Future of Battery Technology Options for Defense Applications

Committee

M. Stanley Whittingham

Chair

Stanley Whittingham (NAE) is a Distinguished Professor of Chemistry and Materials Science and Engineering at Binghamton University. Following his D Phil at Oxford University, he was a research associate in Materials S&E at Stanford University. This was followed by 16 years in the energy industry, before returning to academia at Binghamton. He developed the materials chemistry programs and subsequently MS and PhD degrees in Materials Science and Engineering. He served as the University VPR for five years, and as vice-chair, Board of Directors of the Research Foundation of SUNY. He was the 2019 Chemistry Nobel Laureate for the discovery of lithium rechargeable batteries, and the 2023 VinFutures $3M Grand Prize winner. He is a member of the National Academy of Engineering and Fellow of The Royal Society. He presently leads the Battery-NY $113M economic development effort, and is the Chief Innovation Officer of the recently renewed NSF Upstate New York Energy Storage Engine. He is a founding member of NYBEST, and serves on the Board as Vice-Chair for Research, and Chief Scientific Officer of NAATBatt. He received a knighthood in the King’s birthday honors 2024 list.

Corie Cobb

Member

Dr. Corie L. Cobb is a Professor of Mechanical Engineering at the University of Washington. Prior to starting her appointment at the University of Washington in 2017, she spent nearly seven years as a senior member of research staff at Palo Alto Research Center, Inc. (formerly Xerox PARC), leading research on advanced manufacturing technologies for batteries and other energy storage and conversion systems. Before Palo Alto Research Center, she spent nearly two years at Applied Materials contributing to the design of plasma etching platforms for semiconductor manufacturing. Her research integrates advanced manufacturing, materials processing, engineered materials, and computational design to advance lithium-ion and other battery technologies across manufacturing readiness levels. Dr. Cobb is a recipient of the DARPA Young Faculty Award (2019), DARPA Director's Fellowship (2021), and 3M Non-Tenured Faculty Award (2019). She was elected as a Fellow of the National Academy of Inventors (NAI) in 2024 and as a member of the Washington State Academy of Sciences (WSAS) in 2023. She holds a B.S. in Product Design and M.S. in Mechanical Engineering from Stanford University and a Ph.D. in Mechanical Engineering from the University of California, Berkeley.

Nancy J. Dudney

Member

Nancy Dudney (NAE) retired after over forty years of research at The Department of Energy's Oak Ridge National Laboratory where she achieved recognition as Corporate Fellow and Distinguished Inventor. She led research groups at ORNL in Materials and Chemistry Divisions where work included fundamental and applied research in energy storage, batteries, fuel cells, catalysts, and ceramic and thin film processing. Her interest in battery materials continues through consulting and other projects. Dr. Dudney completed her doctorate in ceramics at Massachusetts Institute of Technology and joined ORNL as a Eugene P. Wigner Fellow. Achievements included being elected Fellow of the Electrochemical Society, Member to the National Academy of Engineering, and recipient of awards from the Association of Women in Science and YWCA Tribute to Women in Science and Technology. She holds four R&D 100 awards, 36 U.S. patents, authored more than 260 journal articles and book chapters, and edited several books. She served as chairperson for the Battery Division of the Electrochemical Society.

Judith Jeevarajan

Member

Dr. Judy Jeevarajan is currently the Vice President and Distinguished Scientific Advisor at UL Research Institutes. Before UL, she served for 12 years as the Lead for Battery Safety and Advanced Technology at NASA's Johnson Space Center. Her 30 years of experience in the area of batteries with a primary focus on the lithium-ion and sodium-ion chemistries, includes studying new energy storage chemistries for performance and safety, material improvements for safer energy storage, safety of aged cells and modules, thermal runaway and its propagation, characterizing fire and fire suppressants for battery fires, flow battery safety, recycling and hydrogen production and safety. Dr. Jeevarajan serves in technical working groups for standards organizations such as ULSE, SAE (Automotive and Aerospace), IEC, UN Informal Working Group and AIAA. She is the Chair for the IEC SC21A subcommittee on battery standards and a member of the Electrochemical Society. Noteworthy awards include the American Ceramic Society Leadership medal, Leaders and Legends from Waves of Color, AIAA Power Systems Award, NASA-NESC Engineering and NASA Exceptional Service medals. She earned her Ph.D. in Physical Chemistry from the University of Alabama, Tuscaloosa and an M.S. in Physical Chemistry from the University of Notre Dame.

Christopher Lashway

Member

Christopher R Lashway is currently a Technical Staff at MIT Lincoln Laboratory and has worked on multiple defense battery packs for space applications. He began his career at Naval Surface Warfare Center Dahlgren Division working in wearable power grids for the Navy and Marine Corps, with an effort to replace proprietary primary batteries with a single secondary battery that could be recharged in the field. This effort later lead to a detail at the Naval Research Laboratory to integrate custom solar photovoltaics. His current work procures specialized battery packs for space applications and has enabled him to get involved in initial chemistry selection and cell pack design, battery and performance modeling, design and conducting extensive test campaigns, and thermal modeling. During his tenure, he has also served on a source selection committee to evaluate emerging high specific energy storage and management solutions, which included solid state lithium ion and state-of-the-art battery management systems. His expertise covers multiple domains to include battery safety and health optimization. He has been a member of IEEE since 2006 and the IEEE Power and Energy Society since 2014. Dr. Lashway received his PhD in Electrical Engineering from Florida International University with a focus on modeling and control of hybrid energy storage systems, to include batteries, supercapacitors, and flywheel energy storage.

Amy Marschilok

Member

Amy Marschilok is a Professor in the Department of Chemistry at Stony Brook University, where she is an Adjunct Faculty in the Departments of Materials Science and Engineering and Chemical and Molecular Engineering and Co-Director of the Institute of Sustainability, Electrification, and Energy (I:SEE). Dr. Marschilok holds a Joint Appointment at Brookhaven National Laboratory, where she serves as Energy Storage Division Manager and Energy Systems Division Manager in the Interdisciplinary Science Department. She also serves as Director of the Center for Mesoscale Transport Properties (m2M), an Energy Frontier Research Center funded by the U.S. Department of Energy. Dr. Marschilok was previously employed as a Senior Scientist in the Medical Battery Research and Development group at Greatbatch Inc., where she was recognized as a Visionary of the Year. Dr. Marschilok was in the inaugural cohort of the Oppenheimer Science and Energy Leadership Program and cohort 6 of the Battelle Laboratory Operations Leadership Academy. In 2026 she received a SUNY Chancellor's Award for Excellence in Scholarship and Creative Activities.

Matthew McDowell

Member

Matthew T. McDowell is Professor and Carter N. Paden, Jr. Distinguished Chair at Georgia Tech, where he is the Director of the Georgia Tech Advanced Battery Center. He also serves as Associate Chair for Research in the Woodruff School of Mechanical Engineering, and he holds a joint appointment in the School of Materials Science and Engineering. Dr. McDowell is an internationally recognized researcher in electrochemical energy storage, with expertise in battery materials, solid-state batteries, electrochemical interfaces, materials characterization, and the coupling of solid mechanics and electrochemistry in energy systems. His work has advanced the field's understanding of battery operation and degradation mechanisms, as well as the development of next-generation batteries for transportation and grid-scale energy storage. His honors include the Presidential Early Career Award for Scientists and Engineers (PECASE), Blavatnik National Award Finalist, Sloan Research Fellowship, NSF CAREER Award, NASA Early Career Faculty Award, Air Force Office of Scientific Research Young Investigator Award, the Electrochemical Society Battery Division Early Career Award, and the GT Sigma Xi Best Paper Award. He is a member of the Materials Research Society and the Electrochemical Society, and he attended the U.S. NAE FOE Symposium in 2021 and was an invited speaker at the U.S.-E.U. FOE Symposium in 2022. Dr. McDowell earned a Ph.D. and M.S. in Materials Science and Engineering from Stanford University and a B.S. in Materials Science and Engineering from Georgia Tech. He was a Postdoctoral Scholar at Caltech.

Matteo Muratori

Member

Dr. Matteo Muratori is the Sector Director for Energy Technologies at the U.S. Department of Energy's Pacific Northwest National Laboratory (PNNL), where he leads a $120M+ research portfolio spanning transportation technologies, batteries, renewable energy, fuels and chemicals, and the integration of those technologies within the broader energy system. Previously, Matteo spent a decade at the National Renewable Energy Laboratory (NREL) and served at the U.S. Department of Energy as Chief Analyst for Sustainable Transportation and Fuels. He started his career as the ExxonMobil Fellow at the Joint Global Change Research Institute. Matteo has received several awards and recognitions—including the 2024 Secretary of Energy Award—and is a member of the 2026 cohort of the National Academies of Sciences, Engineering, and Medicine New Voices program. He has authored 150+ publications cited over 14,000 times. Matteo grew up in Italy and is a first-generation American. The first in his family to attend college, he holds B.S. and M.S. summa cum laude degrees in energy engineering from Politecnico di Milano, as well as M.S. and Ph.D. degrees in mechanical engineering, along with a minor degree in statistics, from The Ohio State University.

William Earl Mustain

Member

William Mustain is a Professor in the Department of Chemical Engineering and the Director of the Carolina Institute for Battery Innovation at the University of South Carolina. He works in several areas related to electrochemical energy generation and storage, including: high capacity materials for Li-ion batteries, alkaline batteries, battery recycling, corrosion and passivation of materials, catalysts and supports for proton exchange membrane and anion exchange membrane fuel cells and electrolyzers, electrochemical reactor design and electrochemical synthesis of fuels. He has published articles over 160 peer-reviewed articles and has over 100 invited lectures. He has served as the chair of both the Energy Technology Division of The Electrochemical Society and chair of AIChE Area 1E: Electrochemical Fundamentals. He has been the recipient of several awards including the U.S. Department of Energy Early Career Award, Electrochemical Society Energy Technology Division Research Award, Connecticut Quality Improvement Platinum Award, Supramaniam Srinivasan Young Investigator Award (Awarded by the Energy Technology Division of the Electrochemical Society), UConn Chemical Engineering Faculty of the Year Award, USC Chemical Engineering Publication Award, USC CEC Research Achievement Award, Illinois Institute of Technology Young Alumnus Award, Fellow of the Electrochemical Society and Fulbright Scholar Fellowship.

Anna Stefanopoulou

Member

Dr. Anna G. Stefanopoulou, is the William Clay Ford Professor of Technology and the Huei Peng Distinguished Professor of Mechanical Engineering at the University of Michigan. She has mentored 50 PhDs and taught a generation of engineers through classroom, online, and asynchronous courses about modeling, estimation, diagnostics, and control of engines, fuel cells, and batteries. She recently prepared a battery course for the Naval Postgraduate School. She was the Director of the UM Energy Institute (2018-2020) and the Director of the Automotive Research Center, a multi-university U.S. Army Center of Excellence in Modeling and Simulation of Ground Vehicles (2009-2018). Before Michigan, she was an assistant professor at the University of California, Santa Barbara, a visiting professor at ETH, Zurich, and a technical specialist at Ford. She has co-authored a book, 23 US patents, and 400 publications. She has received many prestigious awards such as the NAATBATT Lifetime Achievement for advanced battery management and is a Fellow of ASME, IEEE, and SAE. She has served on two US National Academy committees (2015 and 2020) on vehicle fuel economy standards and the workshop on the Electrification of Army’s Light Combat Vehicle Fleet (2022).

Fabian Villalobos

Member

Fabian E. Villalobos is a senior engineer at RAND and a Professor of Policy Analysis at the RAND School of Public Policy. He is an inaugural fellow of RAND's Global Scholar Program for the Defense Industrial Base and Supply Chains. He manages RAND's Engineering and Applied Sciences Speaker Seminar Series. Villalobos' research focuses on the intersection of technology, economics, and geopolitics and how it relates to national security. His work includes topics on emerging technologies, logistics, acquisitions, strategy, the defense industrial base, and China. He has a specific interest in the impact of electrification and critical minerals on military technology, energy security, development, trade, climate, and international relations. Recent work includes the mineral-technology supply chains, protracted industrial capacity, the auto sector, competitiveness of Chinese firms, U.S.-China technological competition, China's industrial policy, military deception, and technological risk. Villalobos has a background in materials science and chemical engineering. He is a co-inventor and co-author of patents. Previously, he worked in industry at startups and established manufacturers supporting R&D, product development, supply chains, quality assurance, business development, and more. His commentary has been published in War on the Rocks, World Economic Forum, The Hill, Barron's, DefenseNews, and more. He has been quoted in the New York Times, Indo-Pacific Defense Forum, The Wire China, and more. Villalobos has been invited to speak to a variety of international audiences on critical minerals, batteries and drones, economic security, and industrial policy.

Jay Whitacre

Member

Dr. Jay Whitacre has 25 years of technical, business, and academic experience. His career is focused on understanding and developing electrochemical materials and systems with a focus on batteries, energy policy, and innovation theory. He is a professor in the Materials Science and Engineering & the Engineering and Public Policy departments, holds the Trustee Chair in Energy, at CMU, where he also served for 6 years as the director of the Wilton E. Scott Institute for Energy innovation. Whitacre developed a novel aqueous battery chemistry that was manufactured and sold by Aquion Energy, a company he founded in 2008 that produced and shipped over 30 MWh of energy storage worldwide. He founded Stratus Materials (2022), a company focused on commercializing next-generation cathode materials for electric vehicle batteries. Earlier in his career, he was a Senior Member of the Technical Staff at JPL/Caltech, where he worked as an energy technologist, system engineer, and a cognizant engineer. Jay has numerous honors to his name including the 2014 Caltech/Resnick Sustainability Institute Resonate Award, the 2015 Lemelson-MIT Prize for Innovation, the 2017 Leigh Ann Conn Prize for Renewable Energy (bestowed by the University of Louisville), and is a Fellow of the National Academy of Inventors. Whitacre has previously worked on various National Academies Panels, including the first assessment of ARPA-E.

Kate Whitefoot

Member

Kate Whitefoot is an internationally recognized engineer and economist in transportation energy and critical technology analysis. She is the Founding Co-Director of the Transportation Engineering, Economics, and Policy PhD Fellowship Program; Associate Director of Carnegie Mellon's Critical Technology Initiative; and a Fellow of the Wilton E. Scott Institute for Energy Innovation. She holds a joint appointment as professor in the Department of Engineering and Public Policy and the Department of Mechanical Engineering at Carnegie Mellon University and a courtesy appointment in the Heinz College of Information Systems and Public Policy. Prior to her current position, she served as a Senior Program Officer and the Robert A. Pritzker Fellow at the National Academy of Engineering where she directed the Manufacturing, Design, and Innovation program. Professor Whitefoot has served on several national and international policy advisory committees. She co-led the energy and critical materials analysis of the National Network for Critical Technology Assessment as well as the National Bureau of Economic Research Energy Use in Transportation research program, organized the UNFCCC COP27 Clean Air as a Human Right Symposium, and was appointed to the World Economic Forum's Global Future Council for Clean Air. She was appointed to two National Academies committees assessing technologies in transportation and manufacturing and was selected by the National Academy of Engineering Frontiers of Engineering Program as an emerging engineering leader. Her research on technological implications for sustainability, economic security, and social welfare is published in Science, the Proceedings of the National Academies of Sciences and Environmental Science & Technology among other journals. Her work is featured in the Atlantic, New York Times, Wall Street Journal, and Washington Post and referenced in multiple rulemakings by the U.S. Department of Transportation and Environmental Protection Agency. She has worked with several Fortune 50 companies and startups across automotive, aircraft, energy storage, and materials industries and has been invited to present briefings at the White House, Capitol Hill, and several federal agencies.