

POLICY ISSUE INFORMATION

March 19, 2008

SECY-08-0038

FOR: The Commissioners

FROM: Luis A. Reyes
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SUBJECT: U.S. NUCLEAR REGULATORY STAFF COMMENTS ON THE
INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION'S
DRAFT REPORT ON ENVIRONMENTAL PROTECTION: THE
CONCEPT AND USE OF REFERENCE ANIMALS AND PLANTS

PURPOSE:

The purpose of this paper is to inform the Commission of the results of the staff's review of the International Commission on Radiological Protection's (ICRP's) draft report, "Environmental Protection: The Concept and Use of Reference Animals and Plants." The paper does not propose any changes to current policy. This paper does not address any new commitments or resource implications.

BACKGROUND:

In 2003, ICRP established a new activity on the protection of the environment. The purpose of the activity is to develop a radiation protection policy for non-human species and create a framework of protection for non-human species based on ethical and philosophical principles. It published the outline for the framework as ICRP Publication 91, "A Framework for Assessing the Impact of Ionizing Radiation on Non-Human Species," in 2003. The proposed framework, which the 2004 draft of ICRP Publication 103 referenced, was intended to serve as a parallel approach to the protection of humans.

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The ICRP also created the new Committee (Committee 5), to establish the framework for the protection of nonhuman species for the 2005–2009 terms. It formed Committee 5 specifically to pursue activities in the environmental protection arena by further developing the framework of protection of non-human species. The ICRP devoted a chapter to “Protection of the Environment,” in both the 2006 and 2007 draft versions of the ICRP Publication 103. In both instances, the U.S. Nuclear Regulatory Commission (NRC) staff informed the ICRP that separate recommendations for protection of the environment are unnecessary and that the NRC opposes future development of separate standards for non-human species. Nevertheless, the chapter was included in the final recommendations, published December 2007, as ICRP Publication 103. The chapter on Protection of the Environment does not establish any separate standards but recommends further development of a framework to analyze impacts. The draft Committee 5 report is the first step in developing this framework.

The ICRP posted the draft report by Committee 5 on its website (www.icrp.org) and requested public comments by March 28, 2008. All comments submitted will be available for viewing on the ICRP website, and will be considered in preparing the final version of the Committee 5 draft report.

In SECY 04-0055, “Plan for Evaluating Scientific Information and Radiation Protection Recommendations,” dated April 7, 2004, (ML040820847) the NRC staff proposed a plan for evaluating radiation protection recommendations, including those from the ICRP. As part of its proposal, the staff committed to continue participating in the process of the development of radiation protection information by providing comments on early draft documents directly to the ICRP.

The NRC staff Radiation Protection Steering Committee, which includes representatives from the Offices of Nuclear Material Safety and Safeguards; Nuclear Reactor Regulation; Nuclear Regulatory Research; Nuclear Security and Incident Response; and Federal and State Materials and Environmental Management Programs, solicited comments on the ICRP Committee 5’s draft report from its members’ respective offices. The NRC staff participated in an Advisory Committee on Nuclear Waste and Materials meeting on February 14, 2008, and discussed the draft report with the Committee. The NRC staff will also be participating in efforts by the Interagency Steering Committee on Radiation Standards to coordinate comments from the Federal Agencies.

DISCUSSION:

Much of the report presents material that describes the current state of knowledge on radiation effects in various non-human species. However, some aspects of Committee 5’s work may potentially affect policy considerations, so the staff is making the Commission aware of the draft Committee 5 report and the NRC staff comments.

Considering prior Commission guidance on ICRP activities, the staff has prepared a set of consolidated comments for the draft report, and is providing these for Commission information (Enclosure). The NRC staff intends to submit these comments to ICRP before the comment period ends on March 28, 2008.

Similar to the reference man concept, the report identifies a set of non-human species for several categories of flora and fauna (e.g., a deer was selected to represent a large terrestrial animal; a duck for an aquatic bird). Careful consideration was given to the type of flora and fauna that were chosen to ensure that the information was not focused on the human food chain or domesticated animals. The data on each of the species is discussed and very simple models are developed to calculate external and internal dose to the animals and plants. Evaluation of the report reveals the amount of data for each of these species varies across a wide range and that the information for several species is incomplete. The report uses the available data to suggest a set of "Derived Consideration Levels." The purpose of the Derived Consideration Levels is to indicate where more detailed evaluation of environmental exposures and their impacts is warranted. The ICRP was clear that the Derived Consideration Levels are not intended as limits, and are proposed for continued discussion.

The text of the report provides numerous caveats on the use of the reference animals and plants and the Derived Consideration Levels. For example, the draft report acknowledges that more work is needed on how information on the reference plants and animals can be related to other organisms. This draft report does not address issues of a more policy nature such as the appropriate end point of such protection (i.e., the protection of individual non-human species or populations of non-human species). The draft report emphasizes its introductory nature and acknowledges that more information and development of the concept is necessary.

The report does not provide any information that would change the current NRC policy that states the protection of humans is also protective of non-human species.

CONCLUSIONS:

Staff general and specific comments are provided in the enclosure. The enclosed comments reflect the preliminary nature of the information contained in the Committee 5 draft report and support the longstanding Commission policy that protection of humans is also protective of non-human species.

Listed below are the actions or activities the staff will complete:

1. Provide the enclosed comments, as NRC staff comments, via the ICRP website, on or before the comment due date of March 28, 2008.

2. Provide the enclosed comments to other Federal Agencies through the Interagency Steering Committee on Radiation Standards to coordinate high level comments.
3. Continue to monitor the activities of ICRP Committee 5 and other international activities in the area of protection of non-human species.

/RA/

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Enclosure:

U.S. Nuclear Regulatory Commission Staff
Comments on International Commission
On Radiological Protection's Draft Report On
Environmental Protection: The Concept and
Use of Reference Animals and Plants

U.S. Nuclear Regulatory Commission Staff Comments on International Commission On Radiological Protection's Draft Report On Environmental Protection: The Concept and Use of Reference Animals and Plants

The U.S. Nuclear Regulatory Commission (NRC) staff appreciates the opportunity to review and offer comments and observations on the International Commission on Radiological Protection (ICRP) Committee 5 draft report, "Environmental Protection: The Concept and Use of Reference Animals and Plants." We continue to applaud the ICRP for providing draft reports for consultation and comment.

The NRC staff appreciates the clear and careful cautions included in Chapter 6 stating that the Derived Consideration Levels are not intended to be dose limits, or substitute values. The NRC staff strongly agrees with these statements. We urge the ICRP to continue to clearly articulate this viewpoint. We also urge that ICRP clearly affirm that the objective of this effort is not the creation of new standards or requirements.

The NRC has a well established system for considering environmental impacts to non-human species associated with its regulatory and licensing decisions. This system is derived from the requirements within the United States under the National Environmental Policy Act, and includes consideration of the full spectrum of possible impacts from regulatory decisions. The NRC staff has therefore examined the draft ICRP Committee 5 report in the context of this system.

The draft report provides a useful step in summarizing the current state of knowledge of radiation effects in various animals and plants. As such, the majority of the report contains scientific and technical information, and the NRC staff does not have many specific comments to offer on this material. It is important to note that there are many areas, for many of the suggested reference animals and plants, where there is little or no information on radiation effects and there is currently no method to extrapolate radiation effects to other non-reference species.

The proposals for Derived Consideration Levels are important from several perspectives. These are outlined as follows:

- These proposals have been made without any consensus having been developed on the particular end points of concern. While the draft report outlines some of the possible measures of environmental protection, this information does little to advance the actual discussion of what measures may be important or relevant for measuring environmental impact in various situations. The report should make it clear that defining such end points was not a goal of the document and that identifying the appropriate end points would need to be resolved before Derived Consideration Levels are established.
- The proposals have been made with much uncertainty in the actual doses at which effects may occur and with minimal information on radiation effects in some reference biota. Moreover, the impacts of other confounding variables, such as temperature or chemical hazards, are not presently addressed. More work is needed to reduce these uncertainties before Derived Consideration Levels can be considered as anything more than topics of discussion.

Enclosure

- The criteria for selecting a reference plant or animal in the report appears to be based, in part, on whether information was available on radiation effects. A more risk informed approach, whereby the influence of the reference plant or animal on the overall ecological system is considered in defining the reference biota, could be explored.
- The suggested initial set of Derived Consideration Levels support the long standing assumption that protection measures established to assure adequate protection of humans provides adequate protection of animals and plants in that environment. The Derived Consideration Levels are all greater than any dose criteria used for humans. Thus, we continue to find that existing systems of control for radiation and radioactive materials are adequate for protection of the environment. We reiterate our position (last stated in our comments on ICRP Report 103) that additional standards do not need to be established to protect the environment.
- An approach of utilizing Derived Consideration Levels could potentially become a useful adjunct to existing methods used for environmental impact considerations by providing additional information regarding the protection of non-human species. However, any consideration of the use of any tools or methods utilizing such an approach cannot be considered until it is fully developed.
- This document is the first step in collecting and analyzing the available information for the ICRP and as acknowledged in Section 5.4, there are several data sources that have not been included in the report. Therefore, we recommend that the ICRP evaluate and discuss the results of the environmental monitoring data, and the relevant effects on the local non-human species, collected at the large nuclear sites around the world.

Specific Comments

- Modeling of internal exposure assumes that none of the exposure results from ingested material inside the digestive system, although paragraph 86 does mention the use of cylinders to represent animals. For some types of animals, exposure from material in the digestive system, even if not absorbed may be significant. For example, deer (terrestrial herbivores) eat leaves, which have a very high surface to volume ratio and therefore can accumulate significant quantities of contaminants on their surface. So for herbivores, the gut as an internal source may be significant. Worms may be as exposed internally through the gut due not only to their eating habits but also their geometry. An expanded discussion of the advantages of different shapes in this analysis and the sensitivity of results to the shape assumption would be helpful in or after paragraph 86.
- Concentrations of Strontium-90 (Sr-90) after the Kyshtym accident (referenced in paragraph 153 and 278) appear to have an error in units. According to "Radiation Effects in Wild Terrestrial Vertebrates – the EPIC Collection" by Tatiana Sazykina and Ivan I. Kryshev in the Journal of Environmental Radioactivity, Volume 88, Issue 1, 2006, pages 11-48, the relevant concentrations of Sr-90 should be much greater than 14 becquerels per kilogram (Bq/kg) and 1 Bq/kg, cited in paragraphs 153 and 278, respectively.

- It is unclear what dose (for each species) is to be compared to the tables of derived consideration levels. Should the comparison be to the reference animal/plant that receives the highest exposure, the mean or median exposure? A discussion of this would be useful in Section 6.
- Section 7, “Applications and Extrapolations,” paragraph 366 argues that it seems appropriate to focus on the effects on the individual organism for the purpose of developing an ecological framework because radiation effects at the population level are mediated through the effects at the individual level. However, the discussion provided is limited. Additional discussion on the issues related to this assumption of focusing on the individual organism would be beneficial in or subsequent to paragraph 366. These issues could include the effects of low-level doses and chronic effects on individual organism behavior, population fitness and survival (perhaps with examples from non-radiological literature), the uncertainty due to paucity of data on such effects in non-human species and how chronic effects that alter population fitness might influence Derived Consideration Levels.