Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

October 28, 2011

10 CFR 50.4

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

Watts Bar Nuclear Plant, Unit 2
NRC Docket No. 50-391

Subject: **WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 – REQUEST FOR ADDITIONAL INFORMATION (RAI) GROUP 8 REGARDING "FIRE PROTECTION REPORT" (TAC NO. ME3091)**

References:
1. Email from Justin Poole (NRC) to Gordon Arent (TVA), dated September 30, 2011, "WBN Group 8 (ML 11286A038)"
2. Email from Justin Poole (NRC) to Gordon Arent (TVA), dated September 30, 2011, "WBN Group 8 (ML 11286A035)"
3. TVA letter to NRC dated September 30, 2011, "Watts Bar Nuclear Plant (WBN) Unit 2 - Request for Additional Information (RAI) Group 7 Regarding 'Fire Protection Report' (TAC NO. ME3091)"
4. NRC letter to TVA dated September 14, 2011, "Watts Bar Nuclear Plant, Unit 2 - Request for Additional Information Regarding Final Safety Analysis Report Amendment Related to Section 9.5.1 'Fire Protection System' Group 7 (TAC NO. ME3091)"

The purpose of this letter is to respond to NRC's Group 8 RAIs pertaining to WBN Unit 1/Unit 2 Fire Protection Report contained in References 1 and 2 and to provide responses to NRC follow-up questions received in an email from NRC on October 12, 2011. NRC's follow-up questions pertained to TVA responses (Reference 3) to NRC's Group 7 RAIs transmitted to TVA in letter dated September 14, 2011 (Reference 4). Enclosure 1 to this letter provides TVA's responses to both NRC's Group 8 questions and Group 7 follow-up questions. Enclosure 2 provides the new Regulatory Commitments contained in this letter.

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If you have any questions, please contact Gordon Arent at (423) 365-2004.

I declare under the penalty of perjury that the foregoing is true and correct. Executed on the 28th day of October, 2011.

Respectfully,

David Stinson
Watts Bar Unit 2 Vice President

Enclosures:

1. Response to NRC's Request for Information Regarding "Fire Protection Report"
2. New Regulatory Commitments

cc (Enclosures):

U. S. Nuclear Regulatory Commission
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245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

NRC Resident Inspector Unit 2
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ENCLOSURE 1

Response to NRC's Group 8 Request for Information Regarding "Fire Protection Report"

References: 1. Email from Justin Poole (NRC) to Gordon Arent (TVA), dated September 30, 2011, "WBN Group 8 (ML 11286A038)"

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4. NRC letter to TVA dated September 14, 2011, "Watts Bar Nuclear Plant, Unit 2 - Request for Additional Information Regarding Final Safety Analysis Report Amendment Related to Section 9.5.1 'Fire Protection System' Group 7 (TAC NO. ME3091)"

5. NRC letter to TVA dated September 1, 2011, titled: "Watts Bar Nuclear Plant, Unit 1 - Issuance of Amendment Regarding Total Flooding Automatic Carbon Dioxide Fire Suppression System Installed in the Auxiliary Instrument Room (TAC NO. ME2532)"

The following provides TVA's response to NRC's Group 8 requests for additional information (RAIs) pertaining to WBN Unit 1/Unit 2 Fire Protection Report (FPR) contained in References 1 and 2, as well as TVA's response to follow-up questions received in an email from NRC on October 12, 2011. NRC's follow-up questions pertained to TVA responses (Reference 3) to NRC's Group 7 RAIs transmitted to TVA in letter dated September 14, 2011 (Reference 4).

NRC's numbering system will be referenced to identify each question. Some NRC questions have been subdivided for clarity of response. For some NRC RAIs, this letter provides TVA's initial response. For the other NRC RAIs in this letter, a response has been provided in previous TVA letters to the NRC, and the NRC has subsequently requested additional information. For these requests, the initial TVA response is not repeated below. The additional NRC information requests are identified in this letter as "**Follow-up NRC Requests**". TVA responses to these items are identified as "**TVA Response to Follow-up NRC Request**".

1. *NRC Question (RAI FPR I-4)*

The separation requirements of Appendix R to 10 CFR 50 are applicable in areas containing redundant trains of fire safe shutdown (FSSD) equipment or cables. However, this information does not appear to be readily available in the FPR in an easily identifiable format. For instance, Table I-1 indicates which rooms contain safe shutdown equipment but does not indicate whether these rooms contain credited or redundant trains of equipment or both. Additionally, Part III, Section 10.3.1, of the FPR states that TVA performed an evaluation for each analysis volume to ensure compliance with Appendix R Section III.G.2.

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Response to NRC's Group 8 Request for Information Regarding "Fire Protection Report"

[1] Identify all rooms and analysis volumes containing redundant trains of FSSD equipment or cables and state whether they comply with the requirements contained in Section III.G.2 of Appendix R. [2] Where explicit compliance is not provided, describe the method used to achieve an equivalent level of protection to that intended by Appendix R. [3] Include a description of the spatial separation between redundant trains, proximity to in situ and transient combustibles, automatic fire detection and suppression systems, and installed fire barriers.

TVA Response:

[1] WBN uses the System Assurance and Fire Protection Engineering (SAFE) module, an engineering analysis tool that performs system failure analysis by evaluating the consequences of failed cables, equipment, and systems. The SAFE software application uses relational databases to evaluate multiple paths of equipment, cables, and required support equipment to achieve each required safe shutdown performance goal. The analysis is applied to each analysis volume (AV) without predetermining the existence of redundant trains. As described in the FPR Part III, Section 10, Safe Shutdown System Separation Evaluation Methodology, the analysis assumes failure of all cables and equipment in the AV (the analysis considers more than the availability of one train of each component).

[2] If none of the success paths for a performance goal are free of fire damage, cables for one path are either relocated out of the AV; protected with electrical raceway fire barrier system (ERFBS) in accordance with Appendix R, Section III.G.2.c; or manual operation of equipment is credited in accordance with Regulatory Guide 1.189, Section 5.3.1. This methodology ensures all AVs comply with Appendix R Sections III.G.1 or III.G.2 except for AV-076 (Control Building), which complies with III.G.3.

The evaluation of each AV in Part VI includes a listing of ERFBS protected cables and a listing of operator manual actions applicable to that AV. These listings identify the cable or component credited to resolve the redundancy issue found in the AV. AV evaluations with no ERFBS or operator manual actions do not contain redundant equipment or cables.

[3] Twenty feet horizontal separation between redundant cables or components is generally only credited in the soft boundaries between AVs as described in Part III, Section 10.3.1. There are a few individual cases crediting 20 feet horizontal separations within an AV. These are identified in the AV's evaluation in Part VI.

Where explicit compliance to III.G.2 is not provided, WBN used the deviation process. Those deviations are contained in Part VII, Section 2, items 2.4, 2.5 and 2.6 of the FPR. These deviations were previously reviewed and approved by NRC in SSER 18,

Section 6.4, Intervening Combustibles – "In addition, the coverage provided by the ceiling sprinklers should produce sufficient cooling to reduce the likelihood that fire will propagate across the intervening space between the redundant trains. Therefore, considering the enhanced distribution of sprinklers in these intervening combustible spaces and the additional sprinklers provided under intermediate level obstructions, the

staff concludes that the presence of intervening combustibles as fire hazards between redundant trains of safe-shutdown functions is adequately mitigated by the sprinkler design. Accordingly, the staff finds acceptable the applicant's request to deviate from the requirements of Section III.G.2.b of Appendix R to 10 CFR Part 50."

Section 6.5, Partial Fire Wall Between Component Cooling Water System Pumps – Until the fire is suppressed, the partial-height wall will shield the pumps from radiant heat on one side and from fire on the other. Therefore, the partial-height wall is an acceptable deviation from the technical requirements of Section III.G of Appendix R to 10 CFR Part 50.

Section 6.6, Openings in Fire Barriers – This section contains three conditions for which WBN requested deviations: (1) the wall and floor to the ventilation and purge air rooms have HVAC duct penetrations without fire dampers; (2) the walls in the Intake Pumping Station separating the ERCW pumps from the traveling screen room have unprotected scupper openings; (3) floor slabs in the auxiliary building have HVAC duct penetrations without fire damper and stairwells and equipment hatch that are provided with water curtains in lieu of rated barriers. NRC also identified several other conditions similar to (3) such as spare conduit sleeves with threaded conduit plugs and waste gas ducts without fire dampers

NRC concluded the following for each of the 6.6 deviations above:

1) "Therefore, this duct configuration is an acceptable deviation from Section D.1.j of Appendix A to BTP (APCSB) 9.5-1 and Sections III.G.2.a and c of Appendix R to 10 CFR Part 50.

2) "Therefore, this scupper configuration is an acceptable deviation from Position D.1.j of Appendix A to BTP APCSB 9.5-1 and Sections III.G.2.a and c of Appendix R to 10 CFR Part 50."

3) "The absence of continuous fire-rated construction at the above-referenced stairways, hatchways, and conduit sleeves is an acceptable deviation from the guidelines of Section D.1 of Appendix A to BTP (APCSB) 9.5-1." "The absence of these fire dampers in the waste gas system is acceptable because the applicant has complied with Section III.G.2.B of Appendix R to 10 CFR Part 50."

For more information on this see SSER 18 Sections 3.1.1, 3.2.1, 3.7.1, 4.2.1, 4.3, 6.4 and 6.8.

2. *NRC Question (RAI FPR IV-5)*

Part VI of the FPR lists alternate shutdown operator manual actions for a fire in Fire Area 48. The feasibility criteria for these manual actions are not explicitly described in Part IV, "Alternate Shutdown Capability". Part V, "Manual Actions, Repairs, and Emergency Lighting," Section 2.1.2, does include operator manual action acceptance criteria, but it is

not clear to the staff reviewers that alternate shutdown operator manual actions are included in that review.

[1] Confirm that operator manual actions for alternate shutdown have been evaluated using the feasibility and reliability analysis criteria in Section 2.1.1 of Part V, and that the evaluation used the acceptance criteria in Section 2.1.2 of Part V. [2] Also, confirm that the walk downs described in Section 2.2.1 of Part V have been performed for alternate shutdown operator manual actions and that the timing of those walkdowns has considered that the control room operators will need to travel from the Main Control Room to the Auxiliary Control Room as part of the timeline.

[3] If the above confirmations cannot be provided, provide a description of the feasibility criteria for operator manual actions performed for alternative shutdown. The discussion should confirm that these operator manual actions have been walked down and confirm that travel time from the Main Control Room to the Auxiliary Control Room has been considered.

TVA Response:

[1] Operator manual actions for alternate shutdown have been evaluated using the feasibility and reliability analysis criteria in Section 2.1.1 of Part V, and the evaluation used the acceptance criteria in Section 2.1.2 of Part V which is the same criteria used in all other OMAs. The FPR Part V, Section 2.1 will be revised as follows:

"2.1 OMAs are evaluated to ensure they are feasible (can be performed) and that they are reliable (can be performed reliably under a wide range of plant conditions that an operator might encounter during a fire). Feasibility and reliability of WBN OMA ***(including OMAs for Control Room abandonment)*** are evaluated to the criteria below which are based on the criteria and technical bases provided in NUREG 1852; "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire" (Reference Part II 4.2.27)."

[2] Performance demonstration walkdowns described in Section 2.2.1 of Part V will be performed for alternate shutdown operator manual actions and the timing of those walkdowns for Unit 2 will consider that the control room operators will need to travel from the Main Control Room to the Auxiliary Control Room or other Auxiliary Control System (ACS) locations, as applicable. Auxiliary Unit Operators (AUOs) would assemble near the Auxiliary Control Room rather than the Main Control Room for a fire in the Control Building. (See Item 3. below for additional information) These performance demonstration walkdowns will be performed prior to Unit 2 fuel load.

[3] N/A

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3. *NRC Question (RAI FPR V-17)*

Part V, Section 2.2, item 5, states, "For a fire located in the control building . . ., notify Appendix R AUOs to report to the control room . . ." Section 2.2.2 states that operators performing manual actions are dispatched, ". . . from the Auxiliary Control Room for Control Building fires."

***[1]** Confirm that the statement in Section 2.2.2 is the appropriate statement. **[2]** If not, provide an explanation of how Appendix R AUOs are assured access to the control room since access to the control room could be impeded by fire, fire products, or gaseous suppression system actuation.*

***[3]** In either case, correct the inconsistency.*

TVA Response:

[1] Both statements are correct. With respect to Part V, Section 2.2, Item 5, the plant fire protection procedure (AOI 30.1) directs the AUOs to report to the Control Room. This is expected to be accomplished upon confirmation of a fire in the Control, Auxiliary, or Reactor buildings and prior to tripping the reactor. If the fire is in the Control Building and the SRO/Shift Manager determines that the Control Room must be abandoned, then the AUOs will move to the Auxiliary Control Room and be dispatched from there, per Part V, Section 2.2.2.

[2] See [1] above.

[3] See [1] above.

4. *NRC Question (RAI FPR VI-12)*

It is unclear to the reviewers why the Diesel Generator Building Pipe Gallery and Corridor (room 742.0-D9) was subdivided into three subsections (742.0-A, -B, -N) and two Analysis Volumes (AV-089A and -089B). Part VI, Section 3.59.3, of the FPR indicates that neither power supplies nor major equipment will be affected by a fire in either Analysis Volume. This does not align with the need to partition this room.

Provide an explanation for why this area was split up when the safe shutdown analysis was performed.

TVA Response:

The Unit 1 analysis was performed with this configuration; therefore, Unit 2 analysis used the same configuration. The original Unit 1 analysis used this configuration to evaluate availability of one train of EDGs for fires in any location in the Diesel Generator Building. Since offsite power proved to be available for all fires in the Diesel Generator Building, onsite power is not credited. The combined plant analysis confirmed that a fire in AV-081A and AV-081B (these are the correct AVs for the corridor, not AV-089A and -089B) does not

impact major equipment required to achieve and maintain fire safe shutdown. This is documented in the FPR for completeness.

5. *NRC Question (RAI FPR VII-27)*

Part VII, Section 6.2 "Justification for Fire Damper Surveillance Requirements," of the FPR states that the surveillances cannot be performed because of ALARA concerns. Examination of Part VI, Section 3.22.1, indicates that these dampers are in ducts that connect rooms 737.0-A5 and 737.0-A1 (damper 0-ISD-31-3846) or rooms 737.0-A5 and 729.0-A6 (dampers 0-ISD-31-3847 and 0-ISD-31-3828). None of these three rooms is on the list of inaccessible high radiation areas in Part II of the FPR.

1. *More clearly describe the nature of the ALARA concern for performing these surveillances.*

2. *The descriptions of the locations of the fire dampers are confusing. More clearly describe the physical location of the dampers. For example, are they located in the wall of room 737.0-A5?*

3. *Where is the collector box identified as the start of the duct in Section 6.2.2.1 located? For example, is it in the wall of the fuel transfer canal?*

4. *Is the "fuel transfer canal" (Section 6.2.2.1) the same location as the "Spent Fuel Pit" (Section 6.2.2.2)?*

5. *Is the large (64 inch by 54 inch) duct mentioned for each of the three dampers the same duct?*

6. *Examination of Part VI, Section 3.22.1 reveals other dampers (specifically -3845 and -3849) that superficially match those that are evaluated in Section 6.2. Confirm that all of the dampers covered by the ALARA concern identified in Section 6.2 have been evaluated.*

7. *The evaluations in Section 6.2 seem to be focused on Unit 1 (room 737.0-A5 is the Unit 1 Ventilation and Purge Air Room). Will there be a corresponding Unit 2 evaluation? If so, when will that be submitted to the NRC?*

It would be appropriate to modify the FPR to incorporate the answer to this RAI.

TVA Response:

[1] The location of the dampers does not involve high radiation areas, but access to these ducts would involve potentially contaminated areas. The beginning of Section 6.2.2 states "The following fire dampers are located in high radiation or contaminated areas and to keep radiation exposure levels as low as reasonably achievable are considered to be inaccessible." The word "high radiation" will be deleted from sentences in 6.2, and this will be in the next FPR submittal.

The only exposed portion of the ducts (approximately 2 feet from the concrete wall and the larger collector duct) is in room 737.0-A5, and the overhead area in this room is considered a contaminated area. The round ducts (for Spent Fuel Pit) associated with dampers 3847 and 3848 are wrapped in an expanded metal lathe and coated with two inches of Pyrocrete in room 729.0-A6 and the rest of the ducts are embedded in concrete. The round duct (for Fuel Transfer Canal) associated with damper 3846 is embedded in concrete and is only exposed for approximately 2 feet from the concrete wall to the large collector duct in 737.0-A5. There are no access doors in the round ducts to allow for visual inspection. Addition of access doors would expose personnel to potential contamination and then the periodic inspections would also expose personnel to potential contamination. The fire hazards in room 737.0-A5 do not present a threat to the duct or barrier, but the contamination exposure to personnel does present a hazard; and it was concluded prior to Unit 1 licensing that the as low as reasonably achievable (ALARA) concern outweighed the fire hazard.

[2] The dampers are located in the A5 column line wall. See Drawing No. 47W920-7, contained in the Attachment.

[3] As can be seen on the attached drawing, there are three collector boxes. One is in the Fuel Transfer Canal wall and two are in the Spent Fuel Pit walls.

[4] The "Spent Fuel Pit" and the "Fuel Transfer Canal" are two distinct features (pits). They are normally isolated from each other by a removable gate so they can be connected during fuel movement. The Spent Fuel Pit is full of water and the Fuel Transfer Canal is normally full of water. Both are located in the Refueling Room, Rm. 757.0-A13. (See Attachment.)

[5] Yes. The duct is 64 inches by 54 inches but narrows down to 58 inches by 54 inches as shown on the Attachment. The ducts associated with dampers 3847 and 3848 enter the duct where it is 58 inches by 54 inches, and the duct associated with damper 3846 enters the duct where it is 64 inches by 54 inches. The next revision to the FPR will be clarified to address the collector duct size.

[6] The other two identified dampers are in normal duct work and are under the normal inspection program. The three dampers associated with the Fuel Canal and Spent Fuel Pit are the only dampers applicable to the deviation.

[7] There is no corresponding Unit 2 configuration.

6. NRC Question (RAI FPR VII-28)

Part VII, Section 2.7, of the FPR indicates that the hand-held portable lanterns, provided in lieu of installed emergency lights, are dedicated and maintained.

[1] Provide the methods used to ensure that the portable lanterns are dedicated for manual actions in containment and for other post-fire manual actions. ***[2]*** *Additionally, provide the*

methods used to maintain the lanterns to ensure that they will provide sufficient lighting for operators to perform the manual actions.

TVA Response:

[1] Ten hand lanterns are staged, in two strategic locations, five lanterns in each location, dedicated to the Appendix R AUOs. These two locations are cages of fire response equipment with restricted access. One cage is in the Auxiliary Building, el. 757.0 in the 480V Shutdown Board Room 1B, and one cage is in the Service Building breezeway next to the Turbine Building, el. 729.0 above and just south of the entrance to the radiological controlled area (RCA) at the Auxiliary Building el. 713.0. These lights are inventoried every 13 weeks in accordance with preventive maintenance procedure WBN PM 0-FPS-777-EQUIP, "Emergency Equipment Storage Locations," to ensure they are in these specified locations.

[2] The hand lanterns are placed on charge within these cages from the plant's 120 VAC lighting system. These lights are inventoried to ensure they are in their assigned location, operated to ensure they will illuminate, and are verified to be on charge every 13 weeks. The hand lanterns are Streamlight Litebox rechargeable 12 VDC devices used by fire departments and utility crews for portable, powerful hand held lighting.

7. NRC Question (RAI FPR VII-29)

The evaluation of penetration seal surveillance requirements in Part VII, Section 6.4.2.3, of the FPR, states that there is no safe shutdown equipment in the Waste Holdup Tank Room. This appears to contradict Table I-1 and Section 3.1.1 of Part VII, which indicate that there is safe shutdown equipment installed in this room.

Resolve this apparent conflict.

TVA Response:

The sentence in Part VII, Section 6.4.2.3 will be revised to clarify that the circuits routed in conduit in room 674.0-A1 (Waste Holdup Tank Room) are not required for a fire in this room or any adjacent rooms. These circuits are only required for a fire in the Control Building that requires Main Control Room abandonment. This revision will be included in the next FPR submittal. (See Item 14 of this response for additional information)

8. NRC Question (RAI FPR VII-30)

Part VII, Section 4.3 "Manual Hose Stations," of the FPR, states that hose stations that are equipped with more than 100 feet of hose have had their pressure tested at the standpipe to compensate for additional lengths of hose. The implication is that the static pressure was tested at the standpipe, not the more appropriate dynamic pressure.

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[1] Provide a description of how TVA assures that the sufficient flow and pressure is available at the nozzles for these extended lengths of hose for fire fighting purposes.

[2] Additionally, for each of the hose stations with these longer hoses, identify the rooms or portions of rooms that each hose station is relied upon to protect.

TVA Response:

[1] The WBN design accounts for these longer hose lengths. System Description N3-26-4002, "High Pressure Fire Protection System," addresses the need for higher pressure for these hose stations by increasing the residual pressure requirement. The System Description, Section 3.1.3.6 provides this additional requirement as stated below:

Hose Valve	Building	Elevation [FT.]	Hose Length [FT.]	Minimum Pressure*[PSIG]
1-26-664	Auxiliary	772.0	125	71
2-26-664	Auxiliary	772.0	125	71
1-26-665	Auxiliary	757.0	150	77
2-26-665	Auxiliary	757.0	150	77
0-26-1193	Control	708.0	150	77
0-26-1188	Control	708.0	150	77
0-26-1077	Diesel Generator	742.0	125	71

*Minimum pressure is defined as the pressure required at the hose valve while flowing 100 gpm. To ensure the added fire hose length (i.e., greater than the installed 100 ft) will not negatively impact the standpipe system performance, the additional friction loss must be considered. An additional 6 psig shall be available (at the standpipe) for each additional 25 ft of fire hose. For example: a 150 ft installed hose will require 100 gpm at 77 psig at the standpipe (the required 65 psig plus 12 psig for the additional installed 50 ft fire hose).

The pre-operational test referenced in Part VII, Section 4.3 tests for pressure at the prescribed flow. The hose stations listed above have 1.5 inch hose and are required to have 65 psig at 100 gpm flowing. The hose stations listed above were not pre-operationally tested, but hose stations at higher elevations for each of the three buildings listed were pre-operationally tested for a minimum of 65 psig at 500 gpm. The current FPR indicates that the hose stations listed above were preoperationally tested. This sentence will be corrected and included in the next FPR submittal. The flow was 500 gpm because the hose stations being tested were a NFPA 14, Type I or III, which required 500 gpm for 2.5 inch hose. Since the piping inside the building is maintained in a similar condition as the piping that is tested and relies upon common headers, it was concluded that the lower hose stations would meet the pressure/flow requirements based on the results of the tests at higher (more limiting) locations.

[2] The rooms protected by these hose stations are as follows:

Hose Station	Rooms Protected
1-26-664	480B Board Rom 1A, 772.0-A1 480B Board Rom 1B, 772.0-A2 125V Vital Battery Room II, 772.0-A3 125V Vital Battery Room I, 772.0-A4 480V Transformer Room 1B, 772.0-A5 480V Transformer Room 1A, 772.0-A6 Unit 1 Mechanical Equipment Room, 772.0-A7 5th Vital Battery & Board Room, 772.0-A8
2-26-664	HEPA Filter Plenum Room, 772.0-A9 Unit 2 Mechanical Equipment Room, 772.0-A10 480V Transformer Room 2B, 772.0-A11 480V Transformer Room 2A, 772.0-A12 125V Vital Battery Room IV, 772.0-A13 125V Vital Battery Room III, 772.0-A14 480B Board Rom 2B, 772.0-A15 480B Board Rom 2A, 772.0-A16
1-26-665	Auxiliary Control Room, 757.0-A1 6.9KV & 480V Shutdown Board Room A, 757.0-A2 125V Vital Battery Board Room II, 757.0-A3 125V Vital Battery Board Room I, 757.0-A4 480V Shutdown Board Room 1B, 757.0-A5 Personnel & Equipment Access, 757.0-A9 Auxiliary Control Instrument Room 1A, 757.0-A25 Auxiliary Control Instrument Room 1B, 757.0-A26
2-26-665	Auxiliary Control Room, 757.0-A1 Personnel & Equipment Access, 757.0-A17 480V Shutdown Board Room 2A, 757.0-A21 125V Vital Battery Board Room IV, 757.0-A22 125V Vital Battery Board Room III, 757.0-A23 6.9KV & 480V Shutdown Board Room B, 757.0-A24 Auxiliary Control Instrument Room 2A, 757.0-A27 Auxiliary Control Instrument Room 2B, 757.0-A28
0-26-1193	Unit 1 Auxiliary Instrument Room, 708.0-C1 Corridor, 708.0-C2 Computer Room, 708.0-C3 Spreading Room , 729.0-C1 (741.0 Mezzanine area in support of 0-26-1192)

Hose Station	Rooms Protected
0-26-1188	Corridor, 708.0-C2 Computer Room, 708.0-C3 Unit 2 Auxiliary Instrument Room, 708.0-C4 Spreading Room , 729.0-C1 (741.0 Mezzanine area in support of 0-26-1187)
0-26-1077	Lube Oil Storage Room, 742.0-2 Toilet, 742.0-3 Diesel Generator 1A-A, 742.0-4 Diesel Generator 2A-A, 742.0-5 Diesel Generator 1B-B, 742.0-6 Diesel Generator 2B-B, 742.0-7 Fuel Oil Transfer Room, 742.0-8 Pipe Gallery & Corridor, 742.0-9 DGB Cable Chase A DGB Cable Chase B

9. *NRC Question (RAI FPR VII-31)*

Part VII, Section 2.6.3.2.b, of the FPR, states, in part: "Sheet metal ducts that are not provided with fire dampers are identified on the Fire Compartmentation drawings (see Part II of this Report). They are constructed of minimum 22 gauge sheet metal and will provide a 1-hour equivalent level of protection." Similar statements are made in sections 6.2.2.1 and 6.2.2.2 of Part VII.

Provide a technical basis for the claimed fire endurance rating for sheet metal ducts.

TVA Response:

The statement that sheet metal ducts will provide a 1-hour equivalent level of protection is taken from the Fire Protection Handbook, 16th Edition, page 8-77 (also in the current 19th Edition, page 12-240). This conclusion was documented in the FPR prior to licensing of Unit 1. The sleeve through the penetration is connected to the barrier on each side with angle iron, and the ducts on each side of the barrier are connected to the sleeve. This fire stop installation ensures that there is no opening for the passage of fire from one side of the barrier to the other, and the metal duct ensures there is no passage of fire through the duct.

10. *NRC Question (RAI FPR VII-32)*

Part VII, Section 3.2, of the FPR, states, in part: "A flexible connection is provided between the purge air duct and the embedded containment duct penetration. The flexible connection is protected with 3M M20A fire barrier mat to give a 3-hour rating to the connection."

Provide a technical basis for the fire endurance rating for the sheet metal ducts. For example, is this a tested configuration?

TVA Response:

The specific configuration of wrapping these purge air ducts (which was reviewed prior to granting of Unit 1 license) has not been fire tested. However, the number of layers of 3M M20A has been tested and shown to provide 3 hours of fire resistive protection for cable trays and conduits and their supports, and the wrap for the ducts was installed per the same requirements as the tested configurations (see UL listing under Building Materials Directory January 1986, R10125 [N], Electrical Circuit Protective Systems-FHIT, System No. 8). The total combustible loading for each room (713.0-A6 and 713.0-A19) results in a fire duration of less than 2 hours, and insulation on cables routed in cable trays accounts for more than 82% of the combustible material. In addition, the rooms are provided with detection and automatic suppression and the portion of the rooms containing the wrapped ducts is maintained as a Combustible Control Zone (CCZ).

11. NRC Question (RAI FPR VII-33)

Section 3.1.2 of Part VII of the FPR states that portions of Room 713.0-A1 lack automatic fire suppression but then the discussion for this deviation appears to credit an automatic suppression system in the immediate vicinity of the area.

***[1]** Justify the statement that automatic suppression in nearby areas will serve as a form of suppression for an unprotected area and **[2]** explain how this is consistent with the underlying purpose of the rule.*

TVA Response:

[1] The fire hazards analysis documented in Part VII, Section 3.1.2 does not claim that the general area suppression in room 713.0-A1 will serve as a form of suppression for an unprotected area. The documentation of the engineering evaluation that justifies not adding suppression over the boric acid tanks states that there are no significant quantities of in situ combustibles and that the curbed area containing the tanks is a CCZ. The evaluation does show that it is highly unlikely that any fire could occur inside the curbed area and even if one did occur it would be detected by the detection system that extends over the tanks and the sprinkler system provided in the rest of 713.0-A1 would contain the spread until arrival of the fire brigade.

The various filters, demineralizers, and ion exchangers in 713.0-A1 that are radioactive are totally enclosed by reinforced concrete (2 to 3 feet thick). These enclosures are not provided with suppression or detection. They have no credible ignition sources or combustible loading and do not present a fire hazard to the plant.

Since there are no credible ignition sources, very little combustible material, and a detection system in the area over the Boric Acid tanks, it was concluded that the extension of the sprinkler system over the tanks would not increase the safety of the

plant. However, the probability of a sprinkler system leak onto the boric acid tanks presents a more likely hazard to the plant safety than would a fire. This area was reviewed prior to obtaining Unit 1 license and has not changed as a result of the completion of Unit 2.

[2] Generic Letter 86-10, item 5 of section titled "Interpretations of Appendix R" provides the following:

"In order to comply with these provisions, suppression and detection sufficient to protect against the hazards of the area must be installed. In this regard, detection and suppression providing less than full area coverage may be adequate to comply with the regulation. Where full area suppression and detection is not installed, licensees must perform an evaluation to assess the adequacy of partial suppression and detection to protect against the hazards in the area. The evaluation must be performed by a fire protection engineer and, if required, a systems engineer. Although not required, licensees may submit their evaluations to the staff for review and concurrence. In any event, the evaluations must be retained for subsequent NRC audits."

WBN performed the evaluation and documented it in the FPR for NRC review. This is consistent with the published guidelines that document NRC interpretation of the rule.

12. NRC Question (RAI FPR X-5)

Part X of the FPR states that CO_2 systems were evaluated against NFPA-12, 1973 Edition, and then discusses any deviations that might exist. However, the FPR does not discuss the fact that several of the rooms protected by these systems have doors installed to swing in the direction of discharge. For instance, the diesel generator rooms have double doors that swing out of the rooms.

Confirm that all door assemblies for rooms containing gaseous suppression systems have been designed, installed, and tested in accordance with the appropriate design standards, or otherwise evaluated, to ensure that appropriate concentrations and soak times can be achieved and maintained for the systems to perform as intended.

TVA Response:

During the preoperational testing of the CO_2 systems for the licensing of Unit 1, full concentration and soak time tests were conducted of the primary room types at WBN that are regulatory required. During these tests, the designed pressure boundary door assemblies were used to achieve and maintain the boundary for the specified concentration and soak time.

Overpressurization of the rooms in the Control Building was a particular concern due to a problem during CO_2 concentration testing in the 1980s. Thus during CO_2 testing for the Units 1 and 2 Auxiliary Instrument Rooms and the Computer Room, the maximum pressure these rooms could withstand was taken into consideration, and this maximum pressure evaluation included the doors in their latched closed position. In addition, to address

overpressurization concerns, pressure relief dampers were added to the Units 1 and 2 Auxiliary Instrument Rooms. NRC acceptance of CO_2 systems is contained in Reference 5.

Only the Diesel Generator (DG) Room 2B was concentration re-tested because it was representative of the other three DG rooms in relation to physical design plus it was the farthest from the CO_2 storage tank. The double doors listed in the question above at the north end of the DG rooms are large heavy equipment doors to allow for the movement of equipment in and out of these rooms. These doors have missile protection concrete blocks stacked against them on the north (outside) and the blocks are bolted to the wall. The Missile Protection (concrete blocks) provides additional assurance that the doors will not open during a CO_2 suppression actuation. This was proven by the CO_2 suppression concentration acceptance testing performed prior to Unit 1 fuel load.

The DG Building Fuel Oil Transfer Pump Room and the Lube Oil Storage Room were not concentration tested, but both rooms have in addition to their architectural doors, CO_2 operated sliding fire doors that close at the beginning of the CO_2 discharge. These sliding fire doors are located on the inside of these two rooms and overlap the walls. Concentration testing was not performed since these rooms' CO_2 protection is provided for property protection as denoted in SSER 18, Section 4.2.1.2, and the door fan pressurization testing verified both the rooms' CO2 system capability to achieve concentration and the ability to hold CO_2 for the specified soak time. Doors in rooms that were tested for CO_2 concentration have remained in place and functional during and after the tests; therefore, it has been demonstrated that these doors are adequate to maintain the required concentrations (and soak times when required) of CO_2.

13. NRC Question (RAI FPR VII-2.6.1) [This question was part of NRC's Group 7 FPR RAIs, Reference 4.]

RAI FPR VII-2.6 requests, in part, that TVA: "Provide a detailed summary of the trending information for each of the monitored hose stations."

The TVA response to RAI FPR VII-2.6, in the August 5, 2011, TVA letter, directs the reader to the response to RAI FPR VII-2.3 for this information. However, examination of the response to RAI FPR VII-2.3 shows that it does not contain information on trending. The response to RAI FPR VII-2.2 does provide some discussion of trending, but does not provide the detailed discussion that RAI FPR VII-2.6 was requesting.

- *Provide a detailed summary of the trending results for each of the eight trending points identified in parts 1 and 2 of the TVA response to RAI FPR VII-2.2 from Unit 1 licensing to the present.*

Follow-up NRC Request:

There appears to be a mistake in the Hazen-Williams equation on Page E1-15, where TVA subtracts twice the delta diameter (due to corrosion) from the nominal pipe diameter. TVA has described their assumption of pipe corrosion as a "reduced pipe diameter of 0.8 inches". If they really meant a reduced radius, then the equation is correct. If they are

using the equation incorrectly, how long have they been doing this for, and what is the impact?

TVA Response to Follow-up Request:

TVA is using the equation correctly. The TVA equation provided on Page E1-15 is from TVA Nuclear Engineering Mechanical Design Standard, DS-M3.5.1, "Pressure Drop Calculations for Raw Water Piping and Fittings." The TVA equation is formulated from a standard Hazen Williams equation in which "d" represents the initial value of the pipe diameter prior to any corrosion or diameter reduction. The standard Hazen Williams equation accounts for corrosion solely through the use of the "C" factor which is a surface roughness coefficient that varies based on pipe material. Based on historical TVA studies of actual in-service raw water piping for a 40-year service life, TVA determined that use of a C-factor alone did not adequately account for the effects of corrosion and thus TVA applies an additional diameter reduction. In the TVA equation, "Δd" is defined as the diameter reduction, which varies based on the service life of the piping. Based on historical studies of actual in-service raw water piping for a 40-year service life, the diameter reduction, "Δd", is 0.4 inches. TVA then multiplies the "diameter reduction" by a factor of 2. Thus for calculation purposes, the 2Δd would result in 2 x 0.4 inches for a piping diameter reduction of 0.8 inches which is subtracted from the original pipe diameter. Additionally, the TVA response to Question 5 (FPR RAI II-44.1), sub-question 3 should have referred to an assumed pipe diameter reduction of 0.8 inches rather than a pipe diameter of 0.8 inches.

14. ***NRC Question (Received during August 31, 2011 meeting in Rockville, Md. and was Letter 'Item 30' in TVA's letter to NRC, dated September 30, 2011, Reference 3)***

Part VII, Section 3.1.1 - In room 674.0-A1, Waste Holdup - Clarify what is meant by "required for auxiliary control?"

Follow-up NRC Request:

The staff finds TVA's response to "Item 30" to be confusing. The reviewers expected that the answer to what "required for auxiliary control" means would be that these cables support alternate shutdown from the Auxiliary Control Room (for a fire in an alternate shutdown area, that is, in the Control Building), and were not needed for safe shutdown for a fire in the Auxiliary Building. This is a different situation from being needed for a fire in the Auxiliary Control Room, as response states.

TVA Response to Follow-up Request:

The correct response for Letter "Item 30" is as follows:

Cables that are only required for a fire in the Control Building are called auxiliary control circuits (required for auxiliary control). The circuits in room 674.0-A1 are auxiliary control circuits and are not required for a fire in this room.

Enclosure 2

New Regulatory Commitments

1. Operator manual actions for alternate shutdown have been evaluated using the feasibility and reliability analysis criteria in Section 2.1.1 of Part V, and the evaluation used the acceptance criteria in Section 2.1.2 of Part V which is the same criteria used in all other OMAs. The FPR Part V, Section 2.1 will be revised as follows:

   "2.1 OMAs are evaluated to ensure they are feasible (can be performed) and that they are reliable (can be performed reliably under a wide range of plant conditions that an operator might encounter during a fire). Feasibility and reliability of WBN OMA ***(including OMAs for Control Room abandonment)*** are evaluated to the criteria below which are based on the criteria and technical bases provided in NUREG 1852; "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire" (Reference Part II 4.2.27)."
   [Letter Item # 2. [1] (RAI FPR IV-5)]"

2. Performance demonstration walkdowns described in Section 2.2.1 of part V will be performed for alternate shutdown operator manual actions, and the timing of those walkdowns for Unit 2 will consider that the control room operators will need to travel from the Main Control Room to the Auxiliary Control Room or other Auxiliary Control System (ACS) locations, as applicable. These performance demonstration walkdowns will be performed prior to Unit 2 fuel load. [Letter Item # 2. [2] (RAI FPR IV-5)]

3. The location of the dampers does not involve high radiation areas, but access to these ducts would involve potentially contaminated areas. The word "high radiation" will be deleted from sentences in 6.2 and this will be in the next FPR submittal. [Letter Item # 5. [1] (RAI FPR VII-27)]

4. The duct is 64 inches by 54 inches but narrows down to 58 inches by 54 inches as shown on the Attachment. The ducts associated with dampers 3847 and 3848 enter the duct where it is 58 inches by 54 inches, and the duct associated with damper 3846 enters the duct where it is 64 inches by 54 inches. The next revision to the FPR will be clarified to address the collector duct size. [Letter Item # 5. [5] (RAI FPR VII-27)]

5. The sentence in Part VII, Section 6.4.2.3 will be revised to clarify that the circuits routed in conduit in room 674.0-A1 (Waste Holdup Tank Room) are not required for a fire in this room or any adjacent rooms. These circuits are only required for a fire in the Control Building that requires Main Control Room abandonment. This revision will be included in the next FPR submittal. [Letter Item # 7. (RAI FPR VII-29)]

6. The hose stations listed in Letter Item # 8. [1] have 1.5 inch hose and are required to have 65 psig at 100 gpm flowing. The hose stations listed in Letter Item # 8. [1] were not pre-operationally tested, but hose stations at higher elevations for each of the three buildings listed were pre-operationally tested for a minimum of 65 psig at 500 gpm. The current FPR indicates that the hose stations listed above were preoperationally tested. This sentence will be corrected and included in the next FPR submittal. [Letter Item # 8. [1] (RAI FPR VII-30)

Attachment

TVA Watts Bar Nuclear Plant Drawing

WBN Drawing No. 47W920-7, Revision 18, Powerhouse Auxiliary Building, Mechanical Heating, Ventilating and Air Conditioning