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10 CFR 50.4

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

Watts Bar Nuclear Plant, Unit 1
Facility Operating License No. NPF-90
NRC Docket No. 50-390

Subject: **Responses to Requests for Additional Information Related to NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage During Design Basis Accidents at Pressurized-Water Reactors"**

References:

1. NRC letter to TVA, "Watts Bar Nuclear Plant, Unit 1 - Request for Additional Information Regarding Generic Letter 2004-002, 'Potential Impact of Debris Blockage During Design-Basis Accidents at Pressurized-Water Reactors' (TAC No. MC4730)," dated September 29, 2009
2. TVA letter to NRC, "Draft Responses to Requests for Additional Information Related to NRC Generic Letter 2004-02, 'Potential Impact of Debris Blockage During Design-Basis Accidents at Pressurized-Water Reactors,'" dated June 3, 2010

In the Reference 1 letter, the NRC requested additional information regarding the containment emergency sump strainer testing conducted in early 2006 for the Watts Bar Nuclear Plant (WBN), Unit 1. The Tennessee Valley Authority (TVA) provided draft responses to the NRC's Requests for Additional Information (RAIs) for WBN, Unit 1 on June 3, 2010 (Reference 2), citing plans for full-scale testing to be conducted during the summer of 2010. In August 2010, full-scale testing of WBN, Unit 1, containment sump strainers was completed.

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Enclosure 1 to this letter provides the final responses to the NRC RAIs incorporating the results of that testing. These responses were discussed during a public meeting held on May 12, 2011, between TVA and the NRC regarding the closeout of Generic Letter 2004-02 for WBN, Unit 1. As discussed in a follow-up telephone call between S. Lingam (NRC) and D. Green (TVA), TVA agreed to submit these RAI responses by August 15, 2011.

Enclosure 1 includes several Attachments. Attachment 2 of Enclosure 1 contains information that AREVA, NP considers proprietary in nature and subsequently, pursuant to 10 CFR 2.390, "Public inspection, exemptions, requests for withholding," paragraph (a)(4), TVA requests that such information be withheld from public disclosure. Attachment 3 of Enclosure 1 contains the affidavit from AREVA, NP supporting this request. Due to the extent of proprietary information in Attachment 2 of Enclosure 1, a non-proprietary version, with proprietary material removed, would not be usable and has not been provided.

Enclosure 2 contains the regulatory commitments associated with this submittal. If you have any questions, please contact Kara Stacy at 423-751-3489.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 15th day of August 2011.

Respectfully,

R. M. Krich

Enclosures:

1. Responses to Request for Additional Information Regarding Watts Bar Nuclear Plant, Unit 1, Containment Emergency Sump Strainer Testing
2. Generic Letter 2004-02 Regulatory Commitments for Watts Bar Nuclear Plant, Unit 1

cc (Enclosures):

NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Watts Bar Nuclear Plant

ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT, UNIT 1

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION REGARDING WATTS BAR NUCLEAR PLANT, UNIT 1, CONTAINMENT EMERGENCY SUMP STRAINER TESTING

Responses to Requests for Additional Information (RAIs) Related to

Watts Bar Nuclear Plant, Unit 1
Containment Emergency Sump Strainer Testing

The following Request for Additional Information (RAI) responses address the RAIs provided by the NRC to the Tennessee Valley Authority (TVA) in "Watts Bar Nuclear Plant, Unit 1 - Request for Additional Information Regarding Generic Letter 2004-02, 'Potential Impact of Debris Blockage During Design-Basis Accidents at Pressurized-Water Reactors' (TAC No. MC4730)," dated September 29, 2009.

The RAIs were primarily developed based on the Watts Bar Nuclear Plant (WBN), Unit 1, strainer performance head loss testing conducted in early 2006 and prior to the guidance contained in the March 28, 2008, letter from the NRC to the Nuclear Energy Institute, "Revised Guidance for Review of Final Licensee Responses to Generic Letter 2004-02, 'Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors.'" Therefore, many of the NRC concerns associated with the small flume testing protocol are addressed by the full scale test of the strainer head loss performed at Alden Research Laboratory (Alden) during the August 2010 using the test tank test facility.

Debris generation/Zone of Influence (ZOI)

RAI 1

The NRC staff requested additional information on the ZOI testing that was conducted to determine plant-specific ZOIs for some materials installed at WBN Unit 1. The licensee provided some additional information on the testing, but the information did not appear to justify the ZOIs assigned for the tested materials. The licensee stated that two "Min-K" tests were performed, one with Min-K and one with a surrogate for Min-K (fiberglass with a scrim) that "is considered conservative with respect to Min-K since it was damaged more easily." The results of the Min-K and surrogate Min-K tests seem to demonstrate conclusively the opposite is true since, at a distance of 10 diameters (10D), the Min-K was completely blown off the target, and the surrogate was undamaged beyond the jacketing. If the behavior is not random or spurious (and if it is random or spurious, then a sufficient number of tests was evidently not performed to obtain useful results), then the licensee's discussion and application of the test results should be revised to conform to the experimental results. The staff's review of the test results indicates that use of a 10D ZOI for Min-K appears to be nonconservative, since a test at this radius demonstrated complete removal of the insulation from the target. The licensee should provide additional information regarding the Min-K testing that justifies that the ZOI selected for Min-K is prototypical or conservative, or should revise the ZOI to a size that is justified.

In addition to the specific issue regarding the Min-K testing that is discussed above, the staff noted that the licensee provided information regarding the ZOI testing for Min-K and 3M-M20C fire barrier material, which is similar to the information that the staff has reviewed as part of a generic review of ZOI testing conducted by Westinghouse. The NRC staff considered that the information contained some of the information requested by the RAI, but did not supply adequate information so that the staff could determine whether the testing was conservative with respect to the plant condition. Although the ZOI testing questions reference the

WCAP-16710 report, the NRC staff believes that most or all of the testing performed at Wyle Labs was conducted under similar conditions, and therefore, similar issues need to be considered for the testing. If one or more of the generic questions regarding the ZOI testing below does not apply to WBN Unit 1, please provide a justification for the reason that the question does not apply.

1. *Although the American National Standards Institute/American Nuclear Society (ANSI/ANS) standard predicts higher jet centerline stagnation pressures associated with higher levels of subcooling, it is not intuitive that this would necessarily correspond to a generally conservative debris generation result. Justify the initial debris generation test temperature and pressure with respect to the plant specific reactor coolant system (RCS) conditions, specifically the plant hot and cold leg operating conditions. If ZOI reductions are also being applied to lines connecting to the pressurizer, then please also discuss the temperature and pressure conditions in these lines. Were any tests conducted at alternate temperatures and pressures to assess the variance in the destructiveness of the test jet to the initial test condition specifications? If so, provide that assessment.*

2. *Describe the jacketing/insulation systems used in the plant for which the testing was conducted and compare those systems to the jacketing/insulation systems tested. Demonstrate that the tested jacketing/insulation system adequately represented the plant jacketing/insulation system. The description should include differences in the jacketing and banding systems used for piping and other components for which the test results are applied, potentially including steam generators, pressurizers, reactor coolant pumps, etc. At a minimum, the following areas should be addressed:*

   a. *How did the characteristic failure dimensions of the tested jacketing/insulation compare with the effective diameter of the jet at the axial placement of the target? The characteristic failure dimensions are based on the primary failure mechanisms of the jacketing system, for example, for a stainless steel jacket held in place by three latches where all three latches must fail for the jacket to fail, then all three latches must be effectively impacted by the pressure for which the ZOI is calculated. Applying test results to a ZOI based on a centerline pressure for relatively low length/diameter (L/D) nozzle to target spacing would be nonconservative with respect to impacting the entire target with the calculated pressure.*

   b. *Was the insulation and jacketing system used in the testing of the same general manufacture and manufacturing process as the insulation used in the plant? If not, what steps were taken to ensure that the general strength of the insulation system tested was conservative with respect to the plant insulation? For example, it is known that there were generally two very different processes used to manufacture calcium silicate whereby one type readily dissolved in water but the other type dissolves much more slowly. Such manufacturing differences could also become apparent in debris generation testing, as well.*

   c. *The information provided should also include an evaluation of scaling the strength of the jacketing or encapsulation systems to the tests. For example, a latching system on a 30-inch pipe within a ZOI could be stressed much more than a latching system on a 10 inch pipe in a scaled ZOI test. If the latches used in the testing and the plants are the same, the latches in the testing could be significantly under-stressed. If a prototypically sized target were impacted by an undersized jet it would similarly be under-stressed. Evaluations of banding, jacketing, rivets, screws, etc., should be made. For example,* *scaling the strength of the jacketing was discussed in the OPG report on calcium silicate debris generation testing.*

3. *There are relatively large uncertainties associated with calculating jet stagnation pressures and ZOIs for both the test and the plant conditions based on the models used in the WCAP reports. What steps were taken to ensure that the calculations resulted in conservative estimates of these values? Please provide the inputs for these calculations and the sources of the inputs.*

4. *Describe the procedure and assumptions for using the ANSI/ANS-58-2-1988 standard to calculate the test jet stagnation pressures at specific locations downrange from the test nozzle.*

   a. *In the WCAP report, was the analysis based on an initial temperature condition that matched the initial test temperature? If not, please provide a justification.*

   b. *Was the water subcooling used in the analysis that of the initial tank temperature or was it the temperature of the water in the pipe next to the rupture disk? Test data indicated that the water in the piping had cooled below that of the test tank.*

   c. *The break mass flow rate is a key input to the ANSI/ANS-58-2-1988 standard. How was the associated debris generation test mass flow rate determined? If the experimental volumetric flow was used, then explain how the mass flow was calculated from the volumetric flow given the considerations of potential two-phase flow and temperature dependent water and vapor densities? If the mass flow was analytically determined, then describe the analytical method used to calculate the mass flow rate.*

   d. *Noting the extremely rapid decrease in nozzle pressure and flow rate illustrated in the test plots in the first tenths of a second, how was the transient behavior considered in the application of the ANSI/ANS-58-2-1988 standard? Specifically, did the inputs to the standard represent the initial conditions or the conditions after the first extremely rapid transient (e.g., say at one tenth of a second)?*

   e. *Given the extreme initial transient behavior of the jet, justify the use of the steady state ANSI/ANS-58-2-1988 standard jet expansion model to determine the jet centerline stagnation pressures rather than experimentally measuring the pressures.*

5. *Describe the procedure used to calculate the isobar volumes used in determining the equivalent spherical ZOI radii using the ANSI/ANS-58-2-1988 standard.*

   a. *What were the assumed plant-specific RCS temperatures and pressures and break sizes used in the calculation? Note that the isobar volumes would be different for a hot leg break than for a cold leg break since the degrees of subcooling is a direct input to the ANSI/ANS-58-2-1988 standard and which affects the diameter of the jet. Note that an under calculated isobar volume would result in an under calculated ZOI radius.*

   b. *What was the calculational method used to estimate the plant-specific and break-specific mass flow rate for the postulated plant loss-of-coolant accident (LOCA), which was used as input to the standard for calculating isobar volumes?*

   c. *Given that the degree of subcooling is an input parameter to the*

ANSI/ANS-58-2-1988 standard and that this parameter affects the pressure isobar volumes, what steps were taken to ensure that the isobar volumes conservatively match the plant-specific postulated LOCA degree of subcooling for the plant debris generation break selections? Were multiple break conditions calculated to ensure a conservative specification of the ZOI radii?

6. *Provide a detailed description of the test apparatus, specifically including the piping from the pressurized test tank to the exit nozzle including the rupture disk system.*

   a. *Based on the temperature traces in the test reports it is apparent that the fluid near the nozzle was colder than the bulk test temperature. How was the fact that the fluid near the nozzle was colder than the bulk fluid accounted for in the evaluations?*

   b. *How was the hydraulic resistance of the test piping that affected the test flow characteristics evaluated with respect to a postulated plant-specific LOCA break flow where such piping flow resistance would not be present?*

   c. *What was the specified rupture differential pressure of the rupture disks?*

7. *WCAP-16710-P discusses the shock wave resulting from the instantaneous rupture of piping.*

   a. *Was any analysis or parametric testing conducted to get an idea of the sensitivity of the potential to form a shock wave at different thermal-hydraulic conditions? Were temperatures and pressures prototypical of pressurized-water reactor hot legs considered?*

   b. *Was the initial lower temperature of the fluid near the test nozzle taken into consideration in the evaluation? Specifically, was the damage potential assessed as a function of the degree of subcooling in the test initial conditions?*

   c. *What is the basis for scaling a shock wave from the reduced-scale nozzle opening area tested to the break opening area for a limiting rupture in the actual plant piping?*

   d. *How is the effect of a shock wave scaled with distance for both the test nozzle and plant condition?*

8. *Please provide the basis for concluding that a jet impact on the components as tested is a limiting condition for the destruction of insulation installed on alternate components that were not tested. For instance, considering a break near the steam generator nozzle, once insulation panels on the steam generator directly adjacent to the break are destroyed, the LOCA jet could impact additional insulation panels on the generator from an exposed end, potentially causing damage at significantly larger distances than for the insulation configuration on piping that was tested. Furthermore, it is not clear that the banding and latching mechanisms of the insulation panels on alternate components provide the same measure of protection against a LOCA jet as those of the piping insulation that was tested.*

9. *Some piping or conduits oriented axially with respect to the break location (including the ruptured pipe itself) could have insulation stripped off near the break. Once this insulation is stripped away, succeeding segments of insulation will have one open end exposed directly to the LOCA jet, which appears to be a more vulnerable configuration than the configuration*

tested by Westinghouse. As a result, damage would seemingly be capable of propagating along an axially oriented pipe significantly beyond the distances calculated by Westinghouse. Please provide a technical basis to demonstrate that the reduced ZOIs calculated for the piping configuration tested are prototypical or conservative of the degree of damage that would occur to insulation on piping lines oriented axially with respect to the break location.

10. *WCAP-16710-P noted damage to the cloth blankets that cover the fiberglass insulation in some cases resulting in the release of fiberglass. The tears in the cloth covering were attributed to the steel jacket or the test fixture and not the steam jet. It seems that any damage that occurs to the target during the test would be likely to occur in the plant. Was the potential for damage to plant insulation from similar conditions considered? For example, the test fixture could represent a piping component or support, or other nearby structural member. The insulation jacketing is obviously representative of itself. What is the basis for the statement in the WCAP report that damage similar to that which occurred to the end pieces in not expected to occur in the plant? It is likely that a break in the plant will result in a much more chaotic condition than that which occurred in testing. Therefore, it would be more likely for the insulation to be damaged by either the jacketing or other objects nearby.*

11. *Did the end caps that were attached to the insulation targets affect the structural strength of the test specimens?*

12. *For the Min-K testing, some of the material was ejected from the test fixture and landed up to 150 ft away. Was the potential for a similar occurrence in the plant evaluated? What would be the result if the insulation impacted an object much closer than 150 ft? Would this impact be more severe? What would be the result if the panel lodged within the jet ZOI? Could the encapsulating material fatigue, fail, and allow the insulating material to be released?*

Response

WCAP-16783, "Jet Impingement Testing to Determine the Zone of Influence (ZOI) of Min-K and 3M M20C Fire Barrier Insulation for Watts Bar Nuclear Plant," will not be utilized to justify the Min-K ZOI value for WBN, Unit 1. A ZOI Radius/Break Diameter of 28.6, which is consistent with the recommended value in the NRC's Safety Evaluation for Nuclear Energy Institute (NEI) 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology," will be used for Min-K and 3M M20C (Interam) at WBN, Unit 1.

Since WCAP-16783 is not used to justify the WBN, Unit 1, ZOI value for Min-K and 3M M20C, Subparts 1 through 12 of the above RAI 1, related to ZOI testing, are no longer applicable.

Head Loss and Vortexing

RAI 3

The response to RAI 3 provided additional information regarding the strainer testing and comparisons between the test and plant conditions. The licensee addressed the following areas:

Fibrous Debris Preparation and Introduction with Respect to Prototypical Sizing

The response stated that the fibrous debris was shredded using a wood chipper and smaller clumps of Nukon were separated by hand. The debris was then mixed with water and stirred. The response also stated that following test 2 that additional fiber, that had been separated into single fibers by hand, was added to the flume within one foot of the strainer. This fiber was stated to deposit mostly on top of the strainer. The NRC staff audit report of WBN Unit 1 (ML062120469) states that the staff found that surrogate for latent fiber to be prepared inadequately. Based on the direct observation of the testing by the staff, the fibrous debris preparation was not realistic for latent fibrous debris. In addition, the licensee statement that the fibrous debris added following test 2 accumulated on the top of the strainer indicates that the introduction of debris was not representative of the plant. It is more likely that the debris would approach the strainer from the side and top, not primarily the top.

Response

AREVA NP, Inc. and Alden Research Laboratory, Inc. performed testing of a WBN, Unit 1, prototypical Emergency Core Cooling System (ECCS) and Containment Spray (CS) system sump strainer to determine the head loss (pressure drop) across the strainer based on the postulated debris load present in a containment post Loss-of-Coolant-Accident (LOCA).

This 2010 full scale testing employed a "test tank" protocol as outlined in Attachment 1 of this Enclosure. This protocol included the following elements to ensure the head loss determined by testing was conservative:

- The test tank was filled with water to the design basis water level and maintained during the duration of the test.
- Fine fiber was shredded by a food processor, Munson shredder, or other type of device that achieved the same form of fines as discussed in NUREG/CR 6885, "Screen Penetration Test Report." The fine fibers were then diluted with water and mixed with a power mixer prior to introduction into the test tank such that no clumps were visually observed.
- The debris was introduced into the test tank only after the start of the recirculation pump and the designed flow rate had been established. Debris was sequenced with the most transportable debris introduced first followed by the next most transportable, and so on, until all debris was sequenced into the test tank.
- Debris was mixed with heated water in a five-to-one ratio of water to debris to ensure debris did not agglomerate.
- A trash pump was utilized to inject the debris into the test tank below the water surface to ensure there was no air entrainment during debris introduction.

Additional discussion of debris preparation, dilution, introduction and suspension is provided in the AREVA Summary Test Report (STR) (Attachment 2).

RAI 3 (continued)

Flume Velocity and Turbulence

The request for additional information (RAI) response stated that the strainer design employs a core tube that results in a constant approach velocity to the strainer under all conditions. The response stated that the flume flow velocity was 0.036 feet per second (ft/sec). This value was corroborated by the NRC staff trip report (Appendix II to the WBN Unit 1 Audit Report (ML062120469) that witnessed the WBN Unit 1 strainer test. The response also noted that the flow in the test flume was representative of transitional flow so that some turbulence should be available to help maintain debris in suspension. The response did not provide the plant flow or turbulence conditions for comparison. However, the flume flow velocity of 0.036 ft/sec is much lower than flow rates for other plants. The low flow rate was likely due to the relatively small height of the strainer resulting in a much larger ratio of circumscribed area to strainer area. The use of a taller strainer module (larger strainer area) in the test may have helped to create a more realistic flow rate in the flume. In the trip report from the WBN Unit 1 testing, the NRC staff noted that the computation fluid dynamics evaluation conducted for WBN Unit 1 shows that the majority of the flow velocity approaching the strainer exceeded 0.28 ft/sec and that some areas exceeded 0.5 ft/sec. The trip report also noted that the circumscribed velocity for the test strainer was about 6.4 times lower than that of the replacement strainer. Considering that significant settling of debris occurred in the test (see near-field settling below), these significant differences between the test and plant configurations cannot be ignored.

Response

The flume velocity and turbulence concern has been addressed by the performance of the full scale testing in a test tank. Section 3.0 of Attachment 2 to this Enclosure provides a description of the test apparatus, including debris preparation, debris mixing and debris introduction. The testing test tank did not credit near-field settling and utilized a perforated floor panel in the middle portion of the tank and two variable speed mechanical mixers in the upstream high energy mixing portion of the tank to ensure debris remained suspended. Maintaining the debris in a suspended condition for transport during the full scale testing has eliminated the need to compare the test tank velocities to the plant containment velocities.

RAI 3 (continued)

Near-Field Settling

The RAI response stated that the debris was introduced 3 - 15 feet upstream of the strainer. In addition, following one test the debris was pushed on top of the strainer and the flow was doubled. The response also stated that the head loss was very low even with the debris directly on top of the strainer. The description provided does not address the issue. Based on the staff trip report, significant near-field settling occurred during the test. It is not expected that manually placing debris onto a strainer will result in realistic head losses because this methodology would not allow a debris bed to form similarly to how a debris bed would form in the plant (the debris bed in the plant would be expected to form more uniformly). The excessive near-field settling that occurred during the testing is considered to be nonconservative. Reference the discussion above regarding flume velocity and turbulence which shows that the test configuration was significantly non-conservative with respect to debris transport.

Response

Near-field settling has been addressed by the performance of the full scale testing in a test tank. Section 3.0 of Attachment 2 of this Enclosure provides a description of the test apparatus, including debris preparation, debris mixing and debris introduction. The design of the test tank for the full scale testing included two variable speed pipe mixers and a perforated floor panel to ensure debris was kept in suspension and available for transport during the retest. The mixers, which draw flow from the top of the tank and push the flow downward toward the floor, prevent debris settling in the upstream section of the tank. The floor panel in the middle section imparts an upward flow to maintain debris suspension without disturbing the debris bed that may form on the strainer.

RAI 3 (continued)

Debris Addition to the Test Flume

The RAI response described the method of addition of debris to the flume. The debris was added with 6 inches of water in the flume. The debris was added 3-15 feet from the strainer with reflective metallic insulation (RMI) debris being added first. The response states that adding the RMI first prevented it from covering the other debris and preventing transport. However, the staff has determined that adding less transportable debris first may inhibit the transport of debris that is added later. Once the debris was added, the flume was filled using overhead spray nozzles. The spray nozzles were then secured, manual debris mixing was performed (which may have trapped some more transportable debris under less transportable debris), and then the recirculation pump was started. This type of debris addition has not been accepted as conservative by the staff because it is likely to result in nonprototypical debris transport to the test module and the formation of a nonprototypical debris bed. In addition, during the trip to witness testing, the staff noted that the debris had likely agglomerated in the buckets prior to addition to the flume. The licensee has not justified that the manual stirring was effective in breaking up the agglomerated debris.

Response

This full scale testing, performed in a test tank, utilized the test apparatus described in Section 3.0 of Attachment 2 of this Enclosure. The following steps were implemented with respect to debris preparation, introduction, and agglomeration, to ensure the head loss determined by testing was conservative:

- The test tank was filled with water to the design basis water level and maintained during the duration of the test.

- Fine fiber was shredded by a food processor, Munson shredder, or other type of device that achieved the same form of fines as discussed in NUREG/CR 6885. The fine fibers were then diluted with water and mixed with a power mixer prior to introduction into the test tank such that no clumps were visually observed.

- The debris was only introduced into the test tank after the start of the recirculation pump and the establishment of the designed flow rate. Debris was sequenced with the most transportable debris introduced first followed by the next most transportable, and so on, until all debris was sequenced into the test tank.

- Debris was mixed with heated water at a five-to-one ratio of water to debris to ensure debris did not agglomerate.
- Utilization of a trash pump to inject the debris into the test tank below the water surface to ensure there was no air entrainment during debris introduction.

RAI 3 (continued)

Head Loss Termination Criteria

The RAI response stated that since all debris is considered to be fine, erosion of fibrous debris would not occur so that head loss should not increase. The response also stated that a large increase in net positive suction head (NPSH) margin (6.5 ft) occurs above the baseline case because of increases in the pool level. The response did not consider other potential sources of head loss increase such as bed compression over time. In general, most licensees add all of the eroded fiber at the start of the test, but still extrapolate results as appropriate based on the behavior of the test. The NRC staff believes that an evaluation would probably show that the increase in NPSH margin would likely bound any increase in debris bed head loss over time, but this should be confirmed by performing an acceptable test and either extrapolating the data or verifying that the head loss is stable or decreasing at the conclusion of the test.

Based on the above considerations and the design basis inputs provided by the licensee, it is very likely that the test results used for the evaluation of the WBN Unit 1 strainer were nonconservative. The licensee should perform a test and head loss evaluation for the strainer using procedures that will result in prototypical or conservative results, or demonstrate that the strainer will have significant open strainer area such that a filtering bed will not occur.

Response

This section of RAI 3 is addressed by performance of a full scale test, utilizing the test tank apparatus described in Section 3.0 of Attachment 1 to this Enclosure.

Since the strainer testing for WBN, Unit 1, was performed over a shorter time than 30 days, a conservative method of predicting the head loss at the 30-day mission time is needed. Test termination is achieved when all debris has been added to the test tank, fifteen tank turnovers have been completed, and the change in strainer head loss is less than one-percent in 30 minutes. Based on the WBN, Unit 1, test results, a limiting head loss value over 30 days was calculated using a conservative statistical approach, incorporating the 30-day head loss extrapolation to determine the maximum head loss value.

RAI 4

The NRC staff requested that the licensee provide additional information regarding the potential for air ingestion due to vortex formation. For one small break loss-of-coolant accident (SBLOCA) case, the tall strainer modules are not expected to be fully submerged in the sump pool. The response to RAI 4 provided additional information regarding the potential for vortex formation. The staff believes that it is very unlikely for a vortex to form on a PCI strainer at typical flow rates if the strainer is fully submerged. However, the Watts Bar strainer maybe slightly (3/4 inch) uncovered under some SBLOCA scenarios. The response provided information on the barriers to vortex formation. However, the response did not consider that if *the strainer is uncovered, air may be present inside the core tube and a vortex may occur within this structure. Based on the height of the strainer that is partially uncovered and the lower flow rates associated with a SBLOCA, it is less likely that a vortex occur than would be the case for a shorter strainer with a higher flow rate. However, it should also be noted that if head loss across the strainer debris bed increases, the potential for a vortex in the uncovered portion of the strainer will increase as the water level inside the core tube will be reduced. The licensee should consider the possibility of a vortex occurring due to the presence of air inside the core tube and verify that it is not credible for air ingestion to occur from this source. If the debris head loss value is changed as a result of addressing the RAIs above, a re-evaluation of this area should also be performed.*

Response

The original analysis based the calculation of the water level value on overly conservative assumptions, including that no additional ice melt occurred after Residual Heat Removal (RHR) switchover to the sump and that the reactor cavity was completely filled with water at RHR switchover. Although the use of such conservative assumptions reduced the calculation complexity, it resulted in a water level value lower than the height of the tall strainer modules.

By including the additional fluid from ice melt after RHR switchover and by calculating the amount of fluid held up in the reactor cavity, the current revision of the WBN SBLOCA water level calculation has resulted in water levels in excess of the maximum strainer height. The current limiting water levels are 5.78 feet at RHR switchover and 9.39 feet for long-term cooling, both of which are in excess of the tall strainer height of 5.724 feet. Additionally, both water level values account for additional hold-up in the Reactor Coolant System (RCS) piping resulting from decreasing RCS temperature and pressure (fluid shrinkage), as discussed in the response to RAI 8.

If the strainer were to be exposed after switchover, vortexing in the core tube does not pose a risk for air entrainment due to the design of the sump pit and strainer assembly. The WBN, Unit 1, strainer assembly consists of 23 vertical strainers mounted atop a large sump pit. For the SBLOCA flow rate of 11,800 gallons per minute (gpm), the maximum flow through each core tube is 513 gpm. The total strainer height for the tall modules is 49.5 inches. The tall modules are separated by 25 sections with four core tube holes per section. The core tube holes vary in size, with larger holes at the top of the strainer module and smaller holes at the bottom of the strainer module. ECCS piping entrances are covered with a one-quarter inch mesh and connect horizontally through the side of the sump pit over 13 feet below the strainer assembly. The slotted design of the core tube, the 90° angle of the ECCS piping relative to the strainers, the depth of the sump pit, and the mesh screen across the piping intakes all ensure vortexing is not a source of air ingestion.

Since WBN, Unit 1, is an ice condenser plant with a relatively low maximum sump water temperature of 190°F, flashing across the strainer assembly is unlikely. Utilizing the maximum sump temperature, conservatively assuming atmospheric pressure in containment, and taking no credit for fluid head, a head loss of 12 feet across the strainer would be necessary before flashing occurs. Since the NPSH margin for the containment spray pumps provides a more limiting value, a head loss of 12 feet across the strainer is not considered credible.

NPSH

RAI 8

The NRC staff requested that the licensee provide a technical basis for considering a contribution of 42,810 gallons of leakage from the RCS in determining a conservative minimum water level for analyzing sump performance under SBLOCA conditions. In responding to this RAI, the licensee stated that consideration of scenarios with stuck open pressurizer valves was unnecessary because the plant would most likely be cooled down and depressurized prior to recirculation becoming necessary. The basis for this statement was not discussed in the response. In addition, it was not clear whether a similar conclusion would apply for other LOCAs that could occur at an elevation higher than that considered in the licensee's evaluation. The licensee's response also includes the statement that "The only volume that can get into the Reactor cavity for a SBLOCA is from the RCS leakage." This part of the response was not clear to the staff, since the RAI had been posed concerning holdup within the RCS, whereas inventory originating in both the refueling water storage tank and the RCS could (and based on the Information provided in the tables accompanying the response, presumably does) be ejected from the pipe rupture in the RCS and contribute to the filling of the reactor cavity. Therefore, although the additional information provided by the licensee was helpful, it remains unclear to the staff what quantity of water is assumed to be held up inside the RCS for the analyzed SBLOCA minimum water level scenarios, and whether the assumed water holdup quantity is justified. Please state the mass of water assumed to be held up in the RCS for the analyzed SBLOCA minimum water level cases and provide justification for the assumed holdup value. Should the licensee desire to demonstrate that recirculation is not necessary for the set of break locations of concern to this question, further clarification should be provided regarding the break elevation for the analyzed SBLOCA cases and the basis for concluding that recirculation would not be necessary for other postulated break locations that could potentially result in additional holdup in the RCS (e.g., breaks at a higher elevation).

Response

For the portion of the RAI which states, *"The NRC staff requested that the licensee provide a technical basis for considering a contribution of 42,810 gallons of leakage from the RCS in determining a conservative minimum water level for analyzing sump performance under SBLOCA conditions. In responding to this RAI, the licensee stated that consideration of scenarios with stuck open pressurizer valves was unnecessary because the plant would most likely be cooled down and depressurized prior to recirculation becoming necessary. The basis for this statement was not discussed in the response,"* the response is as follows.

> The SBLOCA scenario that includes stuck open pressurizer valves is not considered because operator actions are required to verify that all pressurizer power operated relief valves (PORV) are closed. If the PORVs are not closed, operator actions are required to close the pressurizer PORV or associated block valve when RCS pressure is less than 2235 psig. If the valve is not able to be isolated, the event is no longer a RCS depressurization but a SBLOCA. The long-term plant response due to an unisolable valve opening is bounded by the limiting SBLOCA.

For the portion of the RAI which states, *"In addition, it was not clear whether a similar conclusion would apply for other LOCAs that could occur at an elevation higher than that* *considered in the licensee's evaluation,"* the response is as follows.

This statement was specific to the scenario related to a stuck-open pressurizer valve and is not applicable to other SBLOCAs at higher elevations.

For the portion of the RAI which states, *"The licensee's response also includes the statement that "The only volume that can get into the Reactor cavity for a SBLOCA is from the RCS leakage." This part of the response was not clear to the staff, since the RAI had been posed concerning holdup within the RCS, whereas inventory originating in both the refueling water storage tank and the RCS could (and based on the Information provided in the tables accompanying the response, presumably does) be ejected from the pipe rupture in the RCS and contribute to the filling of the reactor cavity,"* the response is as follows.

The reactor cavity is assumed to fill only for:

(a) a break in the hot or cold leg piping at the reactor vessel to nozzle transition,

(b) the rupture of a control rod drive mechanism (CRDM) housing, and

(c) when the lower compartment water level reaches Elevation 715'-8.5".

The bottom of the hot leg penetrations is Elevation 715'-8.5" and the entrance to the keyway is at Elevation 716'-0". The reactor vessel nozzles and the CRDM housings are attached to the reactor vessel and located within the reactor cavity area. All other postulated breaks in the RCS pressure boundary are outside the reactor cavity enclosure. Based on the above, it is a conservative assumption that the initial reactor coolant inventory remains constant and is inside the RCS for all break locations.

For the portion of the RAI which states, *"Therefore, although the additional information provided by the licensee was helpful, it remains unclear to the staff what quantity of water is assumed to be held up inside the RCS for the analyzed SBLOCA minimum water level scenarios, and whether the assumed water holdup quantity is justified. Please state the mass of water assumed to be held up in the RCS for the analyzed SBLOCA minimum water level cases and provide justification for the assumed holdup value,"* the response is as follows.

The current revision of the WBN SBLOCA water level calculation accounts for fluid held up in the RCS as a result of decreasing RCS pressure and temperature when determining minimum SBLOCA water levels. Additional fluid amounts of 49,184 lbm and 100,589 lbm are assumed held up in the RCS for the minimum SBLOCA water level of 5.78 feet at RHR switchover and 9.39 feet for long term cooling, respectively. These holdup amounts were conservatively calculated using equations developed from temperature and pressure curves for the RCS associated with a bounding two-inch SBLOCA.

For the holdup at RHR switchover, the RCS shrinkage is dependent upon time, and the time to RHR switchover is dependent upon the amount of shrinkage.

Therefore, the equations for RCS holdup and switchover time were solved iteratively, converging on a switchover time of
t = 2008 seconds, which in turn provided the holdup quantity given above. The holdup quantity for the long term case was determined by assuming RCS pressure at the accumulator check valve pressure of 610 psig and the corresponding average temperature of 435.8 °F. These values are conservative, given that the amount of fluid injected by the accumulators would make up more fluid than is held up from RCS shrinkage.

Additional Information

As discussed during the May 19, 2011, telephone call with the NRC, the WBN, Unit 1, structural qualification calculations were revised to determine the maximum allowed head loss for the strainer to remain fully structurally qualified. The results of these calculations determined that a head loss of 6.5 feet would be acceptable before exceeding the structural qualification for the strainer. This value is above the maximum head loss possible after design changes are implemented to resolve the high head loss results obtained from initial WBN, Unit 1, design basis loaded thin bed testing.

Attachment 4 of this Enclosure provides additional information as discussed during the public meeting held on May 12, 2011 between TVA and the NRC and during the telephone call conducted on May 19, 2011, between TVA and NRC representatives.

Conclusion

The high head loss results obtained from the initial WBN, Unit 1, design basis loaded thin bed test will be resolved by the following actions:

- Implement design change to replace plenum cover plate with larger orifice sizes
- Implement design change to remove Min-K insulation

These regulatory commitments, in conjunction with the completed full scale testing, satisfactorily address the issues identified in Generic Letter 2004-02 for WBN, Unit 1.

ATTACHMENT 1

TEST TANK PROTOCOL

TEST TANK PROTOCOL

The following steps describe the general approach for testing the Watts Bar Nuclear Plant, Unit 1, Emergency Core Cooling System strainer modules.

1. **VERIFY** that the tank, strainer, piping, and test equipment have been set up in accordance with test setup procedure.

2. **PREPARE** the debris according to the following steps unless otherwise indicated by the Test Engineer.

   Note: The non-chemical debris has been prepared by Performance Consulting, Inc. (PCI) in accordance with PCI Technical Document No. SFSS-TD-2007-004, "Sure-Flow® Suction Strainer - Testing Debris Preparation and Surrogates," and shipped to ALDEN. Changes to this document implemented in the test plan or test(s) shall be documented in the Test Plan with justification, as applicable.

3. **WEIGH** the non-chemical fibrous debris dry in accordance with the quantities specified in the debris allocation tables.

4. **DIVIDE** the non-chemical fibrous debris into even batches by quantity (mass) of fibrous debris required to form a 1/16th inch debris bed on the entire surface of the test strainer.

5. **COMBINE** each batch of the non-chemical debris with water and store for introduction into the test tank in mixing containers. The debris may be "mixed" with hot water (~120°F) to help remove trapped air from fibrous debris. Use the following steps to mix the debris:

   a. **DILUTE** the debris with hot water (~120°F) to an approximate ratio of 5 parts water to 1 part debris (by volume).

   b. **MIX** the debris and heated city water in mixing containers.

   c. If needed, **FURTHER** dilute the debris to ensure there is no agglomeration.

6. **PREPARE** the chemical debris in accordance with chemical debris procedure (if required).

7. **FILL** the test tank with city water and heat to ~ 120°F unless specified by the Test Engineer to the target water level (typically the minimum water level for Emergency Core Cooling System recirculation or equivalent).

8. **DOCUMENT** the recirculation water level in the test tank of all tests and manually verify sump strainer submergence depth (if applicable).

   Note 1: Strainer water level should be below the desired water level to allow for displacement due to diluted debris.

Note 2: If the water level is lowered, ensure that the temperature probe and thermal control switch remain submerged.

9. **BEGIN** performing downstream sampling.

   Document Sample Rate ____________

10. **START** the test tank recirculation pump and maintain the minimum target flow rate.

11. **MEASURE** and **RECORD** the pH of test tank water.

12. **RECORD** the following data at approximately 2 to 5 minute intervals. NOTE that a computer data acquisition automatically records data at approximately 10 second intervals:

    - Flow rate
    - Water temperature
    - Differential pressure across the strainer module
    - Observations of vortexing at the surface of water near strainer (as specified by the Test Engineer)
    - Observations of bore hole formation (as specified by the Test Engineer)
    - Additional appropriate information

13. **FILL** test tank injection hopper or debris pumping receptacle (as applicable) with bypass water from the test loop.

14. **START** debris addition trash pump at slow flow. Allow debris hopper level to stabilize.

15. **ADJUST** trash pump drive frequency accordingly to maintain hopper water level approximately 1" above the tapered floor section and ~ 12" below the overflow section.

16. **RE-MIX** the debris with a paddle mixer, or a paint mixer connected to an electric drill (or equivalent). Note: Additional dilution may be needed to prevent agglomeration.

17. **INSERT** all or batch of the debris (as applicable) into the pumping receptacle in the order prescribed in the debris allocation table.

    a. **MAINTAIN** the water level in the hopper by adjusting the trash pump drive frequency, or cycling the recirculation valve on/off. Water level should be approximately 1" above the tapered floor section and ~ 12" below the overflow section.

    b. **OBSERVE** any floating debris on the water surface of the hopper. **REMOVE** floating debris using the following steps:

       i. **SKIM** water surface with a pool skimmer and place debris into a container.

       ii. **DILUTE** the debris with hot water (120° F) to an approximate ratio of 5 parts water to 1 part debris (by volume).

iii. **MIX** the debris and heated city water in the mixing container.

iv. **INSERT** re-mixed debris into debris injection hopper.

18. **RINSE** the mixing container(s) with water to ensure that all of the debris has been introduced into the test tank/test tank injection hopper (as applicable).

19. **INSERT** the next batch of fibrous debris into the pumping receptacle in the order prescribed in the debris allocation table (if applicable).

20. **DISASSEMBLE** the trash pump to ensure all debris has been transferred to the test tank, if debris is present in the trash pump, perform the following steps:

    a. **DOCUMENT** and **RINSE** any trapped debris into a container.

    b. **DILUTE** the debris with hot water (120° F) to an approximate ratio of 5 parts water to 1 part debris (by volume).

    c. **MIX** the debris and heated water in mixing containers.

    d. **INSERT** diluted debris directly to the test tank.

21. **MAINTAIN** the recirculation flow rate and **MONITOR** the head loss across the test strainer

22. **MEASURE** and **RECORD** the pH of test tank water.

23. **OBSERVE** the strainer area for vortexing and the formation of bore holes.

24. **SLOWLY** decrease the test tank water level to a depth of 41 inches (if applicable).

25. **TERMINATE** the test once all observations of the head loss are deemed acceptable unless directed otherwise by the Test Engineer.

ATTACHMENT 3

AREVA AFFIDAVIT

Attached is the affidavit supporting the request to withhold proprietary information (included in Attachment 2) from public disclosure.

AFFIDAVIT

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF LYNCHBURG)

1. My name is Gayle F. Elliott. I am Manager, Product Licensing, for AREVA NP Inc. (AREVA NP) and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by AREVA NP to determine whether certain AREVA NP information is proprietary. I am familiar with the policies established by AREVA NP to ensure the proper application of these criteria.

3. I am familiar with the AREVA NP information contained in 66-9144025-000, "Watts Bar Unit 1 ECCS Strainer Performance Test Report," and 66-9144028-000, "Sequoyah Unit 1 and Unit 2 ECCS Strainer Performance Test Report," and referred to herein as "Documents." Information contained in these Documents has been classified by AREVA NP as proprietary in accordance with the policies established by AREVA NP for the control and protection of proprietary and confidential information.

4. These Documents contain information of a proprietary and confidential nature and is of the type customarily held in confidence by AREVA NP and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in these Documents as proprietary and confidential.

5. These Documents have been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in these Documents be withheld from public disclosure. The request for withholding of proprietary information is made in accordance with 10 CFR 2.390. The information for which withholding from disclosure

is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by AREVA NP to determine whether information should be classified as proprietary:

(a) The information reveals details of AREVA NP's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA NP.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA NP in product optimization or marketability.

(e) The information is vital to a competitive advantage held by AREVA NP, would be helpful to competitors to AREVA NP, and would likely cause substantial harm to the competitive position of AREVA NP.

The information in these Documents is considered proprietary for the reasons set forth in paragraphs 6(b) and 6(c) above.

7. In accordance with AREVA NP's policies governing the protection and control of information, proprietary information contained in these Documents have been made available, on a limited basis, to others outside AREVA NP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA NP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

SUBSCRIBED before me this 2nd

day of June, 2011.

Sherry L. McFaden
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 10/31/14
Reg. # 7079129

SHERRY L. MCFADEN
Notary Public
Commonwealth of Virginia
7079129
My Commission Expires Oct 31, 2014

ATTACHMENT 4

SUPPLEMENTAL INFORMATION

Supplemental Information to Responses to Requests for Additional Information (RAIs) Related to Watts Bar Nuclear Plant, Unit 1 Containment Emergency Sump Strainer Testing

This Supplement provides additional information supporting the resolution of Generic Letter 2004-02 for Watts Bar Nuclear Plant (WBN), Unit 1. This includes results and associated impacts for the updated sump strainer tests, clean strainer head loss reanalysis, Emergency Core Cooling System (ECCS) and Containment Spray (CS) pump net positive suction head (NPSH) margins, total strainer head loss, strainer structural qualification, and the required modifications.

Sump Strainer Testing Results

Testing of the WBN, Unit 1, containment emergency sump strainer was performed at Alden Labs from July 12, 2010, to July 16, 2010. The design basis debris loaded thin bed Test 4C (Enclosure 1, Attachment 2, Section 6.5), which resulted in a debris loaded head loss of 1.88 feet of water at 120°F measured from the test apparatus, will be credited as the test of record by WBN, Unit 1. At the temperature corrected maximum design sump temperature of 190°F, the debris loaded head loss is 1.09 feet of water. At the minimum 30-day design sump temperature of 99°F, the debris loaded head loss is 2.32 feet of water. The modifications to remove specific Min-K insulation from WBN, Unit 1, to allow Test 4C to be credited as the test of record are discussed in the "Required Modifications" section below.

Clean Strainer Head Loss Reanalysis

The clean strainer head loss was reanalyzed to ensure adequate NPSH margin for ECCS and CS pumps and to verify structural qualification of the strainer. A new clean strainer head loss of 1.98 feet at the maximum flow of 19,100 gallons per minute (gpm) was obtained, contingent upon modifications to replace the plenum top cover plate as discussed in the "Required Modifications" section below. Computational Fluid Dynamics (CFD) simulation modeling, which is a more accurate method of determining head than algebraic methods, was used to determine the clean strainer head loss. The model includes the containment area around the strainer module, the strainer modules, plenum, sump pit, the mesh screen inside the sump, and a small portion of the intake piping. The model itself is executed at the post-large break loss of coolant accident (LBLOCA) pool temperature of 120°F, which mirrors strainer test conditions. This reanalysis provided the pressure loss for multiple locations on the model, including the core tube exits, the plenum exit, and the model exit inside the intake piping.

The 1.98 feet of head loss was obtained after modifying the model with larger orifices, ranging in diameters from 6.5 to 8.0 inches. As determined using the CFD model, these proposed larger orifice diameters will reduce head loss in comparison to the head loss from the currently installed 5.0 and 5.5 inch orifices. These larger diameter orifices will also maintain flow balance through each of the 23 strainer modules.

ECCS and CS Pump NPSH Margins and Total Strainer Head Loss

The most limiting NPSH margin for recirculation from the sump is for the "B" Train CS pump at 4.7 feet, and is associated with a LBLOCA case, assuming water level at the minimum safe operating level at the top of the RHR sump strainer assembly and full ECCS and CS pump flows from the sump. NPSH margin are determined by finding the maximum possible CS pump flow rates during recirculation, assuming no ECCS pumps in operation and maximum sump temperature to maximize flow. The calculated maximum CS flow rate and the maximum ECCS flow rates are then used to determine the pump suction pressure, which along with static fluid height, vapor pressure, and absolute pressure, is used to calculate the NPSH margins for both small break loss-of-coolant accident and LBLOCA cases.

Strainer Structural Qualification

The sump strainers and the strainer plenum are structurally qualified using an input pressure load of 6.0 feet. All limiting components for both strainer modules will remain structurally qualified for over 6.0 feet of load, with the most limiting component remaining qualified up to 6.50 feet. The strainer assembly is evaluated for both seismic events and for pressure drop and debris loading resulting from a loss-of-coolant accident, where each portion of the strainer and plenum box is evaluated by calculating the interaction ratio for each strainer component using GTSTRUDL. The interaction ratio is the ratio of the calculated stress to the allowable stress as defined by applicable codes, standards, and regulations. Note that the structural calculations do account for the modifications being performed on the sump strainer assembly by assuming the openings in the plenum top cover plate are 8.0 inches in diameter, bounding the range of diameters being used as described in the "Required Modifications" section.

Required Modifications

WBN, Unit 1, will implement two modifications as a result of the additional strainer testing. The first modification will remove all Min-K fibrous insulation installations inside the zone of influence from lower containment and the second modification replaces the plenum cover plate with increased diameter orifices. Removal of all Min-K fibrous insulation in containment results in lower debris head loss across the strainer assembly. Additionally, replacement of the plenum cover plate with increased diameter orifices reduces clean strainer head loss by lowering flow losses across the orifices between the core tubes and the plenum cover plate.

Min-K insulation is used at WBN, Unit 1, in areas where close commodity clearances between cable conduits or trays and hot piping preclude the use of RMI. WBN, Unit 1, maintains strict control of insulation inside containment through use of design drawings and has identified 15 Min-K locations in lower containment requiring removal. The volume of each installation varies from 0.03 $feet^3$ to 0.94 ft^3, depending on the location. Some installations of Min-K insulation will remain in lower containment, outside the maximum 28.6 r/D zone of influence.

Each Min-K insulation installation will be replaced with reflective metallic insulation, with conduits and cable trays rerouted as necessary. The clearance distances given on design drawings were verified in walkdowns performed during the recent U1R10 outage.

The clean strainer head loss is calculated as 1.98 feet at the maximum flow of 19,100 gpm after installing the new plenum top cover plate with optimized larger orifice diameters. The optimized larger orifice diameters were calculated in order to reduce head loss while maintaining largely balanced flow through each module. The larger orifice diameters will be implemented by replacing the 9 orifice containing plenum top cover plates.

Insulation and plenum top cover plate replacement will be performed during the WBN, Unit 1, Cycle 11 outage scheduled for the fall of 2012.

ENCLOSURE 2

Generic Letter 2004-02 Regulatory Commitments for Watts Bar Nuclear Plant, Unit 1

REGULATORY COMMITMENTS

COMMITMENTS	COMPLETION DATE
Implement Design Change to Replace Plenum Cover Plate with Larger Orifice Sizes	Fall 2012 Refueling Outage
Implement Design Change to Remove Min-K Insulation	Fall 2012 Refueling Outage