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FACT SHEET

PROTECTING THE PUBLIC AND ENVIRONMENT FROM HARMFUL EFFECTS OF RADIATION:

THE EPA SHOULD STRENGTHEN ITS RADIATION PROTECTION STANDARDS

Progress in using man-made radiation-producing devices has heightened awareness that risks associated with related materials and radiation-based activities have to be evaluated and managed to ensure the safety of the general public.[1] This awareness has resulted in the establishment of regulations and standards to protect the general public from the harmful effects of radiation. In the United States, the U.S. Environmental Protection Agency (EPA) establishes standards for the protection of the general environment from radioactive material related risks.

EPA'S HISTORY OF ESTABLISHING RADIATION PROTECTION STANDARDS

The EPA was formed at the direction of President Nixon under Reorganization Plan No. 3, which became law on December 2, 1970. The reorganization transferred certain functions to the EPA from the U.S. Department of Health, Education and Welfare; the Department of Agriculture; the Department of the Interior; and the Atomic Energy Commission. Among other things, the reorganization provided EPA the authority to establish generally applicable standards for the protection of the general environment from radioactive material.[2] This has led the EPA to develop:

1. **Federal guidance reports (FGRs)** for radiation protection that provide technical information and policy recommendations for radiation dose and risk assessment.
   - FGR 11 (1988)—Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion[3]
   - FGR 12 (1993)—External Exposure to Radionuclides in Air, Water, and Soil[4]
   - FGR 13 (1999)—Cancer Risk Coefficients for Environmental Exposure to Radionuclides[5]
2. **Nuclear fuel cycle standards and regulations** addressing environmental issues for all phases of the uranium fuel cycle, including uranium milling; chemical conversion; fuel fabrication and reprocessing; power plant operations; waste management, storage, and disposal; and site cleanup for milling operations.
   - The Uranium Fuel Cycle (40 CFR Part 190)—standard that sets generally applicable environmental limits for the entire uranium fuel cycle[6]
   - Uranium and Thorium Mill Tailings (40 CFR Parts 192)—health and environmental standards for uranium and thorium mill tailings[7]

WHY DO WE NEED STANDARDS?

These reports and standards are necessary to adequately protect the public and the environment from harmful effects of radiation. Any revision of the standards should be based on sound science and should lead to their strengthening.

RECOMMENDATIONS TO STRENGTHEN THE STANDARDS

The EPA is in the process of revising some of the above-mentioned reports and standards.[8] Considering the following three key items in the revision process will help to strengthen the standards:

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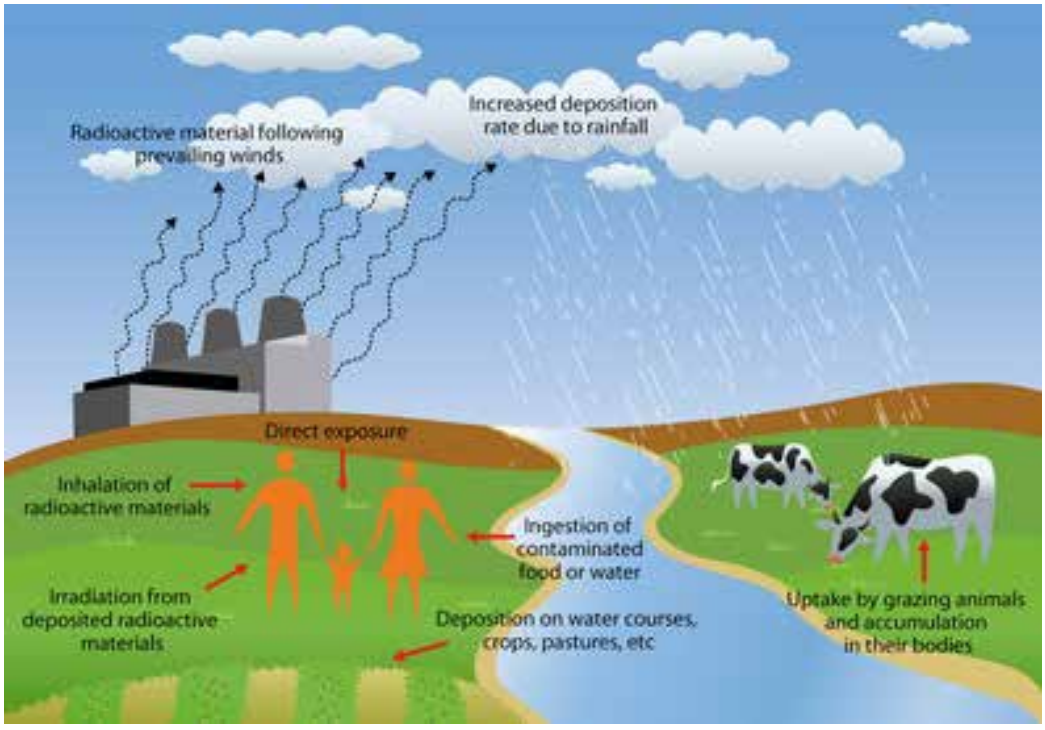
1. **Use the linear nonthreshold (LNT) dose-response model as the basis for any revisions.**
The linear nonthreshold (LNT) dose-response model is used in radiation protection to estimate the cancer risk caused by ionizing radiation. The LNT model assumes that increases in radiation doses will increase the risk of excess cancer or heritable disease in a simple proportionate manner in the low-dose range. In other words, according to the LNT model, even very small doses of radiation can cause cancer or genetic damage. The LNT model is based on extensive studies of Japanese atomic bomb survivors, patients exposed to radiation for medical therapy, and nuclear power plant workers.[9] For the past 40 years, this model has been used when developing practical and prudent guidance on ways to protect the public from the potentially harmful effects of radiation—while, at the same time, balancing the beneficial, justified, and optimized uses of radiation.

2. **Adopt current data from the International Commission on Radiological Protection.**
The International Commission on Radiological Protection (ICRP) issues recommendations on the principles of radiation protection. These recommendations form the basis for more detailed regulation and guidance issued by national authorities. Current EPA guidelines and standards are based on dated ICRP recommendations. Any revision of standards should be aligned with the commission's latest recommendations. Such revision should also consider age and gender-specific differences in the effects of radiation from different radioactive material pathways in the environment.

3. **Consider the effects of radiation exposure from technologically enhanced naturally occurring radioactive materials (TENORM).**
A TENORM is a natural material whose radioactive concentrations have been enhanced by human activities. With increased demand for oil and natural gas, newer technologies based on horizontal drilling and hydraulic fracturing have been deployed in several regions across the United States. Applications of these technologies create potential radiation exposures from TENORM, as well as environmental concerns.

   In January 1999, the National Academy of Sciences (NAS) published a report titled Evaluation of Guidelines for Exposures to Technologically Enhanced Naturally Occurring Radioactive Materials. In this report, NAS stated that "neither EPA, which has primary responsibility for setting federal radiation standards nor any other federal agency with responsibility for regulating radiation exposures has developed standards applicable to all exposure situations that involve TENORM. Instead, federal regulation of TENORM is fragmentary, and many potentially important sources of public exposure to TENORM are not regulated by any federal agency."[10] Any consideration by the EPA to revise its standards should take into account the impacts of TENORM on environmental radiation protection.

Figure I: Radioactive material pathway in the environment



Source: Centre for Food Safety, http://bit.ly/2xoluvY.

ENDNOTES

1 Health Physics Society, *Radiation and Risk: Expert Perspectives*, 2017, https://hps.org/documents/radiation_and_risk.pdf.

2 U.S. Environmental Protection Agency (hereinafter EPA), *Radiation Protection at the EPA: The First 30 Years*, August 2000, https://www.epa.gov/radiation/radiation-protection-epa-first-30-years.

3 EPA, *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion*, Federal Guidance Report No. 11, September 1988, https://www.epa.gov/radiation/federal-guidance-report-no-11-limiting-values-radionuclide-intake-and-air-concentration.

4 EPA, *External Exposure to Radionuclides in Air, Water, and Soil*, Federal Guidance Report No. 12, September 1993, https://www.epa.gov/radiation/federal-guidance-report-no-12-external-exposure-radionuclides-air-water-and-soil.

5 EPA, *Cancer Risk Coefficients for Environmental Exposure to Radionuclides*, Federal Guidance Report No. 13, September 1999, https://www.epa.gov/radiation/federal-guidance-report-no-13-cancer-risk-coefficients-environmental-exposure.

6 EPA, *Environmental Radiation Protection Standards for Nuclear Power Operations* (40 CFR Part 190), 1977, https://www.epa.gov/radiation/environmental-radiation-protection-standards-nuclear-power-operations-40-cfr-part-190.

7 EPA, *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings* (40 CFR Part 192), 1983, last revised 1995, https://www.epa.gov/radiation/health-and-environmental-protection-standards-uranium-and-thorium-mill-tailings-40-cfr.

8 EPA: *40 CFR Part 190: Advance Notice of Proposed Rulemaking*, 2014, https://www.gpo.gov/fdsys/pkg/FR-2014-02-04/pdf/2014-02307.pdf.

9 National Research Council, Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII—Phase 2*, 2006, http://www.cirms.org/pdf/NAS%20BEIR%20VII%20Low%20Dose%20Exposure%20-%202006.pdf.

10 National Research Council, *Evaluation of Guidelines for Exposures to Technologically Enhanced Naturally Occurring Radioactive Materials*, 1999, https://www.nap.edu/catalog/6360/evaluation-of-guidelines-for-exposures-to-technologically-enhanced-naturally-occurring-radioactive-materials.