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APR 23 1994

U.S. Nuclear Regulatory Commission
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Gentlemen:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2 - OFFSITE DOSE CALCULATION MANUAL (ODCM) REVISION 2 - RESPONSE TO NRC'S REQUEST FOR ADDITIONAL INFORMATION (RAI) (TAC NOS. M77553 AND M84410)

This letter provides the response to the NRC's request for additional information dated December 9, 1993. That letter provided NRC's Technical Evaluation Report (TER) concerning Revision 2 of the ODCM that was submitted to the NRC on August 27, 1992. The NRC indicated that the ODCM did not consistently use documented and approved methods that were consistent with the methodology and guidance of NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," and Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I." Consequently, the NRC requested that TVA revise the ODCM, using the comments in the NRC's TER for guidance.

Enclosure 1 provides a matrix, listed by category, of the NRC's comments that identifies deficiencies and suggestions for improvement from the WBN ODCM. This matrix documents TVA's corresponding response to the deficiency suggestion or the section in the revised ODCM that corrects or responds to the NRC's comments. Enclosure 2 provides Revision 3 of the ODCM that incorporates the NRC's comments/concerns.

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No new commitments have been identified in this submittal. If you should have any questions, contact J. Vorees at (615)-365-8819.

Very truly yours,

William J. Museler

Enclosures

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CATEGORY A

The items in this category should be addressed promptly. Some items identify errors or omissions that result in erroneous calculated doses and dose rates. Others identify omissions or inappropriate values that my result in release rate limits being exceeded or reported doses being insufficiently documented.

NRC Comment	TVA Response
A.1 The source of equations used for calculating dose rates and doses should be explicit. There are differences between the calculations in NUREG-0133 and Regulatory Guide 1.109. The equations in NUREG-0133 are abbreviated from those in Regulatory Guide 1.109.	**Regulatory Guide 1.109 and NUREG-0133 equations have been added to the WBN ODCM text and the equations used by WBN have been derived from these.**
Section 7.7.1 through 14 - Gaseous Dose Factors - Specify that these equations are from NUREG-0133, and reference the appropriate section.	See revised and renumbered Sections 7.8.1 through 7.8.14 (pp.120-132).
Section 6.7.3 - Shoreline Recreation Dose Factors - the source of the unlabeled shoreline recreation dose factor equation is unclear. It looks as if the equation was derived from comparing equations A-4 and A-6 of Appendix A in Regulatory Guide 1.109 with the definition of dose factors given on page 16, Section 4.3.1 in NUREG-0133. The source of the shoreline recreation dose factor equation must be clear.	See revised Section 6.7.3 (p. 80).
Sections 6.7.1 and 6.7.2 - Water and Fish Ingestion Dose Factors Specify that this equation is from NUREG-0133, and reference the appropriate section.	See revised Sections 6.7, 6.7.1, and 6.7.2 (pp. 79-80).
Section 6.7 - The Dose Factor Equation section does not define the master dose factor equation. The dose factor equation for aquatic food and water consumption in liquid effluents is defined in NUREG-0133 page 16 Section 4.3.1. The ODCM description of dose factor equations should start with the master equation with all terms defined. Then a description of the special cases for water ingestion, aquatic food ingestion, and shoreline recreation should be included.	The master dose factor equation for the liquid pathways has been included in Section 6.7 (p. 79).
Section 6.3 - Cumulative Liquid Effluent Dose Calculation- The calculational methodologies should be referenced.	See revised Section 6.3 (p.71).
Section 7.2.2 - The source of Equation 7.8 in WBN ODCM is not clear. It has some of the structure of airborne release equations in Section 5.2.1 of NUREG-0133.	See revised Section 7.2.3 (p. 110).
A.2 If any of the equations referenced in NUREG-0133, Regulatory 1.109, and other approved methodology sources are modified, these modifications must be clearly explained with examples that illustrate the changes. Numerous cases have been specified where this was not the case.	**Derivations of all WBN equations from those given in the regulatory guidance have been provided.**
Section 7.7.7 - Tritium pasture Grass-cow/goat-milk Dose Factors - This equation is modified from the equation in NUREG-0133. Any modifications should be explained.	There is no modification of this equation from that provided in the Regulatory Guide 1.109. Any confusion caused by different symbols have been removed in the revision. See Section 7.8.7 (p. 126).

Section 6.3 - The near field average dilution factor in Equation 6.4 uses a mixing factor, 0.10. This mixing factor is defined as the percentage of the river flow that is available for dilution of the release. How was this factor determined? Is it assumed? This should be clearly defined.	This factor has been determined by the hydraulic engineering group within TVA and a reference to the documentation for the determination has been included. See Section 6.3 (p. 71).
Section 7.7.14 - Ground Plane Dose Factors, The equation in the ODCM leaves out the shielding factor, SF, compared to NUREG-0133, Section 5.3.1.2. Explain this modification.	For conservatism, TVA has decided not to account for shielding from building structures in the dose due to ground contamination. A statement explaining this has been added to Section 7.8.14 (p. 132).
Section 7.2 - To be within NRC guidelines, the methodology of ODCM Section 7.2 (used to determine noble gas dose rates) should be corrected by using the proper equations from NUREG-0133, and the calculations should be correlated with the releases from WBN to determine if the site limits are being exceeded.	The equations used in Section 7.2 are consistent with those given in NUREG-0133 and the methodologies presented in Regulatory Guide 1.109. The equations appear different because they are intended to accurately document the calculations performed by the WBN effluent management software. A reference to the source equations has been included for clarification. These equations will be used to calculate the release rate for each release made from WBN and the results compared to the limits to determine compliance with the appropriate ODCM Control (pp. 108-109).
Section 6.6 - The equations of Section 6.6 are not consistent with the methodology described in NUREG-0133 and Regulatory Guide 1.109. NRC regulations require that a detailed description of the dose calculation methodologies used be included in the ODCM. This needs to be corrected promptly.	The equations used in Section 6.6 are consistent with those given in NUREG-0133 and the methodologies presented in Regulatory Guide 1.109. The equations appear different because they are intended to accurately document the calculations performed by the WBN effluent management software. A reference to the source equations has been included for clarification. See Section 6.6 (pp. 74-75).
Section 6.6.2 - Fish Ingestion, only discusses the dose due to consumption of fish living in contaminated water. The fish ingestion sub-pathway is one of four sub-pathways in the aquatic food ingestion pathway. The sub-pathways are freshwater/saltwater consumption of fish and invertebrates. Freshwater is the only possible aqueous contamination pathway at WBN. It is not clear if invertebrate consumption is included. This needs to be clarified.	The ingestion of freshwater fish is the only expected pathway to exist for WBN as is indicated in the WBN FSAR and Final Environmental Statement (FES). Asiatic clams are not considered to be a source of food for the Tennessee River population. They are included in the WBN radiological environmental sampling program because clams are a good indicator for certain radionuclide buildup in the environment. Documentation of this is added to Section 6.3 (p. 71).
Section 6.7 - The dose factor, Ai, for aquatic food and water consumption in liquid effluents as defined in NUREG-0133, page 16, Section 4.3.1, does not include freshwater invertebrate consumption. Table A-1 in Regulatory Guide 1.109 lists the bioaccumulation factor for freshwater invertebrate consumption. In WBN ODCM Section 9.0, Radiological Environmental Monitoring Methodologies, the exposure pathway through freshwater invertebrates is monitored through Asiatic Clams. If data is available on freshwater invertebrate consumption rates, this should be included in the aquatic dose factor equation.	See response above. The clam sampling conducted as a part of the REMP has been moved from the ingestion portion of the program to the waterborne section to clarify the intent of the sampling. The modifications of the dose factor equation given in NUREG-0133 is now explicitly stated in the WBN ODCM in Section 6.7 (p. 79).

Section 6.7.3 - Shoreline Recreation Dose Factors, Any changes in the equation from the references must be noted.	The equation used in Section 6.7.3 is consistent with those given in NUREG-0133 and the methodologies presented in Regulatory Guide 1.109. The equation appears different because it is intended to accurately document the calculations performed by the WBN effluent management software. A reference to the source equations has been included for clarification. See Section 6.7.3 (p.80).
Regulatory Guide 1.109 explicitly discusses tritium exposure through the consumption of food grown on contaminated soil and water. WBN liquid effluents do not discuss exposure due to tritium. This should be corrected promptly.	Land use data in the WBN FES for the WBN plant shows that the irrigated water-food pathway does not exist. This is now explicitly stated in Section 6.3 (p. 71).
A.3 The possibility of simultaneous batch release of radioactive liquid effluent is not discussed. (4.1) This needs to be clarified. If simultaneous batch releases are possible, the appropriate equations should be included in the ODCM.	**The current methodology, described in the revised Section 6.2, places the setpoint at a level based on the expected response of the monitor to the release from one tank, as long as that setpoint is conservative based on the mix of radionuclides. This methodology ensures identification of any simultaneous releases, or any releases of a tank containing higher levels of radioactivity. Procedures are in place to ensure the proper valve alignment to preclude simultaneous releases. A table of the setpoint values and references has been added.**
Section 6.2 - To be within NRC guidelines, the methodology to determine setpoints for the liquid effluent monitors should include the method used to prevent simultaneous releases from more than one batch release tank. This should be addressed promptly. The NRC guidelines also specify that the methods for calculating fixed and adjustable setpoints shall be clearly illustrated. This section would be better illustrated if a table of liquid effluent setpoint locations, setpoint identification and setpoint limits in numerical or symbolic form is included.	See revised Section 6.2 (p. 67).
A.4 Standard Technical Specification 3.11.2.7 requires that the quantity of radioactive gas in each storage tank at a PWR be limited to a predetermined curie content. It is not specified in the ODCM what type of gas storage is used at WBN. This needs to be addressed. (4.6)	**The controls for curie content of gas decay tanks were not moved to the ODCM as a part of NRC Generic Letter 89-01 and are not discussed in NUREG-1301. At WBN, these controls will be contained in a WBN plant procedure. Since the curie limits are to assure compliance with limits for *uncontrolled* release of the contents of these tanks, the ODCM (which contains the requirements and methodologies to be used for the routine/controlled release of radioactive effluents) is not the appropriate location for these calculations.**
A.5 The symbols in the dose projection equation do not match the symbol definitions. This should be corrected promptly. (4.7)	**The symbols have been corrected so that the equation and the definitions match.**
Section 6.5 - The symbols in the dose projection equation do not match the symbol definitions. This should be corrected promptly.	See revised Section 6.5 (p. 72).

A.6 The ODCM should include a detailed presentation of the calculational models used and a complete tabulation of all values assigned to each parameter. This is in general not the case. This should be corrected promptly.	**The values are contained, either in variable descriptions or in Tables. Those in Tables are referenced in the variable descriptions. Text has been added to all sections describing dose calculation methodologies to reference the source of the equation(s) and documents any differences between the source equation(s) and the equation(s) given in the WBN ODCM.**
Section 6.1.2 - No maximum dilution flow rate for the Cooling Tower Blowdown is defined. The range of the total dilution flow, TDF, should be identified. It is recommended that the following statement be made; "The very large dilution factors afforded by the circulating coolant will not be used to allow high concentrations of liquid radioactive waste to be discharged from the plant".	The minimum allowed dilution of 20,000 gpm will be used for all pre-release calculations. See added introduction to Section 6.0 (p. 64).
Section 7.1 - It should be verified that the maximum dose rates occur at the site boundary, as assumed in the ODCM, and a statement to that effect should be included.	Since releases from WBN are ground level releases, the maximum dose rates will be at the site boundary (the boundary of the unrestricted area). A clarifying statement has been added to the introduction to Section 7.0 (p. 102).
Section 7.1.1.3 - Calculated Maximum Setpoint, introduces a dose rate allocation factor, A, and a safety factor, SF. Show the value or range of values of the safety factor. Show how the rate allocation factor is determined for the five discharge points-	The range of the values for the safety factor has been added to Section 7.1.2. A more detailed description of the dose rate allocation factor has also been included (p. 106).
Section 7.1.1.4 - Actual Discharge Point Monitor Setpoints, describes in words the mathematical determination of setpoints. This can be clearly illustrated in the following manner: If $S_{max} < S_D$ then $S = S_{max}$ If $(S_{max} > S_D) \&\& (2S_E < S_D)$ then $S = S_D$ IF$(S_{max} > S_D) \&\& (2S_E > S_D)$ then $S = \min(2S_E, S_{max})$.	A new Section 7.1.2.4 has been added to the WBN ODCM which includes clarification of the setpoint determination for all gaseous release point monitors. The description of the determination of setpoints now includes a mathematical format (p. 107).
Section 6.1.1 - What is the recirculation time used in the radwaste tanks before sampling? This should be indicated to assure adequate mixing. Specify where the samples are collected and what kind of sampling is used.	Several tanks will not require recirculation. These tanks have been listed in Section 6.1.1 of the ODCM. All other tanks will require recirculation, and will have the recirculation times determined by the performance of special tests, and the results of these tests will be in plant procedures; the times will be periodically reevaluated by sampling the tank several times during recirculation to ensure adequate mixing. Text added to Section 6.1.1 clarifies the mixing/recirculation requirements (p. 66).
Section 6.0 - The dose equations listed do not indicate if bioaccumulation factors are used. Bioaccumulation factors are used in place of plant specific data. If plant specific data is available, indicate this in tabular form. If partial or no plant specific data, bioaccumulation factors should be identified and indicated in the ODCM. The use of bioaccumulation factors needs to be clearly illustrated in the dose calculation methodologies. If used, a tabulation of bioaccumulation factors or plant specific values A_{it} that are used in the calculation of doses, should be added to the ODCM.	The bioaccumulation factors are included in the liquid effluent dose calculation (see Section 6.7.3 (p. 80)), but are built into the nuclide specific dose factor equations. This methodology is used because it is consistent with the software methodology to be used at WBN. The bioaccumulation factors used are tabulated in WBN ODCM Table 6.5 (p. 95).

Section 6.3 - The definition of the mixing factor used in Equation 6.4 is defined as the percentage of river flow. If so, should the value reported be 10 instead of 0.10. It looks as if the definition should be changed to the fraction of river flow instead of percentage. In Equation 6.6 in Section 6.6, Dose calculations For Reporting, the dilution factor, 0.10, is defined as the fraction of river flow.	The 0.10 factor is the fraction of the riverflow available for immediate dilution. The terminology has been clarified to reflect this. See Section 6.3 (p. 71) and Section 6.6 (p. 73) .
Section 6.5 - The ODCM contains no methodology to project doses because of releases during succeeding 31 days.	The equation used in Section 6.5 assumes that the dose for the current calendar quarter is sufficient to perform the dose projection. The calendar quarter dose is averaged over a 31 day period to perform the projection. This methodology also assumes that liquid release contents will continue to be relatively steady over periods of time. Any additional radioactivity increases expected to occur in the next 31 days can be added into the average based on operational experience and anticipated plant conditions.
Section 6.2 - Instrument Setpoints, does not explicitly show how the setpoint concentrations, c, are determined. Addendum AA of NUREG-0133 illustrates setpoint calculations for liquid effluents as: $c \leq \frac{F + f}{f} C \sim \frac{F}{f} C$ (μCi/ml) ($f << F$)	Derivation of the WBN liquid setpoint equation from that given in NUREG-0133 has been added. See Section 6.2.2 (pp. 69-70).
Section 6.2.2 - The ODCM defines two types of releases from WBN, batch and continuous. For clarity, specify if the expected setpoints for release point monitors includes both types of releases. Furthermore, show how the setpoints for these two release types are determined.	A new Section 6.2 has been added to the WBN ODCM which includes clarification of the setpoint determination for both batch and continuous release point monitors (pp. 67-70).
Section 8.1 - Total Maximum Individual Doses, gives a brief description of the total dose methodology. NRC guidelines require that the total dose methodology should include the mathematical formulation of the total dose components (for example see Regulatory Guide 1.109), the final total dose expressions, and examples of the expected total dose under expected plant operation. The Total Maximum Individual Dose section should be expanded to include the mathematical description of the methodologies and examples. This may mean some redundancy in the ODCM but that is acceptable for completeness and clarity reasons.	A mathematical expression of the total dose has been included which uses the results of dose calculations performed in ODCM Sections 6.6 and 7.6. See Section 8.1 (p. 163).
Section 6.6.5 - Population Doses, the written description explains the concept, but there are no examples of the expected doses. It is recommended that examples of expected population doses be included in the ODCM. Regulatory Guide 1.109, Appendix D outlines population dose calculations.	The general form of the equation from Regulatory Guide 1.109 has been added to Section 6.6.5 (p. 77). Section 6.6.5 gives specific equations for the determination of the calculation of population doses, using the doses calculated by the methodology of Section 6.6. Examples of expected doses from the operation of WBN are presented in the WBN Final Safety Analysis Report.
Section 7.2.3 - Dose To A Member Of The Public Inside The Controlled Area, outlines an example calculation to a member of the public inside the controlled area, but does not complete the calculation. Numerical results showing the calculated doses are required for completion.	A new Section 7.7.6 (p. 119) has been added to the WBN ODCM to replace Section 7.2.3. The section references doses from the WBN FSAR for this determination.

Section 6.6.4 - Total Maximum Individual Dose, gives a written description of the total maximum individual dose, but no derivations are present. Derivation and illustrations of the methodologies are required by the NRC.	An equation for the total individual dose has been added to Section 6.6.4 (p. 76).
Section 6.3 - Cumulative Liquid Effluent Dose Calculation, first paragraph, the list of liquid effluent pathways is missing the entry for food grown on land with contaminated water.	Land use data in the WBN FES shows that the irrigated water-food pathway does not exist. Text explaining this has been added to Section 6.3 (p. 71).
Section 7.2 - Should include the methodology needed to ensure that the dose rates due to noble gases released by WBN do not exceed the limits of 10 CFR Part 20, Appendix B, Table II, Column 1.	As indicated in the revised basis for ODCM Control 1.2.2.1, compliance with the dose limits of 10 CFR 50, Appendix I and the dose limits of 40 CFR 190 demonstrates compliance with the annual average concentration limits given in 10 CFR 20, Appendix B, Table 2, Column 1 (corresponding to a dose of 50 mrem).
Sections 7.7.1 through 14 - Gas Dose Factors, references to the dose factor sections are unclear.	The sections previously numbered 7.7.1 through 7.7.14 are now number 7.8.1 through 7.8.14. These dose factor equations are referenced in Sections 7.2.3 (p. 110), 7.4.1 (p. 113), and 7.7.3 (pp. 116-117).
Section 6.3 - Cumulative Liquid Effluent Dose Calculation, first paragraph, the list of age groups does not specify the age ranges or whether the dose commitment age is used. The equations in Regulatory Guide 1.109 use the dose commitment age. This is described on page 1 Section 1 of Regulatory Guide 1.109. It is recommended that this data be summarized in tabular form.	The age groups used are the dose commitment age groups associated with Regulatory Guide 1.109. A clarified reference to these age groups has been added and the age ranges have been added to the paragraph. See Section 6.3 (p. 71).

CATEGORY B

The items below concern information that should be added to make the ODCM complete, prevent erroneous interpretation of the methodology, or correct methodology that is erroneous.

NRC Comment	TVA Response
B.1 It is strongly recommended that each major section, for example, liquid and gaseous setpoints, gaseous dose rates, liquid and gaseous doses, and dose projections include an example calculation. These examples should illustrate plant specific values. These example calculations are used to verify that the equations are correct. The actual calculations made be plant personnel can be used as an example. Each step in a calculation should be clear to the reader.	**Doses, dose rates, and setpoints are calculated by software which has been verified and validated against the methodology contained in the ODCM to ensure accuracy. The software verification and validation process ensures that the expected output is obtained for known input using ODCM equations. Based on the above, no examples are provided.**
Section 6.2 and 7.2 - Example calculations of liquid effluent setpoints should be included in the ODCM. Example calculations of the expected dose rates for a member of the public at or beyond the site boundary would be suggested.	Example calculations for expected doses due to the operation of the WBN reactors are presented in the WBN Final Safety Analysis and will not be added to the ODCM.

B.2 For gaseous releases from stacks, the height of the stack should be specified in the ODCM. Are the stacks greater than 80 meters? The dose calculations are dependent on the height of the release point. If the gaseous release points are at ground level, this should be clearly stated in the appropriate section in the ODCM.	**See response to the next item.**
For gaseous releases from stacks, the height of the stack should be specified. Are the stacks greater than 80 meters? This may be specified in WBN Technical Specification, but this information should be included in the ODCM. In a conference call with WBN on November 3, 1993, they indicated that the gaseous release point is at ground level. The NRC regulations require that the ODCM be a stand alone document.	Releases from WBN vents are considered ground level. Statements clarifying this have been added to the introduction to Section 7.0 (p. 102).
B.3 The setpoint calculations for both gaseous and liquid effluents use a factor of 2, called an administrative factor, such factors require justification and/or derivation and examples of how the setpoint results are changed by the administrative factors.	**The previous factor of 2 has been changed to variable x in the revised equations. It is limited to a maximum value of 1.5 (see Section 6.2.2.2 (p. 69) and 7.1.2.2 (p. 106)). The predicted monitor setpoint must take into account uncertainty in detector measurement and electronic and alarm loops. The factor is intended to allow for variation in the monitor response to reduce the potential for spurious alarms which can inhibit plant operation. The pre-release sampling of the tanks is adequate assurance of compliance with the ODCM Controls regarding concentration and dose. Basing the monitor setpoint on expected response, rather than on the limiting condition, establishes conservatism, and provides assurance that unplanned releases are terminated. In no case will the expected monitor response setpoint be used if it exceeds the maximum calculated setpoint**
B.4 WBN ODCM does not indicate if the alarm and automatic control trip are separate devices. If they are, the alarm/trip setpoint in the ODCM should list the separate trip setpoints (4.2). In a conference call with WBN on November 3, 1993, WBN stated that they do not use trip setpoints. In addition, the detectors and alarms are the same device. WBN also indicated that the section on liquid and gaseous effluent monitor setpoints are being rewritten. This needs to be clearly stated in the ODCM.	**The alarm and trip setpoint functions are not provided by separate devices, therefore the alarm/trip setpoint is a single calculated value. A statement has been added to the introduction to Section 7.0 which states this (p. 102).**
B.5 There are several references to flow paths that are not specified. These need to be clarified. Flow paths could be illustrated in a diagram. (4.1)	**Clarifying text has been added in the introduction sections to Section 6.0 (p. 64) and Figure 6.1 (p. 98) has been revised to better illustrate the flow paths.**
B.6 Table of liquid and gaseous effluent setpoint location, setpoint identification and setpoint limits in numerical or symbolic form should be included.	**Tables of monitor identifications, locations, and associated setpoint information have been added (p. 67).**
B.7 Do not specify what the setpoint limits are for discharge monitors (Essential Raw Cooling Water) or for continuous release points.	**Sections 6.2.1 and 6.2.2 have been added to address the setpoints for these monitors (p. 68).**

Section 6.2.1 - Discharge Point Monitor Setpoints, the setpoints for the Essential Raw Cooling Water (ERCW) monitors should normally be very low, because the service water is not expected to be radioactive. It is recommended that the setpoints be a low multiple of detector background.	Section 6.2.1 now addresses setpoints for the ERCW monitors (p. 68).
Section 6.2.2.2 - Continuous Release Monitor Setpoints, does not specify how or what the setpoint limits are. Setpoints for the continuous release points, the steam generator blowdowns and the turbine building sump monitors should normally be very low, because the water is not expected to be radioactive, unless there is a primary to secondary leak. It is recommended that the setpoints be a low multiple of detector background.	Section 6.2.2 now addresses the setpoint determination for both batch and continuous release point monitors (pp. 68-70).

Category C

The items in this category indicate omissions and editorial deficiencies that are not likely to cause significant problems.

NRC Comment	TVA Response
C.1 To improve readability, a numbering system should be used consistently for the equations.	**The equations in the WBN ODCM have been renumbered.**
C.2 Use the word "use" instead of "utilize." This will improve readability of the document.	**A word search was conducted on the WBN ODCM. The word "utilize" appears only in the Controls Section of the ODCM, in text which is taken from NUREG-1301, therefore, no change was made.**
C.3 Understanding is improved if a list of acronyms and a list of symbols and notation conventions is included.	**A List of Acronyms has been added to the Table of Contents.**
Section 6.3 - Cumulative Liquid Effluent Dose Calculation, the calculational methodologies should be referenced, NUREG-0133 Section 4.3. In this case, Equation 6.4. in WBN ODCM, the subscript notation is different from that used in NUREG-0133. This does not distract from the meaning of the symbols defined in the WBN ODCM, but by referencing the methodology, confusion from the use of differing mathematical symbols will be prevented.	References for the calculational methodologies used in the WBN ODCM have been added. The use of different symbols than those used in the regulatory guidance arises because the symbols used in the WBN ODCM is intended to correlate to that used by the effluent management software to be implemented at WBN. A Symbol Key has been added to the Table of Contents to establish variable names and provide a cross-reference to the source document.
It is suggested that a brief section be added that explains the basic concepts and the notation convention that will be used.	Added introductions to Sections 6.0 and 7.0 explain basic concepts. The notation conventions are outlined in the new Symbol Key.
Standard notation should be used for mathematical symbols. It is recommended that the notation conventions in NUREG-0133 and Regulatory Guide 1.109 be used.	The notation used in the WBN ODCM has been chosen to correspond, as closely as possible, to that notation used in the effluent management software which will be implemented at WBN. While this notation differs in some instances from that used in the regulatory guidance, it will minimize conflicting terms for plant personnel using the software and the ODCM. Clarifications added to the ODCM (as well as the Symbol Key) to reference the source equations in the guidance documents should assist other personnel in determination of equivalent variables.

Figure 6.2 - Liquid Radwaste System, the term CVCS (Chemical and Volume Control System) is not defined in the symbol key, figure caption, or in ODCM Chapter 6. This needs to be defined in the figure or its caption even if listed in an acronym list.	The term has been defined in the List of Acronyms provided (p. TOC-12).
Figure 7.2: - though these are common terms the acronyms CVCS, VCT, RCDT, EVAPS, and HT are not defined in a symbol key, figure caption, or in ODCM Chapter 7. Add a symbol/term key.	These terms used in Figure 7.3 (previously Figure 7.2) are now defined in the List of Acronyms (p. TOC-12).
C.4 A compiled list of references would increase clarity.	**A compiled reference list has been added in Section 10.0 (p. 177).**
C.5 The layout of the table of contents would be improved by placing the page numbers to the right of the contents.	**The updated table of contents follows this suggestion.**
C.6 There are several errors or omissions in the tabular data.	**All specified errors and omissions have been corrected.**
Section 7.4.1 - the first paragraph refers to Table 6.1 for χ/Q and D/Q values. This should be Table 7.1	This reference has been corrected in Section 7.4.1 (p. 113).
Table 7.6 - Population Within Each Sector Element, does not indicate the time period that the population data was taken. The year that this data was determined should be specified in the table or table caption.	A reference for the time period of the data has been added to Table 7.6 (p. 147).
Section 9.1 - The following terms are undefined in Tables 9.1 and 9.2, PM, LM. and TRM. They should be listed in Table 9.2, Table Notation.	Descriptions of the terms has been added to Tables 9.1 and 9.2 (pp.170-171).
C.7 There are several errors or omissions in the figures.	**The figures have been corrected.**
Figure 7.3 - Plume Depletion Effect For Ground Level Releases, the vertical axis label "Fraction Remaining in Plume" should read "p Fraction Of Radionuclide Remaining In plume."	The vertical axis label of (now) Figure 7.4 has been revised (p. 159).
Figure 7.4 - Vertical Standard Deviation Of Material In A Plume, has the following undefined labels, A-G. Figures should have all labels described. Define the vertical axis symbol σ_z. This definition can be included in the figure caption. For example, σ_z is the vertical dispersion coefficient.	Definitions of all symbols and labels have been added to (now) Figure 7.5 (p. 160).
C.8 The complicated figures in the WBN ODCM should be separated into several simpler illustrations.	**New figures for the release points and flow paths have been generated and added to the ODCM.**
Figure 6.1, Liquid Effluent Release Points, should be simplified. An example of the possible simplification is illustrated in Figure 1 of this report of Watts Bar 1/2 ODCM. If more detail is desired by the licensee, use a separate figure for each major radioactive gaseous release point. Figures 2 and 3 of the Technical Review of Watts Bar 1/2 ODCM illustrate breaking up ODCM Figure 6.1 into several simpler illustrations.	The figures have been replaced with new Figures 6.1, 6.2,.and 6.3 (pp. 98-100).

ODCM Section 6.0 refers to five paths from which liquid effluents are released. In ODCM Figure 6.2, the five liquid effluent paths are not distinguishable from other effluent paths. Clearly illustrate which effluent paths belong to those that discharge to the Cooling Tower Blowdown and those that are secondary lines. An example of the possible simplification is illustrated in Figure 2 of this report of Watts Bar ODCM.	The figures have been replaced with new Figures 6.1, 6.2,.and 6.3 (pp. 98-100).
Figure 7.1 - Gaseous Effluent Release Points, should be simplified. An example of the possible simplification is illustrated in Figure 4 of the Technical Review of Watts Bar ODCM.	The figure has been replaced with simpler figures.
Figure 7.2 should be simplified. An example of the possible simplification is illustrated in Figure 5 of the Technical Review of Watts Bar 1/2 ODCM.	The figure has been replaced with a new Figure 7.1 (p. 156).
C.9 Move the numerical constant to the front of the left hand side of equations in ODCM Sections 7.7.13 and 7.7.14.	**The numerical constants in the equation have been moved to left hand side of the equation in Section 7.8.13 and 7.8.14 (p. 132). These sections were previously Sections 7.7.13 and 7.7.14.**
C.10 Standard notation should be used for mathematical symbols. Use the following subscripts: i for radionuclide, a for age group, p for pathways, j for organ, and ℓ for time periods.	**Subscripts have been standardized.**

Category D

The following items concern methodology and parameters that the licensee may wish to change because the change may simplify calculations, remove unnecessary conservatism in the calculations, or make use of recent data.

NRC Comment	TVA Response
D.1 Many conversion factors are known to a least 5 or 6 significant digits. Standardize the number of significant digits and other numerical constants, if possible.	**An effort has been made to limit the number of significant digits used in calculational terms to reflect the expected accuracy of the calculations.**
D.2 Some conversion factors need to be cleaned up, i.e. use 8766 hours in a year rather than 8760 hours in a year.	**An effort has been made to limit the number of significant digits used in calculational terms to reflect the expected accuracy of the calculations.**
D.3 There is a data error in Table 6.4, adult ingestion dose factors, for H-3 absorption in bone. There is a note at the end of Table 6.4 that the tritium dose factor for bone is assumed to be equal to the total body dose factor. What is the bases for this?	**Explanatory text has been added to this note (see Table 6.4 (p. 88) and Table 7.7 (p. 155)).**

Uncategorized Comments

The following items were unable to be placed into one of the above categories, so they have been addressed separately.

NRC Comment	TVA Response
Section 9.1 - ODCM Section 9.1 referes to a requirement that is not clearly specified. The referenced requirement needs to be clearly stated.	The reference in Section 9.1 to the requirement has been clarified to reference ODCM Control 1.3.1 (p. 165)
Section 9.1 - An expanded description that introduces the tables and figures is needed.	The text of Section 9.1 has been expanded (p. 165)
Section 6.1.1 - Paragraph 2 needs to be restated. A suggested rephrasing of the first two sentences is "Condensate demineralizer tanks release radwaste continuously. A composite sampler is used to obtain a representative sample during discharge; if an effluent radiation monitor or composite sampler fails, four samples are taken and analyzed. Two samples each of the volume recirculation lines and radwaste tanks are taken and analyzed."	Section 6.1 has been completely revised to clarify the release process (pp. 66-67)
Section 6.1.1 - Remove the repeated word "nuclide" from the second sentence.	The repeated word has been removed from Section 6.1.1 (p. 66).
Section 6.1.1 - The term MPC is not defined. State the definition as follows: MPC = Maximum Permissible Concentrations listed in 10 CFR 20 Appendix B, Table II, Column 2 for each radionuclide, "i" in μCI/cc (Reference 7) list MPC in an acronym list.	The revised WBN ODCM no longer uses the terminology MPC. The terminology "Effluent Concentration Limit" has been adopted to implement the revised 10 CFR Part 20 regulations. See Section 6.1.2 (p. 66).
Figure 7.2, Gaseous Radwaste Treatment System, is not referenced in Chapter 7.	Figure 7.2 (now Figure 7.3) is referenced in WBN Section 7.6, "Gaseous Radwaste Treatment System Description." (p. 114).

ENCLOSURE 2

OFFSITE DOSE CALCULATION MANUAL (ODCM)

REVISION 3