

# Preface

In the first quarter of 2014, a proposal to write a National Council on Radiation Protection and Measurements (NCRP) report on Radiation Protection Guidance for the United States was approved by the Board of Directors. Council Committee 1 (CC 1) was formed in the second quarter of 2014. This Report updates and expands on Report No. 116, *Limitation of Exposure to Ionizing Radiation* (1993). The first meeting of CC 1 was held on September 3 and 4, 2014.

Since NCRP Report No. 116 was published in 1993, there have been advances in knowledge regarding the biological effects of ionizing radiation, particularly relating to cancer. In addition, health effects other than cancer such as cardiovascular disease and cataracts are emerging as potentially important concerns. Patient exposure to medical-imaging procedures and radiation therapy were not addressed in NCRP Report No. 116, nor was guidance for nonhuman biota (*i.e.*, animal and plant life). Also, a discussion of established ethical principles and their application to radiation protection had not been introduced in NCRP Report No. 116. Furthermore, the Fukushima nuclear reactor accident and the potential for a nuclear or radiological incident in the United States, as well as the increase in population exposure to medical use of ionizing radiation (particularly computed tomography examinations, positron emission tomography scans, and nuclear medicine procedures) have increased the awareness of the importance of radiation protection guidance in the United States.

In 2007, the International Commission on Radiological Protection (ICRP) published revised recommendations for its system of radiological protection (ICRP Publication 103). Subsequently an important ICRP report on tissue reactions (also called deterministic effects), including early and late effects (ICRP Publication 118), was published in 2012. While the goals for radiation protection in the United States are the same as those for the international community, there are some differences in the specific approaches taken to achieve these goals [Kase, K.R. (2016). “Twelfth Annual Warren K. Sinclair Keynote Address — the influence of the NCRP on Radiation Protection in the United States: Guidance and regulation,” *Health Phys.* **110**(2), 127–145]. NCRP radiation protection principles for exposure of humans are now expressed as: justification, optimization of protection, and numeric protection criteria (for management of dose to an individual). When there is a numeric protection criterion for a specific exposure situation, the first objective is to meet that protection criterion, then optimization of protection should be applied. These differences are discussed in this Report.

CC 1 considered numerous radiation protection issues that are discussed in the Report. There is overall consistency between the guidance for the United States in this Report and international radiation protection guidance. Where this guidance is unique or has adapted the international guidance for the United States, the rationale is given for the differences.

Notably, two scientific committees were formed to assist in the development of this Report, one on Guidance on Radiation Dose Limits for the Lens of the Eye and the other on Implications of Recent Epidemiologic Studies for the Linear-Nonthreshold Model and Radiation Protection.

Unique aspects of the manner in which CC 1 operated include:

- It was the first committee formed under the direct oversight of the Council as opposed to oversight by one of the NCRP Program Area Committees (PACs).
- All the PACs participated in the development and review of the recommendations.
- The 2015 NCRP Annual Meeting was on “Changing Regulations and Radiation Guidance: What Does the Future Hold?” and addressed the rulemaking activities ongoing within the U.S. Nuclear Regulatory Commission (NRC), the U.S. Environmental Protection Agency, and the U.S. Department of Energy for which the CC 1 guidance should prove useful [Cool, D.A. (2016). “Summary of the NCRP 51st annual meeting,” *Health Phys.* **110**(2), 233–237].
- An effort was made to consult with and present to a number of national and international professional ionizing radiation groups during both the development and review phases of this work, including: the American Association of Physicists in Medicine, the American College of Radiology, the Health Physics Society, ICRP, the International Radiation Protection Association, and the Radiation Research Society.

This Report was prepared by CC 1 on Radiation Protection Guidance for the United States. Members of CC 1 and the PAC Advisors during development of the Report were:

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