

Federal Roundtable on Potential Health Effects Among Individuals Residing Near Nuclear Power Plants

February 14, 2023; 10 AM to 1 PM ET

Meeting Summary

Attendees in Alphabetical Order with Affiliations and Acronyms

Isaf Al-Nabulsi, PhD, Office of Domestic and International Health Studies, Office of Health and Safety, Office of Environment, Health, Safety and Security, Department of Energy (DOE)

Todd Anderson, PhD, Director, Biological Systems Science Division, Office of Biological and Environmental Research, DOE

Armin Ansari, PhD, CHP, Director, Center for Science and Technology, Radiation protection Division, Environmental Protection Agency (EPA)

Erin Arms, National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH)

April Bennett, National Institute of Environmental Health Sciences (NIEHS), NIH

Jean Bérubé, JD, Office of the Director (OD), NIH

Steve Blattng, PhD, Langley Research Center, National Aeronautics and Space Administration (NASA)

Terry Brock, PhD, Office of Nuclear Regulatory Research (RES), Nuclear Regulatory Commission (NRC)

Jeff Buchsbaum, MD, PhD, AM, Medical Officer and Program Director, Radiation Research Program, National Cancer Institute (NCI), NIH

Scott Burnell, Office of Public Affairs, NRC

John Cardarelli II, PhD, CHP, National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC)

C. Norman Coleman, MD, Head, Experimental Therapeutics Section, Radiation Research Program, NCI, NIH

Andrea L. DiCarlo-Cohen, PhD, Director, Radiation and Nuclear Countermeasures Program, NIAID, NIH

Paul Doetsch, PhD, Deputy Scientific Director, NIEHS, NIH

John Gaine, Office of Legislative and Intergovernmental Affairs, NASA

Holly Gibbons, MPP, Office of Government and Congressional Relations (OGCR), NCI, NIH

Nissa Hiatt, NIAID, NIH

Ryan Kinloch, PhD, OGCR, NCI, NIH

Choonsik Lee, PhD, Division of Cancer Epidemiology and Genetics (DCEG) NCI, NIH

Mark P. Little, PhD, DCEG, NCI, NIH

Jennifer K. Loukissas, MPP, DCEG, NCI, NIH

Lindsay M. Morton, PhD, Director, Radiation Epidemiology Branch, DCEG, NCI, NIH

Essence Motley, MPH, OD, NIH

Lauren Mullman, Office of the Assistant Secretary for Legislation (ASL), Department of Health and Human Services (HHS)

Sheila Newton, PhD, Deputy Director, Scientific Planning and Evaluation, NIEHS, NIH

Michael Patterson, PhD, MPH, Program Manager, Intelligence Advanced Research Projects Activity (IARPA)

Adela Salame-Alfie, PhD, Division of Environmental Health Science and Practice, National Center for Environmental Health, CDC
John Tomon, Chief, RES, NRC
Nancy Tourk, Public Analyst, CDC Washington Office
Leslie Zelenko, MPP, Deputy Assistant Secretary for Legislation, HHS

Other Attendees

Anna Hopkins, Notetaker, NIOSH, CDC
Alphonso Lima, Technical Support, NCI

I. Overview

Members of Congress have conveyed to the HHS Secretary concerns about potential health effects among individuals living near nuclear power plants from normal plant operations. Discussion between legislative staff and subject matter experts led to the decision to convene a Federal Roundtable of interdisciplinary experts to discuss the topic. The Roundtable was held virtually on February 14, 2023, and included experts from the DOE, EPA, HHS (CDC and NIH), IARPA, NASA, and NRC. The participants at the Roundtable discussed background information on the topic, current data, and public communication efforts. They also compiled a list of resources referenced during the discussion, which are linked in the text and/or included at the end of this summary.

II. Background

Some members of the public have had long-standing concern about potential health effects among individuals living near nuclear power plants. Meeting participants briefly reviewed key historical information on this topic, beginning with an NCI-led study published in 1991 that did not find clear evidence of increased mortality in counties with nuclear facilities¹. They then reviewed a Governmental effort that started in 2010, when the NRC asked the National Academy of Sciences, Engineering and Medicine (NASEM) to develop a study on cancer risks for individuals living near nuclear power plants. NASEM produced a Phase 1 Report² describing challenges of studies of this type and potential study designs, as well as a Phase 2 Report³ advising on a potential pilot study. In 2019, the NRC assessed that the proposed study was unlikely to provide useful results and the effort was ended⁴.

III. Radiation Exposure and Evidence

Participants at the Roundtable discussed current radiation dose estimates for individuals living near nuclear power plants and the strength of the supporting evidence. Discussions focused on potential exposures during normal plant operations and did not address nuclear accidents. Current estimates place the exposure dose at <0.01 millisieverts (mSv) per year; in comparison, the average annual radiation dose per person in the United States is 6.20 mSv, which mostly

comes from natural background radiation (cosmic rays, radon), air travel, and medical procedures (see Figure 1 on page 8). The current estimated exposure for individuals living near nuclear power plants is based on the 2009 National Council on Radiation Protection and Measurements Report 160,⁵ and has been supported by multiple sources, such as NRC reports and state monitoring, which the participants at the Roundtable discussed in detail.

Briefly, the NRC provides the public with open and transparent information on radioactive effluents,⁶ i.e., liquid and gaseous radioactive waste, from commercial nuclear power plants in the United States. The NRC's Radioactive Effluents from Nuclear Power Plants Annual Report from 2019⁷ reported the same exposure estimation of <0.01 mSv annually for individuals living near nuclear power plants. Also in 2019, all plants were found to be within EPA and NRC regulations for the maximum annual dose for members of the public and within the NRC's criteria of being "as low as is reasonably achievable." That report was based on data from the plants' mandatory reporting of radiation effluent, including excursions or unmonitored releases, and the NRC's routine inspections of facilities, both components of the plant licensing process. Notably, the NRC considers both average or typical doses for individuals living near nuclear power plants, as well as maximally exposed (real or hypothetical) individuals, both of which have consistently been shown to be extremely low. These assessments addressed the question of whether environmental monitoring could reasonably be assumed to correspond to doses to an individual. Independent, state-led environmental monitoring data are consistent with the facility reports from the NRC regarding exposure estimates. The participants at the Roundtable discussed this evidence, and references to the New York state monitoring data are provided below.

The consensus of the participants at the Roundtable was that radiation doses for individuals living near nuclear power plants are low (at least two orders of magnitude lower than the NRC dose limit⁸ to the public of 1 mSv per year) and that this is supported by strong and transparently shared evidence.

IV. Potential Research on Radiation-Related Health Effects

The 2010 NRC request and subsequent reports were made available and considered in advance of the meeting by all participants and reviewed at a high level as part of the opening of the meeting. The participants at the Roundtable agreed that the proposed pilot study would not be effective at answering the main question, citing the same challenges as outlined in the Phase 1 Report² and NRC response.⁹ Namely, a study on this topic would be very unlikely to produce meaningful results because of the extremely low estimated radiation exposures such that any potential health effects would be so small as to be unmeasurable. Further challenges include the inability to account for all potential confounding variables, and the small sample size of potentially exposed individuals. However, the participants at the Roundtable discussed the need for additional research to inform radiation protection standards and to improve understanding of radiation-related health effects, including: 1) direct studies of health effects in other populations exposed to low radiation doses from other sources such as medical procedures (albeit several

orders of magnitude higher than individuals living near nuclear power plants), and 2) basic research to understand potential biological effects of low dose exposures on a cellular and organ level in preclinical models. The participants at the Roundtable briefly discussed the recent NASEM report on low-dose radiation research,¹⁰ the IARPA TEI-REX¹¹ program, and the DOE Low Dose Program.¹²

V. Public Communication

The participants at the Roundtable discussed the importance of public engagement and communication when discussing radiation doses from nuclear power plants and any potential health effects. As there have been successes and challenges communicating this topic in the past, it was agreed that careful consideration is needed to tailor any outreach efforts to be the most effective.

Preliminary recommendations for communicating this complicated topic included avoiding absolutes so that information is accurately conveyed and using language such as “potential health effects” and not “potential risk” since the word risk connotes a hazard, when, in fact, the factor may not present one. The participants at the Roundtable also suggested highlighting that though studies such as the NASEM proposed pilot may not be useful, the underlying question of potential health effects of low dose radiation is still being examined through a number of different research efforts, as described above.

Talking about relative risk also can be a useful communication tool. It may be beneficial to study perceptions of more common, higher dose radiation sources, such as medical testing, air travel, and radon, to see if such comparisons would further understanding on this topic. It was noted public outreach efforts could also include examples of routine monitoring of air, soil, and water that already occur.

The participants at the Roundtable agreed on the importance of considering who delivers these messages; trusted partners in the community are critical. It was discussed that these partners could be from the Federal or State government, from independent institutions such as universities, or trusted community leaders, depending on what is best for different groups.

-
- 1 Jablon, S., Hrubec, Z. & Boice, J. D., Jr. Cancer in populations living near nuclear facilities. A survey of mortality nationwide and incidence in two states. *JAMA* **265**, 1403-1408 (1991).
 - 2 Analysis of Cancer Risks in Populations Near Nuclear Facilities: Phase I. (National Academy of Sciences, National Academies Press, 2012).
 - 3 Analysis of Cancer Risks in Populations Near Nuclear Facilities: Phase 2 Pilot Planning. (Nuclear Radiation Studies Board; Division on Earth and Life Studies; National Research Council, National Academies Press, 2014).
 - 4 Burnell, S. in *U.S. NRC Blog* (United States Nuclear Regulatory Commission, 2015).
 - 5 Ionizing radiation exposure of the population of the United States : recommendations of the National Council on Radiation Protection and Measurements. (National Council on Radiation Protection and Measurements, Bethesda, MD., 2009).
 - 6 *Radioactive Effluent and Environmental Reports*, <<https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info.html>> (2022).

7 *Radioactive effluents from nuclear power plants*, 2019).

8 *Subpart D—Radiation Dose Limits for Individual Members of the Public*,
<<https://www.nrc.gov/reading-rm/doc-collections/cfr/part020/part020-1301.html>> (1991).

9 *Backgrounder on Analysis of Cancer Risks in Populations Near Nuclear Facilities*,
<<https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/bg-analys-cancer-risk-study.html>>
(2019).

10 Leveraging Advances in Modern Science to Revitalize Low-Dose Radiation Research in the
United States. (National Academies of Sciences, Engineering, and Medicine, 2022).

11 IARPA. *Targeted Evaluation of Ionizing Radiation Exposure*,
<<https://www.iarpa.gov/index.php/research-programs/tei-rex>>

12 *Radiobiology: Low Dose Radiation Research*, <<https://science.osti.gov/ber/Research/bssd/Low-Dose-Radiation>>

Additional Resources

Resources Related to the 2010 NRC Request and NASEM Proposed Pilot Study

[Analysis of Cancer Risks in Populations Near Nuclear Facilities: Phase 1](#), NASEM

The NASEM Phase 1 Report describing potential challenges and study designs.

<https://www.nrc.gov/docs/ML1503/ML15035A132.pdf>

[Analysis of Cancer Risks in Populations Near Nuclear Facilities: Phase 2 Pilot Planning](#),

NASEM

The NASEM Phase 2 Report describing a proposed pilot study and additional recommendations.

<https://www.nrc.gov/docs/ml1503/ML15035A135.pdf>

[Backgrounder on Analysis of Cancer Risks In Populations Near Nuclear Facilities](#), NRC

An NRC fact sheet describing the NASEM Phase 1 and 2 reports, and the final NRC response.

<https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/bg-analys-cancer-risk-study.html>

[Examining the Reasons for Ending the Cancer Risk Study](#), NRC

An NRC blog post describing the reasons for ending the proposed NASEM study. [https://public-](https://public-blog.nrc-gateway.gov/2015/10/06/examining-the-reasons-for-ending-the-cancer-risk-study/)

[blog.nrc-gateway.gov/2015/10/06/examining-the-reasons-for-ending-the-cancer-risk-study/](https://public-blog.nrc-gateway.gov/2015/10/06/examining-the-reasons-for-ending-the-cancer-risk-study/)

Resources Describing Estimated Radiation Doses

[Dose Ranges Chart](#), DOE

A DOE chart showing more detailed information on exposures in different radiation dose ranges.

<https://www.energy.gov/sites/default/files/2018/02/f48/dose-ranges-chart.pdf>

[Radiation Sources and Doses](#), EPA

An EPA page describing common sources of radiation and estimated doses for members of the public. <https://www.epa.gov/radiation/radiation-sources-and-doses>

[Radiation Thermometer](#), CDC

An interactive CDC resource that shows relative risk for different sources of radiation.

<https://www.cdc.gov/nceh/radiation/emergencies/radiationthermometer.htm>

[Radon by the Numbers - Long Description](#), CDC

A CDC fact sheet about radiation and health effects associated with radon, a common naturally occurring source of radiation. <https://www.cdc.gov/radon/radon-numbers-ld.html>

[Report No. 160 – Ionizing Radiation Exposure of the Population of the United States](#), NCRP

This 2009 report includes the estimated annual dose for individual living near nuclear power plants. [https://ncrponline.org/shop/reports/report-no-160-ionizing-radiation-exposure-of-the-](https://ncrponline.org/shop/reports/report-no-160-ionizing-radiation-exposure-of-the-population-of-the-united-states/)

[population-of-the-united-states/](https://ncrponline.org/shop/reports/report-no-160-ionizing-radiation-exposure-of-the-population-of-the-united-states/)

[Report No. 184](#) was issued in 2019 to update the section on medical radiation exposure.

[https://ncrponline.org/shop/reports/report-no-184-medical-radiation-exposure-of-patients-in-the-](https://ncrponline.org/shop/reports/report-no-184-medical-radiation-exposure-of-patients-in-the-united-states-2019/)
[united-states-2019/](https://ncrponline.org/shop/reports/report-no-184-medical-radiation-exposure-of-patients-in-the-united-states-2019/)

Examples of Radiation Monitoring and Testing

[Backgrounder on Tritium, Radiation Protection Limits, and Drinking Water Standards](#), NRC

This fact sheet describes how the NRC monitors for tritium contamination in the water from nuclear power plants. <https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.html>

[New York Environmental Radiation Surveillance Program](#), NY.gov

An example of a state radiation monitoring program from New York.

<https://www.health.ny.gov/environmental/radiological/radon/surveillance.htm>

[Radioactive Effluent and Environmental Reports](#), NRC

This page contains links to the mandatory annual reports each nuclear power plant must submit to the NRC describing radioactive effluent discharge from the plant and if there were any environmental effects. <https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info.html>

[Radioactive Effluents from Nuclear Power Plants: Annual Report 2019](#), NRC

The 2019 NRC Annual Report describing radioactive effluents for commercial power plants in the US and an estimated annual dose for individuals living near those power plants.

<https://www.nrc.gov/docs/ML2126/ML21266A422.pdf>

[Regulatory Guide 1.109, Revision 1, 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](#), NRC

This guide provides details on how the annual dose for individuals living near nuclear power plants is calculated for NRC Annual Reports.

<https://www.nrc.gov/docs/ML0037/ML003740384.pdf>

RELATIVE DOSES FROM RADIATION SOURCES

All doses from the National Council on Radiation Protection & Measurements, Report No. 160 (unless otherwise denoted)

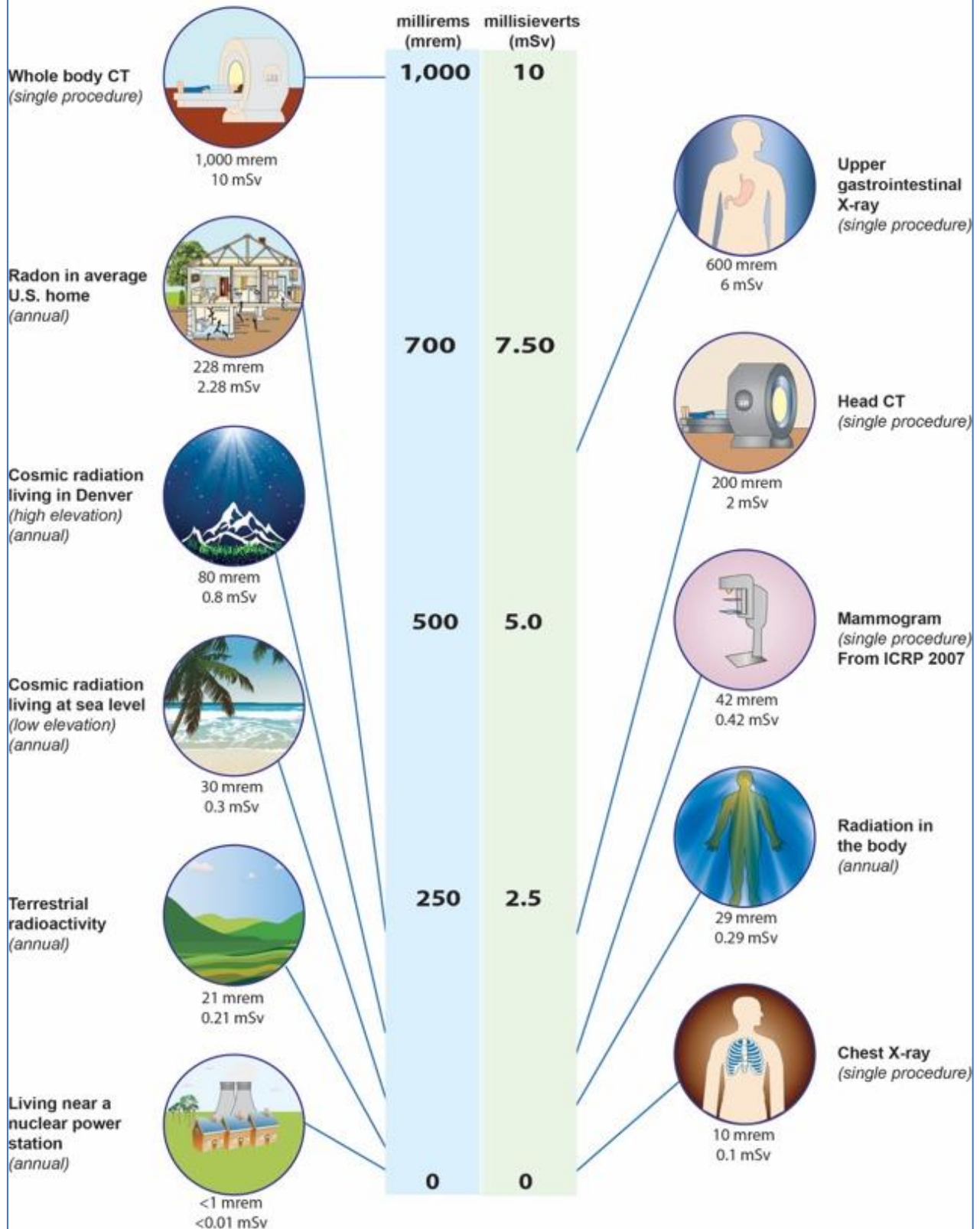


Figure 1 Relative Doses from Radiation Sources (EPA)