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U. S. Nuclear Regulatory Commission
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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 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 October 23, November 12, and December 15 and 16, 2003. This additional information provides a response to questions regarding Section 2.3 and the Aging Management Programs sections of Reference 1. In addition, EGC is revising the response to RAI 2.3.4.2-3 that was submitted in Reference 2.

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

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A098

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

Respectfully,

1/26/04
Executed on

Patrick R. Simpson
Patrick R. Simpson
Manager – Licensing

Attachment: Response to Request for Additional Information – LRA Section 2.3 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 Section 2.3 and Aging Management Programs

RAI 2.3.3.19-4 Supplemental Information Request

The staff has reviewed the applicant's response to RAI 2.3.3.19-4 and determined that the applicant has not adequately described basis for concluding that a failure in the out-of-scope piping will not result in a failure of the demineralized water makeup system. This is an open item.

Response

At Dresden, the preferred makeup source to the isolation condenser is the dedicated diesel driven makeup pumps that take suction from the clean demineralized water tank. The clean demineralized water system is designed to supply water to multiple sources in parallel with the isolation condenser diesel driven makeup pump. For this reason, leakage in any of the branch connections described in the original RAI would not prevent this preferred path from fulfilling its function.

The demineralized water makeup system provides an alternate supply of makeup water to the Isolation Condenser shell from the clean demineralized water storage tank. Therefore the portion of the demineralized water makeup system in the flow path to the Isolation Condenser shell, including the clean demineralized water pumps, piping, associated valves, and instrumentation are included within the scope of license renewal. When establishing the in-scope boundary of the demineralized water makeup system for license renewal, credit was allowed for operator action to close accessible, normally open, manual isolation valves.

The branch connections on the demineralized water piping system that are not included within the scope of license renewal are located within the power block (turbine building, reactor building, radwaste) where detection in the event of failure would be detected. In the event of a significant demineralized water line break, operators would receive a control room low pressure alarm for the clean demineralized water header. Site operating procedure, DAN 923-1 C-6, Clean Demin Water Pp Trip/Press Lo, directs operators to check for excessive use of clean demineralized water and to troubleshoot as needed. Operators would also detect any abnormal increase of input to plant sumps that are monitored continuously by operators in the radwaste control room. Individual sump inputs are monitored which would assist operations personnel in locating the area of any clean demineralized water line break. Operators would respond to these indications of plant leakage and take appropriate actions to isolate the leakage.

Those portions of the clean demineralized water system that can spatially interact with safety related equipment were included during previous system scoping efforts. A pipe break and/or leak from remaining portions of the clean demineralized piping that are not in scope can not spatially affect safety related components.

As stated in the previous response to RAI 2.3.3.19-4, the valves listed below were added to the scope of license renewal and will be managed for aging. Operator closure of these valves would isolate a failure in the out of scope portions of the system located downstream and re-establish the demineralized water system pressure boundary and makeup flow path to the isolation condenser. This action eliminates the need for placing the downstream components within the scope of license renewal.

2-4303-500	2-4399-792	3-4399-711
2-4308-500	3-4399-706	3-4305-500
2-4308-501	3-4399-707	2/3-5799-1113
2-4309-500	3-4399-708	2/3-5799-1115
2-4399-730	3-4399-709	2/3-4311-500
2-4399-732	3-4399-710	2/3-4399-67

In addition, the following valves will be added to the scope of license renewal: check valve 2/3-4300-852 (This valve isolates the branch connection on LR-DRE-M-35-1, grid location D-7, from drawing M-1011-2) and the unnumbered vent valve in line 2-4386-1"-L at grid location D-4 on LR-DRE-M-35-1.

RAI 2.3.4.2-3 (Item 3.1.1.13) Supplemental Information Request

Based on the response to RAI 2.3.4.2-3, the staff understands that the Control Rod Drive (CRD) Return Line Nozzle has been capped, but not rerouted, and therefore augmented inspection for the nozzle is not required per NUREG-0619. The requirements in NUREG-0619 provide actions to be taken to address cracking in these nozzles. However, the aging effects of the cap and applicable weld is not covered in NUREG-0619. Therefore, the staff requests the following concerning the cap and weld which provides a pressure boundary function:

- Describe the configuration and location of the capped nozzle. This should include the existing base material for the nozzle, piping (if piping remnants exist) and cap material, any welds and material type (i.e. 82/182).
- Describe how this weld and cap is managed (i.e. BWRVIP-75).
- Discuss how the event at Pilgrim (leaking weld at capped nozzle) may or may not apply to Dresden and Quad Cities. Include in your discussion the past inspection techniques applied, the results obtained, mitigative strategies, and weld repairs, etc.

Response

- At Dresden, the current configuration includes 3" stainless steel cap welded to a new stainless steel safe-end, welded to the original carbon steel nozzle. Also, a ½" sockolet is welded to the safe-end going to a capped spare ¾" stainless steel line on Dresden Unit 3 only.

  At Quad Cities, the current configuration includes a new 3" stainless steel cap welded to a new stainless steel safe-end, welded to a new 1 ¼" long carbon steel pup piece (pipe) (with a stainless Steel overlay) welded to the original carbon steel nozzle.

- The aging management for this section includes ASME Section XI for the nozzle as stated in Aging Management Program B.1.6, One-Time Inspections Aging Management Program B.1.23 for the remaining portion (safe-end, cap, and welds), and Water Chemistry as stated in Aging Management Program B.1.2.

- The October 1, 2003 event at Pilgrim does not apply to Dresden and Quad Cities based on the following differences:

    - Pilgrim welded their cap directly to the nozzle. Dresden and Quad Cities have installed a new safe-end between the nozzle and cap.
    - The Pilgrim cap was Alloy 600. The Dresden Safe-ends are 316L and the Caps are 304L. The Quad Cities Cap and safe-end are 316L.
    - Pilgrim used Inconel 82/182 alloy weld filler material. Dresden and Quad Cities used E308L. Quad Cities also used E309L for the dissimilar metal weld.
    - Pilgrim had initial weld deficiencies (lack of fusion) that required weld repair. The Dresden and Quad Cities welds were completed without incident (no recordable indications).
    - Pilgrim installed the cap in 1977. Subsequent to the Pilgrim installation it was determined that Inconel 600 caps and Inconel 82/182 nozzle to cap butt welds were, under specific conditions, susceptible to stress corrosion cracking. Dresden installed the caps in 1993 and1986 (Units 2 and 3 respectively) and Quad Cities installed the caps in 1989 and 1990 (Units 1 and 2 respectively) and considered this new operating experience into account in the design of the modification.

- NDE completed since the replacement of the nozzles and caps has included Radiographic and penetrant testing (initial installation of the replacement cap for both nozzle to safe-end and safe-end to cap) and subsequent ultrasonic (of the nozzle to safe-end and one time of the safe-end to cap in response to the Pilgrim event) and penetrant testing (nozzle to safe-end and safe-end to cap) per the ISI program. No reportable indications have been identified.

- The nozzle-to-safe end weld is ASME Section XI, category B-F, and the safe end-to-cap weld is ASME Section XI, category B-J. These welds are GL 88-01, category A welds. All GL 88-01, category A welds were subsumed into the Risk Informed ISI Program as noted on the Relief Request Approved by the NRC on ADAMS Accession Number ML012050103. Similar Relief Requests have been submitted for the next 10 Year Inspection Periods at Dresden and Quad Cities. Therefore, none of the welds listed below are in the scope of BWRVIP-75 or GL 88-01.

- Additionally, the response to RAI 3.1-9 did not include these capped lines. They were omitted from the list as they are not installed piping lines. Therefore, the table below amends the response to RAI 3.1-9. These capped lines have been included in Aging Management Program B.1.23 "One Time Inspection."

Unit	System	Line No.	Material	Weld Type	Drawing (Coordinates) and Comments
D-2	Control Rod Drive	Capped Return Line	Stainless Steel	Butt	LR-DRE-M-26-1 (E-6)
D-3	Control Rod Drive	Capped Return Line	Stainless Steel	Butt And socket	LR-DRE-M-357-1 (B-4)
Q-1	Control Rod Drive	Capped Return Line	Stainless Steel	Butt	LR-QDC-M-35-1 (G-5)

Unit	System	Line No.	Material	Weld Type	Drawing (Coordinates) and Comments
Q-2	Control Rod Drive	Capped Return Line	Stainless Steel	Butt	LR-QDC-M-77-1 (G-5)

B.1.9-b Supplemental Information Request

The rim hold-down bolts are susceptible to stress relaxation. Therefore, the license renewal action item for BWRVIP-25 recommends that the applicant for license renewal should identify and evaluate the projected stress relaxation as a potential TLAA issue if a plant-specific analysis satisfies the six criteria in 10 CFR 54.3 for a TLAA. The staff issued RAI B.1.9-b requesting the applicant to confirm whether D/QCNPS follows the BWRVIP-25 guidelines for managing aging of the rim hold-down bolts and, if so, then identify and evaluate whether the projected stress relaxation in the rim hold-down bolts is a TLAA issue. In response to RAI B.1.9-b in a letter dated October 6, 2003, the applicant states that D/QCNPS follows the BWRVIP-25 guidelines for management of the hold-down bolts. However, the D/QCNPS core plates had wedges installed along with the repair of their shrouds with tie rods. The applicant further states that BWRVIP-25 does not recommend inspection of rim hold-down bolts if wedges are installed. The staff reviewed BWRVIP-25 and confirmed the accuracy of the applicant's statements made in this response. The staff finds the applicant's response acceptable because it follows the recommendations of BWRVIP-25, which is approved by the staff. However, the applicant has not identified whether stress relaxation in the rim hold down bolts is a TLAA. (Open Item 3.1.2.3.6.2-1)

Response

The stress relaxation of the rim hold-down bolts is not a TLAA for Dresden or Quad Cities. As previously stated Dresden and Quad Cities have installed wedge retainers. These wedges structurally replace the lateral load resistance provided by the rim hold-down bolts. As such failure of the bolts due to stress relaxation is no longer a concern and inspection of the bolts is not required. Therefore, the stress relaxation of the rim hold-down bolts does not meet the TLAA criteria 5 "involve conclusions or provide the basis for conclusion related to the capability of the core plate to perform its intended function." Additionally, neither the rim hold-down bolts nor the wedges meet TLAA criteria 3 "time-limited assumptions defined by the current operating term."

RAI B.1.23-2.1 Supplemental Information Request

In response to RAI 3.2.4.1-3, the applicant stated that hardening and loss of strength due to elastomer degradation in the flexible hoses in a containment nitrogen environment would be managed by the One-Time Inspection Program. A one-time inspection is appropriate to verify that aging is not occurring or is occurring slowly enough that the intended function of equipment will be maintained. However, as noted in RAI 3.2.4.1-3 and the applicant's response dated October 3, 2003, the aging of elastomers is dependent, in part, on temperature and radiation levels. The applicant needs to provide sufficient information on the environmental conditions, including temperature and radiation levels, of the hoses in question to justify the use of a one-time inspection rather than periodic inspections for these components.

Response

Upon further review, Exelon believes that these hoses are made of stainless steel with an overall stainless steel outer braided jacket and are not comprised of an elastomer as reported earlier. This is based upon on a procurement-engineering package recently discovered. Exelon will use the One Time Inspection to verify that the hoses are constructed of metal rather than an elastomer material. If as stated in the procurement-engineering package, the hoses are metal, the One Time Inspection will look for any type of mechanical damage. If the hoses are made of an elastomer material they will be replaced with metal flexible hose. This One Time Inspection will be performed prior to the period of extended operation. The internal environment that these hose experience is saturated air at an average temperature of 135 °F. The external environment that these hose experience is containment nitrogen at an average temperature of 135 °F with a maximum relative humidity of 90%. The 60-year radiation dose is 1.65E07 Rads. This applies to Quad Cities only. Dresden has stainless steel tubing installed, not flexible hose.

LRA Table 3.4-2 Aging Management References 3.4.2.18 and 3.4.2.19 will be revised to read as follows. This information supersedes that information provided in RAI response 3.4.1-3.

Ref No	Component Group	Material	Environment	Aging Effect/Mechanism	Aging Management Program	Discussion
3.4.2.18	Flexible Hoses	Stainless Steel	Containment Nitrogen	None	One-Time Inspection (B.1.23)	NUREG-1801 does not address Stainless Steel flexible hose. The One-Time Inspection will be used to verity the material of construction.
3.4.2.19	Flexible Hoses	Stainless Steel	Saturated air	None	One-Time Inspection (B.1.23)	NUREG-1801 does not address Stainless Steel flexible hose. The One-Time Inspection will be used to verity the material of construction.

LRA Table 2.3.4-1 will be revised to read as follows.

Component	Component Intended Function	Aging Management Ref
Flexible Hoses (Quad Cities Only)	Pressure Boundary	3.4.2.18, 3.4.2.19

The following statement from Section A.1.23, One-Time Inspection, in the Updated Final Safety Analysis Report (UFSAR) Supplement for Dresden and Quad Cities will be revised as follows:

Inspection of a sample of compressed gas system piping components for corrosion and a sample of compressed gas system flexible hoses ~~for elastomer degradation~~.

The following statement from Section B.1.23, One-Time Inspection, in Appendix B of the License Renewal Application should have read as follows:

Inspection of a sample of compressed gas system piping components for corrosion and a sample of compressed gas system flexible hoses ~~for elastomer degradation~~.

RAI B.1.23-2.2 Supplemental Information Request

For the component "NSR vents or drains, piping and valves" addressed by AMR Reference 3.4.2.30 (and other references), the applicant has identified that the material/environment includes carbon steel exposed to air, moisture, humidity, and leaking fluid. In its response to RAI B.1.23-2(b), the applicant implies that the loss of material due to corrosion is expected to be sufficiently slow that a one-time inspection can be used for aging management, but does not supply the basis for this expectation. The loss of material of carbon steel in the environments of leaking fluid and humid air, especially with condensation, can be rapid enough to warrant periodic inspection instead of a one-time inspection. The applicant needs to provide sufficient information, such as whether there is condensation, actions to identify and correct leakage, and pertinent operating experience, to justify the use of a one-time inspection.

Response

The subject components are NSR vents, drains, valves and piping outboard of normally closed SR valves. These components were included within the scope of license renewal because they are non safety related lines attached to safety related lines meeting the scoping criteria of 10 CFR 54.4(a)2 as defined in interim staff guidance ISG-9. As such, the intended function requiring aging management for these components is structural support. These NSR vents and drains are attached to normally closed isolation valves and are not likely to contain moisture. Many of these vents and drains are periodically operated (for equipment venting, draining, and testing purposes). Any appreciable leakage/condensation contained inside these components would be identified in the course of these periodic operations or through the daily monitoring of unidentified inputs to radwaste by the operating department. Malfunctioning isolation valves or other degraded conditions would be promptly repaired/replaced/corrected, and any increased rate of failure of these vent/drain components would be noted as an adverse trend that would be evaluated and resolved in accordance with the site corrective action process. For the reasons stated above, the rate of any material loss due to corrosion will be slow.

The proposed one-time inspections will confirm the assumption that loss of material due to corrosion is occurring at a sufficiently slow rate for the subject vents and drains. In the event that the results of the one-time inspections fail to provide this confirmation, evaluations will be performed in accordance with the site corrective action process to identify alternate actions, including possible periodic inspections of the vents and drains.

RAI B.1.23-2.3 Supplemental Information Request

In RAI B.1.23-2, the staff questioned the use of a one-time inspection as the only aging management activity for components exposed to an environment of EHC oil. The staff's concern was that proper maintenance of oil chemistry is critical to preventing any aging effects in this environment. In its response dated October 3, 2003, the applicant restated its position that a one-time inspection is sufficient for components in this environment. However, the staff only considers this acceptable if the oil is maintained at high quality and water free. The applicant needs to provide additional information on the control of the oil quality, and the operating experience, in order to justify the use of a one-time inspection.

Response

Maintaining the electro-hydraulic control (EHC) oil to a high quality and water free condition is paramount to the safe and reliable operation of the main turbine EHC system. As such, sampling and analysis of the EHC oil is included in the Dresden and Quad Cities station lubrication programs. The EHC oil physical properties are tested to standard ASTM methods, and particulate counts are conducted in accordance with ISO 4406. To credit this analysis of the EHC oil for License Renewal, the scope of LRA Appendix B, Aging Management Program B.2.5, " Lubricating Oil Monitoring Activities," will be expanded to include the analysis of the EHC oil at Dresden and Quad Cities stations.

LRA Appendix A, Dresden Units 2 and 3, Section A.2.5, "Lubricating Oil Monitoring Activities," is revised as follows (Also includes changes from RAI B.1.23-2):

> The lubricating oil monitoring activities aging management program manages corrosion, loss of material, and cracking in lubricating oil heat exchangers and other specific components in the scope of license renewal by monitoring physical and chemical properties in lubricating oil. Sampling, testing, and monitoring verify lubricating oil properties. Oil analysis permits identification of specific wear mechanisms, contamination, and oil degradation within operating machinery.

These activities apply to the emergency diesel generator system, station blackout diesel generator system, HPCI system, and electro-hydraulic control system. The complete aging management program for the emergency diesel generator oil coolers, station blackout diesel generator oil coolers, and HPCI oil coolers also includes secondary-side (heat sink) chemistry controls, performance monitoring, and inspections. Those portions of the lubricating oil heat exchanger management program are described in:

- Section A.1.14, "Closed-Cycle Cooling Water System," for the diesel generator and station blackout diesel generator oil coolers; and in
- Section A.2.6, "Heat Exchanger Test and Inspection Activities," for the HPCI oil coolers."

LRA Appendix A, Quad Cities Units 1 and 2, Section A.2.5, "Lubricating Oil Monitoring Activities," is revised as follows (Also includes changes from RAI B.1.23-2 and supplemental information request RAI B.1.23-02.4):

The lubricating oil monitoring activities aging management program manages corrosion, loss of material, and cracking in lubricating oil heat exchangers and other specific components in the scope of license renewal by monitoring physical and chemical properties in lubricating oil. Sampling, testing, and trending verify lubricating oil properties. Oil analysis permits identification of specific wear mechanisms, contamination, and oil degradation within operating machinery.

These activities apply to the emergency diesel generator system, station blackout diesel generator system, HPCI system, electro-hydraulic control system, reactor core isolation cooling system, and generator hydrogen seal oil system. The complete aging management program for the emergency diesel generator oil coolers, station blackout diesel generator oil coolers, and HPCI oil coolers also includes secondary-side (heat sink) chemistry controls, performance monitoring, and inspections. Those portions of the lubricating oil heat exchanger management program are described in:

- Section A.1.14, "Closed-Cycle Cooling Water System," for the diesel generator and station blackout diesel generator oil coolers; and in
- Section A.2.6, "Heat Exchanger Test and Inspection Activities," for the HPCI oil coolers."

LRA Appendix B, Section B.2.5, "Lubricating Oil Monitoring Activities," has been revised to include changes described above along with changes described in the Exelon response to RAI B.1.23-2 and supplemental information request RAI B.1.23-02.4. The revised Section B.2.5 is provided below and all changes have been underlined. Note that while the RCIC pump bearing oil is sampled semi-annually, the RCIC turbine is sampled every 24 months. This is because the RCIC turbine oil system is a closed system, with no provisions made to sample the oil without draining the system, and because of the excellent historical results of turbine oil sample analyses. Every 24 months, the turbine oil is drained and replaced with fresh oil during a preventive maintenance inspection. An oil sample is drawn during the draining process and analyzed.

EPRI TR 1007460, "Terry Turbine Maintenance Guide, RCIC Application," recommends oil analysis be performed after each quarterly run, and every 18-24 months. TR 1007460 is the basis for the RCIC turbine perform-centered-maintenance (PCM) template utilized in the EPRI-based Performance Centered Maintenance (PCM) program. The PCM program provides for the extension of intervals of preventive maintenance activities that is warranted by demonstrated good performance. Since there have been no cases on either Quad Cities Unit 1 or Unit 2 where an oil sample analysis results were outside of the normal range, an exception to TR 1007460 for the quarterly oil sample was taken in accordance with the PCM program.

As stated in the response to RAI B.1.23-2, Part (a), a review of the Dresden and Quad Cities station operating experience for main turbine systems with an EHC oil environment did not identify any components whose failure was attributed to age related degradation.

B.2.5 Lubricating Oil Monitoring Activities

Description

The lubricating oil monitoring activities manage loss of material and cracking in lubricating oil heat exchangers in the scope of license renewal. Additionally, the lubricating oil monitoring activities manage loss of material and cracking of other components in certain selected systems in the scope of license renewal. These activities include measures to minimize corrosion and to mitigate loss of material and cracking in heat exchangers by monitoring lubricating oil properties. Sampling, testing, and trending verify lubricating oil properties and ensure that the intended functions of the heat exchangers and other system components are not lost. Oil analysis permits identification of specific wear mechanisms, contamination, and oil degradation within operating machinery.
The activities manage physical and chemical properties in lubricating oil. The complete aging management program for lubricating oil heat exchangers also includes secondary-side (heat sink) chemistry controls, performance monitoring, and inspections. Those portions of the lubricating oil heat exchanger management program are described in:

- Section B.1.14, Closed-Cycle Cooling Water System, for the diesel generator and station blackout diesel generator oil coolers; and in

- Section B.2.6, Heat Exchanger Test and Inspection Activities, for the HPCI oil coolers.

Evaluation and Technical Basis

(1) Scope of Activity: The following lubricating oil heat exchangers are subject to this program:

- Dresden Unit 2 and 3 HPCI lubricating oil coolers

- Dresden Unit 2, 3 and 2/3 diesel generator lubricating oil coolers

- Dresden Units 2 and 3 station blackout (SBO) diesel generator lubricating oil coolers

- Quad Cities Unit 1 and 2 HPCI lubricating oil coolers

- Quad Cities Unit 1, 2, and 1/2 diesel generator lubricating oil coolers

- Quad Cities Unit 1 and 2 station blackout (SBO) diesel generator lubricating oil coolers

Additionally, components in the following systems, which are exposed to a lubricating oil environment, are subject to this program:

- Quad Cities reactor core isolation (RCIC) cooling system

- Quad Cities generator hydrogen seal oil system (HSO)

- High pressure coolant injection system (HPCI)
- Emergency diesel generator and auxiliaries system
- Station blackout diesel and auxiliaries system (SBO)
- Main turbine and auxiliaries system - electro-hydraulic control (EHC) oil subsystem

(2) ***Preventive Actions:*** Monitoring and control of oil impurities and properties mitigates loss of material and cracking in lubricating oil systems.

(3) ***Parameters Monitored/Inspected:*** The program includes specifications for known oil degradation indicators and degradation characteristics, sampling and analysis frequencies, and corrective actions for control of lubricating oil properties. Lubricating oil physical properties are tested to standard ASTM and ISO methods, for the applicable oil type, to provide accurate quantitative numbers with repeatable results. Samples are taken monthly for emergency diesel generators, EHC oil, and HSO; quarterly for HPCI and SBO diesel generators; semi-annually for the RCIC pump, and every 24 months for the RCIC turbine. Surveillance testing and operational surveillances verify proper heat exchanger performance to support associated system operability.

Oil is analyzed for indications of degraded chemical and physical properties depending on oil type and type of service. Analyses include:

- Chemical parameters and viscosity, total acid number, total base number, rotary bomb oxidation test, water demulsability, particle count, fuel and combustion by-products, sediment, water, anti-foaming characteristics, whole particle counting, air release and emission spectrum.

Normal, alert, and fault levels for oil chemical and physical properties, wear metals, contaminants, and additives are established for the specific oil type and application.

(4) ***Detection of Aging Effects:*** Monitoring activities maintain lubricating oil properties within predefined limits to both mitigate and detect the effects of aging. Oil analysis has become an accurate method for identifying specific wear mechanisms, contamination, and oil degradation characteristics within operating machinery. The program includes normal, alert, and fault action levels for oil chemical and physical properties, wear metals, contaminants, and additives, for the specific oil type and application. Increased impurities and degradation of oil properties indicate degradation of materials in lubricating oil systems. Monitoring of the diagnostic parameters indicates degradation due to aging effects prior to loss of intended function.

Samples are taken monthly for emergency diesel generators, EHC oil, and HSO; quarterly for HPCI and SBO diesel generators; semi-annually for the RCIC pump, and every 24 months for the RCIC turbine. Sampling frequency is increased if plant and equipment operating conditions indicate a need to do so.

(5) ***Monitoring and Trending:*** See Items 3 and 4, above for parameters and frequencies. The lubricating oil analysis results are evaluated for acceptability, and are trended and evaluated using computer software and a database.

(6) ***Acceptance Criteria:*** Normal, alert, and fault levels have been established for the various chemical and physical properties, wear metals, additives, and contaminant levels based on information from oil manufacturers, equipment manufacturers, and industry guidelines, for the specific oil type and application. The program maintains contaminant and parameter limits within the application-specific limits. The procedures outline potential actions to be taken at alert and fault levels, and actions can be chosen based on the level of deviation. Aging effects or unacceptable results are evaluated and appropriate corrective actions are taken.

(7) ***Corrective Actions:*** Lubricating oil chemical and physical test results or contaminants outside the allowable limits are returned to the acceptable range within reasonable time periods as identified in industry guidelines. Evaluations are performed for test or 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 conditions adverse to quality are promptly corrected. If the deficiency is found to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

(8) ***Confirmation Process:*** Site quality assurance 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:*** The overall effectiveness of lubricating oil monitoring activities is indicated by the Dresden and Quad Cities operating experience. Lubricating oil sampling and analysis have detected particulate or water contamination (or both) in lubricating oil systems. In some cases these events resulted in systems being declared inoperable until repaired, and until the oil was flushed or replaced. Operating experience has produced procedure and program changes, which have improved the effectiveness of lubricating oil testing and inspection activities.

Conclusion

The lubricating oil preventive, inspection, and testing activities mitigate, detect, monitor, and trend the effects of loss of material and cracking in lubricating oil coolers. The program provides reasonable assurance that intended functions are maintained consistent with the current licensing basis during the period of extended operation.

RAI B.1.23-2.4 Supplemental Information Request

In RAI B.1.23-2, the staff questioned the use of a one-time inspection as the only aging management activity for components exposed to an environment of generator hydrogen seal oil. The staff's concern was that proper maintenance of oil chemistry is critical to preventing any aging effects in this environment. In its response dated October 3, 2003, the applicant restated its position that a one-time inspection is sufficient for components in this environment. However, the staff only considers this acceptable if the oil is maintained at high quality and water free. The applicant needs to provide additional information on the control of the oil quality, and the operating experience, in order to justify the use of a one-time inspection.

Response

The generator hydrogen seal oil system is a subsystem of the main turbine lubricating oil system. The source of oil to the generator hydrogen seal oil system comes from the main turbine lubricating oil system. Maintaining the main turbine lubricating oil to a high quality and water free condition is paramount to the safe and reliable operation of the main turbine and generator. As such, sampling and analysis of the main turbine lubricating oil, including the generator hydrogen seal oil, is included in the Dresden and Quad Cities station lubrication programs. The turbine lubricating oil physical properties are tested to standard ASTM methods, and particulate counts are conducted in accordance with ISO 4406. The main turbine lubricating oil system, including the generator hydrogen seal oil system, is in scope of License Renewal for Quad Cities station only. To credit the analysis of the Quad Cities station generator hydrogen seal oil for License Renewal, the scope of LRA Appendix B, Aging Management Program B.2.5, " Lubricating Oil Monitoring Activities," will be expanded to include the analysis of the generator hydrogen seal oil at Quad Cities station.

LRA Appendix A, Quad Cities Units 1 and 2, Section A.2.5, "Lubricating Oil Monitoring Activities," is revised as follows (Also includes changes from RAI B.1.23-2 and supplemental information request RAI B.1.23-02.3):

> The lubricating oil monitoring activities aging management program manages corrosion, loss of material, and cracking in lubricating oil heat exchangers and other specific components in the scope of license renewal by monitoring physical and chemical properties in lubricating oil. Sampling, testing, and trending verify lubricating oil properties. Oil analysis permits identification of specific wear mechanisms, contamination, and oil degradation within operating machinery.

These activities apply to the emergency diesel generator system, station blackout diesel generator system, HPCI system, electro-hydraulic control system, reactor core isolation cooling system, and generator hydrogen seal oil system. The complete aging management program for the emergency diesel generator oil coolers, station blackout diesel generator oil coolers, and HPCI oil coolers also includes secondary-side (heat sink) chemistry controls, performance monitoring, and inspections. Those portions of the lubricating oil heat exchanger management program are described in:

- Section A.1.14, "Closed-Cycle Cooling Water System," for the diesel generator and station blackout diesel generator oil coolers; and in
- Section A.2.6, "Heat Exchanger Test and Inspection Activities," for the HPCI oil coolers."

LRA Appendix B, Section B.2.5, "Lubricating Oil Monitoring Activities," has been revised to include the changes described above. A copy of the revised Section B.2.5 is included in the response to RAI B.1.23-02.3. Note that while the RCIC pump bearing oil is sampled semi-annually, the RCIC turbine is sampled every 24 months. This is because the RCIC turbine oil system is a closed system, with no provisions made to sample the oil without draining the system, and because of the excellent historical results of turbine oil sample analyses. Every 24 months, the turbine oil is drained and replaced with fresh oil during a preventive maintenance inspection. An oil sample is drawn during the draining process and analyzed.

EPRI TR 1007460, "Terry Turbine Maintenance Guide, RCIC Application," recommends oil analysis be performed after each quarterly run, and every 18-24 months. TR 1007460 is the basis for the RCIC turbine performance centered maintenance template utilized in the EPRI-based Performance Centered Maintenance (PCM) program. The PCM program provides for the extension of intervals of preventive maintenance activities that is warranted by demonstrated good performance. Since there have been no cases on either Quad Cities Unit 1 or Unit 2 where an oil sample analysis results were outside of the normal range, an exception to TR 1007460 for the quarterly oil sample was taken in accordance with the PCM program.

As stated in the response to RAI B.1.23-2, Part (a), a review of the Quad Cities station operating experience for main turbine lubricating oil system with a generator hydrogen seal oil environment did not identify any components whose failure was attributed to age related degradation.

RAI B.1.23-2.5 Supplemental Information Request

In its undated draft supplemental information in response to RAI B.1.23, the applicant developed AMP B.2.8, "Periodic Inspection of Plant Heating System (Quad Cities)," to manage the aging of components exposed to steam/condensate. The AMP states that visual inspections every 5 years (approximately) will be used to detect general, crevice, galvanic, and pitting corrosion. The AMP also states that selected components will be inspected to ensure they are free of cracking, loss of material, and leakage. The staff notes that the steam/condensate environment is the system's internal environment. It is not clear from the AMP description whether there are any inspections of the internals of the system. The applicant needs to clarify how the inspections would detect internal degradation before a loss of intended function (e.g., before through-wall cracks or leakage occur).

Response

Aging Management Program B.2.8 Periodic Inspection of Plant Heating System cannot be used as a stand-alone document. It must be used in conjunction with the Table 3.3-2 (Aging management review results for the auxiliary systems that are not addressed in NUREG-1801) Aging Reference numbers.

As stated in the response to RAI B.1.23 Supplemental Information Request, Aging Management References 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 will be changed to identify the applicable Aging Management Program as "Periodic Inspection of Plant Heating System, (B.2.8)". These aging management references refer to the internal surfaces of the components listed and as stated in the B.2.8 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".

The component's internal surfaces are exposed to the environment of Saturated Steam/Condensate and the internal surfaces will be inspected using a VT-3 visual inspection. This VT-3 visual inspection will look for corrosion, erosion, cracks or other evidence of aging. If any evidence of corrosion, erosion, cracks or other aging degradation is found, corrective action reports will be written. The aging degradation will

be evaluated and assessed to determine if components should be replacement or additional inspections should be performed. The corrective actions program ensures that the conditions adverse to quality are promptly corrected so that intended function of Leakage Boundary (spatial) is maintained.

The Aging Management References for the external surfaces are shown on Table 3.3-2 as component type "Component External Surfaces".