Review of the Continued Analysis of Supplemental Treatment of Low-Activity Waste at the Hanford Nuclear Reservation

Committee

John S. Applegate

Chair

John S. Applegate, J.D., is the James Louis Calamaras Professor of Law in the IU Maurer School of Law. He has served in Indiana University’s senior leadership since 2008, most recently as interim provost and executive vice president of Indiana University Bloomington and previously as executive vice president for university academic affairs. He teaches and has written extensively in the fields of environmental law, administrative law, international environmental law, risk assessment, and the management of radioactive waste. He chaired the Fernald Citizens Advisory Board at the Department of Energy's (DOE's) Fernald facility in Ohio from 1993-1998, and he served on the DOE Environmental Management Advisory Board from 1994-2001. He has also served on several National Academies studies. A member of the American Law Institute, Professor Applegate has also taught at the University of Paris (Pantheon-Assas) and University of Erlangen-Nurnberg and has been a research fellow at Cardiff University. Before moving to Indiana, he was the James B. Helmer, Jr., Professor of Law at the University of Cincinnati College of Law and was a visiting professor at Vanderbilt University Law School. He was a judicial law clerk for the United States Court of Appeals for the Federal Circuit and an attorney in private practice in Washington, DC. He has served as a board member of the National Academies' Nuclear and Radiation Studies Board, and has served on several National Academies' committees, including most recently chairing the Study Committee on Supplemental Treatment of Low-Activity Waste at the Hanford Nuclear Reservation. He was named a National Associate of NASEM in 2020. Professor Applegate received his B.A. in English from Haverford College in 1978 and his J.D. from Harvard Law School in 1981.

Allen G. Croff

Vice Chair

Allen G. Croff is an adjunct professor of nuclear and environmental engineering in the Department of Civil and Environmental Engineering at Vanderbilt University. He is also a member of the US Nuclear Waste Technical Review Board, appointed to this position by the President in February 2015, and a Distinguished Emeritus Member of the National Council on Radiation Protection and Measurements. Mr. Croff has 29 years of technical and program management experience at Oak Ridge National Laboratory. He was subsequently vice-chairman of the Advisory Committee on Nuclear Waste in the US Nuclear Regulatory Commission and a Senior Technical Advisor to the Blue Ribbon Commission on America's Nuclear Future. He has led or participated in numerous multi-disciplinary national and international technical and review committees for the National Academies, the National Council on Radiation Protection and Management, the Nuclear Energy Research Advisory Committee, and the Nuclear Development Committee of the Nuclear Energy Agency. Mr. Croff's technical accomplishments include creation of the ORIGEN2 computer code used world-wide to calculate the radioactive characteristics of nuclear materials for use in nuclear material and waste characterization, risk analyses, and nuclear fuel cycle analysis; developing and evaluating comprehensive, risk-based waste classification systems, including changing the boundary defining transuranic waste from 10 to 100 nCi/g; technical, economic, and systems analysis of current and advanced nuclear fuel/material cycles from uranium mining through waste disposal; conceiving, analyzing, and reviewing actinide partitioning-transmutation (P-T) concepts beginning with the first comprehensive analysis of P-T from 1976 to 1980 through subsequent cycles of renewed interest in the concept up to the present. Mr. Croff received a B.S. (1971) in chemical engineering from the Michigan State University, a nuclear engineering degree (1974) from the Massachusetts Institute of Technology, and an MBA (1981) from the University of Tennessee.

C.E. Carpenter

Member

C.E. “Gene” Carpenter, Jr., is a Lead Associate at Booz Allen Hamilton (BAH). Prior to BAH, he was with the Director, Office of Nuclear Safety and Environmental Assessments (EA-31) at the U.S. Department of Energy (DOE). The Office of Enterprise Assessments (EA) is the DOE’s autonomous organization responsible for performance of assessments on behalf of the Secretary and Deputy Secretary, in the areas of nuclear and industrial safety, cyber and physical security, and other critical functions as directed by the Secretary and her Leadership team. Prior to serving as the EA-31 Director, Dr. Carpenter held several positions over his 26-year career at the U.S. Nuclear Regulatory Commission (USNRC), with progressively more responsibilities in licensing, technical reviews, and policy development, including as the International Team Leader in the USNRC’s Office of Nuclear Reactor Regulation (NRR) where he managed international programmatic activities. Previously, as a Group Lead and Senior Materials Engineer in the Office of Nuclear Regulatory Research (RES), he developed and managed the USNRC’s anticipatory and confirmatory aging degradation research programs that focused on limited-knowledge and high-risk areas related to long-term (i.e., beyond 60 years) safe operation of nuclear power plants in anticipation of subsequent license renewal requests. He served as Chairman Nils Dias’ International Technical Assistant (TA); as a TA to the RES Director; and, as a Licensing Project Manager. Prior to joining the USNRC, he served aboard two nuclear-powered ballistic missile submarines in the U.S. Navy and then worked for the U.S. Department of Defense at the Puget Sound Naval Shipyard overhauling and refurbishing nuclear submarines. Dr. Carpenter has a B.S. in Mechanical Engineering from Seattle University, an M.S. from the Johns Hopkins University, and an M.A. and a Ph.D. from the George Washington University focusing on nuclear policy and governance issues.

David E. Daniel

Member

Dr. David E. Daniel is President Emeritus of The University of Texas at Dallas and an engineering consultant in Dallas, Texas. His work has focused on environmental controls and on engineered containment systems for land disposal of waste materials. He earned BS, MS, and PhD degrees in civil engineering at the University of Texas at Austin, and served on the faculty at UT Austin from 1981 to 1996. He then served as Head of the Department of Civil and Environmental Engineering, and then as Dean of Engineering at the University of Illinois at Urbana-Champaign. From 2005 to 2015 he served as President of The University of Texas at Dallas and subsequently as Deputy Chancellor and Chief Operating Officer of The University of Texas System in Austin. Honors include the Normal Medal, Croes Medal, Middlebrooks Award, Presidents Award, Opal Award for Education, Terzaghi Lecture, and Geotechnical Hero’s Award from the American Society of Civil Engineers. He was elected to the National Academy of Engineering (NAE) in 2000 and served on the NAE Council from 2013-2019. Past service includes chairing the External Review Panel for ASCE to investigate the causes of the levee failures and flooding of New Orleans as a result of Hurricane Katrina, and service on the NAE panel that investigated the causes for the blowout and explosion of Deepwater Horizon. Dr. Daniel currently serves as President of The Academy of Medicine, Engineering, and Science of Texas (TAMEST) and Chairman of the Gulf Research Program Division Committee of the National Academies of Sciences, Engineering, and Medicine.

Tori Z. Forbes

Member

Tori Forbes is an Associate Professor at the University of Iowa, Department of Chemistry. After postdoctoral research with Professor Slavi Sevov (University of Notre Dame) and Professor Alexandra Navrotsky (UC Davis), she began her independent career in the Department of Chemistry at the University of Iowa in 2010. Her research interests include actinide chemistry and characterizing molecular clusters for use as environmental model compounds and novel materials precursors. She was the recipient of an NSF Career Award with the Division of Materials Research in 2013 and a DOE Early Career Award with the Heavy Elements Chemistry Division in 2015. She is also a University of Iowa Dean's Scholar and the 2020 Chair of the American Chemical Society Division of Nuclear Chemistry and Technology. Tori received her B.S. in chemistry from Beloit College (Beloit, Wisconsin) and Ph.D. in actinide chemistry and environmental mineralogy from the University of Notre Dame.

Robyn E. Hannigan

Member

Dr. Robyn Hannigan became the Provost of Clarkson University in August 2019. Dr. Hannigan is recognized globally as an innovative leader, and her passion for higher education and research, coupled with her dedication to diversity, equity, and inclusion has transformed the institutions where she has served. She served as a member of the National Academies Board on Earth Sciences and Resources from 2003-2006. She has translated her spirit for invention into two start-up companies and continues to be an active, prolific researcher in the broad field of geochemistry. Dr. Hannigan has a B.S. in biology from the College of New Jersey, a master's in geology from the State University of New York-Buffalo, and a master's and Ph.D. in earth and environmental science from the University of Rochester.

Carol M. Jantzen

Member

Carol M. Jantzen, Ph.D., is currently an Affiliate Faculty, College of Sciences and Engineering, University of South Carolina at Aiken (USCA). As a retired consulting scientist from the Savannah River National Laboratory with 45 years of experience in the disposal of high level radioactive waste, her research spanned vitreous, crystalline ceramic, mineral, and cementitious waste form development, processing, and characterization in both the U.S. and Europe. She developed waste form durability tests, process models for vitrification, and glass standards for the stabilization of high level, hazardous, and mixed (radioactive and hazardous) wastes. In 2008, she won the Wendell Weart Lifetime Achievement Award in nuclear waste management for more than three decades of outstanding contributions to nuclear waste management. She is a fellow, past president, and distinguished life member of the American Ceramic Society. Her postdoctoral research was in cement stabilization of U.S. and U.K. wastes in the Department of Inorganic Chemistry at the University of Aberdeen in Scotland. Dr. Jantzen served on the Commission on Physical Sciences, Mathematics, and Astronomy and was a member of the NRSB's Committee on Waste Forms Technology and Performance for six years. Dr. Jantzen received a Ph.D. degree in materials science and engineering from the State University of New York at Stony Brook with a specialization in glass chemistry, glass decomposition mechanisms, and glass durability.

George F. List

Member

Dr. George F. List, Ph.D., P.E., has more than 40 years of experience in both academia and consulting and is a nationally recognized scholar for his work in network operations modeling and control, freight network planning, and simulation. A significant part of Dr. List's research work focuses on highway network operations. Dr. List was the principal investigator on TRB's second Strategic Highway Research Program's Reliability Project, which focused on developing a guidebook for creating travel time reliability monitoring systems. Dr. List is well known for his work in the modeling, simulation, and optimization of transport systems and networks. Dr. List has also led major projects focused on logistics, especially the use of infrastructure investments to help encourage economic development and job growth. Presently, Dr. List is a faculty member in the Department of Civil, Construction, and Environmental Engineering at North Carolina State University. From 2005-2010, he served as the department head. From 1984 to 2005, he was a faculty member in the Department of Civil and Environmental Engineering at Rensselaer Polytechnic Institute. While there he served 10 years as Department Chair and eight concurrent years as the Director of the Center for Infrastructure and Transportation Studies. He also held an appointment in the Department of Decision Sciences and Engineering Systems. He is presently managing more than $2M in research including projects focused on the decarbonization of the rail industry, developing procedures to monitor travel time reliability, and mechanisms to tie transportation investments to economic development. Dr. List is a member of ASCE (Fellow), TRB, IEEE (Senior Member), ITE, and INFORMS. He holds degrees from Carnegie Mellon University (B.S. electrical engineering, 1971), the University of Delaware (master's in electrical engineering, 1976), and the University of Pennsylvania (Ph.D., civil engineering, 1984).

Linda K. Nozick

Member

Dr. Linda K. Nozick is a Professor of Civil and Environmental Engineering at Cornell University and currently serves as its School Director (2014-present). She is also the Co-Founder of the College Program in Systems Engineering and served as its Director from 2009 to 2014. Dr. Nozick has been a member of the Cornell University faculty since 1992, culminating in her promotion to Full Professor in 2003. From 1998 to 1999, Dr. Nozick was a Visiting Associate Professor in the Operations Research department at the Naval Postgraduate School in California. Dr. Nozick was also appointed by President Obama to the U.S Nuclear Waste Technical Review Board in 2011 and served in that capacity until 2019. Dr. Nozick has a B.S.E in Systems Analysis and Engineering from the George Washington University in 1989, an M.S.E in Systems Engineering from the University of Pennsylvania in 1990 and a Ph.D., also in Systems Engineering from the University of Pennsylvania in 1992. Dr. Nozick has been the recipient of several professional honors including a CAREER award from the National Science Foundation and a Presidential Early Career Award for Scientists and Engineers from President Clinton. Dr. Nozick has also received recognition awards from Sandia National Laboratories and the National Nuclear Security Administration for the development of modeling tools for nuclear stockpile analysis, transportation of hazardous/sensitive materials, enterprise planning and budget analyses. Dr. Nozick's primary research interest is the development of mathematical models for use in the management of complex systems, and in particular, systems that can be represented as networks including transportation, logistics, and electric power systems. Much of her recent research has focused on the development of models to combat natural hazards in the built environment. This research has included investment planning in transportation and electric power systems to stem the consequences of earthquakes and manmade hazards, regional evacuation planning for hurricanes and the design of home acquisition and retrofit programs to address hurricane threat.

John L. Provis

Member

John L. Provis is Professor of Cement Materials Science & Engineering at the University of Sheffield. He led the Geopolymer and Minerals Processing Group at the University of Melbourne until joining the University of Sheffield in 2012 with a Chair in Cement Materials Science and Engineering. John was awarded the 2013 RILEM Robert L'Hermite Medal "in recognition of his outstanding contribution to the research and development of geopolymers and other construction materials," and was awarded an honorary doctorate by Hasselt University, Belgium, in 2015 to recognize his leadership in the development of geopolymers and other novel cementitious materials. His research has been funded by the European Research Council as well as other EU sources, UK Research Councils, industry, and international funding bodies, and has resulted in more than 250 refereed international journal articles. He is an invited TAC Expert of RILEM, a Voting Member of committees of BSI, ASTM and ACI, Editor-in-Chief of the leading journal Materials and Structures, Associate Editor of Cement and Concrete Research, and Specialty Chief Editor for the Structural Materials section of Frontiers in Materials. Professor Provis has also been appointed as a Visiting Professor at Lulea University of Technology, Sweden, in the Building Materials division. He completed a combined B.E.(Hons)/B.Sc. in Chemical Engineering and Applied Mathematics at the University of Melbourne, Australia, in 2002, followed by a Ph.D. in Chemical Engineering at the same institution in 2006.

Geoffrey S. Rothwell

Member

Geoffrey S. Rothwell is a Senior Consulting Economist for Longenecker & Associates, contracting with the DOE-NNSA, focused on the role of markets in non-proliferation. Between 2018 and 2021, he was the chief consulting economist for Turner|Harris, Manchester, UK. Between 2013 and 2018, he was the principal economist at the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD) in Paris, France, where he worked on the economics of radioactive waste management, among other topics. From 1986 to 2012 at Stanford University, he was the Director of Honors Programs in the Department of Economics and the Public Policy Program, Associate Director in the Public Policy Program, and a senior lecturer in the Department of Economics and Public Policy Program. He has served on National Academy of Sciences committees to review US DOE's Environmental Management Program (2020-2021); to review US DOE's Nuclear Energy R&D Program (2006-2007); and to review the Decontamination and Decommissioning of Uranium Enrichment Facilities (1993-1996). Dr. Rothwell received his M.A. in Jurisprudence from Berkeley Law School, University of California, Berkeley, in 1984, his Ph.D. in economics from the University of California, Berkeley, in 1985, and finished a post-doctoral fellowship at the California Institute of Technology, in 1986. (Dr. Rothwell graduated from Richland High School in 1971.)

Anne E. Smith

Member

Anne E. Smith is a managing director and co-chair of National Economic Research Associates, lnc.'s (NERA's) Global Environment Practice. Trained in economics, decision sciences, and mathematical modeling, she has applied this expertise to issues including air quality, climate change, contaminated sites, food safety, and nuclear waste management. She has also conducted training courses in health risk assessment and risk management for staff of corporations and government agencies. In addition to her consulting activities, Dr. Smith has served on committees of the National Academies of Sciences, the United Nations Economic Commission for Europe, the UN's Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), and EPA's Board of Scientific Counselors. She is a Member of many different professional societies, performs peer reviews for journal articles, and served on the Board of Directors of the Society for Benefit-Cost Analysis in 2013 and 2014. Prior to joining NERA, Dr. Smith was Practice Leader of Climate and Sustainability at Charles River Associates. She was also a vice president and policy analysis practice leader at Decision Focus Incorporated, and served as an economist in the Office of Policy Planning and Evaluation at the US Environmental Protection Agency. Dr. Smith graduated summa cum laude from Duke University with a B.A. in economics and from Stanford University with an M.A. and a Ph.D. in economics, and a Ph.D. minor in engineering-economic systems.

Kevin W. Smith

Member

Kevin W. Smith is the Senior Consultant for the Falcon-Cougar Management Consultants LLC. Smith's career spans ~40 years with senior leadership positions with both the Department of Energy (DOE) and Department of Defense (DOD). His previous positions include serving as the Manager of Hanford's Office of River Protection and was responsible for management of two of DOE's largest projects, the nuclear Tank Farms and construction of the Waste Treatment and Immobilization Plant. Prior to his role at Hanford, Smith served as Manager of the National Nuclear Security Administration's Los Alamos Site Office, acting Manager of NNSA's Kansas City Plant, Deputy Manager of the Y-12 NNSA Site Office, and Assistant Manager for the Nuclear Material Stabilization Project at the Savannah River Site with responsibility for the Savannah River National Laboratory. With DOD, Smith served in the U.S. Air Force in a number of capacities including as Air Combat Command's Director of Safety where he was responsible for the flying, weapons, industrial, and nuclear safety programs for 100,000 personnel. He also served as Commander of an F-16 fighter squadron, Deputy Chief of Staff for Operations for U.S. Forces Korea, and the Commander of 49th Operations Group at Holloman Air Force Base NM. He flew a number of aircraft to include the F-4, F-16, and the F-117 Stealth Fighter. A native of Olympia, Washington, Smith is a graduate of the U.S. Air Force Academy with a bachelor's degree in physics. He also holds a bachelor's degree in mathematics and a master of science degree in management, from Troy State University.

Chris G. Whipple

Member

Chris G. Whipple has over 40 years of experience in managing risks to human health and the environment. The major emphases of his work have been radioactive wastes, hazardous air pollutants, and environmental mercury. He has served on numerous national committees addressing radioactive waste management, including committees of the National Academies, the U.S. Environmental Protection Agency, and the National Council on Radiation Protection and Measurements, of which he is an emeritus member. He was elected to membership in the National Academy of Engineering in 2001. Chris has chaired the National Academies Board on Radioactive Waste Management, as well as National Academies committees on the Review of the Hanford Site's Environmental Remediation Science and Technology Plan; Models in the Regulatory Decision Process; Medical Isotope Production without Highly Enriched Uranium; and Understanding and Managing Risk in Security Systems for the Department of Energy Nuclear Weapons Complex. Chris also co-chaired the National Academies Report Review Committee from 2008-2016. He was a charter member and second president of the Society for Risk Analysis, and is a Fellow of the American Academy for the Advancement of Science. He received a Ph.D. and M.S. in engineering science from the California Institute of Technology, and a B.S. in engineering science from Purdue University. In 2004, he received Purdue's Distinguished Engineering Alumni Award.

Charles Ferguson

Staff Officer

Charles D. Ferguson is the director of the Nuclear and Radiation Studies Board in the Division on Earth and Life Studies at the National Academies of Sciences, Engineering, and Medicine. Previously, he was the president of the Federation of American Scientists (FAS). Prior to FAS, he worked as the Philip D. Reed senior fellow for science and technology at the Council on Foreign Relations (CFR), where he specialized in nuclear issues, and served as project director for the Independent Task Force on U.S. Nuclear Weapons Policy chaired by William J. Perry and Brent Scowcroft. Before CFR, he was the scientist-in-residence at the Monterey Institute's Center for Nonproliferation Studies, where he co-authored the book The Four Faces of Nuclear Terrorism (Routledge, 2005) and was lead author of the January 2003 report Commercial Radioactive Sources: Surveying the Security Risks. For his work on security of radioactive sources, he was awarded the Robert S. Landauer Memorial Lecture Award from the Health Physics Society in 2003. He is also the author of Nuclear Energy: What Everyone Needs to Know (Oxford University Press, 2011). In addition, he has worked as a physical scientist in the Office of Nuclear Safety at the U.S. Department of State, and he has served as a nuclear engineering officer and submarine officer in the U.S. Navy. He is an elected fellow of the American Physical Society in recognition of his service to public policy and public education on nuclear issues. Dr. Ferguson earned a BS in physics with distinction from the U.S. Naval Academy and MA and PhD degrees, also in physics, from Boston University.

Michael Janicke

Staff Officer

Michael Janicke from Los Alamos National Laboratory joined the National Academies as a Senior Program Officer on the Nuclear and Radiation Studies Board. Mike graduated from Rice University with a B.S. in chemical engineering and continued his education at the University of California Santa Barbara where he earned his Ph.D. in chemical engineering. Following his studies, Mike was an Alexander von Humboldt Fellow at the Max Planck Institute for Carbon Research in Mülheim an der Ruhr. While in Germany, he was extremely lucky to work with Prof. Ferdi Schüth, former vice president of the German National Science Foundation. In 2000, Mike returned to New Mexico as a postdoctoral fellow at LANL and became a staff member in 2002. Most recently Mike was the center director for REFOCUS, the Resonance Center for Chemical Signatures, and has spearheaded efforts in developing new methods to detect chemical threat agents and synthetic opioids at border and airport checkpoints using magnetic resonance techniques. At Los Alamos he was also been involved in several programmatic studies for Enhanced Surveillance Campaigns and Lifetime Extension Programs for the weapons community, participated in NA-22 projects analyzing funded research programs across the DOE complex, and assisted in addressing chemical questions associated with Medical Isotope and Basic Energy Sciences Heavy Element programs.