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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Oyster Creek Generating Station
Facility Operating License No. DPR-16
NRC Docket No. 50-219

Subject: Response to NRC Request for Additional Information, dated March 10, 2006, Related to Oyster Creek Generating Station License Renewal Application (TAC No. MC7624)

Reference: "Request for Additional Information for the Review of the Oyster Creek Nuclear Generating Station, License Renewal Application (TAC No. MC7624)," dated March 10, 2006

In the referenced letter, the NRC requested additional information related to Sections B.1.12, B.2.3, 2.3, and 3.3 of the Oyster Creek Generating Station License Renewal Application (LRA). Enclosed are the responses to this request for additional information.

If you have any questions, please contact Fred Polaski, Manager License Renewal, at 610-765-5935.

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

Respectfully,

Executed on 04-07-06

Michael P. Gallagher
Vice President, License Renewal
AmerGen Energy Company, LLC

Enclosure: Response to 03/10/06 Request for Additional Information

cc: Regional Administrator, USNRC Region I, w/o Enclosure
USNRC Project Manager, NRR - License Renewal, Safety, w/Enclosure
USNRC Project Manager, NRR - License Renewal, Environmental, w/o Enclosure
USNRC Project Manager, NRR - OCGS, w/o Enclosure
USNRC Senior Resident Inspector, OCGS, w/o Enclosure
Bureau of Nuclear Engineering, NJDEP, w/Enclosure
File No. 05040

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Enclosure

Response to 3/10/06 Request for Additional Information
Oyster Creek Generating Station
License Renewal Application (TAC No. MC7624)

RAI B.1.12-1
RAI B.2.3-1
RAI 2.3.1.6-1
RAI 2.3.1.7-1
RAI 3.3.2.1.16-1
RAI 2.3.3.36-1

RAI B.1.12-1

The applicant states that "NUREG-1801 indicates that the program covers all bolting within the scope of license renewal including component support and structural bolting. The Oyster Creek Bolting Integrity program does not address structural or component support bolting. The aging management of structural bolting is addressed by the Structures Monitoring Program, B.1.31 and ASME Section XI, Subsection IWE, B.1.27, addresses Primary Containment pressure bolting. Aging management of ASME Section XI Class 1, 2, and 3 and MC support members, is addressed by the ASME Section XI, Subsection IWF program, B.1.28."

The staff requests the applicant to discuss how these alternate programs meet the intent of the GALL Report and provide assurance of aging management for the component support and structural bolting.

Response:

The NUREG-1801 XI.M18 Bolting Integrity aging management program includes recommendations for activities that will provide assurance of adequate aging management for bolting within the scope of license renewal, including component support and structural bolting.

The NUREG-1801 XI.M18 Bolting Integrity aging management program includes guidance for selection of bolting material. The use of proper bolting material at Oyster Creek is controlled by site procurement procedures, and is applicable to bolting material within the scope of license renewal, including the component support and structural bolting.

The NUREG-1801 XI.M18 Bolting Integrity aging management program also includes guidance for the use of bolting lubricants and sealants, and proper torquing and maintenance practices to assure appropriate preload. Oyster Creek installation practices, defined in plant procedures, ensure that only approved lubricants and proper torque are applied consistent with the NUREG-1801 XI.M18 Bolting Integrity program. These installation practices are applicable to bolting within the scope of license renewal, including the component support and structural bolting.

The procurement controls and installation practices discussed above are described in the LRA Program Descriptions for the Structures Monitoring Program (B.1.31), ASME Section XI, Subsection IWE program (B.1.27) and the ASME Section XI, Subsection IWF program (B.1.28).

The NUREG-1801 XI.M18 Bolting Integrity aging management program also includes guidance for inspection of high strength NSSS component support bolts for cracking. There are no high strength NSSS component support bolts in the scope of license renewal at Oyster Creek. High strength structural bolts are used in other limited structural applications, but these bolts are not subject to significant preload stress, therefore cracking would not be expected.

The NUREG-1801 XI.M18 Bolting Integrity aging management program also recommends visual inspection of structural bolts and fasteners (actual yield strength < 150 ksi) as part of the Structures Monitoring Program or equivalent. The Structures Monitoring Program (B.1.31) includes structural bolting inspections for loss of material, due to corrosion, loose nuts, missing bolts, or other indications of loss of preload. The ASME Section XI, Subsection IWE (B.1.27) aging management program activities for bolting includes visual examination of bolting,

supplemented by Appendix J testing of associated bolted components pressure boundary. [LRA Appendix B, PBD-AMP-B.1.27] The ASME Section XI, Subsection IWF (B.1.28) aging management program activities for bolting include inspecting for loss of material and for loss of preload by inspecting for missing, detached, or loosened bolts.

Indications of bolting age related degradation identified by any of the above visual inspections would be dispositioned in accordance with the Oyster Creek corrective actions process.

RAI B.2.3-1

In order to prevent corrosion of the components in the Generator Stator Cooling Water system, the applicant has to control several parameters characterizing its cooling water chemistry. By maintaining these parameters within certain predetermined limits, corrosion of the system components can be minimized.

The staff requests the applicant to provide the information concerning the following parameters:

1. **Maximum allowable impurity limits in the generator stator cooling water.**
2. **Range of pH of the generator stator cooling water and how this pH is controlled.**
3. **Concentrations of oxygen in the generator stator coolant water and how it is controlled.**
4. **Maximum acceptable value of conductivity of the generator stator cooling water.**
5. **If any of these parameters get outside of their prescribed range, how long would it take bring them back into their operating range?**

The staff also requests the applicant to address the following:

1. **Was the generator stator cooling water chemistry during normal generator operation different from its chemistry during the prolonged periods of inactivity such as, for example, during refueling outages? Please explain.**
2. **What was the method used by the applicant for inspecting components in the generator stator cooling water system for corrosion? Please explain.**
3. **Has the presence of copper in the generator stator cooling water ever caused problems with maintaining generator field ground? Please explain.**

Response:

This response is in two parts to match the two parts of the above RAI B.2.3-1. The first part responds to control of several parameters characterizing stator cooling water chemistry. The Exelon corporate procedure for Stator Water Chemistry activities provides for monitoring and controlling of water chemistry using a process that is based on General Electric (manufacturer), and EPRI TR-105504 recommendations.

1. Maximum allowable impurity limits in the generator stator cooling water. As per the manufacturer and EPRI recommendations, impurities are not monitored per the Exelon Corporate procedure.

2. Range of pH of the generator stator cooling water and how this pH is controlled. As per the manufacturer and EPRI recommendations, pH is not monitored per the Exelon Corporate procedure.

3. Concentrations of oxygen in the generator stator coolant water and how it is controlled. See table below for the Exelon Corporate procedure parameters.

4. Maximum acceptable value of conductivity of the generator stator cooling water. See table below for the Exelon Corporate procedure parameters.

This table shows the parameters monitored for Oyster Creek General Electric Stator Cooling Water System.

General Electric Stator Cooling Water			
Parameter	**Frequency**	**Goal**	**Limit**
Conductivity	1/month[1]	<0.25 µS/cm	<0.5 µS/cm
Dissolved Oxygen	1/month	2-8 ppm	>1 ppm
Iron & Copper[2]	1/month	Evaluate Trend	N/A
Hydrogen[3]	1/month	Evaluate Trend	N/A

1 With inline monitor out-of-service, increase frequency to 1/week.

2 Oyster Creek – lowering iron/copper values requires replacing the filter and demineralizer bed. This can only be accomplished during unit shutdown.

3 Monitoring the cover gas is required for stations which do not have a stator leak monitor system (SLMS), as applicable. Oyster Creek does not have a SLMS.

5. If Stator Cooling water chemistry is outside of the prescribed range, Operations Supervisor and Chemistry Department are notified. If a parameter deviates then Operations will take the necessary steps to bring the parameter back within the goal. Stator cooling water conductivity is maintained less that 0.5 MICRO SIEMENS/CM. The Generator shall be shutdown immediately if the stator cooling water conductivity reaches 10 MICRO SIEMENS/CM. Operator actions are taken in accordance with procedures to return Chemistry parameters back into their operating range, on a timely basis.

The following responds to the second set of questions from the RAI:

1. Typically for short maintenance outages, the station maintains stator cooling water flow with gas pressure higher than water pressure. The water chemistry is maintained within the same limits that apply during operations.

   For refueling outages, Oyster Creek normally shuts down the system because they change out the resin beds. The stator cooling water system is then returned to service by verifying chemistry is acceptable.

2. The method used by Oyster Creek for inspecting components in the generator stator cooling water system is visual inspection. A Y-strainer is removed and visually checked for corrosion and copper plating during each refueling outage.

3. The presence of copper in the generator stator cooling water has never caused problems with maintaining generator field ground at Oyster Creek. Oyster Creek does not have the Alterrex system. Oyster Creek has a DC generator driven by a reduction gear off of the main generator shaft that is air-cooled and not cooled by the generator stator cooling water system.

RAI 2.3.1.6-1

In LRA Page 2.3-22, it was stated that the reactor vessel head spray nozzle is not required to support any intended functions delineated in the rule, and therefore, are not included within the scope of license renewal. It was further stated that a safety assessment for this component was performed and reported in Boiling Water Reactor Vessel and Internals Project (BWRVIP)-06. The staff, however, could not locate the referenced safety assessment in the referenced document. The staff requests the applicant to clarify.

Response:

AmerGen concurs that the BWRVIP-06 does not include an assessment of the reactor vessel head spray nozzle, as stated in paragraph 2.3.1.6 of the OC LRA. The head spray integral nozzle does not perform a safety related function nor is it credited for any of the regulated events. No failure of the head spray integral nozzle has been postulated that could cause subsequent failure of safety related equipment. Therefore, as stated in the LRA, the head spray integral nozzle is not required to support intended functions and is not included within the scope of license renewal.

RAI 2.3.1.7-1

In LRA Table 2.3.1.7, the component type, "Top Head Enclosure Vessel Flange Leak Detection Penetration" was listed as within scope subject to Aging Management Review (AMR). However, it is not clear whether the tubes/pipes connected to the penetration were also included within scope. The staff requests the applicant to confirm if the subject tubes/pipes were included in the scope of license renewal; and if not included, the applicant should include the subject components within scope requiring an AMR.

Response:

As depicted on Oyster Creek License Renewal Drawing LR-GE-237E798, the piping connected to the vessel flange leak detection penetration is included within the scope of components subject to aging management review. This vessel leak-off piping is included as part of the Nuclear Boiler Instrumentation system, and is located in Table 2.3.1.4, included in component types "piping and fittings," and "valve body."

RAI 3.3.2.1.16-1

The GALL Report recognizes possibility of the existence of aging effects in the Boral used in the spent fuel storage racks and the need for having a plant specific aging management program. However, in its submittal, the applicant has indicated that in its plant degradation of the Boral is insignificant and no aging management program is required. The applicant provided several justifications for not having management program. In order to verify, the staff requests the applicant to address the following:

a) **Please provide the following specifications of the Boral panels in the HOLTEC designed spent fuel racks:**

   1. **Geometry of the Boral panels**

   2. **Areal density of boron**

b) **A detailed description of the Boral coupons and the tests performed on them during their examination is needed. Please provide a detailed description for the following:**

   1. **What was the location of coupons relative to the spent fuel racks?**

   2. **How were the coupons mounted and were they fully exposed to the spent fuel pool water?**

   3. **What specific testing procedures were used for determining Boral-10 areal density? Verifying surface corrosion, if any, and examine for blister**

formation?

4. **After removal from the pool for inspection (2 and 4 year exposures) were the coupons inserted back at the same locations in the pool?**

c) Although during the current examinations performed at Oyster Creek, the applicant did not discover any blisters on Boral panels, the industry experience has indicated that during longer exposure such blisters may form. Since formation of blisters may affect the efficiency of the Boral panels to attenuate neutrons (through flux trap formation), and may cause deformation of the fuel cells. The applicant should explain why in its plant it will not be a safety concern.

Response:

a.

1. The Boral panel storage cells are fabricated from 0.075" thick type 304L stainless steel sheet material. Boral neutron-absorber material strips are placed between the cell walls and a stainless steel cover plate. Each storage cell side is equipped with one integral Boral sheet. The cells are welded together in a specified manner to become a free standing structure which is seismically qualified without depending on neighboring modules or fuel pool walls for support. The inside dimension of a cell is 5.9305 inches and the nominal center-to-center spacing of the cells are 6.106 inches. This is as described in Section 9.1.2.2.2.2 "Boral racks" of Oyster Creek's UFSAR.

2. The nominal areal density of boron is 0.0162 g/cm^2 boron-10. The minimum areal density is 0.015 g/cm^2 boron-10 as stated in Section 9.1.2.3.9.2 "High Density Spent Fuel Racks Containing Boral" of Oyster Creek's UFSAR.

b.

1. The coupons are mounted in a coupon tree in an environment similar to that of the in-service Boral panels. The coupon tree is located in a spent fuel storage rack cell.

2. The coupons in the coupon tree, like the in-service panels, are fully exposed to the spent fuel pool water.

3. Oyster Creek procedure 1002.7 "In-service Surveillance Program for Boral Poison Racks" is used for verifying the integrity of the Boral neutron absorber. Neutron attenuation measurements are performed per procedure section 6.3 "Neutron Attenuation" to verify acceptable values of boron-10. Neutron attenuation measurements utilize a beam of thermalized neutrons and a neutron counter (He-3 or BF3). All measurements are performed with a sufficient counting interval to obtain the desired statistical confidence limits (minimum of 80,000 counts). The areal density of the irradiated coupon is compared to its pre-irradiated value.

   Surface corrosion and blister formation is characterized through visual examination and measurement of coupon weight, length, width and thickness.

The last surveillance coupon examination is reported in "Summary Report of the Examination of Oyster Creek Nuclear Station Boral Surveillance Coupon No. HO910070-2-6," Holtec report # HI-2043279, October 2004. The coupon showed no blisters, pits or other degradation on front or back surfaces. Within the accuracy of the measurements, the length, width, and thickness were the same after irradiation as before irradiation. Density of the coupon showed a slight increase, within measurement error. Neutron transmission tests on the coupon showed the boron-10 areal density is 0.0209 g/cm^2 boron-10 which demonstrated (within measurement accuracy) no boron-10 loss. This is indicative of expected Boral performance.

4. The coupon tree remains in the pool. Presently there is no need to return the tested coupons back to the tree, as there is sufficient number of coupons to last for 40 years starting with the inception of the surveillance program in year 2000. Therefore, the tested coupons were not returned to the pool.

c.

Blisters are characterized by a local area where the Boral 11000-series aluminum cladding separates from the aluminum-boron-carbide core and the clad is plastically deformed outward away from the core. The appearance of a blister suggests that the mechanism of deformation is related to a local pressure buildup in the core causing clad/core delamination. Blisters have not been observed to affect the neutron absorbing properties of Boral through neutron attenuation testing of blistered Boral coupons. However, there are two issues associated with Boral blisters:

In BWR fuel racks such as Oyster Creek, blisters in the Boral that occur under the relatively thin stainless wrapper plate can cause the wrapper plate to deform. This can reduce the clearance between cell wall and fuel assembly. If blisters occur in more than one Boral plate in coincident axial locations in the same rack cell location, fuel insertion and withdraw from the spent fuel rack can be impeded.

The second Boral blister issue does not apply to Oyster Creek since it does not utilize flux traps to thermalize neutrons to make the neutron absorber more efficient. This effect only applies to Region 1 PWR racks. Blisters in this case could displace water from the flux trap region increasing the reactivity state.

Therefore, for Oyster Creek, Boral blistering may become an operational concern if sufficient blistering occurs to impede rack cell use. However, Boral blistering is not a safety concern due to the Oyster Creek rack design and industry operational and testing experience. Any aging material effects will be observed as part of the current surveillance program.

RAI 2.3.3.36-1

In LRA Table 2.3.3.36 for the Shutdown Cooling System, heat exchangers for shutdown cooling were listed as component type within the scope of license renewal. However, for these heat exchangers, leakage/pressure boundary were identified as the only intended functions requiring aging management; but their heat transfer function was not listed. The staff believes that the heat transfer function should also be identified as one the intended functions of the component type, so that appropriate Aging Management Program (AMP) be designated, such that there will be a reasonable assurance that this safety-related function of the component type, so that appropriate aging management programs (AMPs) will be designated, such that there will be a reasonable assurance that this safety-related function of the component type does not degrade over the extended period of operation. The staff requests the applicant to clarify why the heat transfer function of the shutdown cooling heat exchangers, in addition to leakage/pressure boundary functions, was not identified as one the intended functions which needs to be preserved during the extended period of operation.

Response:

The shutdown cooling heat exchangers are identified with intended functions of heat transfer and pressure boundary in the Oyster Creek LRA. The shutdown cooling heat exchangers are listed in Table 2.3.3.36 as components subject to aging management review. No intended function is listed for the heat exchangers in this table, as these heat exchangers are evaluated for aging effects with the Reactor Building Closed Cooling Water System, the system that provides the cooling water. In the System Intended Functions section of Section 2.3.3.36 for the Shutdown Cooling System, heat removal is not credited as a 10 CFR 54.4(a)(1) function, however, the system is relied upon to perform a function that demonstrates compliance with the commission's regulations for Fire Protection for 10 CFR 54.4(a)(3). Consequently, the shutdown cooling heat exchangers, which are listed in Table 2.3.3.29 for Reactor Building Closed Cooling Water System Components Subject to Aging Management Review, list intended functions of Heat Transfer and Pressure Boundary.