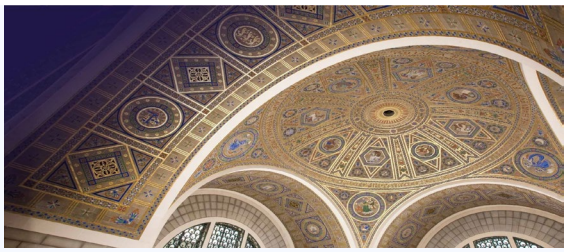
NATIONAL ACADEMIES Sciences Engineering Medicine

Nuclear and Radiation Studies Board | Division on Earth and Life Studies

43rd Meeting of the Nuclear and Radiation Studies Board November 7-8, 2023

Hybrid Meeting (In-Person & Virtual)

Agenda for Open Sessions



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Location
The Keck Center – Keck 103, 500 5th Street NW, Washington, DC 20001

Meeting ID	**Passcode**		
970 3300 8658	N/A		
Phone			
470 250 9358	301 715 8592	669 900 6833	253 215 8782
646 518 9805	312 626 6799	720 928 9299	877 853 5257 (Toll Free)
646 558 8656	602 753 0140	971 247 1195	888 475 4499 (Toll Free)
651 372 8299	669 219 2599	213 338 8477	

TUESDAY, NOVEMBER 7, 2023 (ALL TIMES LISTED ET)

***OPEN SESSION 1 (of 2)* – Open Zoom Link**

1:00 pm **Call to Order and Welcome to NRSB's Open Session**
William H. Tobey, Chair

1:05 pm **U.S. Department of Energy's Isotope Production Program**
Jehanne Gillo, Director, and Ethan Balkin, Program Manager, Office of Isotope R&D and Production (DOE Isotope Program), Office of Science, US Department of Energy (DOE)

1:35 pm **Q&A (Board and staff only)**

2:00 pm **U.S. Department of Energy's Approach to Complex-Wide PFAS Characterization, Treatment, and Source Disposal**
Robert Seifert, Director, Office of Subsurface Closure, DOE

2:25 pm **Q&A (Board and staff only)**

2:50 pm **BREAK**

3:00 pm **U.S. Department of Energy's Office of Environmental Management (DOE-EM): Accomplishments and Future Directions** (oral remarks only)
Jeffrey Avery, Principal Deputy Assistant Secretary, DOE-EM

3:25 pm **Q&A (Board and staff only)**

3:50 pm **American Nuclear Society's Report on Generic Standards for Disposal of High-Level Waste**
John Kessler, Chair, and Peter Swift, Lead Author, along with other members of the ANS Special Committee, Michael Apted, Lake Barrett, and Steve Nesbit

4:15 pm **Q&A (Board and staff only)**

4:40 pm **ADJOURN OPEN SESSION 1**

WEDNESDAY, NOVEMBER 8, 2023 (ALL TIMES LISTED ET)

***OPEN SESSION 2 (of 2)* – Open Zoom Link**

9:00 am **Call to order for Open Session 2**
Will Tobey, Chair

9:05 am **Updates on U.S. Environmental Protection Agency's Radiation Protection Division**
Armin Ansari, Director, Center for Science and Technology, and Sara DeCair, Associate Director of the Center, EPA

9:35 am **Q&A with Board and Staff**

9:55 am **ADJOURN OPEN SESSION 2**

SUPPLEMENTAL DOCUMENTS

American Nuclear Society. 2023. Recommendations on Postclosure Aspects of Generic Standards for the Permanent Disposal of Spent Nuclear Fuel and High-Level and Transuranic Radioactive Wastes in the United States.

National Academies of Sciences, Engineering, and Medicine. 2023. Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors. Washington, DC: The National Academies Press. https://doi.org/10.17226/26500.

National Research Council. 1999. Health Effects of Exposure to Radon: BEIR VI. Washington, DC: The National Academies Press. https://doi.org/10.17226/5499.

U.S. Department of Energy – Office of Isotope R&D and Production. n.d. Isotope R&D and Production (DOE IP).

SPEAKER BIOGRAPHIES

Dr. **Armin Ansari** is Director of the Center for Science and Technology in the U.S. Environmental Protection Agency (EPA) Office of Radiation and Indoor Air/Radiation Protection Division. Prior to joining EPA, he was the Radiological Assessment Team Lead at the U.S. Centers for Disease Control and Prevention. He received his undergraduate and doctoral degrees in radiation biophysics from the University of Kansas, and conducted his postdoctoral research in radiation-induced mutagenesis at Oak Ridge and Los Alamos National Laboratories. Dr. Ansari is an elected member of the National Council on Radiation Protection and Measurements, President-elect of the American Academy of Health Physics, a fellow and president emeritus of the U.S. Health Physics Society, and an adjunct associate professor of nuclear and radiological engineering at Georgia Institute of Technology. Dr.

Ansari has served as member of the United States delegation to UNSCEAR since the sixty-first session in 2014 and as alternative representative since the sixty-third session in 2016.

Michael Apted has been involved for more than 40 years in planning, managing, and conducting regulatory compliance assessments related to nuclear waste management and disposal. His primary work has been in two areas: innovative design and testing of engineered containment systems for disposal of nuclear waste forms and assessment of long-term performance of such geological disposal systems. As an independent consultant, Dr. Apted was the technical program manager for the Electric Power Research Institute's independent oversight of the Yucca Mountain Program, which included developing and conducting parallel but separate safety assessments to evaluate compliance of the program's disposal concept with the Environmental Protection Agency's safety criteria and the Nuclear Regulatory Commission's licensing requirements. He has consulted for Finnish, Swedish, Norwegian, Canadian, Spanish, Chinese, South Korean, South African, Taiwanese, German, French, and Swiss national programs investigating the implementation and regulation of nuclear waste disposal. He has also been a consultant to the International Atomic Energy Agency on used fuel disposal, disposal of spent medical sources and trained the Chinese national disposal program on HLW disposal. Among Dr. Apted's publications are more than 100 papers, contractor documents, and confidential reports related to hazardous and nuclear waste disposal. He is the coauthor of *The Scientific and Regulatory Basis for the Geological Disposal of Radioactive Wastes* (John Wiley & Sons, 1995), based on his lectures from Oxford University. He is the coeditor and contributing author of *Geological Repository Systems for Safe Disposal of Spent Nuclear Fuels and Radioactive Wastes* (Woodhead Publishing, 2017). He served as the meeting organizer and proceedings editor for the OECD Nuclear Energy Agency's international symposium Status of Near-Field Modeling (1993). He has been a frequent invited instructor and mentor on areas of his expertise for courses conducted by the International Training Centre. He earned a B.S. in chemistry from the Massachusetts Institute of Technology and a Ph.D. in geochemistry from the University of California–Los Angeles, and completed a postdoctoral term at Stanford University.

Jeffrey Avery serves as the Principal Deputy Assistant Secretary (PDAS) in the Office of Environmental Management (EM). In this role Avery works to enable the safe and successful execution of the EM mission, while providing management oversight of activities, operations, and program integration across Department of Energy (DOE) field sites. Prior to joining EM, Avery served at Naval Reactors (NR) for over 26 years in various program management, policy, and technical roles. Most recently, he worked as the Director of Regulatory and Security Affairs, responsible for NR program regulatory and policy matters, security programs, environmental affairs and associated stakeholder engagement, oversight of work at the Idaho National Laboratory, and nuclear facility lifecycle management. In a prior role at NR, Avery was responsible for global nuclear powered ship port entry, nuclear propulsion technology exchange programs with the United Kingdom, nonproliferation and export control policy, and strategic communications. Earlier in his career he served in several engineering and quality assurance roles supporting the Navy's fleet of nuclear powered ships. Avery has a Bachelor of Science degree in Mechanical Engineering from Purdue University, holds master's degrees in Engineering Management from Old Dominion University and Business Administration from Indiana University, and is a graduate of the Bettis Reactor Engineering School. He also completed the Massachusetts Institute of Technology Seminar XXI fellowship program in national security policy and international relations.

Ethan Balkin, Ph.D. is the Federal Program Manager for Radioisotope Production Research and Development (R&D) in the U.S. Department of Energy Isotope Program (DOE IP). He is responsible for the National R&D efforts in accelerator and reactor-based isotopes at DOE/NNSA National Laboratories, domestic universities, and non-profit research institutions. Prior to joining the DOE IP, Dr. Balkin was a Professor at the University of Washington in the Department of Radiation Oncology, where his research interests were focused in solid target chemistry for the production of the cyclotron based isotopes, as well as the development of bioconjugation and radiolabeling techniques for novel drug constructs (both monoclonal antibodies and small molecules) in heme-based malignancies. He

also did his postdoctoral training there. Dr. Balkin completed his undergraduate work with a research focus in radioanalytical chemistry, and his doctorate in pathobiology with an emphasis in targeted radiopharmaceutical therapy and rational drug design; both at the University of Missouri-Columbia. In between his undergraduate and graduate work, Dr. Balkin spent two years working in drug development for a critical care segment of the pediatric population at the University of Missouri-Columbia Department of General Surgery; where he helped to successfully bring a drug to market. As well as having spent 13 years in the clinical practice of pharmacy.

Lake Barrett is an independent consultant in the energy field after serving in both government and commercial capacities in the nuclear energy and nuclear materials management areas for 56 years. He was the Nuclear Regulatory Commission's on-site director for the stabilization, recovery, and cleanup of the Three Mile Island reactor accident and currently is a senior nuclear advisor to the Japanese government's International Research Institute for Nuclear Decommissioning and the Tokyo Electric Power Company, aiding in recovery from the Fukushima Daiichi nuclear reactor accident. At the department of Energy, Mr. Barrett led the Yucca Mountain Geologic Repository program through the statutory site selection process and was responsible for commercial nuclear fuel transportation and nuclear fuel storage initiatives. Within defense programs, he was responsible for national security, safety, and environmental protection improvements at the Rocky Flats nuclear weapons plant, which led to the successful restoration of plutonium operations and safe decontamination and decommissioning. He currently serves on the DOE's Nuclear Energy Advisory Committee, focused on used nuclear fuel management. He received a B.S. and M.S. in engineering from the University of Connecticut; is a registered Professional Engineer; Emeritus of the American Nuclear Society; has served on many national and international committees; and has received various honors such as the President's Meritorious Excellence Award, Secretary of Energy's Gold Award, DOE and NRC Meritorious Service Awards, and the Congressional Award for Exemplary Service Finalist. He is active as trustee and president at Christ Venice Church and aids in various international humanitarian missions.

Sara DeCair has been with the U.S. Environmental Protection Agency (EPA) Office of Radiation and Indoor Air since 2003. She has focused on radiological emergency preparedness and spent over a decade negotiating the finalization of the 2017 EPA Protective Action Guides (PAG) Manual. Assisting with adoption of the updated PAG Manual has continued to be a collaborative effort with the Federal Radiological Monitoring and Assessment Center (FRMAC), Advisory Team for Environment, Food and Health and the Federal Emergency Management Agency, and the U.S. Nuclear Regulatory Commission. Currently, Ms. DeCair is Associate Center Director for the EPA's radiological protection program's Center for Science and Technology, a small group of radiation experts who provide federal guidance reports and lead an in-house health physics continuing education program for the Agency. She previously worked for 7 y with the State of Michigan's Department of Environmental Quality. Three of those years were spent in nuclear power plant emergency response and planning where she went from participating in to becoming a trainer for everything from state field team leader, dose assessor, decontamination team leader, various Emergency Operations Center positions, and eventually scenario development and exercise design. The 3 y prior, Ms. DeCair worked as a State of Michigan inspector of radioactive materials registrants and radiation incident responder. Incident responses ranged from scrap yard portal monitor alarms to oil and gas pipe yard naturally occurring radioactive material (NORM) discoveries to medical waste from Ohio or Canada. Source identification, isolation, storage, and even disposal were among the responsibilities of the incident responder. She also led the instrument calibration efforts for materials program instruments, completed several oil and gas NORM site cleanups, and facilitated the proper disposal of numerous orphan radioactive sources in the state. Ms. DeCair is a longtime national Health Physics Society (HPS) member and has served 4 y on the Board of the Baltimore-Washington Chapter of HPS.

Dr. **Jehanne Gillo** has worked at the Department of Energy (DOE) since February 2000 when she joined the DOE Office of Science as Program Manager for Nuclear Physics Facilities & Instrumentation.

Dr. Gillo became part of the Federal Senior Executive Service in 2005 and was appointed as Director of the Facilities and Project Management Division in the Office of Nuclear Physics, where she was responsible for the operations of all nuclear physics scientific user facilities, large construction projects, fabrication of scientific instrumentation, accelerator research and development, and the nuclear physics SBIR/STTR program. Since 2009, she has also been the Director of the DOE Isotope Program. In 2020, she led the DOE Isotope Program to be organized into a standalone Office at the DOE, now called the Office of Isotope R&D and Production, which she currently leads. Dr. Gillo has been awarded the Presidential award and three Secretarial awards during her federal career. She was awarded the 2016 Presidential Rank of Meritorious Executive Award for her accomplishments in the Office of Nuclear Physics. She received the 2022 Secretary's Achievement Award for her participation in the Molybdenum-99 Highly Enriched Uranium Ban Team. She received the 2016 Secretary's Achievement Award for her efforts on the Joint Comprehensive Plan of Action (JCPOA) Support Team. She received the Secretary of Energy Excellence Award in October 2012 for her management of the DOE Isotope Program.

John Kessler founded and is president of J Kessler and Associates following a 21-year career at EPRI, where he had been responsible for the overall management of the institute's Used Fuel and HLW Management Program. He performs strategic planning and management work in the area of used nuclear fuel and radioactive waste management. His clients include the DOE, consulting firms, universities, national laboratories, nuclear utilities, regulators, storage and transportation cask vendors, and nonprofits in the United States and internationally. He led a panel of experts supporting the IAEA's coordinated research program on degradation of used fuel storage systems during long-term operation; supported the Emirates Nuclear Energy Corporation in the development of its waste management program for the Barakah nuclear plants in the UAE; and provided the DOE's Office of Nuclear Energy with programmatic support in their research into the feasibility of direct geologic disposal of dual-purpose (storage and transportation) spent fuel casks and canisters. He also developed a safety case description for deep borehole disposal applied to advanced reactor wastes. During his tenure at EPRI, he directed a technical assessment of the appropriateness of proposed EPA and NRC performance standards for use at Yucca Mountain and was a coauthor of the EPRI-proposed standard for Yucca Mountain performance. In 2009, John organized the Extended Storage Collaboration Program—an international cooperative program for joint R&D on long-term behavior of spent fuel dry storage systems. Dr. Kessler holds a B.S. and M.S. in nuclear engineering from the University of Illinois–Urbana-Champaign and a Ph.D. in mineral engineering (hydrogeology) from the University of California–Berkeley. He is a longtime member of the ANS and chaired its Fuel Cycle and Waste Management Division from July 2022 to June 2023. He has authored over 100 papers, journal articles, contractor documents, book sections, and reports related to SNF and HLW storage, transportation, and disposal.

Steven Nesbit is founder and president of LMNT Consulting, a company he started in 2019 following 37 years with Duke Energy Corporation. During his tenure, he worked on nuclear reactor modeling and simulation, including safety analysis methods development, and also managed used nuclear fuel activities, including both wet and dry storage of used fuel. For nine years he was the company's director of nuclear policy, responsible for developing policy positions related to nuclear power and interacting with industry and government groups on used fuel management and related issues. In the 1990s, Mr. Nesbit supported the DOE's Office of Civilian Radioactive Waste Management, where his responsibilities included development of DOE positions on environmental and safety standards for the proposed Yucca Mountain repository and interactions with the National Academy of Sciences on its *Technical Bases for Yucca Mountain Standards* report. Mr. Nesbit has been involved in used fuel issues through a number of industry groups and other organizations, including ANS, the U.S. Nuclear Industry Council (NIC), the Nuclear Energy Institute, and the Nuclear Waste Strategy Coalition. He has testified before Congress on used fuel issues: the U.S. House of Representatives Energy and Commerce Committee in 2017 and the U.S. Senate Committee on Energy and Natural Resources in 2019. His publications include technical and policy papers on geologic repository seismic design

methodology, centralized interim storage, an improved used fuel management organization, a proposed waste acceptance queue for shut-down nuclear power reactors, NIC recommendations for nuclear waste management reform, and characteristics of future human societies to be used in assessing compliance with geologic repository standards. Mr. Nesbit, a registered Professional Engineer in North Carolina and Maine, received his bachelor's and a master of engineering in nuclear engineering from the University of Virginia. He served ANS as president from June 2021 to June 2022.

Mr. **Robert Seifert** is the Acting Director of the Office of Infrastructure Management and Disposition Policy in the Office of Environmental Management. He is responsible for overseeing work in soil and groundwater remediation as well as infrastructure, sustainability, clean energy, and facility demolition. He has served in the EM program for nearly 31 years. Starting in 1993 at the Paducah Gaseous Diffusion Plant, Mr. Seifert has held a number of technical and management positions as both a contractor and DOE federal employee. Mr. Seifert has a degree in Chemistry and Biology from Murray State University.

Peter Swift is a consulting geoscientist with over 30 years of experience in high-level radioactive waste management and disposal. He was formerly a senior scientist at Sandia National Laboratories, where he most recently served from 2011 to 2020 as the national technical director of the DOE-NE's Spent Fuel and Waste Technology Research and Development Campaign. In that role he provided technical leadership for the DOE's research and development activities relevant to the storage, transportation, and permanent disposal of SNF and HLW. He also held a key role in the certification and licensing process for the proposed Yucca Mountain repository, where he led the total system performance assessment effort that developed estimates of the long-term safety of the site and then served as the chief scientist for the program's lead laboratory. In addition to a broad background in the earth sciences, Dr. Swift has expertise in using results from probabilistic modeling of complex systems to address environmental regulatory requirements. Dr. Swift has authored or coauthored more than 20 peer-reviewed publications, 35 technical reports, and 56 conference papers, and he has made more than 50 public presentations to regulators and external technical oversight boards, including testimony to the U.S. House of Representatives in 2011. He has been an invited speaker to the NAS Board on Radioactive Waste Management, the Blue Ribbon Commission on America's Nuclear Future, and multiple university programs. He has served as a member of the External Advisory Board for the University of California–Berkeley's Department of Nuclear Engineering, the Lawrence Berkeley National Laboratory's Earth Sciences Division Review Panel, Sandia's Geoscience Research Foundation Management Board, and the State of New York's Independent Expert Review Team for the West Valley Environmental Impact Statement. After receiving a B.A. in English from Yale, followed by a B.S. and M.S. in geology from the University of Wyoming, Dr. Swift earned his Ph.D. in geosciences from the University of Arizona. He is a Fellow of the Geological Society of America and is a member or past member of several societies, including ANS, the American Geophysical Union, the American Association of Petroleum Geologists, and the Geochemical Society.