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REGION II
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August 5, 2009

MEMORANDUM TO: Thomas B. Blount, Deputy Director
Special Projects Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

FROM: Kriss M. Kennedy, Director ***/RA/***
Division of Reactor Safety
Region II

SUBJECT: TASK INTERFACE AGREEMENT – REPORTING RADIOACTIVE EFFLUENTS RELATIVE TO COMPLIANCE WITH 10 CFR 50 AND THE LICENSEE'S TECHNICAL SPECIFICATIONS (TIA 2009-04)

This Task Interface Agreement (TIA) documents the applicable regulatory position on reporting radiological effluents and assessing doses agreed upon between Region II (RII) and the Office of Nuclear Reactor Regulation (NRR). Technical staff (health physicists) from RII and NRR cooperated in developing the TIA content, which was subsequently communicated via this document using the Concurrence Method as described in NRR Office Instruction COM-106, Control of Task Interface Agreements, Rev. 3.

In April 2008, the NRC issued inspection report 05000325,324/2008002 for the Brunswick Steam Electric Plant. That report included an unresolved issue, URI 05000325,324/2008002-02, which questioned the licensee's assessment of public doses resulting from evaporation of tritium from an on-site pond. The 64-acre pond, referred to as the Storm Drain Stabilization Pond (SDSP), was classified by the licensee as, "…not part of the pathway for designed releases from the plant." Based on this classification, some of the tritium releases from the pond were not reported as normal releases or abnormal releases in the licensee's Annual Radioactive Effluent Release Report (ARERR). Additionally, because the licensee's Offsite Dose Calculation Manual (ODCM) did not contain models and data for calculating doses due to gaseous release from the SDSP, the inspectors questioned whether the licensee's dose assessment was in compliance with the regulatory requirements and licensing bases (e.g., 10 CFR 50 Appendix I, 10 CFR 50.36a, Brunswick's Technical Specifications, and Brunswick's ODCM). The inspectors also asked how the existing guidance in Regulatory Guide 1.109, "Calculating of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I," should be applied to reporting radioactive effluents from the SDSP.

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To resolve the URI (summarized above) the NRC staff explored the following two questions and determined the answers to be:

1. Did the licensee's reporting of the tritium releases from the SDSP in the 2007 ARERR comply with the regulatory requirements (and does the guidance in Regulatory Guide 1.109 apply to reporting radioactive releases from the SDSP)?

   The licensee's reporting of tritium releases from the SDSP in the 2007 ARERR did not comply with the regulatory requirements. Additionally, the existing regulatory guidance in RG 1.109 does not provide guidance that would allow the licensee to report radioactive releases from the SDSP differently than required by 10 CFR 50.36a(a).

2. Was Brunswick's use of a hypothetical receptor in its dose assessment of SDSP releases in compliance with regulatory requirements and were the dose calculations adequately described in the ODCM?

   Brunswick's dose assessment of SDSP releases was adequate with respect to their usage of a hypothetical receptor; however, the licensee failed to maintain the ODCM with respect to the newly identified releases of tritium from the SDSP.

Licensee Position:

The doses due to (1) tritium evaporation from the SDSP and (2) tritium seepage from the SDSP to the unrestricted area (in the location called Nancy's Creek) do not need to be included in the annual dose assessment in Attachment 7 of the ARERR. The total curies released do not need to be included in the release summations in Attachment 2 of the ARERR. The curies, volume released, and dose were not included because those releases are "…not part of the pathway for designed releases from the plant."

At Brunswick, the dose assessment to the maximum exposed individual from particulates, iodine, and tritium includes a hypothetical exposure pathway involving the ingestion of cow's milk (per Brunswick ODCM 3.3.2). Although this exposure pathway is hypothetical (i.e., milk cows are no longer located within 5 miles of the site as described in Brunswick ODCM 3.3.2), it will continue to be used – instead of an actual exposure pathway – in dose assessments.

Applicable Regulatory Position

Question 1: Did the licensee's reporting of the tritium releases from the SDSP in the 2007 ARERR comply with the regulatory requirements (and does the guidance in Regulatory Guide 1.109 apply to reporting radioactive releases from the SDSP)?

10 CFR 50.36a(a)(2) requires each licensee to, *"…*submit a report to the commission annually that specifies the quantity of each of the principal radionuclides released to unrestricted areas in liquid and gaseous effluents during the previous 12 months…."

10 CFR 50.36a(a)(1) specifies "each licensee…will include technical specifications that …require...operating procedures developed pursuant to 10 CFR 50.34a(c) for the control of effluents be established and followed…." In response to this rule, Brunswick developed Technical Specifications and operating procedures including an ODCM. Brunswick Technical Specification 5.6.3 states, "The [Annual] Radioactive Effluent Release Report…shall include a summary of…liquid and gaseous effluents…consistent with the…ODCM…."

The Brunswick ODCM (Revision 25) Specification 7.4.2 states,

> The Radioactive Effluent Release Report shall include…a summary of the quantities of radioactive liquid and gaseous effluents…as outlined in Regulatory Guide 1.21, 'Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactivity Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants,' Revision 1, June 1974, with data summarized on a quarterly basis similar to the format of Appendix B thereof.

RG 1.21, Revision 1, Section B, (page 1.21-2) defines an abnormal release as an "unplanned or uncontrolled release of radioactive material from the site boundary," and states,

> The number of abnormal releases of radioactive material to the environment should be reported. The total curies of radioactive materials released as a result of abnormal releases should be included. This information should be reported separately for liquid and gaseous releases. The activity values should also be included, as appropriate, in Tables 1 and 2 [of the ARERR].

Gaseous releases of tritium from the SDSP and liquid seepage from the SDSP to Nancy's Creek occurred in all four quarters of 2007. The licensee included the tritium activity released from the SDSP, and the corresponding dose assessments, in the 2007 ARERR, but these SDSP tritium releases were not summarized on a quarterly basis in the 2007 ARERR. This was inconsistent with Brunswick ODCM 7.4.2. Additionally, none of these releases were reported in the ARERR as abnormal releases as outlined in RG 1.21. This was also inconsistent with Brunswick ODCM 7.4.2. In these two cases, the licensee did not follow the guidance in the ODCM. This was inconsistent with 10 CFR 50.36a(a)(1) that requires the licensee to follow

procedures that have been established for the control of radioactive effluents. The failure to report tritium releases in accordance with the ODCM should be considered a minor performance deficiency because it did not impact the public radiation safety cornerstone objective (i.e., to ensure adequate public health and safety).

The discussion above is limited to the strict requirements of 10 CFR 50.36a without consideration of existing NRC staff guidance. The following excerpt from RG 1.109 provides some guidance for dose calculations and dose reporting:

> Equations are provided [in section C of RG 1.109] by which the NRC staff will estimate radiation exposure for the maximum individual…. These equations are appropriate for the exposure pathways that the staff routinely considers in its evaluations. In addition, other exposure pathways that may arise due to unique conditions at a specific site should be considered if they are likely to provide a significant contribution to the total dose. A pathway is considered significant if a conservative evaluation yields and additional dose increment equal to or more than 10% of the total of all pathways considered in this guide.

Because tritium releases from the SDSP were recently identified by the licensee, and because these releases are somewhat unique to Brunswick, the regional inspectors asked whether this provision of RG 1.109 should be applied to tritium releases from the SDSP at Brunswick.

This regulatory guidance in RG 1.109 is only applicable to calculating and reporting doses for an exposure pathway that is not one of the exposure pathways listed in RG 1.109. This guidance may not be applied to evaporative loses from the SDSP at Brunswick since the SDSP is a release source (not a new exposure pathway). As a result, the regulatory guidance in RG 1.109 provides no guidance for reporting the activity from SDSP releases differently than required by 10 CFR 50.36a(a). As a result, the gas releases from the SDSP should be reported as outlined in RG 1.21 in accordance with Brunswick ODCM 7.4.2 and Technical Specification 5.6.3.

The licensee's reporting of tritium releases from the SDSP in the 2007 ARERR did not comply with the regulatory requirements. Additionally, the existing regulatory guidance in RG 1.109 does not provide guidance that would allow the licensee to report radioactive releases from the SDSP differently than required by 10 CFR 50.36a(a).

Question 2: Was Brunswick's use of a hypothetical receptor in its dose assessment of SDSP releases in compliance with regulatory requirements and were the dose calculations adequately described in the ODCM?

In order to answer this question it is necessary to verify (1) the proper receptor location was chosen and (2) the correct method of calculation was used to comply with the regulations.

RG 1.109 Table 1 outlines one acceptable method to demonstrate compliance with 10 CFR 50 Appendix I. That table contains a footnote which states the highest dose offsite due to iodines,

particulates, and tritium in gas releases is "…evaluated at a location where an exposure pathway and dose receptor actually exist at the time of licensing."

At the time of licensing, a cow was located within 5 miles of the Brunswick site (reference the Final Environmental Statement, Brunswick Steam Electric Plant, January 1974, Table V-7), and the dose assessment for iodines, particulates, and tritium therefore included the grass-cow-milk pathway (as described in Brunswick ODCM C.2.3). By choosing to assess the dose at a location which included what is now a hypothetical exposure pathway (as described in Brunswick ODCM 3.3.2), the licensee has chosen to adopt the regulatory guidance from RG 1.109. As a result, it is concluded that the licensee chose an appropriate receptor location at which the dose to the maximum individual may be calculated. It is now necessary to determine if the method the licensee used for the dose calculation is adequate and appropriate.

The SDSP tritium evaporation dose the licensee reported in the 2007 ARERR was calculated to a real individual living near the site boundary rather than at the ODCM-specified location for demonstrating compliance with 10 CFR 50, Appendix I. The licensee performed this calculation by adapting equations and parameters (e.g., x/Q for ground-level turbine building releases) from the ODCM for use with evaporative releases from the SDSP to the site boundary nearest resident. Subsequent calculations by the licensee at the ODCM-specified receptor location for iodine, particulate, and tritium dose determined the incremental dose due to tritium evaporation from the SDSP to be inconsequential. With respect to the liquid seepage from the SDSP, the licensee developed a methodology for calculating the dose that, although reasonable, was not documented in the ODCM.

Based on the guidance provided in RG 1.109, assessing the dose at a location which included a now hypothetical pathway provided a conservative upper bound to the iodine, particulate, and tritium dose and was acceptable for demonstrating compliance with 10 CFR 50 Appendix I. However, to fully evaluate the dose to the maximum exposed individual at the ODCM-specified location, all exposure sources, including the SDSP release must be included. In addition, the calculational methodology for all release sources should be addressed in the licensee's effluent control program (i.e., the ODCM).

Since Brunswick had only recently identified the evaporative losses (i.e., gaseous releases) from the SDSP, the licensee should be allowed adequate time (e.g., approximately one year from the date of discovery) to update the ODCM. In this case, however, liquid releases of tritium from the SDSP had occurred for several years, yet the ODCM had not been revised to adequately address the liquid releases from the SDSP.

10 CFR 50.36a(a)(1) requires "each licensee…will include technical specifications that …require...operating procedures…for the control of effluents be established and followed…."

Brunswick Technical Specification 5.5.4.e states the, "Radioactive Effluent Control Program …shall be contained in the ODCM and shall include…a determination of…dose contributions from radioactive effluents for the current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM at least every 31 days."

The Brunswick ODCM (Revision 25, Section 3.3.2) describes the gaseous release sources for which the ODCM equations apply as follows (note the SDSP is not present in the list):

> Radioiodines, particulates, and tritium may be released from the stack, Reactor Buildings, Turbine Buildings. Radioiodines and particulates may also be released from other sources such as decontamination facility in the Hot Shop and burning waste oil in the incinerator. Effluents from the decontamination facilities in the Radioactive Materials Container and Storage Buildings and hot shop, incinerator and any building exfiltration are combined with the Turbine Building's vent releases…. Therefore, incorporating the various release points into Expression 3.3-13 results in the following expression [equation 3.3-14] to show compliance with 10 CFR 50 for a particular organ:…

Several examples were noted of the licensee's failure to maintain the ODCM to account for the newly identified SDSP releases. It is necessary to update the ODCM for compliance with Technical Specifications 5.5.1 and 5.5.4. Some examples are listed below.

1. Equations in ODCM 3.3.2 do not include parameters for gas releases from the SDSP
2. Brunswick ODCM 2.2.1 states,"…only batch releases occur at [Brunswick]"
3. ODCM 2.2.1 does not address dose assessment of continuous liquid releases from the SDSP to Nancy's Creek
4. ODCM 2.1.3 states SDSP release permits will be based on gamma isotopic analysis
5. ODCM Table 3.2-1 specifies a default radionuclide mixture that contains no tritium in ground level gaseous releases
6. ODCM Table 7.3.7-1 doesn't list SDSP as a continuous gas release or the sample frequency for such releases
7. ODCM Table A-4 lists dispersion factors for point sources but not for area sources such as the SDSP

The newly identified gas releases from the SDSP and the newly identified liquid seepage from the SDSP to Nancy's Creek introduced new release points that were not adequately addressed in the licensee's ODCM. This is inconsistent with Brunswick Technical Specification 5.5.4, which specifies the radioactive effluent control program will be contained in the ODCM, 10 CFR 50.36a(a)(1), which specifies operating procedures for the control of effluents be established and followed, and 10 CFR 50 Appendix I Section III.A.1, which states conformity shall be demonstrated by calculational procedures. The failure to adequately describe the radioactive effluent control program in the ODCM should be considered a minor performance deficiency because in this case it did not impact the public radiation safety cornerstone objective (i.e., to ensure adequate public health and safety).

Although Brunswick reported the dose delivered to the nearest resident due to evaporative tritium releases from the SDSP in the 2007 ARERR, the licensee did not assess/report the dose at the ODCM-specified location for iodine, particulate, and tritium exposure due to evaporative losses from the SDSP. In this case, the dose the licensee calculated at the ODCM-specified location did not significantly underestimate the dose to the public. However, the licensee's ODCM did not adequately address the newly identified tritium releases from the SDSP. As a result, it is concluded that the licensee failed to maintain the ODCM with respect to the newly identified releases of gaseous and liquid tritium from the SDSP.

Conclusions

The licensee's reporting of evaporative tritium releases and selected liquid tritium releases from the SDSP in the 2007 ARERR did not comply with the regulatory requirements. Additionally, the existing regulatory guidance in RG 1.109 does not provide guidance that would have allowed the licensee to report radioactive releases from the SDSP differently than required by 10 CFR 50.36a(a).

Brunswick's dose assessment of SDSP releases was adequate with respect to their usage of a hypothetical receptor. However, the licensee failed to maintain the ODCM with respect to the newly identified releases of tritium from the SDSP.

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