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SUSQUEHANNA STEAM ELECTRIC STATION
REQUEST FOR ADDITIONAL INFORMATION FOR THE
REVIEW OF THE SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 AND 2, LICENSE RENEWAL APPLICATION (LRA)
SECTIONS B.2.2, B.2.20, AND B.2.22 **Docket Nos. 50-387**
PLA-6390 **and 50-388**

References: 1) *PLA-6110, Mr. B. T. McKinney (PPL) to Document Control Desk (USNRC), "Application for Renewed Operating License Numbers NPF-14 and NPF-22," dated September 13, 2006.*

2) *Letter from Ms. E. H. Gettys (USNRC) to Mr. B. T. McKinney (PPL), "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2 License Renewal Application," dated June 23, 2008.*

In accordance with the requirements of 10 CFR 50, 51, and 54, PPL requested the renewal of the operating licenses for the Susquehanna Steam Electric Station (SSES) Units 1 and 2 in Reference 1.

Reference 2 is a request for additional information (RAI) related to License Renewal Application (LRA) Sections B.2.2, B.2.20, and B.2.22. The enclosure to this letter provides the additional requested information.

There are no new regulatory commitments contained herein as a result of the attached RAI responses.

If you have any questions, please contact Mr. Duane L. Filchner at (610) 774-7819.

A120
NRR

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

Executed on: 7/7/08

B. T. McKinney

Enclosure: PPL Responses to NRC's Request for Additional Information (RAI)

Copy: NRC Region I
Ms. E. H. Gettys, NRC Project Manager, License Renewal, Safety
Mr. R. Janati, DEP/BRP
Mr. F. W. Jaxheimer, NRC Sr. Resident Inspector
Mr. A. L. Stuyvenberg, NRC Project Manager, License Renewal, Environmental

Enclosure to PLA-6390
PPL Responses to NRC's
Request for Additional Information (RAI)

RAI B.2.2-1:

The LRA states that AMP B.2.2, BWR Water Chemistry, is an existing program that is consistent with the GALL Report. However, on-site documentation identifies the following differences from recommendations in (Electric Power Research Institute) EPRI TR-103515, BWR Water Chemistry Guidelines, which is a basis for the GALL Report AMP XI.M2, Water Chemistry:

1) EPRI TR-103515 recommends continuous monitoring of local electrochemical corrosion potential (ECP) during reactor power operation (>10% rated power). However, in lieu of monitoring for ECP, SSES currently relies on monitoring of dissolved oxygen for indication of relevant conditions for corrosion.

2) EPRI TR-103515 recommends weekly monitoring of conductivity, chlorides, and sulfate in the Condensate Storage Tank (CST). However, SSES currently measures conductivity, chlorides and sulfate in the CST on a monthly basis.

Please provide a technical justification as to why these deviations from recommendations in EPRI TR-103515 are acceptable. Also, please provide an explanation of why these deviations are not considered to be exceptions to the recommendations in the GALL Report.

PPL Response:

1) EPRI TR-103515 recommends continuous monitoring of local electrochemical corrosion potential (ECP) during reactor power operation (>10% rated power) as a method to demonstrate the effectiveness of hydrogen water chemistry (HWC). EPRI TR-103515 also describes alternative techniques using predictive models to verify the effectiveness of HWC. In such instances, TR-103515 recommends models be benchmarked against ECP measurements in radiolytically identical and operationally similar applications and a correlation be developed between protective chemistry conditions, e.g., ECP, and other plant (secondary) parameters that respond to hydrogen injection and are normally continuously monitored. As described in TR-103515, secondary plant parameters such as feedwater hydrogen flow rate or concentration, normalized main steam line radiation or main steam line oxygen concentration, and reactor coolant oxygen or hydrogen concentration can be directly related to primary parameters such as ECP. The correlation between ECP and secondary parameters, such as dissolved oxygen, is essential since the useful life for the ECP probes can be less than a fuel cycle.

   The BWR Water Chemistry Program for SSES continuously monitors reactor water for dissolved oxygen concentration and uses hydrogen injection to reduce dissolved oxygen to protective levels (equivalent to ECP of less than -230 mV SHE). ECP measurements were taken during initial implementation of HWC and correlated with secondary parameters, including dissolved oxygen. When dissolved oxygen is not available, other secondary parameter correlations may be used to determine that

protection is being achieved. Therefore, since the use of dissolved oxygen in lieu of continuous monitoring of ECP is consistent with the EPRI TR-103515 guidelines, no exception to GALL is required.

2) EPRI TR-103515 recommends weekly monitoring of conductivity, chlorides, and sulfate in the condensate storage tank but allows for reduced monitoring if the sources of water are monitored. During normal power operation, all source water to the condensate storage tanks is routinely monitored for conductivity, chlorides, and sulfate. Therefore, the BWR Water Chemistry Program is consistent with the EPRI guidance and the monitoring frequency is not considered to be an exception to GALL.

RAI B.2.2-2:

In review of on-site documentation related to water chemistry operating experience, the staff noted that SSES has a history of corrective action reports and actions related to high sulfate levels in reactor water following refueling outages. Please provide a discussion of SSES's activities related to understanding and mitigating this chemistry program issue and include the cause of the problem, corrective actions taken and comparison of SSES performance with other BWRs having similar condensate demineralizers. Please include how long the high sulfate levels were in effect before the level was reduced to acceptable concentrations.

PPL Response:

The elevated sulfate levels following refueling outages were determined to be the result of operational actions, such as removing a condensate pump from service, that disturbed or upset the condensate demineralizer resin bed and allowed the cation resin, which releases sulfate and organic sulfonates, to migrate to near the outlet (bottom) of the resin bed. When the condensate demineralizers were restarted after an outage, the sulfates and sulfonates that had concentrated in the bed during the outage washed out of the cation resin at the bottom of the demineralizer bed and caused the elevated sulfate levels. The elevated sulfate levels continued for a week or two, until the excess was rinsed off the beds or new anion resin heels were added to the vessels

PPL undertook two corrective actions to mitigate the elevated sulfate level issue. One included a change in operation of the condensate demineralizers and/or condensate pumps as they are taken out of service. The procedures were changed to bypass the condensate demineralizer so as to not upset the beds during initial startup or final shutdown of the condensate pumps. Another corrective action rinses the resin bed with demineralized water before starting the condensate demineralizer. The out of service condensate demineralizer resin bed is covered with demineralized water which is flushed to radwaste, taking any excess sulfates with it, thus mitigating the elevated sulfate level. The condensate demineralizer is placed in service after the rinse is completed.

In addition, PPL installed a condensate filtration system in the late 1990s. Since then, PPL has experienced a continually improving trend in sulfate levels, including the elevated sulfate levels following each outage. PPL maintains sulfate data as a monthly average, as reported to INPO. The data shows that monthly average sulfate levels following outages have not exceeded 5 ppb since completion of the Unit 2 outage in 2003.

These actions have resulted in monthly average sulfate levels that are typically below 2 ppb and often below 1 ppb. Comparison of SSES with other BWRs having similar filters and condensate demineralizers, based on October 2007 data, places both SSES units above the median value, but below the EPRI recommended goal of 2 ppb.

RAI B.2.20-1:

The LRA takes an exception to recommendations in the GALL Report for AMP XI.M30, Fuel Oil Chemistry program element, "monitoring and trending," which recommends that water and biological activity or particulate contamination concentrations be monitored and trended in accordance with the plant's technical specifications or at least quarterly. The exception is that SSES uses an annual frequency to sample fuel oil for biological activity. SSES technical specifications for the Diesel Fuel Oil Testing Program state that "the program shall include sampling and testing requirements and acceptance criteria, following the guidelines of the applicable American Society for Testing and Materials (ASTM) Standards."

a) What ASTM standard is used by SSES to establish the frequency for monitoring fuel oil for biological activity?

b) If there is no applicable ASTM standard or the applicable standard is not being used, then please provide the basis for the current sampling frequency and provide a technical justification that the current sampling schedule for biological activity in the fuel oil, which is less frequent than recommended in the GALL Report, provides adequate aging management during the period of extended operation.

PPL Response:

The schedule for sampling the emergency diesel generator fuel oil in the fuel oil storage tanks for biological activity was changed from annually to quarterly in 2007. No ASTM standard was identified since the sampling frequency now matches the frequency recommended by GALL. The exception to monitoring and trending is no longer needed and is deleted.

The following changes are made to the LRA to delete the Monitoring and Trending exception from the Fuel Oil Chemistry Program.

B.2.20 Fuel Oil Chemistry Program

➢ The third bullet under the Exceptions to NUREG-1801, in Section B.2.20 (LRA Page B-65) is revised by deletion (~~strikethrough~~) as follows:

- ~~**Monitoring and Trending -**~~
  ~~An annual frequency for sampling of fuel oil for biological activity is used for SSES, along with monthly or quarterly sampling for other contaminants.~~

RAI B.2.22-1:

In the LRA's description of the "monitoring and trending" program element for the AMP B.2.22 Chemistry Program Effectiveness Inspection, reference is made to future engineering evaluations to determine sample size and components to be examined by this one-time inspection program.

a) Please describe the methodology that will be used to select sample sizes and sample locations for various components included in the Chemistry Program Effectiveness Inspection.

b) Please explain what methodology or basis will be used to determine the sample size if unanticipated aging effects are found.

PPL Response:

a) The stated purpose of the Chemistry Program Effectiveness Inspection is to detect and characterize the condition of materials in representative low flow and stagnant areas of the systems within the scope of the activity. A representative sample of components in low flow and stagnant areas will be examined for evidence of loss of material. The sample will also include stainless steel components exposed to temperatures above the threshold for susceptibility to stress corrosion cracking.

   The sample population will be selected such that it is representative of each material and environment combination within the scope of the inspection. Consideration will be given in the sample selection to the variations among the treated water environments that could affect the potential for aging effects to occur. Each material type exposed to fuel oil will also be included in the sample population. The sample selection will focus on those locations determined to be subject to low flow or stagnant conditions, as these locations are expected to be the most likely to first experience the effects of degradation should it be evidenced. Identification of the inspection locations will be based on engineering knowledge of the system(s), supported by walkdowns of the systems as necessary, including the time in service

and severity of operating conditions. The inspection will focus on those systems, or portions of systems, most subject to stagnant or low flow conditions.

b) The results from the inspection of the sample population will be reviewed for any evidence of degradation. If degradation is detected the results will be entered into the SSES corrective action program. The corrective action program requires evaluation of the extent of the degradation, the effect on the component intended function, and the necessary corrective actions. The need to perform inspections of a larger portion of the total population of components within the scope of the activity will also be considered.

The license renewal application is amended as follows to clarify the potential for an increased sample size based on the results of the initial inspections and to correct the reference back to the Detection of Aging Effects program element:.

B.2.22 Chemistry Program Effectiveness Inspection

- The second paragraph in the Monitoring and Trending discussion in Section B.2.22 (LRA page B-70) is revised by addition (***bold italics)*** and deletion (~~strikethrough~~).

Sample size will be determined by engineering evaluation, as described for the ~~Parameters Monitored or Inspected~~ ***Detection of Aging Effects*** element above. ~~Results of the inspection activities that require further evaluation/resolution (e.g., if degradation is detected), if any,~~ ***Unacceptable inspection findings*** will be evaluated using the SSES corrective action process. ***The evaluation done under the SSES Corrective Action Program will identify appropriate corrective actions including the need to perform additional inspections.***

RAI B.2.22-2:

In the acceptance criteria of the GALL Report, AMP XI.M32 states that any indication or relevant conditions of degradation detected are evaluated. LRA Selection B.2.22 states that the acceptance criterion of the Chemistry Program Effectiveness Inspection will be no unacceptable loss of material or cracking of stainless steel exposed to temperatures above 140°F, that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation. Please explain why the acceptance criteria for B.2.22 differ from the recommendations of the GALL Report and clarify what "no unacceptable loss of material or cracking" means.

PPL Response:

Any indications or relevant conditions of degradation detected during the inspections will be evaluated. Similar to the example provided in the GALL text, the inspection

observations will be compared to predetermined acceptance criteria. Inspection results that do not meet the acceptance criteria will be entered into the corrective action program for evaluation.

The license renewal application is amended as follows to provide consistency with the GALL Acceptance Criteria

B.2.22 Chemistry Program Effectiveness Inspection

- The following text under Acceptance Criteria in Section B.2.22 (on LRA page B-70) is revised by addition (***bold italics***) and deletion (~~strikethrough~~) as follows:

Any indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined ~~The~~ acceptance criteria. ~~for the Chemistry Effectiveness Inspection will be: No unacceptable loss of material, or cracking of stainless steel exposed to temperatures above 140°F, that~~ ***If the acceptance criteria are not met, then the indications/conditions will be evaluated under the SSES Corrective Action Program to determine whether they*** could result in a loss of component intended function during the period of extended operation~~, as determined by engineering evaluation~~.