Robert J. Franssen
Plant Manager

Susquehanna Nuclear, LLC
769 Salem Boulevard
Berwick, PA 18603
Tel. 570.542.3170 Fax 570.542.1504
robert.franssen@talenenergy.com

TALEN ENERGY

OCT 3 1 2016

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

10 CFR 50.54(f)

SUSQUEHANNA STEAM ELECTRIC STATION
RESPONSE TO GENERIC LETTER 2016-01,
"MONITORING OF NEUTRON-ABSORBING MATERIALS IN SPENT FUEL POOLS,"
PLA-7518

Docket Nos. 50-387 and 50-388

References:

1. *NRC Generic Letter 2016-01, "Monitoring of Neutron-Absorbing Materials in Spent Fuel Pools," April 7, 2016.*
2. *NUREG-1931, "Safety Evaluation Report Related to the License Renewal of Susquehanna Steam Electric Station, Units 1 and 2, Docket Nos. 50.387 and 50.388," November 2009 (ADAMs Accession No. ML093170780).*

On April 7, 2016, the NRC issued Reference 1 to all power reactor licensees except those that have permanently ceased operation with all power reactor fuel removed from on-site spent fuel pool storage.

The purpose of this letter is to provide a response for Susquehanna Steam Electric Station (SSES) Unit 1 and Unit 2. Based upon review of Generic Letter 2016-01, SSES has determined that both Unit 1 and Unit 2 fall under Category 4 in accordance with Reference 1. As a Category 4 licensee, information on the neutron absorber material, criticality analysis of record, and neutron absorber monitoring program is requested depending on the type of neutron absorber material present and credited in the spent fuel pool. The SSES Unit 1 and 2 spent fuel pools credit Boral and therefore are required to provide information in the following areas: 1, 2, and 4. Enclosure 1 contains responses to the requested information.

This letter contains no new regulatory commitments.

Should you have any questions regarding this submittal, please contact Mr. Jason Jennings, Manager – Nuclear Regulatory Affairs at (570) 542-3155.

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

Executed on: 10/31/2016

R. J. Franssen

Enclosure: SSES Unit 1 and Unit 2 Response to Areas of Requested Information in Appendix A of Generic Letter 2016-01, "Monitoring of Neutron-Absorbing Materials in Spent Fuel Pools"

cc: Director, Office of Nuclear Reactor Regulation
NRC Region I
Mr. J. E. Greives, NRC Sr. Resident Inspector
Ms. T. E. Hood, NRC Project Manager
Mr. M. Shields, PA DEP/BRP

Enclosure 1 to PLA-7518

SSES Unit 1 and Unit 2 Response to Areas of Requested Information in Appendix A of Generic Letter 2016-01, "Monitoring of Neutron-Absorbing Materials in Spent Fuel Pools"

Introduction

On April 7, 2016, the Nuclear Regulatory Commission (NRC) issued Generic Letter 2016-01 (GL 2016-01), Monitoring of Neutron-Absorbing Materials in Spent Fuel Pools (Reference 7). The purpose of GL 2016-01 is to address degradation of neutron-absorbing materials in wet storage systems for reactor fuel at power and non-power reactors. The primary focus of the GL is neutron–absorbing material credited for limiting the maximum effective multiplication factor (keff) to less than that assumed in the licensing and design basis.

Specifically, the NRC has two purposes for issuing the GL:

1) To request submittal of information, or provide reference to previously docketed information, which demonstrates that credited neutron-absorbing materials in Spent Fuel Pools (SFP) are in compliance with the licensing, design basis and applicable regulatory requirements; and that there are measures in place to maintain this compliance.

2) To collect requested information and determine if additional regulatory action is required.

Susquehanna Steam Electric Station (SSES) Unit 1 and Unit 2 each have a Spent Fuel Pool with a common refuel floor. Each Spent Fuel Pool contains high density Boral racks containing neutron-absorbing material (B4C) in an aluminum matrix. The Spent Fuel Pools have the capability to be cross-connected for optimization of Spent Fuel Pool cooling and cleanup. The condition and capability of the Boral racks have been monitored by the station as part of the in-service inspection program established prior to startup. The in-service inspection program utilizes Boral test coupons which are located within the Spent Fuel Pool simulating the condition of the Spent Fuel racks over time (Reference 6).

In September 2006, Susquehanna Steam Electric Station (SSES) submitted a License Renewal Application (LRA) to the NRC for SSES Units 1 and 2 (Reference 1). Within the LRA, and corresponding Request for Additional Information (RAI) responses, SSES presented the NRC with the existing Spent Fuel Pool rack monitoring program. In response to NRC request, SSES included a License Renewal Commitment to continue to complete Boral coupon testing within the period of extended operation. This was reviewed and approved by the NRC under the License Renewal Safety Evaluation Report, NUREG-1931 (Reference 5).

Based upon review of GL 2016-01, Susquehanna Steam Electric Station (SSES) has determined that both Unit 1 and Unit 2 fall under Category 4. SSES has an approved Spent Fuel Pool neutron-absorbing material monitoring program, as documented in Reference 5, but this program is not incorporated into the licensing basis.

As such, the SSES response to GL 2016-01 found in this enclosure consists of references to previously docketed information submitted under the SSES License Renewal Application (LRA). Additionally, SSES has reviewed the GL 2016-01 Appendix A, Guidance for Category 4 Responders to Generic Letter 2016-01, and provided responses to the requested information. Any updates and missing information from that previously docketed has been provided within this response.

Appendix A Request	Reference	SSES Response
1. Provide a description of the neutron-absorbing material credited in the Spent Fuel Pool (SFP) Nuclear Criticality Safety (NCS) Analysis of Record (AOR) and its configuration in the SFP:		
a) manufacturers, dates of manufacture, and dates of material installation in the SFP;	**Reference 16** **Reference 28**	Rack Manufacturer: The SSES High Density Spent Fuel Storage Racks (HDSFR) were purchased from PaR. The Boral was supplied to PaR by Brooks & Perkins. Manufacture Date: After a reasonable search of plant records, including docketed information, SSES determined that the requested information was not part of the original licensing basis or previously requested by the NRC as part of the licensing action that approved the neutron absorber monitoring program. Installation Date: The SSES High Density Spent Fuel Storage Racks (HDSFR) are the original racks installed during plant construction. It is estimated that the racks were installed at Unit 1 in 1982 and at Unit 2 in 1983. The Spent Fuel Racks were delivered to site during the 8/31/79 to 1/31/80 timeframe.
b) neutron-absorbing material specifications, such as: i. materials of construction, including the certified content of the neutron-absorbing component expressed as weight percent;	**Reference 16**	The Spent Fuel Storage Rack Material Specifications include the following: - The clad material is ASTM B209 Alloy 1100 - The aluminum core binder material meets the following chemical limits which exceed the requirements for 1100 alloy aluminum: Fe 0.25% max Si 0.15% max Ti 0.20% max Other elements 0.03% max each Other elements 0.15% max total

		Remainder 99.25% min aluminum (0.20% may be in the form of Aluminum Oxide) - The boron carbide ASTM C750-74 Type 2 except that: 1) Total boron and carbon content allowed is 95% by weight min. 2) Total boron shall be 70.0 to 78.3 percent 3) B-10 isotopic content in boron shall be 19.75 +/- 1.0% by weight
ii. minimum certified, minimum as-built, maximum as-built, and nominal as-built areal density of the neutron-absorbing component; and	**Reference 16** **Reference 22**	The areal density of the Boral in the SSES Spent Fuel Storage Racks is equal to or greater than 0.0233 gm/cm^2 B-10 loading with 60 mesh size boron carbide. Minimum B4C Content 0.192 (grams/ cm^2) Minimum Attenuation Factor A @ .06 electron-volts 0.9630 (this equates to 0.0233 g/cm^2 areal density). Minimum as-built and Maximum as-built Areal Density: After a reasonable search of plant records, including docketed information, SSES determined that the requested information was not part of the original licensing basis or previously requested by the NRC as part of the licensing action that approved the neutron absorber monitoring program.
iii. material characteristics, including porosity, density, and dimensions;	**Reference 16, 22**	The following describes the material characteristics of the Boral Panels within the Spent Fuel Storage Racks at SSES: Size

		1) Width 5 ¼" + 1/16" - 1/32" 2) Length 152" +/- 5/32" Thickness 0.077" (Min) to 0.100"(Max) Squareness 5/16 inch total Lateral Bow – 3/16 inch max from 152 inch side edge Flatness General waviness of sheets shall not exceed 1/2 inch total Deviations shall not exceed 0.05 inch per linear inch. Boral panel porosity is not available.
c) qualification testing approach for compatibility with the SFP environment and results from the testing	**Reference 21**	The qualification testing approach and results for Boral can be found in AAR Manufacturing Report 624.
d) configuration in the SFP, such as: i. method of integrating neutron-absorbing material into racks (e.g., inserts, welded in place, spot welded in place, rodlets); and	**Reference 15, 16, 6, 1**	The neutron absorber material (Boral) is sealed within two concentric square aluminum tubes referred to as poison cans. This information was previously provided under Reference 1.
ii. sheathing and degree of physical exposure of neutron-absorbing materials to the SFP environment;	**Reference 15, 16, 6, 1**	The neutron absorber material (Boral) is sealed within two concentric square aluminum tubes, as stated above. The neutron absorbing material is not exposed to the Spent Fuel Pool environment.
e) current condition of the credited neutron-absorbing material in the SFP, such as: i. estimated current minimum areal density;	**Reference 17, 3**	SSES completed the latest Spent Fuel Pool coupon analysis in September 2015 from the Unit 1 Spent Fuel Pool. The results of this analysis showed the lowest B-10 areal density was 0.0257 gm/cm^2. The average areal density was 0.0267 gm/cm^2 for all the coupons tested. Results of coupon testing of the neutron absorber have provided no indication of loss of neutron absorbing material. Therefore, the estimated current minimum areal density is the

		same as when the material was fabricated and installed in the SFP.
ii. current credited areal density of the neutron-absorbing material in the NCS AOR; and	**Reference 10** **Reference 19** **Reference 11** **Reference 13** **Reference 14** **Reference 12**	Criticality analyses have been performed for each fuel design utilized at SSES to demonstrate that storage of fuel assemblies of each design in the spent fuel pool high density racks results in Keff <0.95. Based on review of the referenced calculations, the following areal density is assumed: GE-8x8 Fuel – 0.0232gm/cm^2 B10 AREVA (EXXON)-8x8 Fuel – bounded by GE-8x8 Fuel AREVA (EXXON)-9x9 Fuel – 0.0232gm/cm^2 B10 Lead Use Assemblies (LUA)-GE12 – 4-bundles (U2C8-10/1995) bounded by AREVA (EXXON)-9x9 Fuel LUA-ABB/Westinghouse SVEA96 – 4-bundles (U1C10-10/1996) bounded by AREVA (EXXON)-9x9 Fuel AREVA-ATRIUM10 – 0.0233gm/cm^2 B10
iii. recorded degradation and deformations of the neutron-absorbing material in the SFP (e.g., blisters, swelling, gaps, cracks, loss of material, loss of neutron-attenuation capability).	**Reference 2, 3, 17, 23**	Coupon Test results: Reference 2 provides the SSES response to the LRA NRC RAI 3.3-1 requested under reference 8. Within this response, SSES discusses the observed conditions of the vented samples. Some blistering has been observed near the edges of the plate, but neutron attenuation testing has shown the Boral retained its design properties. No issues have been identified with the non-vented coupons. This

		information has not changed based on recent coupon testing performed in 2015. Reference 3 provides the SSES response to LRA NRC RAI 3.3.2.2.6-5 and 3.3.2.2.6-6 requested under Reference 9. Within this response SSES provides evaluation against the 2003 Seabrook Boral Test Coupon Operating Experience as well as SSES internal Operating Experience with respect to identified poison can bulging in Unit 1 Spent Fuel Storage Pool cell PP-2 and C-13. The EPRI Handbook of Neutron Absorbing Materials for Spent Nuclear Fuel Transportation and Storage Applications 2009 Edition discusses blistering experienced in Boral panels. According to EPRI, no loss of material or impact on areal density has been experienced in observed cases. The issue is cosmetic in nature. SSES stated in reference 3 that the bulging experienced in cell PP-2 and C-13 were isolated incidents and not indicative of a fuel storage rack problem. There have been no changes observed in the conditions discussed in 2009 in response to the RAI in reference 3.
2. Provide a description of the surveillance or monitoring program used to confirm that the credited neutron-absorbing material is performing its safety function, including the frequency, limitations and accuracy of the methodologies used:		
a) Provide the technical basis for the surveillance or monitoring method, including a description of how the method can detect degradation mechanisms that affect the material's ability to perform its safety function. Also, include a description and technical basis for the technique(s) and method(s) used in the surveillance or monitoring program, including: i. approach used to determine frequency, calculations, and sample size;	**Reference 2, 3, 4, 5, 6, 23, 24, 25**	SSES Boral sample coupons are a shortened production- type can similar to the spent fuel rack. Half of the Boral coupon inventory are non-vented in order to simulated expected conditions where spent fuel pool is not in contact with the Boral. The other half are vented to simulate conditions where Boral would be in contact with the water. Reference 2 provides the SSES response to LRA NRC RAI 3.3-1 requested under Reference 8. Reference 3 provides the SSES response to LRA RAI 3.3.2.2.6-3 requested under Reference 9.

		Within these responses the SSES Spent Fuel Pool Boral Coupon test frequency is discussed for both the original operating license and the extended operating license. As discussed, the in-service inspection program was established based on original manufacturer recommendations. Two Boral coupon capsules, one vented to the pool water and one sealed, are shipped from the SSES Spent Fuel Pool to Northeast Technology Corp's (NETCO) laboratory for analysis. Dates and results of previous coupon testing can be found under reference 2. In addition to the original in-service inspection program established, SSES has committed to continuing the coupon testing program in the tenth or eleventh year of extended operation (reference 4 and 5). SSES Unit 1 and Unit 2 are operated with the spent fuel pools cross-tied. As such, testing a single set of coupons provides representative results for both pools (reference 3).
ii. parameters to be inspected and data collected;	**Reference 2, 17, 20, 25**	Reference 2 provides the SSES response to LRA NRC RAI 3.3-1 requested under Reference 8. Within this response SSES provides discussion on the Boral Coupon Test program and provides the details on each parameter measured when a coupon is removed. The following examinations and tests are performed: - Visual examination and high resolution photography - Inspection of each coupon for anomalies (films, pitting, blisters, discoloration) - Dry coupon weight-weigh coupon and record dry weight - Drying and subsequent weighing- dry coupon until no further weight loss is observed

		- Thickness measurement at 5 locations on each coupon - Neutron attenuation testing for B-10 areal density at 5 locations
iii. acceptance criteria of the program and how they ensure that the material's structure and safety function are maintained within the assumptions of the NCS AOR;	**Reference 2, 6**	Reference 2 provides the SSES response to LRA NRC RAI 3.3-1 requested under Reference 8. Within this response SSES states: "The acceptance criteria of Boral neutron attenuation from the FSAR is K_{eff} of <0.95 which corresponds to a B-10 areal density of 0.0233 g/cm^2." Any other anomalies observed will be documented and entered into the corrective action program for evaluation by the engineer and industry experts (as needed).
iv. monitoring and trending of the surveillance or monitoring program data; and	**Reference 2, 17**	Reference 2 provides the SSES response to LRA NRC RAI 3.3-1 requested under Reference 8. Within this response SSES provides Areal Density Results for each coupon tested from 1985 until 2005. Since providing this information in support of the LRA, SSES has completed 1 additional coupons test. As discussed above, SSES completed the latest Spent Fuel Pool coupon analysis in September 2015 from the Unit 1 Spent Fuel Pool. The results of this analysis showed the lowest B-10 areal density was 0.0257 gm/cm^2. The average areal density was 0.0267 gm/cm^2 for all the coupons tested. Results of coupon testing of the neutron absorber have provided no indication of loss of neutron absorbing material. Therefore, the estimated current minimum areal density is the same as when the material was fabricated and installed in the SFP.
v. industry standards used.	**Reference 3, 18**	The following Standards are used by NETCO in performing Boral coupon analysis:

		ASTM C992, "Specification for Boron-Based Neutron Absorbing Materials Systems for Use in Nuclear Spent Fuel Storage Racks" ASTM C1187-15, "Standard Guide for Establishing Surveillance Test Program for Boron-Based Neutron Absorbing Materials Systems for Use in Nuclear Fuel Storage Racks in a Pool Environment."
b) For the following monitoring methods, include these additional discussion items. i. If there is visual inspection of inservice material: (1) describe the visual inspection performed on each sample; and (2) describe the scope of the inspection (i.e., number of panels or inspection points per inspection period).	**Reference 15**	Due to the design of the Boral poison cans, a visual inspection of the in-service material is not possible. The neutron absorbing material is enclosed within the panel. Reference the response to 2.a.ii above for details on the visual inspection during the coupon evaluation.
ii. If there is a coupon-monitoring program: (1) provide a description and technical basis for how the coupons are representative of the material in the racks. Include in the discussion the material radiation exposure levels, SFP environment conditions, exposure to the SFP water, location of the coupons, configuration of the coupons (e.g., jacketing or sheathing, venting bolted on, glued on, or free in the jacket, water flow past the material, bends, shapes, galvanic considerations, and stress-relaxation considerations), and dimensions of the coupons; (2) provide the dates of coupon installation for each set of coupons; (3) if the coupons are returned to the SFP for further evaluation, provide the technical justification for why the reinserted coupons would remain representative of the materials in the rack; and (4) provide the number of coupons remaining to be	**Reference 2, 15, 23, 24, 27** **Reference**	(1) As discussed in reference 2, SSES Boral sample coupons are a shortened production-type can similar to the spent fuel rack. The coupons meet the same specifications as installed in the racks. There are 4 hanger brackets and there were 8 coupon assemblies per Spent Fuel Pool. They are hung on the side of Spent Fuel Pool adjacent to storage locations with no poison cans (but not at corners of racks). The coupons are positioned 8 to 10 feet below top of rack when installed on brackets. Half of the Boral coupon inventory are non-vented in order to simulated expected conditions where spent fuel pool is not in contact with the Boral. The other half are vented to simulate conditions where Boral would be in contact with the water. (2) All coupon assemblies were installed same

tested and whether there are enough coupons for testing for the life of the SFP. Also provide the schedule for coupon removal and testing.	**15** **Reference 18** **Reference 3, 6, 17**	time as racks. (3) The SSES Boral Coupon Testing program requires a destructive examination of the test coupon. As such, the coupons are not returned to the SFP after examination. (4) There are 2 coupons left at Unit 1 and 3 coupons left at Unit 2. Based on original license commitments, a coupon test is next scheduled for 2023 and will be taken from the Unit 2 Spent Fuel Pool. This will result in 2 sets of coupons remaining at each unit for the period of extended operation. SSES has committed to performing coupon testing on one set of coupons during the tenth or eleventh year after Unit 1 enters the period of extended operation. Upon completion of this test, 3 coupons will remain in the SSES Spent Fuel Pools at the end of the operating license.
iii. If RACKLIFE is used:	**Reference 7**	RACKLIFE is only applicable to the Boraflex neutron absorber material. As discussed above, SSES has only Spent Fuel racks containing Boral. As such, per Table 1 of Generic Letter 2016-01, item 2(b)(iii) of the requested information does not apply.
iv. If in-situ testing with a neutron source and detector is used (e.g., BADGER testing, blackness testing): (1) describe the method and criteria for choosing panels to be tested and include whether the most susceptible panels are chosen to be tested. Provide the statistical sampling plan that accounts for both sampling and measurement error and consideration of potential correlation in sample results. State whether it is statistically significant enough that the result can be extrapolated to the state of the entire pool; (2) state if the results of the in-situ testing are		SSES does not perform in-situ testing of the Boral Racks. As such, Reference 7 Appendix A Section 2.b.iv does not apply.

trended and whether there is repeat panel testing from campaign to campaign; (3) describe the sources of uncertainties when using the in-situ testing device and how they are incorporated in the testing results. Include the uncertainties outlined in the technical letter report titled "Initial Assessment of Uncertainties Associated with BADGER Methodology," September 30, 2012 (Agencywide Document Access and Management System Accession No. ML12254A064). Discuss the effect of rack cell deformation and detector or head misalignment, such as tilt, twist, offset, or other misalignments of the heads and how they are managed and accounted for in the analysis; and (4) describe the calibration of the in-situ testing device, including the following: a. describe how the materials used in the calibration standard compare to the SFP rack materials and how any differences are accounted for in the calibration and results; b. describe how potential material changes in the SFP rack materials caused by degradation or aging are accounted for in the calibration and results; and c. if the calibration includes the in-situ measurement of an SFP rack "reference panel," explain the following: i. the methodology for selecting the reference panel(s) and how the reference panels are verified to meet the requirements; ii. whether all surveillance campaigns use the same reference panel(s); and iii. if the same reference panels are not		

used for each measurement surveillance, describe how the use of different reference panels affects the ability to make comparisons from one campaign to the next.		
3. Provide a description of the technical basis for determining the interval of surveillance or monitoring for the credited neutron-absorbing material:	**Reference 7**	As discussed above, SSES has only Spent Fuel racks containing Boral. As such, per Table 1 of Generic Letter 2016-01, item 3 of the requested information does not apply.
4. Provide a description of how the credited neutron-absorbing material is modeled in the SFP NCS AOR and how the monitoring or surveillance program ensures that the actual condition of the neutron-absorbing material is bounded by the NCS AOR:		
a) Describe the technical basis for the method of modeling the neutron-absorbing material in the NCS AOR. Discuss whether the modeling addresses degraded neutron-absorbing material, including loss of material, deformation of material (such as blisters, gaps, cracks, and shrinkage), and localized effects, such as non-uniform degradation.	**Reference 6, 10, 11, 12** **Reference 6, 12**	The technical basis behind General Electric's (GE) and AREVA's method of modeling the neutron-absorbing material is the SSES FSAR (reference 6). The following reflects the FSAR discussion: "…a uniform minimum B10 areal density of 0.0233 gm/cm^2 ….Benchmark measurements in (Susquehanna) Boral slabs yield a neutron attenuation factor of 0.963 minimum." A B10 loading of 0.0233 gm/cm^2, producing an attenuation factor of 0.963, yielded a Boral core thickness of 0.055 ± 0.003 inches. This is less than the Boral nominal thickness of 0.080 inches. Degraded neutron-material is not addressed within any SSES Criticality Safety Analysis. Per the SSES FSAR (9.1.2.3.1 Criticality Control), the spent fuel storage pool has also been analyzed under abnormal and accident conditions. These conditions included a fuel bundle placed vertically along the edge of the spent fuel pool, a fuel bundle laid horizontally on the top of the spent fuel pool racks, and a single missing Boral panel from the storage array. For all normal, abnormal, and accident conditions, the spent fuel pool rack keff remained less than 0.95.

b) Describe how the results of the monitoring or surveillance program are used to ensure that the actual condition of the neutron-absorbing material is bounded by the SFP NCS AOR. If a coupon monitoring program is used, provide a description and technical basis for the coupon tests and acceptance criteria used to ensure the material properties of the neutron-absorbing material are maintained within the assumptions of the NCS AOR. Include a discussion on the measured dimensional changes, visual inspection, observed surface corrosion, observed degradation or deformation of the material (e.g., blistering, bulging, pitting, or warping), and neutron-attenuation measurements of the coupons.	**Reference 20**	Per the SSES SFP Surveillance Coupon Analysis procedure, the average B10 areal densities, from all coupon surveillances, are plotted versus the sample date. A linear regression is then performed to determine if the trended B10 areal density will reach its minimum allowed value during the time interval to the next scheduled testing. The coupon analysis determines the effect a high radiation field (e.g., neutron and gamma) has on BORAL™ and confirms the assumptions made in the FSAR (Reference 6). The acceptance criteria compares the FSAR 0.0233 gm/cm^2 B10 areal density to that from the coupon analyzed by the vendor. This data is then plotted to determine if the B10 areal density will reach its minimum allowed value during the time interval to the next scheduled testing. The SSES Criticality Safety Analysis does not evaluate any measured dimensional changes, visual inspections, surface conditions and other general degradations of the neutron-absorbing material. The only verification is comparing the FSAR minimum 0.0233 gm/cm^2 B10 areal density to that from the coupon analyzed by the vendor.
c) Describe how the bias and uncertainty of the monitoring or surveillance program are used in the SFP NCS AOR.		Bias and uncertainty of the monitoring or surveillance program (the SFP Surveillance Coupon Analysis procedure) are not addressed within any SSES Criticality Safety Analysis.
d) Describe how the degradation in adjacent panels is correlated and accounted for in the NCS AOR.	**Reference 6, 10, 11, 12**	The SSES Criticality Safety Analysis DOES evaluate a single missing Boral panel from the storage array, but it does NOT address degradation in adjacent panels.

5. Provide a description of the technical basis for concluding that the safety function for the credited neutron-absorbing material in the SFP will be maintained during design-basis events.	**Reference 7**	As discussed above, SSES has only Spent Fuel racks containing Boral. As such, per Table 1 of Generic Letter 2016-01, item 5 of the requested information does not apply.

References

The following references support the SSES responses provided for the requested information in Generic Letter 2016-01.

1. PLA-6110, "Susquehanna Steam Electric Station Application for Renewed Operating Licenses Numbers NPF-14 and NPF-22," September 13, 2006 (ADAMS Accession No. ML062630225).
2. PLA-6401, "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) Section 3.1, 3.2, 3.3, and 3.4," August 15, 2008 (ADAMS Accession No. ML082400534).
3. PLA-6504, "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) Section 3.3.2.2.6," May 13, 2009 (ADAMS Accession No. ML091520031).
4. PLA-6518, "Susquehanna Steam Electric Station Units 1 and 2, License Renewal Application (LRA) Amendment to LRA Commitment #61," May 28, 2009 (ADAMS Accession No. ML091590040).
5. NUREG-1931, "Safety Evaluation Report Related to the License Renewal of Susquehanna Steam Electric Station, Units 1 and 2, Docket Nos. 50.387 and 50.388," November 2009 (ADAMs Accession No. ML093170780).
6. Susquehanna Steam Electric Station Final Safety Analysis Report (FSAR), Section 9.1.2, Spent Fuel Storage.
7. NRC Generic Letter 2016-01, "Monitoring of Neutron-Absorbing Materials in Spent Fuel Pools," April 7, 2016.
8. 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 July 15, 2008 (ADAMs Accession No. ML081780698).
9. Letter from Ms. E. H. Gettys (USNRC) to Mr. W. H. Spence (PPL), "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2 License Renewal Application," dated April 13, 2009 (ADAMs Accession No. ML091030296).
10. M. L Kennedy and C. Ho, "Nuclear Criticality Analysis for the Spent Fuel Racks of the Susquehanna Power Plant," NAI 78-75 Revision 3, Nuclear Associated International, March 31, 1981.
11. "Criticality Safety Analysis Susquehanna Spent Fuel Storage Pool with Exxon Nuclear Company, Inc. 9x9 Reload Fuel (March 1986)," XN-NF-86-45, Revision 1, Exxon Nuclear Company, Inc., May 1986.

12. "Susquehanna Spent Fuel Storage Vault Criticality Safety Analysis for ATRIUM-10 Fuel," EMF-96-136(P), Revision 0, Siemens Power Corporation, Nuclear Division, October 1996.

13. "Susquehanna Steam Electric Station, Unit 2 Cycle 8 Reload Summary Report," PL-NF-95-007, Revision 2, PP&L, August 1996.

14. "Susquehanna Steam Electric Station, Unit 1 Cycle 10 Reload Summary Report," PL-NF-96-005, Rev 2, PP&L, July 1997.

15. Specification, 8856-M-192, "Technical Specification for High Density Spent Fuel Storage Racks for the Susquehanna Steam Electric Station Units 1 and 2 of the PP&L Company," Revision 4, May 12, 1980.

16. PaR QCP-82-4, "Specification for Neutron Absorber Plates for SSES Units 1 and 2," FF107400 Sheet 0901.

17. SE-036-001, "Spent Fuel Pool Surveillance Coupon Analysis," Work Order Number RTSV 1467487, Completed on 9/2/2015.

18. SEP-28076-000-01, Special Engineering Procedure, "Procedures for Measuring and Recording Boral® Surveillance Coupon Physical Attributes," NETCO, Rev 1, 3/3/15.

19. "Susquehanna SES Unit 1 Cycle 2 Reload Summary Report," NPE-84-015, PP&L, December 1984.

20. Procedure, SE-036-001, "Spent Fuel Pool Surveillance Coupon Analysis," Rev 5.

21. "Boral Neutron Absorbing. Shielding Material, Product Performance Report" AAR Brooks & Perkins Corp., Report 624, July 20, 1982 (ML050420037).

22. 8856-M192-113-2, Revision 2, "Boral Requalification Procedure for PaR Systems Corp.," FF107401, Sheet 1301.

23. "Handbook of Neutron Absorber Materials for Spent Nuclear Fuel Transportation and Storage Applications," EPRI, Palo Alto, CA: 2009. 1019110.

24. Drawing, M192-135, "Test Coupon Assembly for Spent Fuel Storage Racks," FF107401, Sheet 3501.

25. 8856-M192-129-3, "Coupon Checking Instructions for Test Coupon Assemblies PaR Job No. 3157." FF107401, Sheet 2901.

26. Drawing, M192-134, "Boral Shearing and Sampling Sketch for Spent Fuel Storage Racks," FF107401, Sheet 3401.

27. Drawing, M192-137, "Test Coupon Installation for Spent Fuel Storage Rack," FF107401, Sheet 3701.

28. NRC Inspection Report, 50-387/ 83-06, 50-388/ 83-03, Dated April 15, 1983.