UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 11, 2011

Mr. Ashok S. Bhatnagar
Senior Vice President
Nuclear Generation Development
and Construction
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 – REQUEST FOR ADDITIONAL INFORMATION REGARDING SEVERE ACCIDENT MANAGEMENT ALTERNATIVE REVIEW (TAC NO. MD8203)

Dear Mr. Bhatnagar:

By letter dated October 14, 2010 (Agencywide Documents Access and Management System Accession No. ML102910629), the Tennessee Valley Authority submitted an updated Severe Accident Management Alternatives (SAMA) for Watts Bar Nuclear Plant, Unit 2.

In an effort to complete the Nuclear Regulatory Commission staff review, enclosed is a request for additional information regarding the SAMA analysis.

A response is required 14 days from the date of this letter.

If you should have any questions, please contact me at 301-415-2048.

Sincerely,

Justin C. Poole, Project Manager
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-391

Enclosure:
Request for Additional Information

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REQUEST FOR ADDITIONAL INFROMATION

WATTS BAR NUCLEAR PLANT (WBN), UNIT 2

SEVERE ACCIDENT MITIGATION ALTERNATIVES

TENNESSEE VALLEY AUTHORITY (TVA)

DOCKET NO. 50-391

1. Provide the following information regarding the Probabilistic Risk Assessment (PRA) used for the updated Severe Accident Mitigation Alternative (SAMA) analysis:

   a. The submittal refers to a number of versions of the PRA, or PRA-related analyses, and a number of activities using different versions. Version of those mentioned include;

      IPE [Individual Plant Examination]
      IPEEE [Individual Plant Examination of External Events]
      WBN_U1_U2_Flood (Record Model)
      WBN_U1_U2_Flood_SAMA (SAMA Model)
      Unit 1 PRA model
      Unit 2 PRA model
      Dual unit model
      Current model of record
      WBN4SAMA

      The activities using different versions include;

      WOG [Westinghouse Owners Group] peer review
      NRC [Nuclear Regulatory Commission] Staff IPE review
      NRC Staff IPEEE review
      Changes to the PRA to resolve Level A and B F&Os [facts and observations]
      Original SAMA analysis
      Updated SAMA analysis

      Place the PRA versions in chronological order and include the dates. Identify which activity was performed on which versions adding any additional intermediate versions as necessary. Insofar as the requested history does not provide the information, provide the following:

      i. Identify the WBN Unit 2 PRA model that was peer reviewed.

      ii. Clarify the model that resolves the WOG peer review A and B F&Os (WBN_U1_U2_Flood or WBN_U1_U2_Flood_SAMA.). See Request for Additional Information (RAI) 1.b.ii below.

      iii. Provide a summary of the WBN Unit 2 PRA model development from Revision 4 of the WBN Unit 1 PRA to the Record Model inclusive. Include in the response the core damage frequency (CDF) and large early release frequency (LERF) for each revision and the most significant changes to each model to produce the succeeding model.

iv. The IPE submittal states that insights from the Unit 1 PRA model were incorporated into the development of the Unit 2 model. Clarify how Unit 1 PRA models were utilized in the dual unit model. Also clarify how the prior SAMA model, WBN4SAMA, was used to develop the record model or the dual unit model.

v. Identify the most significant changes in terms of impact on CDF or LERF and indicate if the change increased or decreased the CDF.

vi. Some of the changes to the Record Model used to produce the SAMA model appear to be the result of the resolution of the peer review F&Os. For example, Change 4 concerning the auxiliary feedwater (AFW) pump appears to address F&O 1-7, while Change 5 concerning battery board modeling appears to address F&O 1-5. It is stated in the updated submittal that all A and B F&Os were resolved in the "current model of record." If this refers to the Record Model (WBN_U1_U2_Flood), clarify why the changes were included in the listing.

b. TVA's response to NRC staff WBN Unit 2 IPE request for additional information RAI 7 indicates that corrections to the loss of emergency raw cooling water (ERCW) initiating event frequency would increase the frequency by over a factor of 10 and response to IPE RAI 9 indicated other corrections would increase the frequency by a factor of 5. The CDF for the loss of ERCW given in the Updated SAMA submittal is a factor of 5 lower than the value given in the IPE. While the use of the portable diesel driven fire pump indicated to be credited in the updated SAMA model would lead to a reduction in the loss of ERCW CDF, provide further discussion of the reason for the large reduction in loss-of-ERCW CDF.

c. Section 4.4 states that the Level 1 and Level 2 changes made for the updated SAMA analysis were independently reviewed. Provide more information on this review including by whom, scope of the review, and results.

d. Provide the CDF contribution due to station blackout (SBO), from both a loss of offsite power (LOSP) and as a consequence of other initiating events, and anticipated transient without scram (ATWS) events.

e. The risk profile, as indicated by the CDF contribution by initiating event for the updated SAMA model in Table 14c, is significantly different from that for the original SAMA analysis given in the response to original WBN2 SAMA RAI 1.a. For example, LOSP makes up 41 percent of the CDF for the updated model while it makes up 3 percent in the original analysis, total loss of ERCW makes up 6 percent of the CDF in the updated model versus 29 percent in the original analysis and a very small loss-of-coolant accident (LOCA) makes up <2 percent in the updated model (since a very small LOCA is not included in Table 14a with its Fussell-Vesely cutoff of 0.02) versus 37 percent in the original analysis. Explain the reasons for these differences.

f. The response to the original SAMA submittal RAI 1.e.i indicates that WBN Units 1 and 2 shared the electric power, ERCW, component cooling water system (CCS), plant and control air, and heating, ventilation and air conditioning (HVAC) systems. Discuss the modeling of these systems in the dual unit model including the inclusion of dual unit initiating events and assumptions concerning the availability of Unit 1 components/systems for both dual and Unit 2 initiating events.

g. The WBN Unit 2 IPE submittal states that the IPE is based on the Unit 1 design and operation as of April 1, 2008. Identify any implemented or planned physical or procedural modifications to Unit 1 or Unit 2 since that date (assuming that that freeze date is applicable to the SAMA model) that are expected to exist at the time of Unit 2 operation that could have a significant impact on the Unit 2 PRA or the SAMA analysis. Include those changes identified in the TVA response to original WBN Unit 2 SAMA submittal RAI 5.g, which describes a number of Phase I SAMAs that were considered implemented but not credited in the original WBN Unit 2 SAMA PRA. Provide a qualitative assessment of their impact on the PRA and the results of the SAMA analysis.

h. The WBN Unit 2 IPE summary report includes, as an Appendix, the details of 50 F&Os (presumably Level A and B) resulting from the WOG peer review. TVA's response to NRC staff IPE RAIs discusses the resolution of a number of these F&Os. For the Level A and B F&Os not discussed in the IPE RAI responses and those F&Os discussed in the RAI responses whose resolution had not been completed by the time of the response, provide a brief summary of the final resolution as incorporated in the Record Model or the SAMA Model, if different.

2. Provide the following information relative to the Level 2 PRA analysis used for the updated SAMA analysis:

   a. Except for the addition of release category (RC) IV, the discussion of nuclide releases in Section 4.6.4 appears to be almost identical to that in the original SAMA submittal, and the release characteristics provided in Tables 7 and 8 are (except for the RC IV) the same as those given in the original SAMA submittal with both referencing a 2007 Science Applications International Corporation report. This report, provided in response to an RAI, did not, however, independently develop these results. They were obtained as input from TVA. Since the Level 1 model used in the updated SAMA analysis is a CAFTA based model where sequences and end states might be different from those of the prior RISKMAN model, the linking of the Level 1 and Level 2 models would be expected to have been revised to accommodate the CAFTA model. In addition, the updated SAMA submittal states that the Record Model was revised to reassign the core damage sequences to a finer categorization of end states than used in the previous SAMA analysis.

      i. Describe in detail the linking of the Level 1 and Level 2 models for the updated SAMA analysis including identification of the core damage end states and any binning that is performed.

      ii. Provide the details of the assignment of the release categories to containment event tree (CET) endpoints including identification of the release categories and their frequencies.

      iii. Provide the details of the binning of the large number of CET end states into the five release categories (subsequently reduced to four) used for the Level 3 analysis.

iv. If the dominant core damage end state for each release category does not also lead to the largest expected consequence, discuss how the release characteristics for the release categories were determined.

v. Since the Level 2 model used for the Unit 2 SAMA analysis is different from that used for the Unit 2 IPE and subsequently peer reviewed by the WOG, describe how the technical adequacy of the SAMA Level 2 analysis was evaluated.

b. The level 2 model developed for the Unit 2 IPE is different from that used for the updated SAMA analysis with the latter being based primarily on the 1994 Unit 1 IPE model. The Unit 2 IPE model utilized different, updated, CETs and incorporated accident progression analysis results from Modular Accident Analysis Program (MAAP) 4.0.7 instead of the Unit 1 IPE's MAAP 3B analysis. The Unit 2 IPE model incorporated the Model D3 steam generators (SGs), which are less resistant to creep rupture than the Unit 1 SGs and presumably modeled in the Unit 1 IPE. The Unit 2 IPE model appears to be more current than the model used to support the SAMA calculations. Discuss the differences between the two models and the impact of the updated CETs, MAAP analysis, and differences in CET question split fractions on the overall results of release category frequencies, release fraction, and other characteristics.

c. Provide the LERF for the updated SAMA model and its basis. Note that this is different from the frequency for RC I which, while called LERF, actually incorporates Large Early Containment Failure sequences and has a CsI release fraction of less than 0.1, the usual criterion for determining if a release is large and can lead to early fatalities. Based on this the LERF for the updated SAMA model would be the RC II frequency or 3.5E-07 per year, which is considerably less than that from the IPE of 2.62E-06 per year.

d. The total of the four release category frequencies is 1.85E-05 per year (as per the column "SAMA Model Frequency" in Table 3), which is more than the total CDF of 1.72E-05 per year even though this release category total doesn't include RC V for intact containment. What is the frequency of RC V? Explain why the release frequency exceeds that total CDF.

3. Provide the following information regarding the treatment of external events in the SAMA analysis:

a. The total CDF for all fire areas considered in the Unit 2 IPEEE's Phase II, step 3 fire analyses is 8.3E-06 per year. Provide a summary discussion of the conservatisms and non-conservatisms in these fire CDFs and a best estimate of the total fire CDF.

b. The WBN Unit 2 IPEEE indicates that a modified version of the WBN plant model was used in the Phase II, step 3 quantitative evaluation of fire risk. Describe this model and its basis, and the impact on the fire CDF if the SAMA Model is utilized to determine the fire CDF instead of the PRA model used in the IPEEE analysis.

c. NRC Information Notice 2010-18, Generic Issue 199, "Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants," informs licensees that updated seismic data and models show increased seismic hazard estimates for some plants. The NRC report cited in the information notice estimates the "weakest link model" seismic CDF for WBN to be 3.6E-05 per year using 2008 U.S. Geologic Survey seismic hazard curves. If this is combined with a fire CDF of 8.3E-06 per year from the Unit 2 IPEEE, the total CDF for internal plus external events (assuming other external events make a negligible contribution) is 6.1E-05 per year. This corresponds to external events multiplier of at least 3.6 compared to the multiplier of 2 used in the updated SAMA assessment. Provide an assessment of the impact on the Phase I and II SAMA results (baseline and baseline with uncertainty – see RAI 6.b below) using an external events multiplier of at least 3.6, or justify a lower multiplier and provide an assessment of the impact of this multiplier on the SAMA results.

d. The TVA response to the original Unit 2 SAMA RAI 3.a does not fully dispose of the two issues identified in the NRC review of the Unit 1 IPEEE. Provide assurance that the fire risk assessment for WBN Unit 2 has considered the potential for multiple failures in nonsafety related control systems having an adverse impact on safety related protection systems. Also provide assurance that the WBN Unit 2 flooding analysis has considered the potential for flooding and/or water intrusion affecting safety related equipment either directly or indirectly through flooding and/or water intrusion on multiple trains of nonsafety related equipment.

e. In presenting the quantitative strategy for external events, please address the following:

   i. In discussing fire risk, the contributions from interfacing-systems LOCAs (ISLOCAs) and reactor coolant pump (RCP) seal LOCAs are assumed to be bounded by the internal events contributions. Discuss whether it is possible that fire-induced failures could render these more likely than for internal events, given the potential for not necessarily improbable fire-induced spurious operations of valves that, in the internal events CDF, were random events of typically very low probability. If so, discuss how this has been addressed in the SAMA analysis. If not, provide the justification.

   ii. If the process of resolving (i) above causes a potential increase in any of the benefit evaluations involving ISLOCA frequency associated with previously identified SAMAs (including ones that might no longer merit screening out in Phase I (e.g., SAMAs 95, 112 [retained for Phase II], 115 [which includes 178], 116 [which includes 237]), and 184)) or any potential new SAMAs, provide an updated cost-benefit evaluation of those SAMAs.

4. Provide the following information with regard to the selection and screening of Phase I SAMA candidates:

   a. Section 6.2 describes the SAMA identification from the results of the latest WBN Unit 2 PRA indicating that the reviews of importance ranking were down to a risk reduction worth (RRW) of 1.02 for most basic events, 1.007 for operator actions and 1.13 for LERF contributors. The lower RRW cutoff should be based on an assessment of the value of the maximum potential benefit if the failure indicated by the basic event is eliminated that would not exceed the minimum SAMA cost. The minimum SAMA cost given in Table 17 is $26,773 (except for one somewhat unique SAMA, SAMA 256, which is $19,608). This corresponds to an RRW of 1.008 for an external events multiplier of 2.0 or 1.005 (1.0045) for the external events multiplier of 3.6 identified in RAI 3.c above.

i. Extend the identification of SAMAs for the Unit 2 SAMA model CDF importance lists down to 1.005 or justify a higher RRW review cutoff.

ii. For LERF, determine the appropriate RRW cutoff consistent with the above but based on the updated SAMA model rather than the Unit 2 IPE and provide the results of the extended SAMA identification.

iii. In providing the results of this review, identify for each basic event above the RRW cutoff the applicable SAMA or SAMAs or why no SAMA is considered. The current table organization makes it difficult to trace the completeness of the SAMA identification process.

b. The response to the original WBN Unit 2 SAMA RAI 5.a discusses the disposition of several insights and recommendations included in the WBN1 IPE update. With regard to these responses:

i. The response for Item 2 indicates that the use of the containment spray pumps for emergency core cooling system (ECCS) recirculation was considered in Phase1 SAMAs 31, 32 and 33. However, while these SAMAs address ECCS recirculation, none explicitly addresses the use of the containment spray pumps. Revise the assessment to include of the use of containment spray pumps.

ii. The response to Item 4, which recommends consideration of using the other unit's shutdown board and bypass of feedwater isolation under emergency conditions, references SAMA 78. This SAMA addresses the use of the startup feedwater pump but does not address the recommendation in Item 4. Revise the assessment of this item to address the IPE recommendation for the use of the other unit's shutdown board and bypass of feedwater isolation under emergency conditions.

iii. The response to Item 9, which recommends consideration of using fire suppression water for cooling the centrifugal charging pumps (CCPs), references SAMA 64. This SAMA is intended to address the use of fire water for the CCS or the cross-tying of CCS headers but the resolution does not address the recommendation in Item 9. Revise the assessment of this item to address the IPE recommendation to provide fire water to the CCPs.

c. RAI 5.e on the original WBN Unit 2 SAMA submittal requested the identification of potential SAMAs that address the limiting seismic failure modes for plant components identified in the WBN Unit 1 IPEEE with high confidence low probability of failure (HCLPF) values low enough to possibly contribute significantly to a seismic CDF. While the response to this RAI cited a number of SAMAs addressing seismic failures, most were screened out based on passing the IPEEE seismic margin review. Either justify that the IPEEE seismic margin review does not screen out potentially cost effective SAMAs given today's understanding of seismic hazard at the WBN Unit 2 site (see RAI 3.c above), or provide an assessment of the significance to seismic CDF of the items with HCLPFs of less than 0.7 g (the value corresponding to a seismic CDF approximately equal to the internal events CDF) and of the feasibility of SAMAs that would address these items.

d. The WBN Unit 2 IPEEE describes an assessment of the WBN Unit 2 fire risks and includes a detailed quantitative assessment (Phase II, Step 3) of fire CDF for areas that were not earlier screened out. The response to RAI 5.f of the original WBN Unit 2 SAMA submittal identified a number of generic (that is, not WBN Unit 2 specific) SAMAs that were included in the WBN Unit 2 SAMA analysis and stated to address the important WBN Unit 1 fire risk contributors. The response did not specifically address the important fire risk sequences as requested. For each of the fire sequences identified in the WBN Unit 2 IPEEE with a CDF greater than 3E-07 per year (corresponding to a benefit of approximately $27,000 – the minimum for procedure change and training), identify potential SAMAs that might reduce the fire risk, either individually or as a group, and justify why these SAMAs should not be considered further.

e. RAI 5.h of the original WBN Unit 2 SAMA submittal requested additional justification for the Phase I screening of certain SAMAs. Further information is needed for following responses:

    i. SAMA 5 to provide DC bus cross-ties is screened out as having very low benefit on the basis of the availability of AC bus cross-ties and a spare #5 vital battery that can be connected to any of the four DC buses. The AC cross-ties are not expected to have a benefit for SBO conditions and are not included in the PRA model. However, the availability of the spare #5 battery would be beneficial. While the SAMA analysis implies that a means of cross-tying DC buses is available, it would be necessary to proceduralize its use. The WBN Unit 2 IPE indicates that two battery failures have RRWs in the range of 1.02 to 1.01 and therefore battery failures cannot be considered to be low benefit (see RAI 4.a above). Provide further justification that the DC cross-ties should not be included in the Phase 2 analysis.

    ii. SAMA 29 to provide capability for alternate injection via diesel driven fire pump is screened out as having very low benefit on the basis of not providing a recirculation path and the need to depressurize the reactor coolant system (RCS) to less than 150 psig which requires an excessive inventory of makeup. As WBN Unit 2 already has procedures for RCS depressurization (see response to RAI 4.h.vi of the original WBN Unit 2 SAMA submittal), further support the screening of this item including quantification of the statement concerning requiring an excessive inventory of makeup.

    iii. SAMA 48 to add caps to the component cooling water system drain and vent valves was screened out because the intent of this SAMA has been achieved based on a greater probability of failure of the socket weld connection than of the drain valve itself. In response to the original RAI, failure probabilities are provided that indicate this is not true and it is further argued that, since the proposed caps need to be removable, their failure probability following re-installation is judged to be higher than the failure of the seated valve itself. While the latter may be true, this is not a justification for not adding the caps since failures of both the valve and caps are necessary to result in a leak. Provide justification for not considering this SAMA further.

iv. SAMA 58 to install improved reactor coolant pump seals was screened out as not being applicable based on the cost for a new design by Westinghouse not being available and, hence, since this SAMA is not under TVA control, no cost benefit analysis can be performed. In response to an RAI to the original WBN Unit 2 SAMA submittal (RAI 5.h.x), TVA indicates that a cost estimate is available and that, while not cost beneficial in the base analysis, it would be at the 95th percentile. Even so, TVA states that this SAMA would not be considered further for implementation. The benefit for this SAMA would be the same as that determined for SAMA 215 in the updated SAMA analysis or $963,504. If this is adjusted for the increased external events multiplier described in RAI 3.c above, the benefit would be $1,734,000 in the baseline evaluation. This results in a benefit/cost ratio of 1.6 using the cost of $1,100,000 per unit given in the RAI response. The benefit/cost ratio increases to 3.1 in the uncertainty evaluation. Include this SAMA for future implementation, or provide justification for why it should not be implemented.

v. The response to RAI 5.h.xiii on SAMA 80 to provide a redundant train or means of ventilation indicates, in addition to chillers being upgraded, that heatup calculations are being updated. The dispositions of SAMAs 278 and 160 in Table 16 of the updated SAMA submittal also address HVAC requirements repeating that heatup calculations are being updated (SAMA 278) and describing rooms that do and do not need room cooling and compensatory measures for the diesel generator electric board rooms. In addition, two board room exhaust fan basic events have RRWs above the 1.02 screening criteria (and more may be above the 1.005 screening criteria identified in RAI 4.a above). Provide the following: an updated listing of the important HVAC/room cooling failures, the extent to which compensatory measures are proceduralized and incorporated for the important HVAC/room cooling failures, and the status and expected completion date for the room heatup calculation update.

vi. The response to RAI 5.h.xiv dismisses SAMA 111 that would reduce ISLOCA frequency on the basis that ISLOCAs contribute 0.09 percent of the CDF. Table 4 of the updated SAMA submittal indicates that ISLOCAs are one of the principal contributors to release category II. Provide further justification for screening SAMA 111.

f. SAMA 183 related to general internal flood prevention and mitigation enhancements is screened out as having a very low benefit. In contrast, SAMAs 293 and 294, to eliminate flood propagation paths, are added to the Phase I SAMA list because of two internal flood sequences that had RRWs greater than 1.02. TVA has committed to implement these SAMAs. However, the list of commitments in Enclosure 2 of the updated SAMA submittal does not include commitments for these two SAMAs. Clarify this discrepancy.

g. SAMA 242 was screened out in Phase I as having excessive implementation cost. The cost benefit analysis of SAMA 255, permanent dedicated generator for the normal charging pump, one motor driven AFW pump and a battery charger, is stated to be similar to SAMA 242, permanent dedicated generator for the normal charging pump with local operation of the turbine-driven (TD) AFW pump after 125V battery depletion, except it addresses the additional scenarios in which the TDAFW pump is unavailable. Since the cost for SAMA 242 is expected to be less than that for SAMA 255, SAMA 242 should not have been screened out in Phase 1. Provide a Phase 2 cost benefit analysis for SAMA 242.

h. SAMA 296, to improve training and procedures to respond to loss of both trains of AFW actuation signal, was screened out on the basis the event importance was reduced to less than 1 percent by changes in initiating event frequency. Reconsider this SAMA using the lower screening threshold discussed in RAI 4.a above.

5. Provide the following information with regard to the Phase II cost-benefit evaluations:

   a. The response to RAI 6.a on the original SAMA submittal discussed the basis for the cost estimates used in the SAMA cost benefit analysis. Clarify whether the costs associated with procedure development and training was included in the cost estimates.

   b. RAI 6.c on the original SAMA submittal requested a discussion of the impact on cost of savings due to implementation of SAMAs on both units. The response to this RAI appears to imply that the costs used for the Unit 2 SAMA analysis are a two-unit total. Since the benefits associated with a SAMA are based on a single unit, the costs must also be on a per unit basis. Clarify this and, if necessary, provide the costs of each SAMA on a per unit basis and a re-assessment of impacted SAMAs.

   c. For each Phase 2 SAMA provide the frequency of each release category, the population dose risk, and the offsite economic cost risk.

   d. For SAMA 45, to enhance procedural guidance for the use of cross-tied component cooling or service water pumps, the risk benefit was assessed by setting the human action to cross-tie opposite unit and train ERCW headers for charging pump cooling as guaranteed success. Since the CCS supplies more than just the charging pump cooling, it is not obvious that this provides a complete assessment of the benefit of this SAMA. Justify this assumption.

   e. For SAMA 70, install accumulators for turbine-driven auxiliary feedwater pump flow control valves, the risk benefit is stated to be bounded by eliminating the cognitive portion of human error to restore AFW control following loss of instrument air while the risk model was revised to remove the four level control valves dependence on auxiliary control air system. Explain the apparent inconsistency in these two statements and, in particular, how the removal of the cognitive human error appropriately models the addition of accumulators.

   f. For SAMA 93, install an unfiltered hardened containment vent to eliminate the containment overpressure failure; the assumptions for determining the risk benefits are not clear. Provide additional information on the adjustments made to the LATE release category.

g. For SAMA 110, erect a barrier that would provide enhanced protection of the containment walls (shell) from ejected core debris following a core-melt scenario at high pressure, the benefit is estimated by removing the rocket mode and ex-vessel steam explosion failure modes from the containment event tree. Provide additional information that supports the use of these two failure modes to determine the benefit of removing the seemingly unrelated shell failure due to debris impingement mode.

h. For SAMA 215, provide a means to ensure RCP seal cooling so that RCP seal LOCAs are precluded for SBO events, the benefit was assessed by modifying RCP seal LOCA probabilities. The description of the SAMA indicates that the change considered would also benefit the loss of ESW and loss of component cooling water events in addition to SBO events. Confirm that the changes in seal LOCA probabilities were made for all these events in determining the benefit of this SAMA.

i. The determination of the risk benefit for SAMA 299, initiate frequent awareness training for plant operators/maintenance/testing staff on key human actions for plant risk, and SAMA 300, revise procedure FR-H.1 to eliminate or simplify complex (and/or) decision logic for establishing feed and bleed cooling and to improve operator recovery from initial mistakes, both involve reducing human errors associated with CDF and release categories. For SAMA 299, key human actions are reduced while, for SAMA 300 only, those associated with bleed and feed were reduced. It would be expected that the former would have a greater risk benefit than the latter since the latter is a subset of the former. While this is true for net benefit, it is not true for the CDF. Explain this discrepancy and provide more details on the magnitude of the human error reduction in each case.

j. SAMAs 303 and 305 both involve actions to reduce operator error to initiate hydrogen igniters. The risk benefit for both was stated to be determined by setting the human action to place igniters in service as success. The net benefit for the two are however significantly different, $1,168 for SAMA 303 and $100,735 for SAMA 305. Explain the apparent discrepancy.

k. Conflicting information is provided for the costs associated with several SAMAs. For SAMA 32, the response to original SAMA submittal RAI 6.h gives a cost of $1.5M while $2.1M was used in the updated cost benefit analysis. For SAMA 56, the original submittal cost was given as $2.4M, RAI 6.h response gives $4.0M while the updated cost benefit uses $8.23M. For SAMA 103, Table 16 of the updated submittal cites a cost of $2M to $5M while the updated cost benefit uses $8M. For SAMA 280, the response to original SAMA submittal RAI 6.h gives a cost of $387K while $815K was used in the updated cost benefit analysis. Discuss the reasons for these differences and justify the cost used in the updated C/B analysis.

6. Provide an assessment (similar to that provided in response to RAI 7.a on the original SAMA submittal) of whether any of the Phase I SAMAs screened due to excessive implementation costs or very low benefit should be retained for a Phase II evaluation based on the 95th percentile results for CDF and LERF and incorporating the higher external events multiplier discussed in RAI 3.c above. Provide a Phase II evaluation for any retained SAMAs.

7. The TVA response to original SAMA submittal RAI 8.a concerning the use of a gagging device to close a stuck open SG safety valve is that it is not practical at WBN due to design and location of these valves and would result in significant hazard to plant personnel. Elaborate on the design features and location issues and the specific hazards involved.

Mr. Ashok S. Bhatnagar
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and Construction
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6A Lookout Place
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Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 – REQUEST FOR ADDITIONAL INFORMATION REGARDING SEVERE ACCIDENT MANAGEMENT ALTERNATIVE REVIEW (TAC NO. MD8203)

Dear Mr. Bhatnagar:

By letter dated October 14, 2010 (Agencywide Documents Access and Management System Accession No. ML102910629), the Tennessee Valley Authority submitted an updated Severe Accident Management Alternatives (SAMA) for Watts Bar Nuclear Plant, Unit 2.

In an effort to complete the Nuclear Regulatory Commission staff review, enclosed is a request for additional information regarding the SAMA analysis.

A response is required 14 days from the date of this letter.

If you should have any questions, please contact me at 301-415-2048.

Sincerely,

/RA/

Justin C. Poole, Project Manager
Watts Bar Special Projects Branch
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Docket No. 50-391

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