INEL
Idaho National Engineering Laboratory

June 15, 1989

Mr. Wayne Meinke
Radiation Protection Branch
Mail Stop 11D23
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

LETTER REVIEW OF THE RIVER BEND ODCM REVISION 3 - DWA-33-89

Dear Mr. Meinke:

Attached is a copy of our review of River Bend Station (RBS) ODCM updated through Revision 3, submitted by Gulf States Utility Company (GSU). Revision 3 was submitted in response to a letter from W. A. Paulson (NRC) to J. C. Deddens (GSU) dated March 28, 1989, which requested that the licensee provide a complete legible copy of the current River Bend Station ODCM within 30 days. This ODCM includes changes made in response to a letter from W. A. Paulson (NRC) to J. C. Deddens (GSU) dated February 29, 1988 in which it was requested that all points raised in the Conclusions section of the review TER, EGG-PHY-8003, be addressed within six months in a new revision of the ODCM. The Licensee's responses to the points raised in the review TER were transmitted to the NRC July 28, 1988; rationales for related changes made to the ODCM were transmitted to the NRC on February 28, 1989 with the RBS Semiannual Radioactive Effluent Release Report for the last six months of 1988, but changed pages were not included. Revision 3 also includes several relatively minor changes initiated by the Licensee.

The attached evaluation is divided into three parts. The first deals specifically with the Licensee's responses to the points raised in the review TER. The second identifies deficiencies resulting from changes made in response to the review TER. The third section identifies some problems with the site specific dose factors which were not identified in the original review.

The review TER, EGG-PHY-8003, noted that RBS uses the radionuclide mix from the FSAR (changed to USAR in the current ODCM) to calculate dose rates due to noble gases released. The noble gas releases at RBS are extremely low and the Licensee states that this does not allow the use of actual plant data. However, the ODCM is somewhat contradictory in the treatment of this problem. Recommendations for some changes and clarifications are made in the paragraph identified as Comment 4 in the attached evaluation. A recommendation is also included that more care be taken to be sure that all figures and maps in the ODCM are legible. The quality of these varies considerably between revisions. Changes made in response to recommendations in the review TER appear to be within the guidelines of NUREG-0133 except as noted in the following paragraph.

EG&G Idaho, Inc. P.O. Box 1625 · Idaho Falls, ID 83415

In revising the ODCM to make use of the assumed 1000 cfs near field dilution flow permitted by Section 4.3 of NUREG-0133, as recommended in the review TER, the Licensee apparently inadvertently made a change without properly compensating for it by a change in the remainder of the equation. This problem is discussed in the first item of the second part of the attached evaluation. Other items in this second part are very minor.

The third part of the attached evaluation is concerned with the site specific dose factors (Dose Conversion Factors in the Licensee's terminology). The main problem here is that the RBS dose factors for I-131 and I-133 are too high for the inhalation and ground plane pathways.

Very truly yours,

D W Akers

D. W. Akers
Nuclear Sciences

TEY/lkw

Attachments:
As stated

EVALUATION OF RIVER BEND ODCM UPDATED THROUGH REVISION 3 - DWA-33-89

Gulf States Utility Company (GSU), the Licensee for River Bend Station Unit 1 (RBS), transmitted a complete River Bend Station ODCM, updated through Revision 3, to the NRC with a letter from J. E. Booker (GSU) to Document Control Desk (NRC) dated April 24, 1989. Revision 3 was transmitted in response to a letter from W. A. Paulson (NRC) to J. C. Deddens (GSU) dated March 28, 1989, which requested that the Licensee provide a complete legible copy of the current River Bend Station ODCM within 30 days. A complete ODCM updated through Revision 2, which was in effect for the period of the latest Semiannual Radioactive Effluent Release Report was transmitted in the package with Revision 3. (Note: Some confusion is possible when refering to a RBS ODCM by revision number. An ODCM Revision 3 was submitted September 16, 1985. The next revised ODCM was submitted April 30, 1987 (after the start of commercial operation) and was designated Revision 0. Revision numbers in this evaluation refer to the series beginning with the Revision 0, submitted April 30, 1987.) At the request of the NRC, Revision 1 of the ODCM was reviewed at the INEL and the results of the review were reported in a Technical Evaluation Report (TER) dated February 1988 (EGG-PHY-8003).

Most of the changes resulting in Revision 2 were made in response to a letter from W. A. Paulson (NRC) to J. C. Deddens (GSU) dated February 29, 1988. This letter requested that all points raised in the Conclusions section of the review TER dated February 1988 be addressed within six months in a new revision of the ODCM. The Licensee responded to this request in a letter from J. E. Booker (GSU) to Document Control Desk (NRC) dated July 28, 1988, which stated that the RBS ODCM would be revised to incorporate 14 of the 20 items in the Conclusions section of the review TER and gave reasons for not incorporating the remaining 6 items. Rationales and documentation of approvals for the changes, but not changed pages of the ODCM, were transmitted to the NRC with the Semiannual Radioactive Effluent Release Report for the period from July 1 to December 31, 1988 with a letter from J. E. Booker (GSU) to Document Control Desk (NRC) dated February 28, 1989. Documentation accompanying Revision 3 of the ODCM shows that the changes made in response to items in the review TER were included in ODCM Revision 2, which became effective July 29, 1988. Rationales and documentation of approvals for the changes resulting in Revision 3 of the ODCM were apparently not transmitted to the NRC with Revision 2 and Revision 3. According to the RBS Technical Specification 6.14.2.1 these should be submitted with the semiannual report for the Jan-Jun 1989 period, since Revision 3 became effective February 13, 1989.

The Licensee's letter of July 28, 1988 giving reasons for not incorporating six of the recommendations in the review TER into the revised ODCM included verbatim copies of the six recommendations. Copies of this letter and the Conclusions section of the review TER are attached for convenient reference. Numbers assigned to the recommendations (comments) by the Licensee are used for identification in the following discussions.

<u>Comment 1.</u> This recommendation stated that the total dilution water volume during the reporting period should be used, instead of the dilution water volume during the release period, when calculating

doses to an individual due to radioactive material released in liquid effluents. The response from GSU states that use of the total dilution volume during the reporting period will be considered in a future revision.

The Licensee made some changes in the description of the methodology used to calculate doses due to liquid effluents. With the new description in ODCM Revision 3 it is clear that the calculated doses are consistent with doses calculated using the methodology of NUREG-0133. Also, the Licensee's Semiannual Radioactive Effluent Release Reports include sufficient data to permit verification of the Licensee's calculated doses.

Comments 2, 3, and 5. The Licensee calculates noble gas air doses and determines noble gas monitor setpoints based on calculated air doses and dose rates at the unrestricted area boundary instead of at the site boundary. The Licensee realizes that the calculations give conservative results, but prefers to retain the present methodology. It allows dose projection calculations and comparisons at the location monitored by the RBS Radiological Environmental Monitoring Program. The unrestricted area boundary is entirely enclosed by the site boundary, so the requirements of the RBS Technical Specifications limiting dose rates and doses due to noble gases are satisfied by the methodology now described in the ODCM.

Comment 4. The comment in the review TER notes that in ODCM Sections 3.3.1.2.1 and 3.3.1.2.2 the Licensee calculates noble gas dose rates using data from the FSAR instead of actual plant release data. The response by GSU states that due to high fuel integrity at RBS the "current radionuclide mixes and inconsistent release rate levels have not allowed the use of actual plant data."

The paragraph, "The radionuclide mix was based upon source terms tabulated in the River Bend Station USAR, Table 11.3-1 and are summarized in Appendix D." appears in Section 3.3.1.2.1 of the ODCM. This paragraph implies that the radionuclide mix from the USAR will always be used in the "General Approach" to calculating dose rates due to releases of noble gases. If the methodology of NUREG-0133, using actual release data to calculate dose rates, is to be used when feasible, this paragraph should not be included in Section 3.3.1.2.1. Instead, the rationale for using the radionuclide mix from the USAR during periods of very low releases should be added to Section 3.3.1.2.2. This rationale should also be included in the footnotes of Tables C-3, C-4, and C-5.

Comment 6. In response to the suggestion that Section 2.3.2.1 include a low level alarm for the liquid radwaste monitor, the Licensee states that lower tier procedures prescribe a low level alarm setpoint as a fraction of the high alarm setpoint.

In addition to the clarifications recommended in Comment 4 above, care should be taken when preparing future revisions of the ODCM that all the figures and maps included are legible.

The following items, associated with Revisions 2 and 3, were identified during the present review and should be addressed by the Licensee.

1. In response to a recommendation in the review TER, the Licensee modified ODCM Equation 2.4.2-1 so the near field dilution flow used in the dose calculations corresponds to the 1000 cfs dilution flow permitted by Section 4.3 of NUREG-0133. The Licensee's use of the symbol, D_w, in Equation 2.4.2-1 for the "applicable factor" in Section 4.3 of NUREG-0133 is confusing, since D_w is used for a different quantity in Table B-2 of ODCM Appendix B. Different symbols should be used in Equation 2.4.2-1 and in Table B-2.

   The dilution factor for potable water intake (D_w = 24,800) in ODCM Table B-2 should apparently be reduced to compensate for the use of the "applicable factor" (D_w = 77.4) in Equation 2.4.2-1 of Revision 3. The product of the liquids released by the plant (averaging ~7.37 cfs for releases during 1987), the "applicable factor" (77.4), and the dilution factor from near field to potable water intake (now 24,800) should not exceed the river flow.

2. The term "$\Sigma D_{TOTAL\ \tau}$" in Equation 2.5.2-1 should be defined and the period covered by it identified.

3. "Site boundary" in the first paragraph of Section 3.4.1.2.3.a should be changed to "unrestricted area boundary" for consistency.

4. The term "ΣD_τ" in Equation 3.5.2-1 and "D_τ" in the following definitions should be made consistent, probably by removing the "Σ".

The site specific dose factors in the RBS ODCM were compared with dose factors calculated by the reviewer using the methodology and parameters of NUREG-0133 and Regulatory Guide 1.109, Revision 1. Differences between the Licensee's values and those calculated by the reviewer are discussed below.

1. The following differences were identified in Table B-1, Liquid Effluent Dose Parameters. The total body dose parameter for Mo-99 is 28% of the reviewer's value. The total body dose parameter for Te-129m is 75% of the reviewer's value. All iodine total dose and critical organ dose parameters are 119% of the reviewer's values. The values of these parameters should be checked using the methodology of NUREG-0133. In Table B-2, the "10^{-5}" in the definition of $A_{i\tau}$ should be "10^{+5}." Also, the Licensee may wish to use more recent values of the bioaccumulation factor for phosphorus-32 than those in Table A-1 of Regulatory Guide 1.109. These values are 3000 for freshwater fish and 600 for freshwater invertebrates. References for these values are: "The Importance of P-32 in Nuclear Reactor Liquid Effluents," Edward F. Branagan, Jr., Charles R. Nichols, and Charles A. Willis, Health Physics Annual Meeting, June 27 - July 1, 1982; and B.Kahn and K. S. Turgen, "The Bioaccumulation Factor for Phosphorus-32 in Edible Fish Tissue," NUREG/CR-1336, March 1980.

2. In Tables I-1 through I-4, the I-131 and I-133 Dose Conversion Factors for the Inhalation pathway appear to be too high by a factor of 2 (except the I-131 factor for the adult liver, which is too high by a factor of 1.86.) These values should be corrected. The inhalation dose factors for iodines in ODCM Table G-1, which should be the same as those in Table I-3, appear to be correct.

3. In Table I-5, the I-131 and I-133 Dose Conversion Factors for the Ground Plane are apparently too high by a factor of 2. The skin dose factor for Cs-137 should be 1.21E+10 instead of 1.21E+07. These values should be corrected.

4. In Tables I-6 through I-19, the Licensee's Dose Conversion Factors for I-131, I-133, and C-14 agree with the reviewer's values. The factors for H-3 are lower than the reviewer's values, which is consistent with the Licensee's using dose factors equal to those in LADTAP II or GASPAR instead of Regulatory Guide 1.109. Other Dose Conversion Factors in Tables I-6 through I-19 are generally lower than the reviewer's values by between 5% and 30%. Dose Conversion Factors exhibiting this range of differences have been calculated by other Licensees.

This review was performed by T. E. Young.

GULF STATES UTILITIES COMPANY

July 28, 1988
RBG-28342
File No. G9.5

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Gentlemen:

River Bend Station - Unit 1
Docket No. 50-458

By letter dated February 29, 1988, the Nuclear Regulatory Commission transmitted a Technical Evaluation Report (TER) prepared by EG&G Idaho, Inc. of River Bend Station's Offsite Dose Calculation Manual (ODCM), Revision 1. Each of the discrepancies/suggestions in the TER have been reviewed. Gulf States Utilities Company (GSU) will revise the ODCM to incorporate 14 of the 20 items listed in the conclusion section by July 30, 1988. The remaining items and the reasons for not incorporating them in the next ODCM revision are listed below:

1. Comment: "In Section 2.4, the DF_1 should be defined as the total dilution water volume during the reporting period instead of the dilution volume during the release period which may result in overly conservative calculated doses."

   GSU Response: The DF_1 based on the dilution volume during the release period is a conservative method of calculating liquid pathway doses. GSU will consider in a future revision incorporating a DF_1 based on the total dilution volume during the reporting period.

2. Comment: "In Section 3.3.1.2.1, the X/Q is evaluated at the unrestricted area boundary which may result in overly conservative calculated dose rates for noble gases instead of being evaluated at the site boundary."

   GSU Response: The X/Q evaluated at the unrestricted area boundary is a conservative method of calculating dose rates for noble gases. This location allows dose projection calculations and comparisons at a location that is monitored by the River Bend Radiological Environmental Monitoring Program.

A009

3. Comment: "In Section 3.4.1.2.a, the X/Q referenced in Appendix E is evaluated at the unrestricted area boundary (instead of being evaluated at the site boundary) which may result in overly conservative calculated doses to air."

GSU Response: See item no. 2.

4. Comment: "In Section 3.3.1.2.1 and 3.3.1.2.2, data from the FSAR are used for gaseous effluent radionuclide mix in the dose rate calculations instead of using actual plant data."

GSU Response: Due to River Bend's high fuel integrity, current radionuclide mixes and inconsistent release rate levels have not allowed the use of actual plant data.

5. Comment: "In Section 3.3.2.2.a.i, the X/Q used to determine the noble gas monitor setpoint is defined and evaluated at or beyond the unrestricted area boundary instead of at or beyond the site boundary as required in Technical Specification 3.11.2.1."

GSU Response: See item no. 2.

6. Comment: "In Section 2.3.2.1, it may be prudent to include a low level alarm for the liquid radwaste monitor with a setpoint slightly above the spurious alarm setting."

GSU Response: At RBS, lower tier procedures prescribe a low level (ALERT) alarm setpoint as a fraction of the HIGH alarm setpoint.

If you have any questions, please contact our Mr. James W. Cook at (504) 381-4151.

Sincerely,

J. E. Booker

J. E. Booker
Manager-River Bend Oversight
River Bend Nuclear Group

JEB/LAE/JWC/ch

cc: U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

NRC Resident Inspector
Post Office Box 1051
St. Francisville, LA 70775

4. CONCLUSIONS

The Licensee's ODCM Revision 1 for the River Bend Station Unit 1 was reviewed. It was determined that the ODCM uses methods that are, in general, consistent with the guidelines of NUREG-0133. However, it is recommended that another revision to the ODCM be submitted to address the discrepancies identified in the review.

The following are considered to be major discrepancies:

- In Section 2.4, the DF_1 should be defined as the total dilution water volume during the reporting period instead of the dilution volume during the release period which may result in overly conservative calculated doses.

- In Section 2.4, the dilution volume should be adjusted in accordance with the recommendations of Section 4.3 of NUREG-0133.

- In Section 3.3.1.2.1, the X/Q is evaluated at the unrestricted area boundary which may result in overly conservative calculated dose rates for noble gases instead of being evaluated at the site boundary.

- In Section 3.3.1.2.3, the dose rate is determined for the infant age group instead of the child age group. The child age group is the limiting age group and is the required age group as defined in the bases statement of Technical Specification 3.11.2.1.b.

- In Section 3.4.1.2.a, the X/Q referenced in Appendix E is evaluated at the unrestricted area boundary (instead of being evaluated at the site boundary) which may result in overly conservative calculated doses to air.

The following are additional discrepancies:

- In Section 2.4, it is not clear if Equation 2.4.2-1 determines the dose due to liquid effluents for the release of a single batch or for a series of batches.

- In Section 2.4.2, Equation 2.4.2-2 should use an index other than "i" in order not to confuse it with the radionuclide "i" used in Equation 2.4.2-1.

- In Sections 2.5 and 3.5, a different definition should be considered for X_D, since it appears that the existing definition will result in overly conservative dose projections.

- In Section 3.3.1.2.1 and 3.3.1.2.2, data from the FSAR are used for the gaseous effluent radionuclide mix in the dose rate calculations instead of using actual plant data.

- In Section 3.3.1.2, Equations 3.3.1.2.2-1 and 3.3.1.2-2 have units of mrem/sec instead of mrems/year. The mrems/year are required for consistency with Technical Specification 3.11.2.1. Therefore, a constant must be included in the equations to adjust the calculated result to mrems/year.

- Section 3.3.1.2.3 references Table E for X/Q_D instead of the values from Table F. The data in Table F should be used in the dose calculations due to the release of I-131, I-133, particulates with half lives greater than eight days, and tritium.

- In Section 3.3.2.2, the expressions on each side of the equal signs are not equal because of the 0.8 factor and the effective dose factor on one side of the equation.

- In Sections 3.3.2.2.a.i and 3.3.2.2.a.ii, it is not clear which setpoint is the actual high alarm setpoint.

- In Section 3.3.2.2.a.i, the X/Q used to determine the noble gas monitor setpoint is defined and evaluated at or beyond the unrestricted area boundary instead of at or beyond the site boundary as required in Technical Specification 3.11.2.1.

- In Section 3.3.2.2.a.i.Step 5, it is not clear what is meant by the "monitor's loop accuracy".

- Figures 2 and 4 illustrating the liquid and gaseous radwaste treatment systems are illegible and should be replaced.

- A figure illustrating the solid waste treatment system is not included in the ODCM.

The following are not discrepancies in the ODCM, but are suggestions that should be brought to the attention of the Licensee:

- In Section 2.3.2.1, it may be prudent to include a low level alarm for the liquid radwaste monitor with a setpoint slightly above the spurious alarm setting.

- In Section 3.3.1.2.3, tritium is not addressed and "Radioiodines" is stated which implies all radioiodines instead of only "I-131 and I-133" as required in Technical Specification 3.11.2.1.

- In Section 4.0, Table 4.1 under "Airborne Particulates and Radioiodines" specifies "radioiodines" instead of only "I-131".