Regulatory Guide Periodic Review

Regulatory Guide Number:	**1.109, Revision 1**
Title:	**Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I**
Office/division/branch:	**NRO/DSEA/RPAC**
Technical Lead:	**Richard Clement**
Staff Action Decided:	**Revise**

1. What are the known technical or regulatory issues with the current version of the Regulatory Guide (RG)?

This RG, issued in 1977, provides an acceptable method to calculate radiation doses from normal routine radioactive effluents from licensed nuclear power plant operations under annual average environmental conditions. This RG also demonstrates compliance with the design objectives specified in 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion As Low As is Reasonably Achievable (ALARA) for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." However, as this RG has not been updated since 1977, several improvements could be made.

The dose methodology and terminology used in RG 1.109, Revision 1, and the ALARA design objectives in 10 CFR Part 50, Appendix I, are based on recommendations from the International Commission on Radiological Protection (ICRP) Publication 2 (ICRP-2), "Permissible Dose for Internal Radiation," issued in 1959. However, 10 CFR Part 20, "Standards for Protection Against Radiation," revised in 1991, is based on ICRP-26, "The System of Dose Limitation," issued in 1977, and the ICRP-30 series, "Limits for Intakes of Radionuclides by Workers," issued from 1979 through 1988. The ICRP-2 dose assessment methodology is not directly comparable with ICRP-26 and ICRP-30.

As such, the staff proposes to incorporate references to the latest versions of the XOQDOQ, LADTAP II, and GASPAR II codes in an update to the NRCDose code and reflect these changes in the proposed RG update. This RG update would also incorporate references to coding corrections and published errata, non-human biota dose calculations from gaseous effluents, and new reactor licensing lessons learned. An expanded radionuclide listing with ICRP-2, ICRP-26, ICRP-30, and ICRP-72 dose factors and recent parameter values will be reflected in revised RG 1.109 tables. In addition, the staff will be adding a discussion with equations to assess the recreational boating and swimming exposure pathway from liquid effluents. The updated NRCDose code which would implement the guidance in the proposed RG update is planned to be available for distribution once its development, testing, and documentation is completed in late 2018.

2. What is the impact on internal and external stakeholders of <u>not</u> updating the RG for the known issues, in terms of anticipated numbers of licensing and inspection activities over the next several years?

The primary use of this RG is for reactor licensing and implementing operational programs. There is little or no impact on internal or external stakeholders of not updating RG 1.109, Revision 1, for large light-water reactors (LWRs) since the staff is not expecting any applications in the near future. However, the staff does anticipate that there will be several small modular reactor (SMR) and advanced reactor design applications. There may be a need for additional requests for information to ensure that the appropriate information is addressed for these designs.

In general, the calculation models, assumptions, parameter values, and methods for assessing the exposure pathway doses in RG 1.109, Revision 1, are adequate and conservative. However, revising the RG may assist applicants and licensees to perform more accurate dose calculations, may assist inspectors in determining if regulatory requirements are being adequately implemented, and improve the effectiveness and efficiency in NRC's licensing process by using an updated NRCDose code. As with large LWRs, the proposed RG update would also provide guidance to assess exposure pathway doses for SMR and advanced reactor designs.

3. What is an estimate of the level of effort needed to address identified issues in terms of full-time equivalent (FTE) and contractor resources?

An estimate of the effort needed to review relevant technical and regulatory issues of this RG is 1 FTE. This work can be performed by the staff without the need for contract support.

4. Based on the answers to the questions above, what is the staff action for this guide (Reviewed with no issues identified, Reviewed with issues identified for future consideration, Revise, or Withdraw)?

Revise.

5. Provide a conceptual plan and timeframe to address the issues identified during the review.

The staff plans to develop a draft revision of this RG by September 2019 and issue it for public comment by the end of FY 2020.

NOTE: This review was conducted in March 2018 and reflects the staff's plans as of that date. These plans are tentative and are subject to change.