piping components for corrosion.

- Inspection of a sample of lower sections of carbon steel fuel oil and lubricating oil tanks for reduced thickness.

- Inspection of a sample of fuel oil and lubricating oil piping and components for corrosion.

- Inspection of a sample of standby gas treatment and ventilation system components for loss of material.

- Inspection of a sample of stainless steel standby liquid control (SBLC) system components not in the reactor coolant pressure boundary of the SBLC system for cracking, to verify effective water chemistry control.

- Inspection of a sample of HPCI turbine lubricating oil hoses for age-related degradation.

- Inspection of a sample of non-safety related vents and drains including their valves and associated piping, for age-related degradation leading to a loss of structural integrity.

Inspection of a sample of 10 CFR 54.4(a)(2) components for corrosion for which the component, material, environment, aging effect, or their combination is not specifically identified in NUREG-1801, "Generic Aging Lessons Learned (GALL) Report."

<u>RAI B.1.25-01 Supplemental Information Request</u>

a) B.1.25 response #4) the applicant provided clarifying information related to buried pipes and tanks. The applicant indicated in this response that they do not know whether all buried carbon steel piping is coated. The applicant needs to provide justification regarding how aging of carbon steel piping will be managed in lieu of the potential lack of coating since, coated components are one of GALL program attributes relied on to manage aging. Further, the applicant needs to identify that the lack of coating is an exception to the program.

b) In response #4) the applicant provided clarifying information regarding a modification which exposed buried, coated carbon steel piping. The staff requests the applicant to provide information regarding the condition of the coating in this section of piping.

Response

(a) Some of the piping & instrumentation drawings (P&IDs) for Dresden and Quad Cities contain specific notes detailing the type of coating on portions of buried pipe. However, this is not a standardized convention on Exelon drawings and such detail does not exist on all P&IDs that contain buried pipe. The statement in the response to RAI B.1.25 that "plant records do not indicate whether all buried carbon steel piping in other systems is coated" was based upon the absence of this type of notation about external coating on the P&IDs for some systems. However, the buried piping specifications followed during original construction of both sites requires that all buried carbon steel pipe have a protective coating. Additionally, the installation specification required an independent inspection of the coating integrity prior to burial

Upon closer review of whether buried carbon steel piping is coated, Exelon has determined with reasonable assurance that all buried carbon steel piping at Dresden and Quad Cities was, in fact, coated prior to installation. This determination is based upon two facts: 1) original and current installation specifications applicable for buried piping do require an external coating on buried carbon steel piping, and 2) there has been no failure history at Dresden or Quad Cities of buried carbon steel piping attributed to the absence of an external coating on the piping.

Based upon its determination that all buried carbon steel piping at Dresden and Quad Cities is coated, Exelon has concluded that Aging Management Program B.1.25 (Buried Piping and Tanks Inspection) as described in the LRA is consistent with NUREG-1801 with regard to having an external coating on buried carbon steel piping, and AMP B.1.25 does provide appropriate aging management for all buried, in-scope carbon steel piping at Dresden and Quad Cities.

(b) A recent modification of buried Fire Suppression System piping at Quad Cities provided an opportunity for inspection and ultrasonic testing of a part of the pipe that was removed. The subject piping was 10" schedule 40, carbon steel wrapped with coal tar paper that had been buried in the early 1970's. The nominal wall thickness for this pipe is 0.365". The minimum and maximum wall thickness measurements were 0.320" and 0.400", respectively, indicating little effect of aging for a period of approximately 30 years. The condition of the external coating on the buried pipe was described by the craftsman doing the work as "generally in good shape." However, no quantitative data concerning the thickness of the pipe's external coating are available.

RAI B.1.27 Supplemental Information Request

The applicant's response to RAI B.1.27 did not address the staff's concern, but served to reinforce the concern regarding the inspection of Class MC Supports. The applicant's existing IWF program is NOT consistent with GALL in that it does not include the inspection of Class MC supports. The staff's acceptance of IWF (or any other existing program) for aging management during the license renewal period is substantially based on the assumption that the components covered by the scope of the existing program are being periodically inspected during the current licensing term and any problems affecting performance of intended function(s) have been detected and corrected. In its response to RAI B.1.27, the applicant states that "containment supports are not required to be examined in accordance with Subsection IWF." Furthermore, the response states that "as there is no inspection history of containment supports, there is no site operating experience related to this program to provide." Since there is no existing program to inspect Class MC supports, the staff can not accept the use of IWF in the license renewal period without further information or actions by the applicant.

Furthermore, the staff is confused as to which Class MC supports the applicant is proposing to inspect under IWF in the license renewal period. The response to RAI 2.4-2 lists at least three items that appear to be Class MC supports (items c, d and j), but the LRA Table number and component group referenced for each item leads to the Structures Monitoring Program, not IWF. The response to RAI 2.4-2 also lists a number of items that appear to be Class 1 supports (items a, b, and f (regarding anchor bolts)), but the LRA Table number and component group referenced for each item leads to the Structures Monitoring Program, not IWF. Some of the same components discussed in the response to RAI 2.4-10 reference IWF, so there is an inconsistency between the two RAI responses.

The response to RAI 3.5-14 supports the applicant's proposal that downcomer bracing (a Class MC support) should be inspected using IWE. This raises an additional staff concern as to how many other Class MC supports the applicant intends to inspect using IWE rather than IWF.

Some of the Class MC supports discussed by the applicant in the above RAI responses seem to be inaccessible. Therefore, the staff needs to better understand how the applicant is treating these supports.

In order to resolve the staff's concerns, the applicant is requested to provide the following information:

(1) Identify each type of Class MC support by name and confirm whether the support will be inspected under IWF during the period of extended operation. Provide a technical explanation for those supports that are proposed to be inspected under another program (such as IWE or Structures Monitoring) or for cases where no inspection is planned.

(2) Since Class MC supports are not currently being inspected, provide a commitment to perform a baseline inspection of typical samples of each type of Class MC component support prior to the period of extended operation, to identify and correct any problems affecting performance of intended functions.

(3) Describe how the performance of Class MC component supports in inaccessible areas are currently being managed and how they will be managed during the period of extended operation. Clarify the commitment to the provisions of !0CFR50.55a covering inaccessible areas.

(4) Review the response to RAI 2.4-2 and identify the aging management program applicable to each item (a) through (k). Also verify the consistency of this RAI

response with the response to RAI 2.4-10.

This is Open Item 3.5.2.3.2.2-1.

Response to Item (1)

Class MC components at Dresden and Quad Cities stations are divided into four groups based on the section of the containment in which they are installed. These groups are:

(a) Drywell
(b) Suppression chamber
(c) Vent system between the drywell and suppression chamber
(d) Piping that penetrates the primary containment.

The supports in each group are discussed separately below.

(a) Drywell

This group includes supports that provide structural support for the drywell portion of the primary containment. This group includes the following supports:

i. Drywell Steel Support Skirt and Anchor Bolts – The steel support member is part of the Class MC support, however, it is encased in concrete and is inaccessible, and is exempt from examination per ASME Section XI, IWF-1230 (components encased in concrete).

ii. Biological Shield to Containment Stabilizer – These supports are not currently inspected. However, prior to the end of the current term of operation the IWF program will be augmented to cover these Class MC supports.

iii. RPV Male Stabilizer Attached to Outside of Drywell Shell – This is a subset of the "Biological Shield to Containment Stabilizer" support.

iv. RPV Female Stabilizer and Anchor Rods (also referred to as Gib) Embedded in Reactor Building Concrete Wall – This is a subset of the "Biological Shield to Containment Stabilizer" support. A portion of this support is inaccessible and the inaccessible portion is exempt from examination per ASME Section XI, IWF-1230 (components encased in concrete).

(b) Suppression Chamber

This group contains supports that provide structural support for the suppression chamber (torus). Supports in this group include the following:

i. Suppression Chamber Ring Girder Vertical Supports and Base Plates - These supports are not currently inspected. However, prior to the end of the current term of operation the IWF program will be augmented to cover these Class MC supports.

ii. Suppression Chamber Saddle Supports and Base Plates - These supports are not currently inspected. However, prior to the end of the current term of operation the IWF program will be augmented to cover these Class MC supports.

iii. Suppression Chamber Seismic Restraints and Base Plates - These supports are not currently inspected. However, prior to the end of the current term of operation the IWF program will be augmented to cover these Class MC supports.

(c) <u>Vent System Between Drywell and Suppression Chamber</u>
This group contains supports that provide structural support on the vents that connect the drywell with the suppression pool.

i. Vent Header Vertical Column Supports - These supports are not currently inspected. However, prior to the end of the current term of operation, the IWF program will be augmented to cover these Class MC supports.

ii. Vent Header Downcomer Stiffener Plates – These supports are considered to be integral attachments (stiffeners) to a Class MC pressure retaining component. As such, they are presently included in the IWE program at each site.

iii. Vent Header Lateral Bracing – These supports are considered to be integral attachments (stiffeners) to a Class MC pressure retaining component. As such, they are presently included in the IWE program at each site.

iv. Vent Header Longitudinal Bracing – These supports are considered to be integral attachments (stiffeners) to a Class MC pressure retaining component. As such, they are presently included in the IWE program at each site.

The specific Class MC components listed above are also included in NUREG 1801, Volume 2, Chapter III, Section III B1.3 which recommends the IWF aging management program for the period of extended operation. Because the downcomer bracing was already included as part of the "ASME Section XI, Subsection IWE" aging management program (AMP), an exception was taken in the LRA to the "ASME Section XI, Subsection IWF" AMP. The impact of utilizing IWE instead of IWF (there was no impact) was provided in the response to RAI 3.5-14.

(d) <u>Class MC Piping Penetrating Primary Containment</u>
This group of piping supports at Dresden and Quad Cities stations include MC piping systems that penetrate and are attached to the primary containment. Examples of systems included in this category are: instrument air, service air, primary containment vent and purge piping, and reactor building closed cooling water. Component supports for this category of piping are not included in the ASME Section XI, Subsection IWF programs at either site.

The technical basis for this exclusion is found in Table IWF-2500-1 contained in Subsection IWF of ASME Section XI. Specifically, Item No. F1.40 of Table IWF-2500-1 only recommends the inspection of Class MC supports other than piping supports. The basis for excluding MC piping supports in Table IWF-2500-1 is found in IWF-1230 and IWE-1220.

Subsection IWF-1230 states:

> "Component supports exempt form the examination requirements of IWF-2000 are those connected to components and items exempted from examination under IWB-1220, IWC-1220, IWD-1220, and IWE-1220."

Subsection IWE-1220 states:

> "The following components (or parts of components) are exempted from the examination requirements of IWE-2000: (d) piping, pumps and valves that are part of the containment system, or which penetrate or are attached to the containment vessel. These components shall be examined in accordance with the rules of IWB or IWC, as appropriate to the classification defined by the Design Specifications."

For the reasons stated above, Class MC piping supports at Dresden & Quad Cities stations are excluded from the ASME Section XI, Subsection IWF program.

The MC pipe supports at Dresden and Quad Cities stations are not included in the IWB or IWC programs at each site and are excluded from the IWE program. For the reasons stated above, they are exempt from the IWF program as specified in Subsections IWF-1220.

The MC pipe supports at Dresden and Quad Cities stations are managed for aging by visual inspections performed under the Structures Monitoring (SM) program, as described in the LRA, Appendix B, B.1.30,"Structures Monitoring Program." The SM program is intended to encompass all component supports, including Class MC, that are not included in the IWF program. As such, both programs are technically adequate to manage the aging effects of the component supports within their respective scopes. A comparison of the two programs, with respect to Class MC piping supports, is as follows:

- Both programs are based on sampling of the total support population. Once a sample is selected for inspection during the initial interval, this same sample is then inspected during successive intervals; 10 year intervals in the case of the IWF program, and five year intervals in the case of the SM program.

- ASME Subsection IWF, Table IWF-2500-1, addresses Class 1 (25% inspected each interval), Class 2 (15% inspected each interval), and Class 3 (10% inspected each interval) piping supports, but does not address Class MC piping supports. Class MC supports are addressed in Table IWF-2500-1 under "Supports Other Than Piping Supports (Class 1, 2, 3, and MC)," with 100% of the supports examined each inspection interval. However, Note (3) in Table IWF-2500-1 allows that for multiple components other than piping with a similar design, function, and service, the supports of only one of the multiple components are required to be examined.

- The SM program inspects a fixed number of supports every 5 years. These supports are selected as representative of the supports throughout the plant, including environmental conditions as well as configuration. The same supports in the selection are inspected every interval.

  A minimum of ten supports on Class MC piping will be included in the sample population, representing each environment – configuration combination that exists for systems that contain Class MC piping.

- Component supports under the SM program are visually inspected by Inspectors that are "suitably knowledgeable." The results are evaluated by an Evaluator who is a degreed civil/structural engineer with at least 5 years experience. Component supports under the IWF program are visually VT-3 examined by an Examiner qualified to at least a Level II.

- The SM program presently includes component support inspection attributes for excessive deflection, distortion, misalignment, significant corrosion resulting in a loss of cross-section, loose bolting, cracked welds, and damaged grout pads. The SM program does not presently include the inspection of standard components such as snubbers, struts, and spring cans. But as stated in the response to RAI B.1.30 Supplemental Information Request, the SM program will be expanded to include the inspection of standard components such as snubbers, struts, and spring cans.

- The IWF program includes component support examination attributes for structural distortion or displacement of parts; loose, missing, cracked, or fractured parts, bolting or fasteners; corrosion or erosion that reduces cross-sectional area; misalignment of supports; improper hot or cold positions for snubbers and spring cans; and damaged or broken grout or concrete.

Response to Item (2)

Baseline inspections of typical samples of each type of Class MC component support added to the IWF program will be performed prior to the start of the period of extended operation.

Response to Item (3)

10 CFR 50.55a does not address Class MC component supports. ASME Section XI, Subsection IWF-1230 states:

"In addition, portions of supports that are inaccessible by being encased in concrete, buried underground, or encapsulated by guard pipe are also exempt from the examination requirements of IWF-2000."

Two of the Class MC component supports listed above in the response to Part (1) were identified as inaccessible due to being encased in concrete. They were the "Drywell Steel Support Skirt and Anchor Bolts" component support, and the Anchor Rods or Gib portions of the "RPV Female Stabilizer and Anchor Rods" component support. Loss of Material due to corrosion of the encased portion is not an aging effect requiring management. EPRI TR-114881, "Aging Effects for Structures and Structural Components (Structural Tools)," Section 5.3.1.5, states that, "The high alkalinity (pH > 12.5) of concrete provides an environment around embedded steel and steel reinforcement which protects them from corrosion." Therefore, the inaccessible portions of these supports do not require aging management.

Response to Item (4)

The response to RAI 2.4-2 Supplemental Information Request identifies items (b), (c), (d), and (j) as Class MC component supports with aging management references to the IWF program. Items (a), (e), (f), (g), (h), (i), and (k) are components other than Class MC component supports. With respect to Class MC component supports, the response to RAI 2.4-2 Supplemental Information Request is consistent with this response to RAI B.1.27 Supplemental Information Request.

Also, the response to RAI 2.4-10 is consistent with the response to RAI 2.4-2 Supplemental Information Request (and with this response to RAI B.1.27 Supplemental Information Request), with the following clarification. At the time the response to RAI 2.4-10, Item (b), was submitted, the phrase, "drywell lower ring support," listed in Part (b) of the request was assumed to be the drywell support skirt. Based on this, it was identified as a Class MC component support, being managed by the IWF program, the same as Item (j) in the response to RAI 2.4-2 Supplemental Information Request. On the other hand, if the requestor meant the 6x1-inch continuous steel ring on the interior bottom of the drywell discussed in the Quad Cities UFSAR Section 3.8.2 and UFSAR Figures 3.9-5 and 3.9-7, then it would be the same as RAI 2.4-2 Supplemental Information Request, Item (i). Since the interior shear ring is encased in concrete, as is the drywell steel support skirt, its aging management requirements are the same as previously discussed for the drywell steel support skirt.