

February 27, 2009

Mr. William H. Spence
Executive Vice President
Chief Operating Officer/Chief Nuclear Officer
PPL Corporation
Two North Ninth Street – GENTW16
Allentown, PA 18101-1179

SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION – NRC LICENSE RENEWAL
INSPECTION REPORT 05000387/2008007 AND 05000388/2008007

Dear Mr. Spence:

On August 29, 2008, the U.S. Nuclear Regulatory Commission (NRC) completed the major onsite portion of the Region I team inspection of your application for license renewal of your Susquehanna Steam Electric Station Units 1 and 2. The enclosed report documents the results of the inspection, which were discussed on January 13, 2009, with you and members of your staff in an exit meeting open for public observation in Berwick, PA.

The purpose of this inspection was to examine, on a sampling basis, the plant activities and documents that support the application for a renewed license of the Susquehanna Steam Electric Station Units 1 and 2. The inspection team reviewed the scoping of non-safety-related systems, structures, and components, as required in 10 CFR 54.4(a)(2). Further, the team determined whether the proposed aging management programs are capable of reasonably managing the effects of aging. These NRC inspection activities constitute one of several inputs into the NRC review process for license renewal applications.

The team concluded that the scoping of non-safety-related systems, structures, and components was implemented as required in 10 CFR 54.4(a)(2). Further, the team concluded that the aging management portion of the license renewal activities was conducted as described in the License Renewal Application. The team concluded that the documentation supporting the application was in an auditable and retrievable form. The team identified a number of areas that resulted in changes to the application or the site program in order to meet Part 54 related standards.

Overall, the inspection results support a conclusion of reasonable assurance that actions have been identified and have been taken or will be taken to manage the effects of aging in the systems, structures, and components identified in your application and that the intended functions of these systems, structures, and components will be maintained in the period of extended operation.

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Sincerely,

/RA/

Richard J. Conte, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 50-387; 50-388
License Nos. NPF-14, NPF-22

Enclosures: Inspection Report 05000387/2008007 and 05000388/2008007
Attachment: Supplemental Information

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REGION I

Docket No: 50-387, 50-388

License No: NPF-14, NPF-22

Report No: 05000387/2008007 and 05000388/2008007

Licensee: PPL Susquehanna, LLC (PPL)

Facility: Susquehanna Steam Electric Station, Units 1 and 2 (Susquehanna)

Location: Berwick, Pennsylvania

Dates: August 11 - 29, 2008
October 15, 2008

Inspectors: G. Meyer, Team Leader, Division of Reactor Safety (DRS)
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Accompanied by: E. Gettys, NRR

Approved By: Richard J. Conte, Chief
Engineering Branch 1
Division of Reactor Safety

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SUMMARY OF FINDINGS

IR 05000387/2008007, 05000388/2008007; 10/01/2008 – 12/31/2008; Susquehanna Steam Electric Station, Units 1 and 2; Scoping of Non-Safety Systems and the Proposed Aging Management Programs for the Susquehanna Application for Renewed License.

This inspection of license renewal activities was performed by six regional office inspectors. The inspection was performed in accordance with NRC Manual Chapter 2516 and NRC Inspection Procedure 71002. This inspection did not identify any findings as defined in NRC Manual Chapter 0612. The inspection team concluded scoping of non-safety related systems, structures, and components was implemented as required in 10 CFR 54.4(a)(2). Further, the team concluded the aging management program portions of the license renewal activities were conducted as described in the License Renewal Application. The team concluded the documentation supporting the application was in an auditable and retrievable form. The team identified a number of areas that resulted in changes to the application.

Overall, the inspection results support a conclusion of reasonable assurance that actions have been identified and have been taken or will be taken to manage the effects of aging in the systems, structures, and components identified in your application and that the intended functions of these systems, structures, and components will be maintained in the period of extended operation.

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Report Details

4. OTHER ACTIVITIES (OA)

4OA2 Other - License Renewal

a. Inspection Scope (IP 71002)

This inspection was performed by NRC regional inspectors to evaluate the thoroughness and accuracy of the scoping of non-safety-related systems, structures, and components, as required in 10 CFR 54.4(a)(2) and to evaluate whether aging management programs will be capable of managing identified aging effects in an appropriate manner.

The inspectors selected a number of systems, components, and structures for review to determine if the methodology applied by PPL appropriately addressed the non-safety systems affecting the safety functions of a system, structure, or component within the scope of license renewal.

The inspectors selected a sample of aging management programs to verify the adequacy of PPL guidance, implementation activities, and documentation. The selected aging management programs were reviewed to determine whether the proposed aging management implementing processes would adequately manage the effects of aging.

The inspectors reviewed supporting documentation and interviewed PPL personnel to confirm the accuracy of the license renewal application conclusions. For a sample of plant systems and structures, the inspectors performed visual examinations of accessible portions of the systems to observe aging effects.

b.1 Scoping of Non-safety-related Systems, Structures, and Components

For scoping, the inspectors reviewed PPL program guidance procedures and summaries of scoping results for Susquehanna to assess the thoroughness and accuracy of the methods used to bring systems, structures, and components within the scope of license renewal into the application, including non-safety-related systems, structures, and components, as required in 10 CFR 54.4 (a)(2). The inspectors determined PPL procedures to be consistent with the NRC accepted guidance in Sections 3, 4, and 5 of Appendix F to Nuclear Energy Institute (NEI) 95-10, Rev. 6, Industry Guideline for Implementing the Requirements of 10 CFR Part 54, (Section 3: non-safety-related systems, structures, and components within scope of the current licensing basis; Section 4: non-safety-related systems, structures, and components directly connected to safety-related systems, structures, and components; and Section 5: non-safety-related systems, structures, and components not directly connected to safety-related systems, structures, and components).

The inspectors reviewed the set of license renewal drawings for Units 1 and 2 submitted with the Susquehanna License Renewal Application (LRA), which had been color-coded to indicate systems and components in scope for license renewal. The inspectors interviewed personnel, reviewed license renewal program documents, and independently inspected numerous areas within Units 1 and 2 to confirm that appropriate

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systems, structures, and components had been included within the license renewal scope; that systems, structures, and components excluded from the license renewal scope had an acceptable basis; and that the boundary for determining license renewal scope within the systems, including seismic supports and anchors, was appropriate.

The in-plant areas reviewed included the following:

- Units 1 & 2 Turbine Buildings
- Units 1 & 2 Reactor Buildings
- ESSW Pumphouse
- Condensate Storage Tanks (CSTs)
- Diesel Generator Rooms
- Unit 1 Service Building
- Unit 2 Dedicated Auxiliary Feedwater Pump Room
- Unit 1 Main Steam Valve Area & Cable Vault
- Service Water Valve Pit

PPL excluded the Turbine Buildings and the contained equipment from license renewal, and the inspectors confirmed the appropriateness of this scoping based on reviews, and in-field inspection and walkdowns. The inspectors noted that subsequent to submittal of the LRA, PPL had identified that safety-related cables for the high pressure coolant injection (HPCI) system within the Unit 1 Turbine Building had not been fully evaluated for the potential effect of non-safety related equipment. The evaluation was subsequently performed under Condition Report (CR) 774401, which concluded that failure of these cables would not prevent the accomplishment of a safety-related function. The inspectors reviewed the evaluation and requested that the LRA be revised to address this evaluation and correct an erroneous statement. PPL subsequently revised the applicable scoping description in Susquehanna LRA Amendment PLA-6428, dated September 30, 2008, to resolve this issue.

For systems, structures, and components selected regarding spatial interaction (failure of non-safety-related components adversely affecting adjacent safety-related components), the inspectors determined that the in-plant configuration had been accurately and acceptably categorized within the as-amended license renewal program documents. The inspectors determined the personnel involved in the process were knowledgeable and appropriately trained.

For systems, structures, and components selected regarding structural interaction (seismic design of safety-related components dependent upon non-safety-related components), the inspectors determined that structural boundaries had been accurately determined and categorized within the license renewal program documents. The inspectors determined that PPL had reviewed applicable isometric drawings to determine the seismic design boundaries and had correctly included the applicable components in the license renewal application, based on the inspectors' independent review of a sample of the isometric drawings and the seismic boundary determinations.

In summary, the inspectors concluded that PPL had implemented an acceptable method of scoping of non-safety-related systems, structures, and components and that this method resulted in accurate scoping determinations.

b.2 New Aging Management Programs

The following aging management programs (AMPs) are new programs that will be implemented at Susquehanna prior to the period of extended operation. Some of the new programs are one-time programs which involve testing of applicable components in the 10 years prior to the period of extended operations to confirm the absence of significant corrosion. If the results confirm this, the program will be completed. Should significant corrosion be found, additional inspections or periodic inspections may be appropriate.

At the time of the inspection, PPL had described the proposed new programs within the application but not completed many of the actions identified in the programs. Therefore, the inspectors were unable to assess the effectiveness of the implementation of these programs.

Also, industry operating experience that formed the bases for these new programs is described in the operating experience element of NUREG-1801, Revision 1, Generic Aging Lessons Learned (GALL Report) program description. The inspectors reviewed site-specific operating experience to determine whether any aging effects for the systems and components within the scope of these programs were outside the bounds of industry operating experience.

Supplemental Piping/Tank Inspection

The Supplemental Piping/Tank Inspection Program is a new, one-time inspection program. During the 10 years prior to the period of extended operation, the program will verify that an aging management program is not needed during the period of extended operation by confirming that aging effects are not occurring or are occurring in a manner that does not affect the safety function of various systems, structures, and components. Non-destructive examinations will be performed by qualified personnel using procedures and processes consistent with the approved plant procedures and appropriate industry standards. Any relevant detected degradation will be compared to established acceptance criteria and evaluated to determine whether a loss of component intended function could result during the period of extended operation.

The inspectors reviewed the program basis document, including proposed scope, parameters to be monitored, method of monitoring, and system drawings. The inspectors also interviewed selected system and component engineers responsible for the associated program elements and components.

The inspectors identified that the emergency diesel generator starting air tanks and the stainless steel fuel oil piping and valve components located in the diesel generator fuel oil storage tank vaults had not been included within the scope of this program. PPL

subsequently revised this program in Susquehanna LRA Amendment Letters PLA-6428 and PLA-6435, dated September 30, 2008, and October 21, 2008, respectively, to resolve this issue.

For the Supplemental Piping/Tank Inspection Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. As amended in program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Buried Piping and Tanks Inspection Program

The Buried Piping and Tanks Inspection Program is a new program, which is credited with managing the effects of external corrosion on the pressure-retaining capability of buried carbon steel, stainless steel, and cast iron piping components and tanks in a soil environment. The aging effects will be managed by preventive measures (i.e., coatings and wrappings) to mitigate corrosion, in accordance with standard industry practice for maintaining external coatings and wrappings (except fire protection piping and stainless steel piping are not wrapped or coated), and by visual inspections during planned excavations. The program specified performing at least one inspection within the 10 year period prior to the period of extended operation, either during an excavation for other purposes (i.e., opportunistic) or during an excavation planned for this inspection. An additional inspection will also be performed during the first 10 years of extended operation. The program will provide inspection and acceptance criteria, and will require evaluation of the inspection results. Inspections will be performed in accordance with approved station procedures.

The inspectors reviewed the program basis document, including proposed scope, parameters to be monitored, method of monitoring, acceptance criteria, and system drawings. The inspectors also interviewed selected system and component engineers responsible for the associated program elements and buried components. The inspectors performed field walkdowns to independently assess the material condition of visible portions of short sections of cast iron fire header piping, which was exposed for unrelated post indicator valve work. The walkdowns also included portions of wrapped pipe in valve vaults and manholes for buried fire pipe and buried emergency service water (ESW) and residual heat removal service water (RHRSW) pipe. Although the piping in the vaults and manholes had not been in direct contact with a soil environment, it nevertheless provided an opportunity to inspect the exposed pipe wrap.

In addition, the inspectors reviewed records and photographs of a section of buried carbon steel pipe, replaced in 2007, to confirm the pipe was properly wrapped and coated. The pipe section had been replaced because of a microbiologically induced corrosion (MIC) leak. The inspectors noted that, at the time, no formal inspection had been performed or documented for either the as-found or as-left condition of the pipe wrap or coating, but engineering personnel involved with the excavation stated the as-left external pipe wrap and coating had been applied in accordance with PPL specifications, and was in satisfactory condition.

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The inspectors identified an inconsistency between the proposed program and the recommendations of GALL Report Section XI.M34, Buried Piping and Tanks Inspections. The inspectors identified that the program needed clarification of opportunistic inspections and sample selection criteria of coated and uncoated piping. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6446, dated November 17, 2008, to resolve this issue.

The team identified deficiencies within the program procedures regarding piping and tank environments and acceptance criteria, which did not need LRA amendments. PPL planned to revise the program accordingly and entered corrective action program items (MRA 1067530 on AR 1062118) to accomplish this.

For the Buried Piping and Tanks Inspection Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. As amended in program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Area-Based NSAS Inspection Program

The Area-Based NSAS (non-safety affects safety) Inspection Program is a new, one-time, plant-specific program which will examine the internal surfaces of carbon steel, cast iron, copper alloy and stainless steel components in raw water environments. Where corrosion resistant materials and/or non-corrosive environments exist, the Area-Based NSAS Inspection Program is intended to verify that an aging management program is not needed during the period of extended operation by confirming that aging effects are not occurring or are occurring in a manner that does not affect the safety function of systems, structures, and components. Non-destructive examinations will be performed by qualified personnel using procedures and processes consistent with the approved plant procedures and appropriate industry standards.

The inspectors reviewed the program description, program implementing procedures, and proposed sampling plan, discussed the planned activities with the responsible staff, and reviewed a sample of corrective action program documents for applicable components, including inspector-initiated searches of the condition report database.

The inspectors noted that in the application PPL specified that copper alloy components would be examined only if ammonia or ammonium compounds were detected. (Corrosion of copper alloys inherently involves ammonia or ammonium compounds.) The inspectors noted that significant corrosion of the copper alloy components could have occurred but not be on-going, such that ammonia or ammonium compounds were not present. PPL stated that the prerequisite for the presence of ammonia or ammonium compounds would be deleted from examination of copper alloy components in the LRA and program documents. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6428, dated September 30, 2008, to resolve this issue.

The inspectors noted that acceptance criteria in program documents specified “no unacceptable loss” and concluded that this represented an unworkable specification, which could necessitate subsequent analysis of each inspection result. PPL stated that program development would determine specific, measurable acceptable criteria for program inspections. PPL entered corrective action program items (MRA 1067458 on AR 1062118) to accomplish this.

For the Area-Based NSAS Inspection Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. As amended in program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Selective Leaching Inspection Program

The Selective Leaching Inspection Program is a new, one-time program, which is credited with managing the aging of components made of cast iron, bronze, brass, and other alloys exposed to raw water, treated water, soil, or other environments that may lead to selective leaching of material constituents. The program will include a one-time visual inspection and hardness measurement test of selected components that may be susceptible to selective leaching to determine whether loss of material due to selective leaching is occurring, and whether the leaching process will affect the ability of the components to perform their intended function during the period of extended operation.

The inspectors reviewed the program description, program implementing procedures, proposed sampling plan, discussed the planned activities with the responsible staff, and reviewed a sample of corrective action program documents for applicable components, including inspector-initiated searches of the condition report data base.

For the Selective Leaching Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. In program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Chemistry Program Effectiveness Inspection Program

The Chemistry Program Effectiveness Inspection Program is a new, one-time program intended to verify the effectiveness of other aging management programs, including the BWR Water Chemistry, Closed Cooling Water Chemistry, and Fuel Oil Chemistry Programs, by reviewing various aging effects for impact. As chemistry programs have been used to create non-corrosive environments, this program is intended to provide confirmation of chemistry program effectiveness and further assurance that the integrity of susceptible components is maintained consistent with the current licensing basis during the period of extended operation. During the 10 years prior to the period of extended operations, these confirmations will be accomplished by non-destructive evaluation performed by qualified personnel.

The inspectors reviewed the program description and program outline document, and discussed the planned activities with the responsible staff.

The program is intended to be consistent with GALL Report Section XI.M32, One-Time Inspection, however, the inspectors noted that the program description did not include a statement that procedures and processes would be consistent with the American Society of Mechanical Engineer's Boiler and Pressure Vessel Code (ASME Code) and 10 CFR 50, Appendix B. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6428, dated September 30, 2008, to resolve this issue.

The program outline document did not address closed cooling water systems, as these programs had been added to this program by amendment to the LRA. PPL stated the program outline documents would be updated to include the pertinent closed cooling water systems information and entered a corrective action program item (MRA 1062393 on AR 1062118) to accomplish this.

For the Chemistry Program Effectiveness Inspection Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. As amended in program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Small Bore Class 1 Piping Inspection Program

The Small Bore Class 1 Piping Inspection Program is a new program structured to confirm the BWR Water Chemistry Program is mitigating the loss of material in small bore piping in the Class 1 system, and to confirm that cracking in small bore piping in the Class 1 system is not a significant aging affect requiring a management program. The program is applicable to ASME Code Class 1 piping and systems less than 4" nominal pipe size (NPS).

The program will manage this aging effect by performing one-time volumetric examinations for selected ASME Code Class 1 small-bore butt welds located in piping, fittings, and branch connections less than 4" NPS. It should be noted that socket welds are excluded from this program. The program will include locations susceptible to cracking and will include measures to verify that unacceptable degradation is not occurring in Class 1 small bore piping. The program will utilize volumetric nondestructive examinations qualified on small bore piping.

PPL originally took credit for vibration failures when establishing the sample selection criteria for one-time volumetric examinations. The rationale was that repair of prior vibration failures would eliminate the primary causes for cracking failure of small bore piping that had failed by exceeding the vibration endurance limit. This rationale however contradicts the position taken by PPL and the Electric Power Research Institute (EPRI), when establishing the basis for a fatigue program that vibration failure is not an aging affect. The industry position is that although vibration is a relatively high frequency subset of the cycles considered for fatigue, a component should have been originally designed so that it will not exceed the vibration endurance limit. Thus failures of

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components by vibration are therefore considered to be failures of design and not a manageable aging affect. In general the NRC agrees with this position.

Because vibration is not an aging affect, it should not be used to eliminate any small bore piping from consideration. PPL subsequently revised this program to exclude vibration failures from consideration in Susquehanna LRA Amendment Letter PLA-6428, dated September 30, 2008, to resolve this issue.

The sample selection will be based on susceptibility, ability to inspect, dose considerations, operating experience, and limiting conditions. The sample selection will use the bounding components most susceptible to cracking as detailed in EPRI Report 1000701; however, PPL had not determined how the guidance developed for a pressurized water reactor will be applied to a boiling water reactor.

The inspectors reviewed the proposed nondestructive testing techniques and sample locations and discussed with the responsible staff how the program will be implemented. The inspectors reviewed current program elements and compared them with the existent guidance.

For the Small Bore Class 1 Piping Inspection Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. As amended in program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Buried Piping Surveillance Program

The Buried Piping Surveillance Program is a new program, which is credited with managing the effects of external corrosion on the pressure-retaining capability of buried carbon steel piping components in a soil environment. The program scope is limited to portions of the residual heat removal service water (RHRSW) / emergency service water (ESW) common return header known to have damaged external coatings. The aging effects will be managed by preventive measures (cathodic protection) to mitigate corrosion in accordance with standard industry practice and by opportunistic visual inspections during planned excavations. The program will provide inspection and acceptance criteria, and will require evaluation of the inspection results. Inspections will be performed in accordance with approved station procedures.

The inspectors reviewed the program basis document, including proposed scope, parameters to be monitored, method of monitoring, and system drawings. The inspectors also interviewed the system and component engineers responsible for the associated program elements and the cathodic protection system.

For the Buried Piping Surveillance Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. In program-level documents PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

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Heat Exchanger Inspection Program

The Heat Exchanger Inspection Program is a new, one-time inspection program. that will be implemented prior to the period of extended operation. During the 10 years prior to the period of extended operation, the program will verify that an aging management program is not needed during the period of extended operation by confirming that aging effects are not occurring or are occurring in a manner that does not affect the safety function of systems, structures, and components. Non-destructive examinations will be performed by qualified personnel using procedures and processes consistent with the approved plant procedures and appropriate industry standards. Any relevant detected degradation will be compared to established acceptance criteria and evaluated to determine whether a loss of component intended function could result during the period of extended operation.

The inspectors reviewed the program basis document, including proposed scope, parameters to be monitored, method of monitoring, and system drawings. The inspectors also interviewed selected system and component engineers responsible for the associated program elements and components.

For the Heat Exchanger Inspection Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. In program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Lubricating Oil Inspection Program

The Lubricating Oil Inspection Program is a new, one-time program intended to verify the effectiveness of the Lubricating Oil Analysis Program by reviewing various aging effects for impact. As corrosion resistant materials and/or noncorrosive environments exist, the Lubricating Oil Inspection Program is intended to verify that an aging management program is not needed during the extended period of operation by confirming that aging effects do not affect the safety functions of systems, structures, and components. Non-destructive evaluation will be performed by qualified personnel using procedures and processes consistent with the ASME Code and 10 CFR 50, Appendix B in the 10 years prior to the period of extended operation.

The inspectors reviewed the program description, implementation plan, and inspection sample basis, and discussed the planned activities with the responsible staff.

For the Lubricating Oil Inspection Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. In program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Non-EQ Inaccessible Medium-Voltage Cables Program

The Non-EQ Inaccessible Medium-Voltage Cables Program is a new program, which will be comparable to that described in GALL Report, Section XI.E3, Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. This program applies to inaccessible (e.g., in conduit or direct-buried) medium-voltage cables that are exposed to significant moisture simultaneously with applied voltage. The program includes a commitment to test these cables at least once every 10 years to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined and implemented prior to the expiration of the current license. The program also includes inspections for water accumulation in manholes at least once every two years.

The inspectors reviewed program documentation, condition reports, aging management review documents, and existing procedures. The inspectors also interviewed the engineer responsible for the program.

On August 13, 2008, the inspectors observed an activity to inspect cable vaults under manholes 8, 19 and 31. The inspectors observed low levels of standing water with some low voltage cables submerged under manhole 8. There were no medium voltage cables submerged, and PPL pumped the water out of the cable vaults. In addition, the inspectors reviewed the results of previous inspections, and noted that water was typically found at depths below 1 foot during a period when monthly inspections were being performed. This level was insufficient to submerge the medium voltage cables and indicated that a suitable inspection frequency could be established.

For the Non-EQ Inaccessible Medium-Voltage Cable Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. In program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program

The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is a new program credited with managing the aging effects in instrument cables exposed to adverse localized environments. The aging effects will be managed by periodic cable testing of insulation resistance.

The inspectors interviewed plant personnel, reviewed completed surveillance test results, and reviewed program documentation to assess the capability of the proposed program to manage aging effects. The inspectors noted that although the program will be implemented later, PPL has been implementing many of the proposed actions and that the reviewed activities appeared to have been effective in identifying cases of reduced insulation resistance.

For the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. In program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Non-EQ Electrical Cable Connections Program

The Non-EQ Electrical Cable Connections Program is a new program credited with managing the aging effects in electrical cable connections. The purpose of the program is to inspect electrical cable connections for loosening of the connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation. The aging effects are managed by periodic inspection of a representative sample of in-scope connections using thermography.

The inspectors reviewed program documents and had discussions with plant personnel to assess the proposed program and its capability to manage aging effects. Although the program will be implemented prior to the period of extended operation, PPL has been performing similar inspections. The inspectors observed thermography inspection of the 2D666 vital uninterruptable power supply (UPS).

The inspectors identified that the Aging Management Review of Electrical Component Commodity Groups had excluded vibration and corrosion as stressors that would result in aging effects that needed to be managed. PPL stated that the program documents would be revised to include vibration and corrosion as stressors to be addressed by the Non-EQ Electrical Cable Connections Program. PPL entered a corrective action program item (MRA1066240 on AR1062118) to accomplish this.

For the Non-EQ Electrical Cable Connections Program, based on a review of site-specific operating experience, the inspectors determined that there were no aging effects at Susquehanna outside the bounds of industry operating experience. In program-level documents, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

b.3 Existing Aging Management Programs

The following aging management programs (AMPs) are existing programs at Susquehanna. These programs have established program and procedures, records of corrective actions, and operating experience for applicable components. Further, some programs have enhancements, i.e., program aspects that will be implemented prior to the period of extended operation.

Structures Monitoring Program

The Structural Monitoring Program (SMP) is an existing program, which is credited with managing the effects of aging for structures and structural components within the scope of license renewal. The program is based on the requirements in 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power

Plants," and the recommendations in NUMARC 93-01, Rev. 2, "Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Regulatory Guide 1.160, Rev. 2, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." Aging effects identified within the scope of the Structures Monitoring Program, such as loss of material, cracking, change in material properties, and loss of form, are to be detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended function. The scope of the existing program at Susquehanna also includes condition monitoring of masonry walls (described separately in the Susquehanna LRA and below).

To assess the effectiveness of the current program, the inspectors reviewed the program description, program basic documents, condition reports and maintenance history, approved station procedures and drawings, results of prior inspections and follow-up of inspections findings, and current inspection schedules. In addition, the inspectors also interviewed cognizant personnel, and performed walkdown visual examinations of the accessible structural items, including reinforced concrete and structural steel members, components, and systems to assess the effectiveness of the current program. The frequency for structural inspections is every 5 years for accessible areas, and every possible opportunity for normally inaccessible areas.

The inspectors performed a general walkthrough inspection of the site, including the Units 1 and 2 Turbine Buildings, Units 1 and 2 Reactor Buildings, Diesel Generator Buildings A - D, control room, Engineered Safeguards Service Water (ESSW) Pumphouse, and other applicable structures, systems, and components related to the SMP. The inspectors held discussions with supervisory and technical personnel to verify that areas where signs of degradation, such as spalling, cracking, leakage through concrete walls, corrosion of steel members, deterioration of structural materials and other aging effects, had been identified and documented. Also, the inspectors verified that PPL maintained appropriate (photographic and/or written) documentation of these inspections to facilitate effective monitoring and trending of structural deficiencies and degradations.

Through the review of documents, walkthrough inspections, and discussions with engineering and plant personnel, the inspector identified that the existing program did not meet the guidance in GALL Report, Section XI.S6, Structures Monitoring Program, in the elements of Monitoring and Trending, Acceptance Criteria, and Detection of Aging Effects, as follows.

- There were no explicitly established acceptance criteria for documenting concrete crack location, width, orientation, and stability (stable or active) of inspected/examined cracks. The inspection of concrete and structural steel was based on a checklist format with only satisfactory/unsatisfactory observation, leaving the acceptability of the observed condition to individual judgment of the inspector/examiner and creating potentially inconsistent observation/judgment by different inspectors/examiners at different times.

- The primary inspection documents (checklist) are not retained as records, but are only used in making and documenting the general assessment of the structure to which the checklist was related, thus eliminating the basis of the documented assessment.
- A technically acceptable trending was not evident in the documentations to establish the status of observed cracks (stable or active) due to the lack of quantitative data from previous inspections/examinations.
- The qualification and certification of inspectors/examiners are not explicitly established and documented to assure assignment of qualified individuals for inspection, the selection is solely left to the supervisor of the group.
- Due to the lack of records of quantitative data related to concrete cracks, site-specific operating experience may not be verifiable and/or reliable for assessing observed deterioration in concrete as the aging effect or an isolated occurrence at a particular place and environment.

PPL stated that the LRA would be amended to enhance the existing program to address the program deficiencies. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6427, dated September 23, 2008, to resolve this issue.

For the Structures Monitoring Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Masonry Wall Program

The Masonry Wall Program is an existing program (within the Structures Monitoring Program) that will be enhanced prior to the period of extended operation. The program is credited with managing the effects of aging of in-scope masonry walls by inspecting for deterioration to assure that the established basis for each wall remains valid during the period of extended operation. The scope of the program includes all masonry walls that are in-scope for 10 CFR 50.65, Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, and perform intended functions in accordance with 10 CFR 54.4. The program is based on the requirements and recommendations in NRC Bulletin 80-11, Masonry Wall Design, Information Notice 87-67, Lessons Learned from Regional Inspections of Licensee Actions in Response to Bulletin 80-11, and 10 CFR 50.65.

The inspectors reviewed the program description, program basis documents, condition reports, approved station procedures, drawings, related references used to manage the aging effects on the masonry walls, and the results of prior inspections. The inspectors interviewed supervisory and technical personnel responsible for this program.

During a walkdown inspection of the ESSW Pumphouse, the inspectors determined that a masonry wall existed with the pumphouse, which had not been addressed within the LRA. (The pumphouse had been modified with the masonry wall to address security considerations.) PPL stated that the LRA would be amended to include the ESSW Pumphouse masonry wall. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6427, dated September 23, 2008, to resolve this issue.

(The program deficiencies discussed above in the Structures Monitoring Program also apply to masonry walls but are being addressed within the Structures Monitoring Program, because masonry walls are administered within the Structures Monitoring Program.)

For the Masonry Wall Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Fuel Oil Chemistry Program

The Fuel Oil Chemistry Program is an existing program, which is credited with managing the affects of aging for loss of material (corrosion) and fouling in fuel oil systems. The aging effects are managed by a combination of periodic chemistry sampling and analysis, and periodic fuel oil tank cleaning and inspection.

The inspectors reviewed the existing fuel oil monitoring program, associated procedures and results for sampling and tank cleaning, and recent fuel oil analysis results to evaluate the effectiveness of the existing program. The inspectors reviewed tank inspection records to verify the results were within the acceptable range. In addition, the inspectors interviewed engineering personnel, and performed field walkdown inspections of the fuel oil systems for A and E emergency diesel generators, and the A diesel fuel oil storage tank to independently assess the material condition of the fuel oil systems and identify inconsistencies between the as-built plant configuration, and the aging management evaluations and programs. The inspectors also reviewed a sample of corrective action program documents related to fuel oil, including a fuel oil testing program self-assessment.

The inspectors identified an inconsistency between the proposed program enhancements and the recommendations of GALL Report, Section XI.M30, Fuel Oil Chemistry. Specifically, the GALL Report recommends ultrasonic thickness measurements of tank bottom surfaces be performed to ensure that significant degradation is not occurring. However, the Susquehanna LRA did not address this aspect. PPL subsequently stated that the LRA would be amended to perform some ultrasonic thickness measurements of tank bottoms and to take an exception regarding the EDG fuel oil storage tank bottoms, given the coatings on these tanks would need to be removed to enable ultrasonic thickness measurements. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6435, dated October 21, 2008, to resolve this issue.

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For the Fuel Oil Chemistry Program, the inspectors concluded PPL had performed adequate evaluations, as well as industry experience and historical reviews, to determine aging effects. As amended, PPL provided adequate guidance to ensure the aging effects will be appropriately identified and addressed.

Piping Corrosion Program

The Piping Corrosion Program is an existing program that will be enhanced prior to the period of extended operation. The program is credited with managing the maintenance of internal protective coatings and piping, as well as the prevention of excessive macro-fouling and bio-fouling, associated with the open cycle emergency service water (ESW) and residual heat removal service water (RHRSW) systems. The aging effects of material loss (corrosion) and fouling are managed by a condition and performance monitoring program (e.g., visual inspections and/or non-destructive examinations), and control techniques (e.g., chemical treatment), as recommended by NRC Generic Letter 89-13. The program includes piping and components in the ESW and RHRSW systems, service water system, emergency diesel generator system, control structure chilled water system, reactor and turbine building closed cooling water systems, fuel pool cooling and cleanup, and reactor building heating, ventilation and air conditioning system.

The inspectors reviewed the existing program, approved plant procedures, trending reports, intake structure inspection records, ESW and RHRSW piping through-wall leakage logs, and river and service water system health reports to evaluate the effectiveness of the existing program. The inspectors interviewed the system engineers and the engineers responsible for the associated program elements, and performed field walkdown inspections to independently assess the material condition of the ESW and RHRSW systems, and to identify inconsistencies between the as-built plant configuration and the aging management evaluations and programs. The inspectors reviewed heat exchanger inspection records, buried piping test records, intake structure and spray pond inspection records, and service water system health reports.

The inspectors identified an inconsistency between the proposed program and the recommendations of the GALL Report, Section XI.M20, Open Cycle Cooling Water. Specifically, the LRA had not addressed internal coatings which the existing program had credited for prevention. In addition, the LRA credited opportunistic visual inspections, but did not specifically require an inspection to be performed, documented, or trended. PPL stated that the Piping Corrosion Program would be revised to address these concerns and the LRA would be amended. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6435, dated October 21, 2008, to resolve these issues.

The inspectors identified a second inconsistency between the proposed program and the recommendations of XI.M20. This inconsistency was not identified as an exception, and no technical basis was provided in the program basis documents. Specifically, XI.M20 recommends periodic flushing of infrequently used lines, but several infrequently used lines were not periodically flushed, such as the backup water supplies to the reactor and turbine building closed cooling water heat exchangers. PPL stated that the program

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would be revised to include periodic flushes of stagnant lines as a preventive measure, as recommended in XI.M20. PPL entered corrective action program items (MRA 1066148 on AR 1062118) to accomplish this.

For the Piping Corrosion Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended, PPL provided adequate guidance to ensure the aging effects are appropriately identified and addressed.

Fire Water System Program

The Fire Water System Program is an existing program that will be enhanced prior to the period of extended operation. The program is credited with managing the effects of aging in water-based fire protection systems. The aging effects of material loss (corrosion) and fouling are managed by periodic testing and inspection of systems and components exposed to water, including sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, and above ground and underground piping and components.

The inspectors reviewed program basis documents and implementing procedures to assess the effectiveness of the existing program. The inspectors reviewed the implementing procedures and results of periodic flow testing. The inspectors also performed interviews and walkdown inspections of portions of the fire water system to evaluate the effectiveness of the existing program. Program enhancements were reviewed for adequacy and completeness.

The inspectors identified that selected pre-action and deluge piping was occasionally wetted but had not been included in the program scope of pipe inspections for infrequently wetted fire water piping. Additionally, the program credited opportunistic inspections but had no requirement to inspect if an opportunity had not occurred. PPL stated that the program would be revised to include inspections of pre-action and deluge piping that was infrequently wetted and perform at least one inspection per year of wet pipe, if no opportunistic inspection occurred, and that the LRA would be amended to address these items. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6435, dated October 21, 2008, to resolve the issues.

For the Fire Water System Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine aging effects. As amended, PPL provided adequate guidance to ensure the aging effects are appropriately identified and addressed.

Instrument Air Monitoring

The inspectors identified an inconsistency between the LRA and the recommendations of the GALL Report, Section XI.M24, Compressed Air Monitoring. Specifically, XI.M24 recommended that system air quality be monitored and maintained in accordance with the recommendations of Generic Letter (GL) 88-14, Instrument Air Supply Problems Affecting Safety-Related Equipment. PPL had determined that the instrument air system

was not in-scope of license renewal, because it was non-safety related and did not provide any motive operating force for any credited in-scope function. As a result, PPL had also not included any air quality monitoring in the LRA.

The inspectors identified that PPL had assumed a dry instrument air environment existed and had used a dry air environment in the aging management review of components within the scope of license renewal that were supplied by the instrument air system. PPL stated that existing air quality monitoring, credited in their response to GL 88-14, would be continued throughout the period of extended operations and the LRA would be amended to include a commitment for this. PPL subsequently issued Susquehanna LRA Amendment Letter PLA-6435, dated October 21, 2008, which addressed this issue as Commitment 58. The inspectors concluded that this resolved the concern on air quality monitoring in the instrument air system.

System Walkdown Program

The System Walkdown Program is an existing program that will be enhanced prior to the period of extended operation. The program is credited with managing the effects of aging on external surfaces of mechanical components. The aging effects of material loss (corrosion) for metal and cracking and/or change in material properties for elastomers are managed by a condition monitoring program by performing periodic visual inspections. The program is also credited with managing loss of material from internal surfaces for situations in which internal and external material and environment combinations are the same, such that external surface condition is representative of internal surface condition.

The inspectors reviewed the program description and program basis documents, including proposed scope enhancements, parameters to be monitored, method of monitoring, system drawings, and condition reports. The inspectors performed walkdown inspections of fire protection piping and valves in two manholes, emergency service water (ESW) and residual heat removal service water (RHRSW) system piping in one of six piping vaults, and numerous below grade through wall pipe penetrations in the reactor and turbine buildings (e.g., underground piping entering the buildings). The inspectors also interviewed selected system and component engineers responsible for the associated program elements and components. The inspectors accompanied a system engineering manager during a walkdown of several systems. In addition, the inspectors reviewed station procedures and condition reports generated as a result of system walkdowns, and performed interviews to assess the effectiveness of system walkdowns.

The inspectors identified that the six piping vaults for the ESW and RHRSW systems had not been included within the scope of the enhanced program nor had the vaults ever been inspected, and the proposed program enhancements were unclear as to the inspection requirements and inspection frequency of other inaccessible areas. PPL made arrangements to open a vault, and on October 15, 2008, PPL personnel and an inspector observed the conditions of the piping and structure. Conditions were acceptable. PPL stated that the System Walkdown Program would be revised to include such inspections as an enhancement and the LRA would be amended. PPL

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subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6435, dated October 21, 2008, to resolve this issue.

In addition, the inspectors identified that some below grade through-wall pipe penetrations had a history of ground water leakage through the penetration, which had resulted in external corrosion on the pipe surfaces. The inspectors reviewed some CRs written to address the leaking building penetrations. The inspectors noted that the program enhancements did not have clear administrative controls or acceptance criteria regarding the management of aging effects associated with corrosion caused by ground water leakage through building pipe penetrations. PPL stated that in addition to the on-going visual inspections, the System Walkdown Program would be revised so that such piping was ultrasonic tested and evaluated, and that the LRA would be amended. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6435, dated October 21, 2008, to resolve this issue.

For the System Walkdown Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. As amended, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Closed Cooling Water Chemistry Program

The Closed Cooling Water Chemistry Control Program is an existing program credited with managing the aging effects of material loss (corrosion) and cracking for piping components and heat exchangers in closed cooling water systems. The aging effects are managed by monitoring and controlling water chemistry to minimize contaminant concentration and mitigate loss of material.

The inspectors reviewed the existing water chemistry program and the associated chemistry procedures, and interviewed water chemistry specialists to evaluate the effectiveness of the existing program. The inspectors reviewed a sample of historical chemistry data and records from check valve inspections in the RBCCW system. In addition, the inspectors performed field walkdown inspections and observed portions of an on-going emergency diesel generator intercooler inspection to independently assess the material condition of selected closed cooling water systems, and identify inconsistencies between the as-built plant configuration and the aging management evaluations and programs.

The inspectors independently reviewed the Susquehanna corrective action database to identify any history of problems with closed cooling water system degradation. None was found beyond that identified by PPL in the LRA.

The inspectors identified an inconsistency between the program and GALL Report, Section XI.M21, Closed Cooling Water System. The LRA has an exception to performance or functional testing for detection of aging effects, and discusses the coverage in the one-time Chemistry Program Effectiveness Inspection and the one-time Heat Exchanger Inspection Programs. The inspectors noted that without periodic visual inspections for detection of aging effects, the proposed program would not meet the

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GALL Report recommendations. PPL stated that the LRA would be amended to clarify this aspect as an exception. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6428, dated September 30, 2008, to resolve this issue. The amended description notes that, depending on the results of the Chemistry Program Effectiveness Inspection, periodic inspection activities may be established.

For the Closed Cooling Water Chemistry Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. As amended, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Preventive Maintenance Activities – RCIC/HPCI Turbine Casings Program

The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings program is an existing plant-specific program. The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings Program manages the affect of general corrosion on the interior surfaces of the reactor core isolation cooling (RCIC) system and high pressure coolant injection (HPCI) system casings and associated piping, including rupture disks and valve bodies, caused by exposure to moist air. (The RCIC and HPCI systems consist of steam driven turbine pumps with the steam supply coming from the main steam line.) The program is comprised of a visual examination performed of the internal surfaces of the turbine casings once every 10 years; the internal conditions of the associated components are to be inferred from this inspection.

The inspectors reviewed the existing preventive maintenance program procedures and prior work-packages for maintenance of the turbines, which did not address many of the elements expected of an aging management program in the GALL Report. Also, the inspector noted the supporting program documents for this program did not contain many aging management program features, including inspection methods, inspector qualifications, inspection reporting and trending, and acceptance criteria. PPL stated that the program would be revised to address these features and the LRA would be amended. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6435, dated October 21, 2008, to resolve this issue.

For the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. As amended, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Leak Chase Channel Monitoring Program

The Leak Chase Channel Monitoring Program is an existing, plant-specific program that monitors leakage from the spent fuel pools and fuel shipping cask storage pool, which thereby monitors the condition of the spent fuel pool liner and shipping cask storage pit liner.

The inspectors reviewed the Aging Management Program (AMP), the program description, engineering documents, corrective action documents, work request documents, implementing procedures, and related references for the program, including prior leakage records. The inspectors held discussions with supervisory and technical personnel to evaluate the effectiveness of this program to manage aging effects and potential degradation of the liner materials.

The inspectors noted that the program description inappropriately referred to the Leak Chase Channel Monitoring Program supplementing the BWR Water Chemistry Program in detecting loss of material. PPL stated that the program description would be revised to delete this statement and the LRA would be amended. PPL subsequently revised this program in Susquehanna LRA Amendment Letter PLA-6427, dated September 23, 2008, to resolve this issue.

For the Leak Chase Channel Monitoring Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. As amended, PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Bolting Integrity Program

The Bolting Integrity Program is an existing program, which implements bolting monitoring guidelines specified by EPRI NP-5067, Good Bolting Practices and maintenance recommendations of EPRI TR-104213, Bolted Joint Maintenance & Application Guide. The Bolting Integrity Program manages loss of preload, cracking, and loss material due to corrosion of bolts within scope of license renewal.

The inspectors reviewed the program description and supportive material. The program is implemented through the System Walkdown Program and In-service Inspection Program for mechanical bolting; and by the In-service Inspection Program - IWF and the Structures Monitoring Program for structural bolting. As such, the inspectors reviewed inspection reports, condition reports, site procedures, drawings, and related references used to manage the aging effects related to bolting within these programs.

For the Bolting Integrity Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

BWR CRD Return Line Nozzle Program

The BWR CRD Return Line Nozzle Program is an existing program credited with managing the aging effect of cracking of the control rod drive return line nozzle, cap, and connecting weld. The control rod drive return lines had been cut and capped prior to starting the plants. Final liquid penetrant examinations and system performance testing were completed in accordance with NUREG-619, BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10 (Technical Report), Revision 1, November 1980. Plant maintenance procedures were

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revised to include flushing the exhaust-water header and cleaning the filters in the insert and exhaust lines. This aging management program takes credit for the ASME Code, Section XI, Subsection IWB, Table 2500-1 examinations to detect the onset of cracking.

The inspectors reviewed the relevant planning documents to assure the inspections will be performed going forward. The inspector reviewed procedures and reports to determine if the examinations were being implemented in accordance with the stipulated requirements.

For the BWR CRD Return Line Nozzle Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Flow-Accelerated Corrosion

The Flow-Accelerated Corrosion Program is an existing program, which is credited with managing the corrosion aging effects in carbon steel components and applies to systems containing high energy fluids carrying two-phase or single-phase fluid. The aging effects are managed by performing non-destructive examinations (e.g. ultrasonic testing) to detect wall thinning and by predicting wear rates to support the proactive replacement of system piping. In addition, the program performs follow-up inspections to confirm predictions and to determine the need for repairs or replacements as necessary.

The inspectors reviewed the piping ultrasonic testing wall thickness inspection results, condition reports related to the program, and the 2007 Flow Accelerated Corrosion Program Focused Self-Assessment Report, and interviewed the program manager. The inspectors noted that piping replacements to address identified flow-accelerated corrosion had involved replacement piping material which was more resistant to corrosion than the original piping material.

For the Flow-Accelerated Corrosion Program, the inspectors concluded PPL had performed adequate evaluations, as well as industry experience and plant historical reviews, to determine the appropriate aging effects. PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Inservice Inspection Program – IWE

The Inservice Inspection (ISI) Program - IWE, is an existing program, which visually examines the accessible surfaces of the steel liner of the reinforced concrete primary containment and its integral attachments. In 10 CFR 50.55a (g)(6)(ii)(B), NRC required that licensees of all operating nuclear power plants implement the inservice examinations specified for the first period of the first inspection interval in Subsection IWE of the 1992 Edition with the 1992 Addenda in conjunction with the modifications specified in § 50.55a (b)(2)(ix) by September 9, 2001, regardless of the Edition of the Code to which they were operating. Subsequent to this accelerated implementation requirement, PPL has met the requirements of the ASME Code, Section XI, Division 1,

1998 Edition with 2000 Addenda. Also, PPL has not identified any inaccessible Class MC or Class CC areas.

The inspectors reviewed the proposed non-destructive testing techniques and sample locations, and discussed how the program was being implemented with the responsible plant personnel. The inspectors reviewed existing program elements and compared these elements with the applicable guidance.

For the Inservice Inspection (ISI) Program – IWE, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Inservice Inspection Program – IWF

The Inservice Inspection (ISI) Program - IWF is an existing program, a part of the ISI program, implemented to manage the aging effects caused by corrosion, deformation, misalignment, improper clearance, improper spring settings, damage to close tolerance machined or sliding surfaces, and missing, detached, or loosened support items. This program is an inspection, evaluate or repair program, and therefore does not contain elements of monitoring and trending.

The inspectors reviewed an extensive number of work orders and Visual Examination of Component Supports and Snubbers (VT-3) reports. The results of the program were well documented, and the examinations appeared to be thorough. The review of corrective actions, taken as a consequence of reported visual indications, including bent spring can support rods and welding arc strikes, were consistent with the specifications and anticipated functions of the supports. Some corrective actions were selected for follow-up in the plant. The inspector verified by observing the hanger, sway bar, or pump support that the reported corrective action or results of the visual examination corresponded with the hanger, sway bar, or support as found in the plant. There were no disparities between the record or the actual item, indicating the program was functioning as claimed.

For the Inservice Inspection (ISI) Program – IWF, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Inservice Inspection Program – IWL

The Inservice Inspection (ISI) Program - IWL is an existing program that manages the aging effects on the concrete portions of containment by visual examination of accessible surface areas of the reinforced primary containment. The program is a requirement of the ASME Code, Section XI, Division 1, 1998 Edition with 2000 Addenda contained in Subsection IWL. Inaccessible areas are considered under this program, in compliance with 10 CFR 50.55a(b)(2)(ix)(E), which stipulates that aging affecting accessible areas should be considered for inaccessible areas. To date the program has

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not reported any accessible area aging that would affect inaccessible areas of the containment.

The inspectors reviewed the proposed non-destructive testing techniques and sample locations, and discussed how the program has been implemented with the responsible plant personnel. The inspectors reviewed existing program elements and compared the elements with the applicable guidance.

For the Inservice Inspection (ISI) Program – IWL, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

Lubricating Oil Analysis

The Lubricating Oil Analysis Program is an existing program, which manages the effects of loss of material due to corrosion in lubricating oil systems. The aging effects are managed by a combination of periodic chemistry sampling and analysis, and periodic replacement of lube oil. The program will be enhanced prior to the period of extended operation to add selected systems not currently in the program but within the scope of license renewal.

The inspector reviewed program basis documents, plant procedures, and recent oil analysis results, and interviewed personnel to determine the effectiveness of the existing program. The inspector also performed walkdowns of various lubricating oil systems.

For the Lubricating Oil Analysis Program, the inspectors concluded PPL had performed adequate evaluations, including reviews of industry experience and plant history, to determine appropriate aging effects. PPL provided adequate guidance to ensure aging effects are appropriately identified and addressed.

b.4 System Review

The Susquehanna license renewal application listed a number of plant systems within the scope of license renewal. From this list, the inspectors selected the high pressure coolant injection system (HPCI) for a focused review to determine whether the aging management programs were adequate to effectively manage aging effects related to this system. The aging effects requiring management for the HPCI system are cracking, fouling, and loss of material due to corrosion. The following existing aging management programs are credited for managing HPCI aging effects: bolting integrity; BWR water chemistry; chemistry program effectiveness inspection; flow-accelerated corrosion; heat exchanger inspection; lubricating oil analysis; lubricating oil inspection; preventive maintenance activities - RCIC/HPCI turbine casings; supplemental piping/tank inspection; and system walkdown.

The inspectors interviewed the HPCI system engineer, performed walkdowns, and reviewed various documents to verify that the existing programs credited with managing the effects of aging in the HPCI system have been effective. Specifically, the inspectors evaluated a sample of the aging management programs by reviewing the applicable system health reports, condition reports, self assessment, and data from completed periodic surveillance tests.

For the HPCI system, the inspectors concluded that the physical condition of the system and the results of tests and inspections of the various existing aging management programs demonstrated that aging effects on the HPCI system have been appropriately identified and addressed. Also, the inspectors concluded that the HPCI system was appropriately addressed within the applicable aging management programs.

c. Overall Conclusions

Overall, the inspection results support a conclusion that the proposed activities will reasonably manage the effects of aging in the systems, structures, and components identified in the application; and that the intended functions of these systems, structures, and components will be maintained in the period of extended operation. The inspection concluded that the documentation supporting the application was in an auditable and retrievable form.

40A6 Meetings, Including Exit Meeting

The inspectors presented the inspection results to Mr. William Spence, Executive Vice President, and members of his staff in an exit meeting that was open for public observation on January 13, 2009, in Berwick, PA. PPL had no objections to the NRC observations and made no presentation. NRC slides from the exit meeting are located in ADAMS within package ML090420392.

No proprietary information is present in this inspection report.

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

PPL Personnel

L. Casella	System engineer
D. Cassel	License renewal team
S. Davis	System engineer
M. Detamore	License renewal team
R. Doebler	Systems engineer
P. Engel	System engineer
J. Fallbright	Systems engineer
D. Flyte	Lead engineer, license renewal team
D. Filchner	Engineer, Nuclear Regulatory Assurance
R. Gardner	License renewal team
J. Glaser	System engineer
F. Gruscavage	System engineer
F. Habib	System engineer
J. Jeanguenat	System engineer
A. Klopp	System engineer
J. Kraiss	Manager, special projects
G. Maertz	System engineer
M. May	License renewal team
E. Miller	Engineer, Nuclear Regulatory Assurance
B. Rhoads	System engineer
D. Ritter	System engineer
R. Sheranko	System engineer
L. Supon	System engineer
W. Texter	License renewal team
T. Walters	System engineer
J. Weik	License renewal team
J. Williams	Unit supervisor, Operations

NRC Personnel

F. Jaxheimer	Senior Resident Inspector, Susquehanna
A. Rosebrook	Acting Resident Inspector, Susquehanna
E. Gettys	License Renewal Project Manager, NRR

LIST OF DOCUMENTS REVIEWED

License Renewal Program Documents

LRPD-04, Operating Experience Review Results, Rev 2
LRPD-05-A3, Evaluation of Civil Structural AMP Attachments, Rev 1

Aging Management Reviews

LRAMR-E01, Electrical Component Commodity Groups, Rev 3
LRARM-M07, Service Water Systems, Rev 2
LRARM-M08, Fire Protection Systems, Rev 2
LRARM-M11, Compressed Air and Gas Systems, Rev 1
LRAMR-M20, High Pressure Coolant Injection (HPCI) System, Rev 1
LRAMR-M25, Non-safety Systems Affecting Safety Systems – Spatial Interaction, Rev. 4
LRAMR-S01, ESSW Pump house and Spray Pond, Rev 1
LRAMR-S02, Reactor Building, Rev 2
LRAMR-S03, Primary Containment, Rev 2
LRAMR-S04, Other Structures, Rev 1
LRAMR-S05, Yard Structures, Rev 1

Aging Management Program Outlines

Area-Based NSAS Inspection, 12/12/07
Buried Pipe & Tanks Inspection Program, 12/19/007
Buried Piping Surveillance Program, 01/11/2008
Chemistry Program Effectiveness Inspection, 12/12/07
Condensate & Refueling Water Tanks Inspection, 01/11/2008
Heat Exchanger Inspection, 12/12/2007
Non-EQ Cables and Connections Used in Low-Current Instrument Circuits Program, 1/23/08
Non-EQ Inaccessible Medium-Voltage Cables Program, 2/7/08
Non-EQ Electrical Cable Connections Program, 1/23/08
Selective Leaching Inspection, 12/12/07
Supplemental Piping/Tank Inspection, 12/12/2007

LRPD-05, Aging Management Program Evaluation Results, Rev 3

Attachment 1.2, BWR CRD Return Line Nozzle Results, Rev 2
Attachment 2, Non-Class 1 Mechanical, Rev 3
Attachment 2.1, Area-Based NSAS Inspection, Rev 1
Attachment 2.3b, Closed Cooling Water Chemistry Program, Rev 2
Attachment 2.3c, Fuel Oil Chemistry Program, Rev 2
Attachment 2.3d, Chemistry Program Effectiveness Inspection, Rev 2
Attachment 2.8, Flow-Accelerated Corrosion, Rev 1
Attachment 2.13, Selective Leaching Inspection, Rev 0
Attachment 2.15, System Walkdown Program, Rev 2
Attachment 2.16, Bolting Integrity Program, Rev 2
Attachment 2.17, Lubricating Oil Analysis Program, Rev 2

Attachment 2.17a, Lubricating Oil Inspection, Rev 2
Attachment 3.3, Inservice Inspection (ISI) Program – IWE, Rev 0
Attachment 3.5, Inservice Inspection (ISI) Program – IWL, Rev 0
Attachment 4.2, Non-EQ Cables & Connections in Low-Current Instrument Circuits, Rev 1
Attachment 4.3, Non-EQ Inaccessible Medium-Voltage Cables Program, Rev 1
Attachment 4.5, Non-EQ Electrical Cable Connections Program, Rev 1

License Renewal Application Drawings

Complete set of License Renewal Application Scoping and Boundary Drawings

Other Drawings

C-59, Sheet 1, Underground Yard Piping, Rev 24
C-805 Sh. 1, Typical Concrete Masonry Wall Details, Rev 16
C-805 Sh. 2, Typical Concrete Masonry Wall Details, Rev 17
C-805 Sh. 3, Typical Concrete Masonry Wall Details, Rev 8
C-807, Attachments to Concrete Masonry Walls, Rev 3
C-1032, Sheet 2, Instrument and Valve Vault Details, Rev 5
E107150, U1 & U2 Single Line Diagram Station, Rev 33
FCI-P49-1032, Reactor Bldg – CCW to Recirculation Pump Motor Supply Line: HBD-129, Rev 7
HBD-129-3, Isometric – Reactor Bldg CCW, Unit 1, Rev 2/F7
HBD-129-H24, Pipe Support – Inside Containment CCW, Unit 1, Rev 5/F2
HBD-129-H25, Pipe Support – Inside Containment CCW, Unit 1, Rev 2/F1
JRD-141-1, Isometric - Turbine Bldg – Emergency Service Water – Unit 1, Rev 5
JRD-141-1, Turbine Bldg – Emergency Service Water – Unit 1, Rev 5
JRD-141-H7, Pipe Support - Reactor Bldg – Emergency Service Water – Unit 1, Rev 5/F1
M-122, Sheet 2, Fire Protection Turbine Bldg., Control Structure, and Rad Waste Bldg., Rev 51
M-120, Sheet 1, Diesel Fuel Oil Storage and Transfer, Rev 32
SE-016-310, Sheet 1, ISI Pressure Test Diagram, Functional Test ESW/RHRSW Loop-A, Rev 2
SE-016-310, Sheet 2, ISI Pressure Test Diagram, Functional Test ESW/RHRSW Loop-A, Rev 1
SE-016-311, Sheet 1, ISI Pressure Test Diagram, Functional Test ESW/RHRSW Loop-B, Rev 2
SE-016-311, Sheet 2, ISI Pressure Test Diagram, Functional Test ESW/RHRSW Loop-B, Rev 1
SPHBD-3306-H1, Pipe Support D/G Building B, Rev 0
SPHBD-3306-4, Lube Oil Piping Yard, Rev 0
SPHBD-3307-4, Jacket Water Piping Yard, Rev 0

Plant Procedures

C-1109, Containment Suppression Chamber Inspections, Rev 5
CH-099-011, Chemistry Control Matrix, Closed Cooling Water and Chilled Waters, Rev 7
CH-AD-001, Chemistry Sampling Analysis and Work Schedule, Rev 4
CH-CC-075, Microbiological Sampling and Determination, Rev 6
CH-CC-046, Water and Sediment in [Fuel] Oil, Rev 9
CH-CC-062, Determination of Microorganisms in [Fuel] Oil, Rev 4
CH-SY-018, Corrosion Monitoring, Rev 2
EG916, Perform System, Program and Component Monitoring, Rev 1
IC-078-001, Nuclear Instrumentation Cable and Detector Tests, Rev 11

IC-278-008, LPRM Detector and Signal Cable Tests-Post Undervessel Maintenance, Rev 3
MI-PD-003, Lube Oil Analysis Program, Rev 3
MI-PD-012, Lube Oil Screening and Analysis – Oil-view, Rev 0
MT-AD-522, Repair, Alteration and Replacement of ASME Code Components, Rev 8
MT-GM-015, Torquing Guidelines, Rev 19
MT-GM-025, Heat Exchanger Cleaning and Inspection, Rev 15
MT-050-003, RCIC Pump Turbine Disassembly and Reassembly, Rev 7
MT-052-002, Unit 1 and Unit 2 HPCI Turbine Maintenance, Rev 5
NDAP-QA-0449, Fire Protection Program, Rev 4
NDAP-QA-0504, Heat Exchanger Program, Rev 4
NDAP-QA-0630, Conduct of Chemistry, Rev 6
NDAP-QA-0633, Diesel Fuel Oil Testing Program, Rev 0
NDAP-QA-1106, Flow Accelerated Corrosion Program, Rev 1
NDAP-QA-1163, Structural Monitoring Program, Rev 2
NDAP-QA-1195, Chemistry Program, Rev 4
NDAP-QA-1608, Inservice Inspection, Rev 10
NDAP-QA-1610, Reactor Coolant System Material Degradation Management Program, Rev 2
NDE-UT-014, Ultrasonic Thickness Examination, Rev 4
NDE-VT-002, Visual Examination VT-2 (Leakage), Rev 4
NDE-VT-003, Visual Inspection VT-3, Rev 6
NEIM-00-1162, ISI Data Review and Approval, Rev 0
NEIM-00-1180, ISI BWRVIP Inspection Implementation, Rev 1
NEIM-00-1181, ISI Risk Informed Inspection Program, Rev 1
NEIM-QA-1182, Guidelines for Flow Accelerated Corrosion Program Activities, Rev 0
NEPM-QA-1172, Guidelines for Flow Accelerated Corrosion Program Activities, Rev 1
NEPM-QA-11165, Reactor Pressure Vessel Internals ISI Examinations, Rev 3
NSEI-AD-407, Reactor Building Structural Monitoring, Rev 1
NSEI-AD-408, Turbine Building Structural Monitoring, Rev 1
NSEI-AD-409, Diesel Generator Building (A-D) Structural Monitoring, Rev 1
NSEI-AD-410, Control Structure Structural Monitoring, Rev 1
NSEI-AD-418, Miscellaneous Buildings Structural Monitoring, Rev 1
NSEI-AD-420, Predictive Maintenance (PdM) Process, Rev 0
NSEP-AD-0002, Station Health Reporting Process, Rev 2
ON-104-001, Loss of All Offsite Power, Rev 16
ON-111-001, Loss of Service Water, Rev 14
OPS 15, Inservice Inspection and Testing, Rev 15
REWL S0477, Perform Stroke Fuel Pool Liner Drain Valves, Unit 1
REWL S5477, Perform Stroke Fuel Pool Liner Drain Valves, Unit 2
REWL S5478, Perform Stroke Shipping Cask Storage Pit Liner Drain Valves, Common
SE-016-310, ESW & RHRSW Loop A Flow Path Test, Rev 3
SE-016-311, ESW & RHRSW Loop B Flow Path Test, Rev 3
SE-023-A01, Diesel Generator A Fuel Oil System ASME Pressure Test, Rev 5
SE-159-130, Primary Containment Visual Inspection, Rev 2
SE-259-130, Primary Containment Visual Inspection, Rev 1
TP-054-099, Directing ESW Flow through CCW Heat Exchangers, Rev 3
WA P61570, Disassembly of Unit 1 Turbine

System Health ReportsUnit 1&2 ESW System Health Reports, 1st Quarter 2006 to 1st Quarter 2008Unit 1&2 RHRSW System Health Reports, 2nd Quarter 2006 to 1st Quarter 2008Unit 1&2 HPCI System Health Reports, 2nd Quarter 2007 to 1st Quarter 2008Condition Reports (CRs)

* = CRs written as a result of the NRC inspection

94-0251	555543	688458	874988
97-0671	556520	690859	936723
97-1150	559696	693091	953758
288747	562880	695755	954842
291237	573736	710805	970713
308919	575205	714224	971098
320881	582588	718328	971111
324428	592895	742342	1023316
460111	592958	745741	1052514
462472	596983	750221	1061550*
462525	603048	752296	1061562*
471218	632935	755777	1061672*
475719	644313	758177	1061674*
492649	645015	758841	1062083*
506542	647078	774401	1062118*
509881	649369	800571	1066139*
514776	649556	806327	1067530*
531884	649571	814906	
534931	661892	830720	
555375	678228	849783	

Maintenance Requests & Work Orders

108018	805962
616645	811746
616728	833852
616900	876507
616929	889294
617488	917447
617667	961627
617974	1030693
701105	1031119
711324	5643910
739674	5643926
748441	5970986
780804	

Completed Surveillance Tests

ERPM 440727, LPRM Detector and Cable Testing, 5/17/04
ERPM 793868, Disassemble RBCCW Check Valve 213066, 10/20/06
ERPM 339253, Disassemble RBCCW Check Valve 113060, 10/30/01
SC-023-006, 31 Day Particulate & Water Check, D FO Storage, 7/15/08, 8/13/08
SO-152-005, 24 Month HPCI Flow Verification, Unit 1, 4/16/2008
SO-252-005, 24 Month HPCI Flow Verification, Unit 2, 4/12/2007
SE-152-002, 2 Year Functional Test for HPCI, Unit 1, 10/22/2007
SE-252-002, 2 Year Functional Test for HPCI, Unit 2, 10/13/2006
SM-023-001, 10 Yr. Diesel Fuel Oil Storage Tank Cleaning Surveillance, 8/21/07 (A), 7/3/08 (D)

Structural Monitoring Condition Survey Results - 2003

System 12 B - Turbine Building Units 1 and 2
System 12 D - Circulating Water Pumphouse and Water Treatment Building
System 12 F - Reactor Buildings
System 12 G - Diesel Generator Buildings A-D
System 12 K - Control Structure
System 12 Y - Diesel Generator Building E

Calculations, Specifications, and Design Documents

Chemistry Manual, Chapter 5, Emergency Water Supplies, Rev 3
Chemistry Manual, Chapter 7, Closed Cooling Systems, Rev 3
C-1007, Maintenance Painting of Buildings and Equipment, Rev 6
EC-PIPE-0839, ECOR Determination of Minimum Wall Thickness Requirements
EC-054-1021, NDE Methods for Buried Piping Systems, Rev 0
EC-078-1008, LPRM Acceptability Criteria for Insulation Resistance, Rev 0
GDS-011, Life Assessment of Structures, Rev 1
GDS-012, Condition Surveys of Structures, Rev 1
H-1004, Heat Exchanger & Condenser Inspection and Condition Assessment, Rev 6
H-1019, Piping Corrosion and Degradation Inspection Program, Rev 2
M-1414, Inspection - ASME Class 1, 2, 3 & B31.1 Piping for Moisture Erosion/Corrosion, Rev 10
M-1548, Heat Exchanger Performance Monitoring Program, Rev 0
NEIM-00-1185, Pipe Corrosion Program Implementation, Rev 0
SUS04.G01, ISI Program Plan Third Ten Year Inspection Interval, Rev 2

Miscellaneous Documents

Engineering Work Request (EWR) 871061, Reactor Bldg. Pipe Penetrations
Chemistry manual Change Notice 5-3-2, Emergency Water Supplies, 01-05-2006
Spray Pond Sediment Survey, 08-06-2008
Spray Pond Sediment Survey, 10-23-2006
Spray Pond Sediment Survey, 08-30-2004

Closed Cooling Water Chemistry Control Program Self Assessment, November 2005
FAC Program Self Assessment, 2007
HPCI Self Assessment, 2005
EDG Fuel Oil Testing Program Focused Self Assessment, December 2005

Unit 2 12th RIO FAC Program Outage Summary
FAC System Susceptibility Evaluation (SSE)
Unit 2 FAC Inspection and Replacement Plan for the 14th Operating Cycle and RIO
HPCI System Walkdown Plan
Service Water System Walkdown Plan
Aging Management Program Outline for Lubricating Oil Inspection 2007
Cooper-Bessemer EDG Lube Oil, Jacket Water, Fuel Oil and Governor Oil Analyses Guidelines
Certificate of Analysis for lubricating oil samples from EDG crankcase reservoir
eSOMS Narrative Logs (OPS)

C Diesel Generator Chemistry Parameters, 8/10/05 – 8/13/08
U1 Reactor Closed Cooling Water Chemistry Parameters, 8/10/05 – 8/13/08
Sampling Plan for Selective Leaching

PPL Letters/Correspondence

Response to NRC IE Information Notice 87-67 on Concrete Block Walls
PLA-523, NRC Information Request: Category I Masonry Walls, September 8, 1980
PLA-3153, Response to GL 88-14, Sept. 24, 1989
PLA-3385, Supplemental Response to GL 88-14, Nov. 30, 1990
PLA-5503, SSES Unit 1 Twelfth Refueling Outage ISI Summary Report, July 19, 2002
PLA-5649, SSES Unit 2 Eleventh Refueling Outage ISI Summary Report, July 18, 2003
PLA-5775, SSES Unit 1 Thirteenth Refueling Outage ISI Summary Report, July 16, 2004
PLA-5917, SSES Unit 2 Twelfth Refueling Outage Owner's Activity Report, June 15, 2005
PLA-6078, SSES Unit 1 Fourteenth Refueling Outage Owner's Activity Report, June 21, 2008
PLA-6228, SSES Unit 2 Thirteenth Refueling Outage Owner's Activity Report, June 29, 2007
PLA-6388, SSES Unit 1 Fifteenth Refueling Outage Owner's Activity Report, July 07, 2008
PLA-6177, Response to Scoping and Screening RAIs, April 17, 2007
PLA-6391, Response to Selective Leaching RAIs,
PLA-6427, LRA Amendment in Response to Regional Inspection, Sept. 23, 2008
PLA-6428, LRA Amendment in Response to Regional Inspection, Sept. 30, 2008
PLA-6435, LRA Amendment in Response to Regional Inspection, Oct. 21, 2008
PLA-6446, LRA Amendment in Response to Regional Inspection, Nov. 23, 2008

NRC Documents

GL 88-14, Instrument Air Supply System Problems Affecting Safety-Related Equipment
GL 91-17, GSI 29: Bolting Degradation or Failure in Nuclear Power Plants
IN 2006-17, Recent Operating Experience of Service Water Systems due to External Conditions
IN 2007-06, Potential Common Cause Vulnerabilities in Essential Service Water Systems
NUREG-0619, BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking
NUREG-1801, Generic Aging Lessons Learned (GALL) Report, Rev 1
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

Industry Documents

ASME IWA-5244-1980, Buried Components
 EPRI NP-5067, Good Bolting Practices, 1987
 EPRI NP-5769, Degradation and failure of Bolting in Nuclear Power Plants, 1998
 EPRI TR-103834-P1-2, Effects of Moisture on the Life of Power Plant Cables, Aug 1994
 EPRI TR-107396, Closed Cooling Water Chemistry Guideline, Oct 1997
 NEI 95-10, Guidelines for Implementing the Requirements of 10 CFR Part 54, Rev 6
 NFPA 25-2008, Inspection, Testing, and Maintenance of Water Based Fire Protection Systems

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
AMP	Aging Management Program
AMR	Aging Management Review
ASME	American Society of Mechanical Engineers
CASS	Cast Austenitic Stainless Steel
CR	Condition report
DRS	Division of Reactor Safety
EPRI	Electric Power Research Institute
EQ	Environmental Qualification (i.e., 10 CFR 50.49)
ESW	Emergency Service Water
FAC	Flow-Accelerated Corrosion
GALL	Generic Aging Lessons Learned [Report] (NUREG-1081)
GL	[NRC] Generic Letter
IP	[NRC] Inspection Procedure
ISG	Interim Staff Guidance
ISI	Inservice Inspection
kV	Kilovolts
LER	[NRC] Licensee Event Report
LRA	License Renewal Application
MIC	Microbiologically induced corrosion
MRP	[EPRI] Materials Reliability Project
NEI	Nuclear Energy Institute
NPS	Normal pipe size
NRC	US Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation, NRC
OA	Other activity
PARS	[NRC] Publicly Available Records
PM	Preventive maintenance
RHRSW	Residual heat removal service water
RVLIS	Reactor vessel level indicating system
SSES	Susquehanna Steam Electric Station
TAA	Time-limited Aging Analysis