COMMENTS CONCERNING H.R. 1628
THE ENEWETAK ATOLL CLEANUP RADIATION STUDY ACT

Statement of

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before the
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Committee on Veterans' Affairs
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Chairwoman Luria, Ranking Member Bost and members of the Subcommittee, thank you for the opportunity to testify today. My name is Dr. David Butler and I serve as a Scholar in the Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine and as Director of its Office of Military and Veterans Health. Accompanying me is Dr. Ourania Kosti, Senior Program Officer in the National Academies' Nuclear and Radiation Studies Board and Principal Investigator for the Radiation Effects Research Foundation Program, which provides support to a cooperative Japan-US research organization that studies radiation effects in the survivors of the atomic bombings of Hiroshima and Nagasaki.

The National Academy of Sciences was created more than 150 years ago through a congressional charter signed by Abraham Lincoln in order to serve as an independent, authoritative body outside the government that could advise the nation on matters pertaining to science and technology. Every year, approximately 6,000 Academies members and volunteers serve pro bono on our consensus study committees or convening activities. We do not advocate for specific policy positions. Rather, we enlist the best available expertise across disciplines to examine the evidence, reach consensus, and identify a path forward. Our reports, proceedings and other publications are available via the web in PDF form without charge.

The National Academies has a long history of advising the federal government on the health effects of radiation exposures in general and radiation exposures resulting from military activities in particular. This work originated with a November 1946 directive from President Truman asking our organization to undertake a program to study the long-range biological and medical effects of the atomic bomb on man. Since then, we have—among other efforts—conducted reviews of the methods used to assign radiation doses to service personnel at nuclear weapons tests, an examination of the use of film badge dosimetry in atmospheric nuclear tests, studies of the mortality of military participants in U.S. nuclear weapons tests, and in 2003, a comprehensive review of the dose reconstruction program of the Defense Threat Reduction Agency. The National Academies has also previously reviewed dose assessments generated by the federal government for personnel exposed to radioactive materials as a result of their work at

the Department of Energy's Hanford, Fernald, and Savannah River nuclear weapons production facilities.

The Office of Military and Veterans Health that I direct includes the Medical Follow-up Agency, which was established after World War II and which maintains a collection of epidemiologic data on over 100 study populations of former military personnel. These data include information on the causes of death of participants in the Operation CROSSROADS atmospheric nuclear test series that took place in the Bikini Atoll in the Marshall Islands.

I have included a list of National Academies of Sciences, Engineering, and Medicine reports related to ionizing radiation exposure due to military service and clean-up operations and radiation dose reconstruction in the materials submitted for the subcommittee's attention.

Turning to the legislation under consideration in this hearing, H.R. 1628 outlines the parameters of a study that would allow for a more complete understanding of the radiation doses received by those involved in the clean-up operations undertaken at Enewetak Atoll from 1977 to 1980 in response to nuclear testing in the area in the 1940s and 50s. It takes as its starting point a 2018 Defense Threat Reduction Agency report that presented the results of a radiation dose assessment for military personnel involved in the clean-up operations.

A radiation dose assessment—which is also called a *dose reconstruction*—is, in brief, a means of characterizing a person's received ionizing radiation dose through an accounting of the radiation sources, their source strengths and the routes and duration of exposure. The 2003 National Academies review of the DTRA dose reconstruction program I mentioned identified six basic elements of any radiation dose assessment:

1. Definition of exposure scenarios: the location and activities of individuals in areas where radiation exposure could occur, the time spent in those locations, and the characteristics of the radiation environment in those areas.

2. Identification of exposure pathways: the relevant pathways of external (proximity to sources) and internal (through ingestion or inhalation of, or skin contact with sources) exposure to radioactive substances.
3. Development and implementation of methods of estimating dose: the data, assumptions, and methods of calculation used to estimate dose from the relevant exposure pathways in the assumed scenarios.
4. Evaluation of uncertainties in the estimates of dose: assessment of the effects on estimated dose of uncertainties in assumed exposure scenarios and uncertainties in models and data used to estimate dose in assumed scenarios, to obtain an expression of confidence in the estimated dose.
5. Presentation and interpretation of results: documentation of the assumptions and methods of estimating dose and discussion of the results in context of purpose of the dose reconstruction.
6. Quality assurance and quality control: the systematic and auditable documentation of the dose reconstruction process and results. [p. 30-38]

Depending on the available information, a dose assessment will include some combination of direct or indirect measurements obtained, for example, by film badges and field survey instruments; and estimates of unmeasured parameters that are based on historical data, proxies for exposure such the subject's job, the physics of the radioactive materials, and human biology and physiology. A radiation dose assessment often entails of the calculation of the estimated upper-bound dose—that is, the dose that would occur if all of the uncertain components of the analysis were set to the plausible value that would in combination yield the highest estimate.

The proposed study would address two primary questions related to the Enewetak veterans:

- whether information exists to conduct a revised or alternative radiation dose assessment that would consider exposures and exposure pathways that were not part of the 2018 radiation dose assessment; and
- whether conducting such a revised or alternative radiation dose assessment is feasible and would likely yield substantively improved estimates of the radiation

dose received by members of the Armed Forces who participated in the cleanup of Enewetak Atoll.

If the answers to those questions were “yes”, the study would go on to

- identify the sources of the data for the new assessment, including a delineation of the protocol to be used in conducting such an assessment;
- estimate the time and funding needed to conduct the assessment;
- identify the major sources of uncertainty in the assessment and how such sources may affect the estimates generated by it; and
- identify the best means to carry out the new assessment.

The National Academies believes that this is a scientifically-sound approach to addressing lingering questions regarding the exposures of the Enewetak veterans and that the results would allow these veterans, their loved ones, and the Federal Government to make more fully informed decisions.

Thank you for your attention. Dr. Kosti and I would be happy to answer your questions.

National Academies of Sciences, Engineering, and Medicine reports related to ionizing radiation exposure due to military service and clean-up operations and radiation dose reconstruction

Health Risks from Exposure to Low Levels of Ionizing Radiation
(1956; 1972; 1977; 1980; 1990; 1999; 2006)

Federal Research on the Biological and Health Effects of Ionizing Radiation
(1981)

Review of the Methods Used to Assign Radiation Doses to Service Personnel at Nuclear Weapons Tests.
(1985)

Mortality of Nuclear Weapons Test Participants.
(1985)

Review of the U.S. Army Ionizing Radiation Dosimetry System
(1986)

Film Badge Dosimetry in Atmospheric Nuclear Tests
(1989)

The Hanford Environmental Dose Reconstruction Project: A Review of Four Documents
(1994)

A Review of Two Hanford Environmental Dose Reconstruction Project (HEDR) Dosimetry Reports Columbia River Pathway and Atmospheric Pathway
(1995)

Radiation Dose Reconstruction for Epidemiologic Uses
(1995)

Adverse Reproductive Outcomes in Families of Atomic Veterans: The Feasibility of Epidemiologic Studies
(1995)

Mortality of Veteran Participants in the CROSSROADS Nuclear Test
(1996)

An Evaluation of Radiation Exposure Guidance for Military Operations: Interim Report
(1997)

A Review of the Radiological Assessments Corporation's Fernald Dose Reconstruction Report
(1997)

Exposure of the American People to Iodine-131 from Nevada Nuclear-Bomb Tests: Review of the National Cancer Institute Report and Public Health Implications
(1999)

Potential Radiation Exposure in Military Operations: Protecting the Soldier Before, During, and After
(1999)

The Five Series Study: Mortality of Military Participants in U.S. Nuclear Weapons Tests
(2000)

Letter Report to Review and Comment on the Phase II Draft Report Prepared for the CDC by the Risk Assessment Corporation (RAC) Titled "Savannah River Site Environmental Dose Reconstruction Project Phase II" (2000)

A Review of the Dose Reconstruction Program of the Defense Threat Reduction Agency
(2003)

Gulf War and Health: Updated Literature Review of Depleted Uranium
(2008)

Review of the Toxicologic and Radiologic Risks to Military Personnel from Exposures to Depleted Uranium During and After Combat
(2008)

(Underlined titles are available in PDF form via embedded links in the digital copy of this document.)