Mark Adamiak, **IEEE Fellow** – is the Chief Application Architect for GE Grid Automation and is responsible for identifying, developing, and integrating new technology for GE's substation protection, control, and automation business. Mark received his Bachelor of Science and Master of Engineering degrees from Cornell University in Electrical Engineering and an MS-EE degree from the Polytechnic Institute of New York. Mark started his career in the utility business with American Electric Power (AEP) and in mid-career, joined General Electric where his activities have ranged from advanced development, product planning, application engineering, and system integration. Mr. Adamiak is a member of the IEC61850 WG, a Fellow of the IEEE, a registered Professional Engineer in the State of Ohio and a GE Edison award winner. In 2012, Mr. Adamiak was elected to the US National Academy of Engineering.

Jason Allnutt currently serves as program manager for four IEEE Conformity Assessment Programs (ICAP) all in the Power and Energy sector. His duties include oversight of the Conformity Assessment Steering Committees for each program as well as providing technical input when necessary. Prior to joining IEEE-SA Jason spent five years at a Nationally Recognized Test Lab (NRTL) where he performed military and FCC style Electromagnetic (EMC) Testing. Jason received his undergraduate Electrical Engineering degree from the University of Pittsburgh where he concentrated in Power Systems.

Monica Anderson received her BSEE in 1988 from the University of California, Davis. Monica is a registered professional engineer in California and has been with PG&E system protection since 2003. Her current PG&E position is a protection engineer supporting the 500 kV system. Previously she worked at Western Area Power Administration, First Energy Corp, and Puget Sound Energy.

Rahul Anilkumar received M.S and B.S degrees in electrical power engineering from Washington State University and VisvesvarayTechnololgical University respectively. He has five years of active research and industry experience in the fields of transmission and distribution network planning, renewable integration and algorithm development.

He is currently at Quanta Technology, as a Senior Engineer, working with transmission and distribution system planning, and Synchrophasor R & D. He has completed multiple internships in the field of data center design, automation and power quality, prior to joining Quanta. His research and interests include Transmission and Distribution network planning and operations, system stability and control, application of optimization algorithms to power system operations, model development and application of synchrophasor technology to power systems.

He is also a reviewer of IEEE transactions on industry automation and control and Industry applications.

Galina Antonova is with ABB Power Grid, Grid Automation group, North America. She has over 20 years of experience in the area of electrical engineering, data communications and time synchronization, which she mainly applied to the power industry. In her current role with ABB, Galina is applying her expertise to substation automation and protective relaying applications. Galina received her M. Sc. degree (1993) and a Ph.D. (1997) in Electrical Engineering and Data Communications from the State University of Telecommunications, St. Petersburg, Russia, and spent one year at University of British Columbia (UBC) on a scholarship from the Russian President. She is actively involved with IEEE PSRC and is a Canadian member of the IEC TC57 WG10.

Dr.Alexander Apostolov, **IEEE Fellow** – received MS degree in Electrical Engineering, MS in Applied Mathematics and Ph.D. from the Technical University in Sofia, Bulgaria. He has 40 years of experience in power systems protection, automation, control and communications. He is presently Principal Engineer for OMICRON electronics in Los Angeles, CA.

He is an IEEE Fellow and Member of the Power Systems Relaying Committee and Substations C0 Subcommittee. He is a past Chairman of the Relay Communications Subcommittee, serves on many IEEE PES Working Groups and is Chairman of Working Groups C2 “Role of Protective Relaying in Smart Grid”. He is a member of IEC TC57 working groups 10, 17, 18 and 19. He is a Distinguished Member of CIGRE (International Council on Large Electric Systems) and Convenor of CIGRE WG B5.53 ”Test Strategy for Protection, Automation and Control (PAC) functions in a full digital substation based on IEC 61850 applications” and member of several other CIGRE B5 working groups. He holds four patents and has authored and presented more than 470 technical papers.

He is an IEEE Distinguished Lecturer and Adjunct Professor at the Department of Electrical Engineering, Cape Peninsula University of Technology, Cape Town, South Africa. He is an Editor-in-Chief of PAC World.

Thomas Owen Bialek received a Bachelor and Master of Science Degree in Electrical Engineering from the University of Manitoba in 1982 and 1986 respectively. He also obtained a Doctor of Philosophy in Electrical Engineering from Mississippi State University in 2005.

He is currently employed by San Diego Gas & Electric Company ("SDG&E") as a Chief Engineer. His present responsibilities involve technology strategy and policy for transmission and distribution issues including equipment, operations, planning, distributed generation and development of new technologies. He was also the Principal Investigator on DOE and CEC funded Micro Grid projects. He is also a frequently requested external speaker and DOE R&D peer reviewer. Tom was also recognized by Greentech Media in its inaugural 100 Top Movers and Shakers in Smart Grid. In 2009 Tom was recognized with SDG&E’s Cornerstone award and in 2010 received the Outstanding Engineer award from the San Diego County Engineering Council.

He has held various positions with other North American utilities and equipment manufacturers since graduating in 1982. His experience includes electric utility design, planning and operation and equipment design, development and manufacturing.

Tom is an IEEE Senior Member. Tom sits on the DOE Electricity Advisory Committee as the Smart Grid Subcommittee Vice Chair. Tom also chairs the NREL’s Electric System Integration Technical Review Panel. Tom is also a member of Phi Kappa Phi Honors Society. He is also a registered Professional

Engineer, Electrical Engineering, in the State of California. He has authored a variety papers on a diverse of subjects such as distribution fault location, surge protection of equipment and testing of cables and has been awarded three patents.

Chris Bolton joined SDG&E in 2011 as an Associate Engineer with rotational assignments at North Coast C&O, Transmission Planning, and Substation Engineering. Upon completing the rotational program, he continued his work in Substation Engineering on the Capital Projects Team where he managed and provided engineering support for various projects such as the Sunnyside Substation Rebuild, Sewage Plant Rebuilds, and Synchronous Condensers. In 2016, Chris transferred to the Substation Technical Analysis & Support team at Kearny Maintenance and Operations where he managed the construction and commissioning of various projects such as the Point Loma Sewage Rebuild, Sewage Pump Station #1 Rebuild, Miguel Synchronous Condensers, and San Luis Rey Synchronous Condensers. Chris was then promoted to Team Lead in System Protection Maintenance where he supervised Relay Technicians responsible for installing, commissioning, and maintaining SDG&E's substation control and protection infrastructure. Following his time as Team Lead, Chris was then promoted to Manager of System Protection and Control Engineering where he oversees the engineering of all SDG&E control and protection / automation equipment for electric infrastructure. Chris graduated with a Bachelor's Degree in Electrical Engineering from California State Polytechnic University, Pomona and is a Licensed Professional Engineer in the State of California.

John Boudreaux is a distributed energy resource planning engineer at Entergy. His role is to study how customer centric programs such as electric vehicle charging stations, demand response, energy efficiency, and technologies such as solar and storage will impact our grid. Through modeling and simulation, this work is looking to demonstrate the capabilities these programs have to be utilized as non-wire alternatives. With new technologies at our disposal and software to perform advanced forecasting studies, John is examining how the distribution planning process moves forward into the grid of the future.

Before joining his current position, John was a distribution asset planner for the Southeast Louisiana region. John received his BSEE from in 2013 and his MSEE in 2018 from Louisiana State University with a focus in power systems and renewable energy integration.

Ramon Leon is the Program Manager of the New Energy Business initiative at Interconexión Eléctrica S.A. (ISA), developing new business models and ventures on grid scale storage and distributed energy resources for the corporation's business portfolio in Latin America. He has 21 years of experience in strategic planning of energy systems, management of research and development projects, and the structuring of corporate entrepreneurship projects based on innovation.

Mr. Leon is an Electrical Engineer from Universidad Tecnologica de Bolívar and has a Masters Degree in Electrical Engineering from Iowa State University. Currently is the Chair of the Colombian IEEE PES Chapter.

Sal Cardella is the Product Marketing Manager, Protection and Communication Products, for the Ametek Power Instruments division located in Rochester New York. He is responsible for P&L as well as all aspects of product development for the Fault Recorder business line for Ametek.

A 1999 graduate of the Rochester Institute of Technology earning a Bachelor of Science degree in Electrical Engineering Technology. Sal also earned an Associate degree from the College of Applied Sciences and Technologies from Rochester Institute of Technology in 1993.

He is also Six Sigma Green Belt Certified and earned the Dale Carnegie certification in 2001 along with several other industry related certifications.

Sal has been employed at Ametek Power Instruments since June 2015, initially as an Application Specialist then promoted to Product Manager in 2016 and then Product Marketing Manager in 2017. He was previous employed at Eastman Kodak Company & Kodak Alaris from 1989 through 2015, holding several positions over his 25-year career including Sales Technical Manager, Technical Manager, Senior Service Engineer & Field Engineer.

He has extensive Technical and Sales background and experiences with all aspects of Customer Service, Field Service, Service Engineering, Quality Assurance, Product Development, Hardware & Software Development & Testing and Business Management.

Mark Carpenter is Sr. Vice President of Transmission & Distribution Operations at Oncor where he has spent his entire career. Over Mark's 44 year career, he has held various field management and engineering management positions in the transmission and distribution of electrical energy. Previous assignments also include Vice President-Chief Information Officer, Vice President-Chief Technology Officer, Director of Engineering, and Director of System Protection. He was responsible for the development and implementation of the Advanced Metering System, its integration with the Outage Management System, and the associated analytics. Throughout his career, he has focused on developing people and creating high performance teams.

Mark earned a bachelor's degree in electrical engineering at Texas Tech in 1975 and is active in professional activities. He is a member of the IEEE Power System Relaying Committee, the IEEE/PES Industrial Advisory Council, and the Texas Society of Professional Engineers. He is a registered Professional Engineer in the State of Texas and is on the Dean of Engineering Council at Texas Tech. He recently served on ERCOT's board of directors.

He is also active in the community as demonstrated by his involvement with the Chinese Institute of Engineers DFW Chapter and as President of Family Promise of Irving, a non-profit organization that assists homeless family regain their foothold by providing safe housing and developmental opportunities in conjunction with a network of churches in Irving. He is active in his church and is married with five kids, four daughters-in-law, and seven and one half grandkids.

Bill Chiu is the Director of Grid Resiliency Program Management Office at Southern California Edison (SCE) with responsibility for enterprise-wide grid resiliency strategy and efforts to proactively address various opportunities to further strengthen the electric grid against the potential vulnerability and its threat on public safety. Most recently, Bill was the Director of Engineering in Transmission and Distribution business unit with responsibilities for all engineering disciplines and technical requirements involved in SCE's transmission, substations, distribution, and smart metering system, including the interconnections of renewable resources. With nearly three decades of experience in the energy industry, Bill has served in a variety of functional areas that include business strategy, regulatory policy, operations, system planning, engineering, and bulk power infrastructure projects.

Bill is an active IEEE Senior Member and served as the Chairman of the IEEE/PES Transformers Committee. Bill is currently one of the IEEE/PES Board of Governor's Liaisons to the Federal Energy Regulatory Commission. In 2014, Bill was recognized by IEEE USA with the Regional Leadership Award for his contributions to the power industry.

Bill is passionate about STEM education and currently serves on the Industry Advisory Board for the USC Viterbi School of Engineering and the California State University at Los Angeles School of Engineering, Computer Science, and Technology. Bill has a Bachelor of Science degree in Electrical Engineering from Cal Poly Pomona, a Master of Science in Electrical Engineering from USC Viterbi School of Engineering, and an MBA degree from the USC Marshall School of Business. Bill is also a registered professional engineer in the state of California and Texas.

Robert W. Cummings is NERC Senior Director of Engineering and Reliability Initiatives. Mr. Cummingsjoined NERC in 1996 and has extensive experience in the industry in system planning, operations engineering, and wide area planning. He holds a Bachelor of Science Degree in Power System Engineering from Worcester Polytechnic Institute and is an IEEE Life Senior Member.

He is a member of the U.S. Department of Energy (DOE) Electricity Advisory Committee, and its Energy Storage and Smart Grid Subcommittees, and is a member of the External Advisory Board of the for the DOE Beyond Levelized Cost of Energy (LCOE) Project.

Cummings is also a member of theScientific Advisory Board of CURENT (Center for Ultra-wide Area Resilient Electric Energy Transmission Networks), a National Science Foundation and Department of Energy Engineering Research Center at the University of Tennessee, Knoxville.

His geographically diverse experience includes Central Vermont Public Service Corporation in System Planning (generation and transmission), Public Service Company of New Mexico (Operations Engineering and Wide Area Planning), and the East Central Area Reliability Coordination Agreement (ECAR), a former regional office of NERC.

The Reliability Initiatives and System Analysis group acts provides a consulting engineering function within NERC, performing deep-dive forensic engineering analysis of major system disturbances and providing subject matter expertise to standards drafting teams and various other areas of NERC staff.

Cummings was a principal investigator of the 2003 blackout as a team leader and the more recent September 8, 2011 Arizona-Southern California Outage analysis. In both instances he led multiple teams with responsibilities in the sequence of events development, modeling and studies (powerflow and dynamics analysis), and transmission/generation performance areas.From 2005 through 2009, he directed the NERC Event Analysis and Information Exchange program, directing or working on 12 major disturbance analyses.

Cummings was instrumental in the founding of the NERC System Protection and Controls Task Force, now the System Protection and Control Subcommittee, acting as the staff coordinator from 2004 through 2009.

Cummings is the senior staff technical advisor for the NERC System Analysis and Modeling and the System Protection and Controls Subcommittees, and the NERC Inverter-Based Resource Performance Task Force, and is a technical advisor to the North American Synchro-Phasor Initiative. He is also the technical director of the NERC System Protection Improvement Initiative, the Modeling Improvements Initiative, and the Frequency Response Initiative

Ali Daneshpooy- Quanta Technology

Mihir Desu is a Manager in Strategen's consulting practice. He is currently involved in corporate strategy work and public proceeding support across the US, covering such topics as rate design, electric vehicle and energy storage policy, project development strategy, and designing new market structures that accurately value and compensate distributed energy resources (DERs). Prior to joining Strategen, Mihir worked for Portland General Electric, an investor-owned electrical utility in Oregon, where he supported DER rate design and policy proceedings and developed models to value qualifying facilities, demand response, and electric vehicles. He has also worked as a consultant for The Cadmus Group evaluating demand-side management programs for utilities and government organizations. He started his career analyzing ISO markets for energy traders and developers with EnergyGPS. Mihir holds a Bachelor of Arts degree in Mathematics from Binghamton University.

Prof. Xinzhou Dong was graduated from Xi'an Jiao Tong University respectively in 1983, 1991 and 1996, and received his bachelor, master and doctoral degree. In 1999, after the postdoctoral work in Tianjin University, he joined the Department of Electrical Engineering in Tsinghua University. Now, he serves as a full professor. He is also the director of Green Energy and Power Safety Beijing International Cooperation Center, and the PI of National Key Research Plan project "large-scale AC / DC hybrid power grid operation, control and protection". He is an IET Fellow, IEEE Fellow, and CSEE Fellow.

He is mainly engaged in the teaching and research work of power system relay protection. In recent years, he has been engaged in high voltage transmission line fault location, traveling wave protection, Fault feeder selection in neutral non-effective grounding distribution system, protection of transmission line with FACTS devices and application of wavelet transform. He has published more than 200 papers related to his research area, including SCI/EI 154 papers; and has completed 10 key projects, including the National Key Research Plan project, Natural Science Foundation of major international cooperation projects, key projects, 863 plan project, 973 plan sub project. He won the two 2nd prize of China National Technological Invention Award, 6 province-level 1st prize of Technological Invention Award.

Babak Enayati received his PhD in Electrical Engineering from Clarkson University, Potsdam, NY in 2009. He joined National Grid, USA in 2010 and is currently the Manager of the Technology Deployment team, which is responsible for development and implementation of the Transmission Network modernization strategy. He joined Institute of Electrical and Electronics Engineers (IEEE) in 2006 and currently is a Senior IEEE Member. Babak currently serves as the IEEE Power and Energy Society (PES) Governing Board Member-at-Large. Babak is also the Vice Chair of the IEEE Standards Coordinating Committee 21 (SCC21) and IEEE 1547, Standard for Interconnecting Distributed Energy Resources with Electric Power Systems. Babak is a registered Professional Engineer (PE) in the state of Massachusetts.

Pavel V. Etingov is a staff research engineer at the US Department of Energy's Pacific Northwest National Laboratory (PNNL), Richland, WA. He graduated with honors from Irkutsk State Technical University specializing in electrical engineering in 1997. He was a fellow at the Swiss Federal Institute of Technology in 2000-2001. P.V. Etingov received his Ph.D. degree in 2003 from the Energy Systems Institute of the Russian Academy of Sciences, Irkutsk, Russia. He joined PNNL in 2008 where he serves as a Project Manager, Principal Investigator (PI)/co-PI and key technical contributor in multiple projects. These projects are ranged from $50k to more than $1M and funded by the U.S. Department of Energy (DOE), Bonneville Power Administration (BPA), California Energy Commission, California ISO, ISO New England, and some others electrical utilities. He is a member of the IEEE Power & Energy Society (PES), CIGRE, WECC Joint Synchronized Information Subcommittee (JSIS), WECC Modeling and Validation Work Group (MVWG), and North American SynchroPhasor Initiative (NASPI) research analysis task team. His research interests include stability analysis of electric power systems, power system operation, modeling and control, phasor measurement units (PMUs) application, wind and solar power generation, application of artificial intelligence to power systems, and software development.

Aaron Feathers is a Principal Engineer in System Protection Engineering at Pacific Gas and Electric Company, where he has been employed since 1992. He has 27 years of experience in the application of protective relaying and control systems on transmission systems. Aaron's current job responsibilities include design standards, wide area RAS support, NERC PRC compliance, and relay asset management support. He has a BSEE degree from California State Polytechnic University, San Luis Obispo and is a registered Professional Engineer in the State of California. He is also a member of IEEE and is on the Western Protective Relay Conference planning committee and participated on the NERC Protection System Maintenance Standard Drafting Team developing NERC Standard PRC-005-2 to PRC-005-6.

John Finney heads Technology and Business Development for Grid Automation in the Power Systems division of ABB. In this role, he oversees ABB's product development in the areas of substation automation, mission critical communications, network control, enterprise software as well as microgrids and renewable automation. Having joined ABB as a researcher in 1995, John has spent his whole career in the development and management of ABB's products and businesses applying mathematics, software and digital technologies to improve economy and reliability of utility networks. John now lives and works for ABB in Switzerland, and holds Bachelor and PhD degrees in electrical engineering from the Georgia Institute of Technology.

Dr. Yong Fu is an Associate Professor in the Department of Electrical and Computer Engineering at Mississippi State University (MSU). He has been awarded the Tennessee Valley Authority (TVA) Endowed Professorship in Power Systems Engineering. He received his B.S. and M.S. degrees in Electrical Engineering from Shanghai Jiao Tong University, China, in 1997 and 2002, respectively. In 2006, he received his Ph.D. degree in Electrical Engineering from Illinois Institute of Technology, Chicago. From 2006-2009, he was a senior research associate at the Robert W. Galvin Center for Electricity Innovation at Illinois Institute of Technology, Chicago. He joined the Department of Electrical and Computer Engineering at Mississippi State University as an Assistant Professor in Fall 2009.

He has over 15 years of research experience in the area of power system operation and control, and has published over 90 referred journal and conference papers (including 45 IEEE Transactions papers). He serves as a PI or co-PI on several projects including Smart Grid, Renewable Energy Integration, Electric Ship Research, Micro-CHP, and Synchrophasor.

He was a recipient of the NSF Faculty Early Career Development (CAREER) Award in 2012. He serves as an editor for the IEEE Transactions on Power Systems, the IEEE Power Engineering Letters, the IEEE Access, the Journal of Electric Power Components and Systems, the CSEE Journal of Power and Energy Systems, and the Journal of Modern Power Systems and Clean Energy. He was a Guest Editor of the IEEE Transactions on Smart Grid: Special Issue on "Optimization Methods and Algorithms Applied to Smart Grid". He was also awarded the 2015 Exceptional Reviewer of the IEEE Transactions on Power Delivery, and the 2018 Exceptional Reviewer of the IEEE Transactions on Sustainable Energy. He is an IEEE senior member.

Dr. Peter Fuhr has been involved in industrial wireless, sensors, and secure systems as a NASA space optical physicist, university professor, serial entrepreneur, and a Dept of Energy National laboratory researcher. Peter has authored and delivered hundreds of technical journal and conference publications/presentations. His pioneering work in networked sensor systems for structures earned him the Presidential Award for Excellence in Research. Segments of his research activities are featured in the SPIE Milestone Series on Fiber Optics. Dr. Fuhr is a Distinguished Scientist at Oak Ridge National Laboratory serving in the capacity as the Technology Director for the Unmanned Aerial Systems (UAS) Research Laboratory and Director of Grid Security. In addition, Peter is a Professor of Electrical Engineering and Computer Science at the University of Tennessee with an affiliated appointment within the University's Bredesen Center.

Daniel P. Gabel is Senior Manager, DER Interconnection. Dan is the Senior Manager of DER Interconnection for Chicago-based Commonwealth Edison. In this role, Dan directs a group of professionals who are responsible for the safe, efficient, and reliable interconnection of generators, solar arrays, energy storage and other distributed energy resources to ComEd's electric grid. Dan's team acts as the liaison between customers, developers and internal stakeholder groups, and is charged with implementing ongoing technology solutions and process improvements to ensure a premier customer experience throughout the interconnection process life cycle. Dan also sets the strategy, creates the structure, and leads execution of cross-functional business plans to enhance the rigor, efficiency, and transparency of ComEd's DER interconnection processes.

Dan has 29 years with ComEd, including previous roles in engineering, customer operations, T&S, project management and transmission planning. Prior to his current role, Dan was Manager of Smart and Technology for ComEd, where he was responsible for evaluating advanced smart grid technologies and

leveraging ComEd's existing smart grid assets to provide added value to customers; as well as ComEd's initiatives related to electric vehicles, including managing the impacts to the electric grid, and preparing the market for EVs in ComEd's service area.

Dan chairs the IEEE DER Interconnection Task Force, focused on identifying and implementing industry-wide best practices in the interconnection of 3rd party distributed energy resources. Dan is also chairing the 2020 IEEE Smart Cities North America Conference and is Treasurer for the 2020 IEEE PES T&D Conference.

Dan holds a Bachelor's degree in electrical engineering from the Illinois Institute of Technology, and a Master's degree in project management from Keller Graduate School. He is an Illinois Licensed Professional Engineer.

Robert Merring is principal advisor MISO since 2017, prior to that worked in MISO group that maintained and enhanced MISO market system and was the group supervisor for six years. Prior to that was with TVA in various positions from Nuclear Plant construction, to Fossil plant improvement and power trading, spent 6 years with DOE, spent 6 years with Navy as officer. Qualified as officer of Deck and Engineering Officer of the Watch on a nuclear submarine.

Masters and Bachelors of Electrical Engineering U of Louisville, Speed Engineering School.

Sam Hirsi is a Transmission Planning Engineer with the Bonneville Power Administration (BPA). He earned his BS and MS degree in Electrical Engineering from the University of Washington and Portland State University in 2010 and 2014, respectively.

Sam started his career with BPA Transmission Operations in 2010. Where he was responsible of performing power flow, voltage and transient stability studies and set operating limits on the COI (WECC Path 66) and the Pacific Direct Current Intertie (PDCI – WECC Path 65) using computer programs such as PowerWorld and GE PSLF to simulate power system performance to plan the operations horizon of BPA's transmission system. Additionally, he provided 24-7 on-call support as needed for real-time emergencies.

Currently, he works in BPAs Transmission Planning department, where he is responsible for performing power system analysis (load flow, voltage stability and dynamics) to recommend corrective action plans and planning horizon limits in the Eastern Washington area compliant with applicable NERC, WECC and BPA planning standards (TPL, PRC, FAC and MOD). Recent undertaking, include PDCI Remedial Action Schemes (RAS) Automation project.

Hamody M. Hindi is an electrical engineer with the Bonneville Power Adminstration. He joined BPA in 2009, and has been with the transmission planning department since 2011. He received a B.A. in physics from UC Berkeley and a M.S.E.E. in power systems from University of Washington Seattle. Other areas of interest include load modeling. He is a registered professional engineer in the state of Washington.

Dr. Juergen Holbach has a 30-year distinguished career in design and application of protective relaying. He led the development of numerical line differential relays for relay manufacturer. As an application expert for transmission protection, he was responsible for approval test of transmission relays with utility customer around the world. Since 2000 he works in the US as a product manager for protection relays. Juergen was one of the lead engineers on the first IEC61850 based Protection and Control, Multi-Vendor Project in the United States (500KV Bradley Station-TVA). In recent years, Juergen has been involved in several industrial and utility projects focusing on wide-area protection coordination studies and protection setting calculation. Juergen contributed to several working groups in CIGRE as well as in IEEE-PSRC. He published over a dozen papers at the major relay conferences in North America.

Rich Hunt is a Senior Product Manager with the Grid Solutions business of GE Power, focusing on digital substation solutions for protection and control systems. Rich has over 30 years' experience in the electric power industry with both utilities and solution providers and has authored more than 50 technical papers presented at more than 90 conferences. Rich earned the BSEE and MSEE from Virginia Tech, is a Senior Member of IEEE, a member of the Main Committee of the IEEE Power System Relaying Committee, the U.S. representative to the CIGRE B5 Technical Committee, and is a registered Professional Engineer.

Mike Jensen is a Principal Protection Engineer with Pacific Gas and Electric, with 27 years of experience in the power industry in transmission protection, substation design, generation protection, and nuclear power plant maintenance/design at Diablo Canyon PP. He was the System Protection Supervisor for the Southern Area Protection group for 11 years and has been with System Protection for 20 years.

He is presently the PG&E Protection Lead for transmission and distribution interconnected generation projects, specifying interconnection requirements and testing for interconnection into the PG&E system. Extensive experience with various protection schemes from distribution feeder protection, to transmission high speed communication assisted schemes, transmission transformer protection and generation protection. Is an active member of IEEE PSRC, IEEE 1547.1, IEEE 1547.2 WG, and a member of NERC drafting teams. Served 6 years in the U.S. Navy on board nuclear submarines as a nuclear power plant operator and technician. Received a BS in Electrical Engineering from California Polytechnic University, San Luis Obispo in 1992 and is a registered Professional Engineer in the state of California

Dr. Masoud Karimi received his PhD from University of Toronto, Canada in 2004. He has worked for multiple industries and academic institutes. He is currently an associate professor with the Department of Electrical and Computer Engineering at the Mississippi State University, USA. He has worked extensively on the design and control of power electronic converters used for various applications including integration of renewable energy systems and energy storage.

Gordon Kawaley has worked at Bonneville for 11 years as an Electrical Engineer. Gordon is the main point of contact for Dynamic Generator Model Validation at BPA, System Electric Database for Generators, an active contributor to BPA Transmission Planning Implementation Procedures and provides support on WECC Basecases along with various NERC compliance standards. Six of his Eleven years at BPA have been spent working in the Transmission Planning Grid Modeling (TPMG) group, working alongside Dmitry Kosterev and Steve Yang on various Technology Innovation Projects. He is also a member of the North American Transmission Forum, Model Validation Work Group, Power Plant Modeling and Verification Task Force and the Renewable Energy Modeling Task Force.

Chl-Hwan Kim received the B.S., M.S., and Ph.D. degrees in the electrical engineering from Sungkyunkwan University, Republic of Korea (South Korea), in 1982, 1984 and 1990, respectively. In 1990, he joined Jeju National University, Cheju, Korea, as a Full-Rime Lecturer. He was a visiting Academic with the University of Bath, Bath, U.K., in 1996, 1998 and 1999. He joined the faculty of the Sungkyunkwan University as an assistant professor (1992), associate professor (1996-2000) and full professor (2001-present).

He served as KIEE (Korean Institute of Electrical Engineers) PES society President (2018) and is Vice President of the KIEE in 2019. He is a chair of IEEE Seoul Section PES chapter now. Chul-Hwan, an IEEE senior fellow and KIEE fellow. Since 2018 he is an expert advisor (area of power engineering and electric machine) of research board in NRF (National Research Foundation) of Korea.

He holds 52 patents (including 13 international patents) and published more than 250 Transactions and Journals papers related to his research area, including SCI/E indexed 98 papers. He has received a number of awards, including the academic award of the KIEE (2000), Prof. Yong-Moon Park's academic award (2001), the paper award of the KIEE (2017), and fifty of his papers have received the best paper award from the IEEE, KIEE and other academic institute.

He is mainly engaged in the teaching and research work of power system protection and electromagnetic transients. In recent years, he has been engaged in low voltage DC (LVDC) distribution line analysis and DC microgrid protection and control.

Peter Klauer is a Senior Advisor, Smart Grid Technology, at the California Independent System Operator Corporation in Folsom California. The ISO manages the flow of electricity across the high-voltage, long-distance power lines that make up 80 percent of California's and a small part of Nevada's grid. The nonprofit public benefit corporation keeps power moving to homes and communities supported by a competitive wholesale energy market and comprehensive infrastructure planning effort.

Peter is responsible for supporting smart grid research and facilitating the integration of emerging smart grid technologies into the ISO's wholesale energy markets and operational systems. Peter acts in an advisory role on technical programs and research initiatives, including, the California Energy Commission's EPIC Program, the US Department of Energy's ARPA-e agency, national laboratory research initiatives, EPRI, and California Investor Owned Utility demonstration projects with the ISO.

Peter also supports state energy policy development in emerging renewable and smart grid technology areas within the California Public Utilities Commission's Energy Division and the Governor's Office of Business and Economic Development.

Dmitry Kosterev is a transmission planning engineer at Bonneville Power Administration. His responsibilities include transmission system planning, grid modeling and controls. Recently, he's been involved in joint studies to increase transfer capabilities between California and Pacific Northwest, as was requested by California Energy Commission. Dmitry Kosterev has been also involved in development of BPA Synchrophasor RAS to improve voltage stability on California-Oregon Intertie, the scheme went into operations in 2017.

Albert "Skip" Kurz is a world leader in OH Transmission/Distribution Line, OPGW and ADSS hardware, vibration control products and Overhead Transmission Line Monitoring (OTLM) systems. Mr. Kurz has held positions in Sales and Marketing and Business Development for Tyco's Energy group (Raychem, AMP, and Dulmison), ABB and Southwire and has consulted for USi on their Power Donut and Cat systems for transmission line monitoring and Dynamic Line Ratings (DLR). Mr. Kurz holds a BS in Civil Engineering and an MBA from Temple University's Fox School of Business and is an active member in IEEE - ICC and PES groups and has over 30 years in the Utility industry.

Yilu Liu received her M.S. and Ph.D. degrees from the Ohio State University, Columbus, in 1986 and 1989. She received the B.S. degree from Xian Jiaotong University, China.

Dr. Liu is currently the UT-ORNL Governor's Chair at the University of Tennessee, Knoxville and Oak Ridge National Laboratory (ORNL). She is also the deputy director of the DOE/NSF engineering research center CURENT (curent.utk.edu). She led the effort to create the North American power grid Frequency Monitoring Network FNET/GridEye (fnetpublic.utk.edu, powerit.utk.edu). Dr. Liu is an expert in large grid dynamic modeling and simulations.

Dr. Liu is a member of National Academy of Engineering, a member of the National Academy of inventors, a fellow of IEEE. She can be reached at Liu@utk.edu.

Ralph Mackiewicz is Vice President of SISCO, a developer of communications and integration products for electric utility applications located in Sterling Heights, Michigan. Ralph is an active participant in several IEC and IEEE PSRC/PSCC standards activities and has expertise with IEC 61850, ICCP – TASE.2, Common Information Model (CIM), OPC and ISO 9506 (MMS). Ralph is currently Chairman of the Board for the UCA International Users Group and participates in CIM Users Group, IEC 61850 Users Group and CIGRÉ activities. When Ralph is not pursuing his passion of interoperability, and when the water is not frozen, he and his wife enjoy their boat by fishing on beautiful Lake St. Clair which is situated between the US and Canada north of Detroit.

Vahid Madani **Ph.D., PE, Fellow IEEE** – is the Executive Engineer at GridTology, LLC., an international advising corporation and training institution in advanced power systems applications, grid modernization, and deployment of emerging technology in generation, transmission, and distribution.

Madani's experience spans across system planning, operation, protection and control engineering at Pacific Gas and Electric Co. (PG&E). Vahid has held many leadership and technical positions in emerging technologies from exploration to deployment. His work has led to many national and international collaborations.

Dr. Madani has held many technical, leadership, and advisory roles including Chair of Regional Reliability at the Western Electricity, and as advisor to the U.S. Department of Energy (DOE) on wide-area systems and on portfolio of energy programs with recent focus on synchronizing renewables for integrated grid.

Dr. Madani is a Tau Beta Pi and a Phi Kappa Phi member with many publications and transactions, and has co-authored text books and reference handbooks. He is adjunct faculty at Mississippi State University, an IEEE Distinguished Lecturer, is IEEE Fellow and chairs IEEE PES major Awards. He is a board certified Electrical Engineer in California, and holds multiple US and International patents.

Dr. Sakis (A. P.) Meliopoulos, **IEEE Fellow** –was born on March 19, 1949 in Katerini, Greece. Dr. Meliopoulos has 47+ year-experience in power system analysis, design and automation; he has developed analysis tools for safe ground designs, lightning protection, three-phase power flow, short circuit analysis, dynamic bus design, transients, he introduced dynamic state estimation based protection (setting-less relay) and protection of energy automation systems against cyber-attacks. The safety software and smart ground multimeter are utilized by more than 130 utilities, consulting firms and vendors in the US and abroad. He has performed numerous studies and he has published authoritative text books. He has published over 380 technical papers and he has taught over 300 short courses/continuing education programs to practicing engineers (GT Continuing Education and IEEE) in addition to teaching regular classes at Georgia Tech. He is the inventor of the "setting-less" protection method and presently leads an effort to integrate the setting-less protection into a centralized substation protection utilizing recent technologies of merging units and GPS-synchronized measurements. He leads two Georgia Tech conferences: (a) Protective Relaying Conference and (b) Fault and Disturbance Analysis. Dr. Meliopoulos is a Fellow of the IEEE (1993). He holds 3 patents, he has published three books, a chapter in the Standard Handbook for Electrical Engineers and over 380 technical papers. He has received a number of awards, including the Sigma Xi Young Faculty award (1981), the outstanding Continuing Education Award, Georgia Institute of Technology (twice 2002 and 2014), the 2017 D. Scott Willis ECE Distinguished Mentor Award, three of his papers have received the best paper award (IEEE-PES-SC-1984, IEEE-PES-EC-1987, and IEEE-CSS-HICSS 2002), he received the 2005 IEEE Richard Kaufman Award and the 2010 George Montefiore international award.

Mr. Scott R. Mix, CISSP, joined PNNL in May, 2017 following more than 35 years of experience working in various facets of the electricity industry, including as Senior CIP Technical Manager for the North American Electric Reliability Corporation (NERC), a consultant with KEMA, Inc., Infrastructure Security Manager with the Electric Power Research Institute (EPRI), Senior Security Analyst at the PJM Interconnection, and more than ten years with Leeds & Northrup Co. as a programmer/analyst and systems architect. For more than thirty years, he has focused on the areas of computer and infrastructure security for the electricity sector. While at NERC, he was a staff subject matter expert for Critical Infrastructure Protection (CIP) standards, and participated in the ongoing development of the revisions to the NERC CIP Standards, and served as the

NERC Staff Facilitator for the Critical Infrastructure Protection Committee (CIPC) and several of its working groups and task forces.

Throughout his career prior to joining PNNL, Mr. Mix worked closely with numerous industry and government organizations, including NERC's Critical Infrastructure Protection Committee (CIPC) and its predecessors, its working teams, was the inaugural convener of the Control System Security Working Group, was an active and vocal observer to the NERC Cyber Security Standards Version 1 Drafting Team (and the NERC 1200 process before that), and was a member of the OASIS "How" Working Group. He has also worked with the Department of Energy, the Department of Homeland Security, the FBI's National Infrastructure Protection Center, and the Federal Energy Regulatory Commission dealing with Electricity Sector security issues. He has organized and presented at numerous industry symposia, both domestically and internationally. He is a member and has been secretary of the Philadelphia Chapter of InfraGard, is a member of the ISA and has participated in the ISA99 and ISA100 standards activities, and is a member of the IEEE as well as its Computer Society, Power Engineering Society, and Standards Association. He is a Certified Information Systems Security Professional (CISSP).

Mr. Mix is a graduate of the Bloomsburg University of Pennsylvania with a Bachelor of Science degree in Computer & Information Science and Chemistry.

Nick Moran – PG&E

Jean-Marc Moulin is the Transmission Vice-President at GE with over 26 years experience in the development, delivery and support of Energy Management Systems, along with solid experience in the electricity Market Management System (MMS), Energy Telecom and Distribution Management System (DMS) fields.

He joined CEGELEC / Alstom (now GE Grid Solutions) in 1990 as an EMS software engineer and has since obtained expert knowledge and experience across Telecom and Control Systems for the power industry.

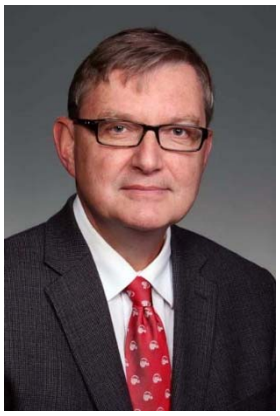
He has also managed international teams in Operations, Software and Support and is a frequent invited technical speaker at international industry events including IEEE's Power Engineering Society and Electricity Power Control Center conferences.

He has driven the Business Development for Transmission for several years as the Transmission Leader for SWS.

Dr. Om Nayak is the President of Nayak Corporation which represents RTDS and PSCAD in the US. His area of expertise is electromagnetic transients modeling and simulation of power systems. He has extensive hands-on experience with RTDS and PSCAD as a developer, user and a consultant to many utilities in the US.

Dr. Nayak obtained his bachelor's degree from Mysore University, India and M.Sc. and Ph.D. degrees from University of Manitoba, Canada, all specializing in power systems. His past industry experience includes his work at Bosch and Siemens in India and Manitoba Hydro International in Winnipeg, Canada. He is a Senior Member of the IEEE.

Dr. Damir Novosel is president and founder of Quanta Technology, a subsidiary of Quanta Services, a Fortune 500 company. Previously, he was vice president of ABB Automation Products and president of KEMA T&D US. Dr. Novosel is also an adjunct professor of Electrical Engineering at North Carolina State University.



Dr. Novosel is elected to National Academy of Engineers in 2014. He served as IEEE Power and Energy Society President (2016-2017) and Vice President of Technical Activities (2011-2012). He is also a member of the CIGRE US National Committee and received the CIGRE Attwood Associate award. He is presently chairing Industry Technical Support Task Force organization responsible for IEEE cooperation with global regulatory agencies.

Damir holds 17 US and international patents and published over 140 articles in Transactions, Journals and Proceedings, receiving IEEE PES 2011 and 2013 Prize Paper Awards, and CIGRE distinguished paper award in 2006. He contributed to 5 books.

Damir Novosel, IEEE Fellow since 2003, holds PhD and MSc, BSc degrees in electrical engineering from Mississippi State University (where he was a Fulbright scholar), the University of Zagreb, Croatia, and the University of Tuzla, Bosnia and Herzegovina. Dr. Novosel was selected Mississippi State University Distinguished Engineering Fellow in 2015.

Dr. Manu Parashar is the Services Director at GE, responsible for the Wide Area Monitoring Systems (WAMS), Generation and Markets Applications at GE Grid Solutions (formerly known as ALSTOM Grid Inc). Prior to this, he was the WAMS Activity Director and had been involved in the Research and Development activities of GE's Stability Solutions, including synchrophasor applications, and was the technical lead in delivering these applications to the North American customers.

Prior to joining GE, he was with Electric Power Group where he was responsible for all synchrophasor related research & development initiatives, including leading the development of the real time and offline synchrophasor applications.

Manu has been active in various technical forums in North America such as the North American SynchroPhasor Initiative (NASPI) and IEEE Power Systems Relaying Committee (PSRC), and has numerous publications including a co-author of the "Wide Area Monitoring and Situational Awareness" chapter of the Electric Power Engineering handbook. Manu received his BS, MS, and PhD degrees in Electrical Engineering from Cornell University, Ithaca, NY, in 1997, 1999, and 2003, respectively.

John Paul "JP" Skeath was born in Allentown, PA in the United States of America on September 29, 1994. He graduated from Colorado School of Mines in 2017 with his B.S. in Electrical Engineering with a minor in Computer Science and has graduated Georgia Institute of Technology in 2018 with an M.S in Electrical and Computer Engineering.

His employment experience included being a laborer installing residential and commercial solar panel systems at Insight Energy, L.L.C; a transmission planning intern at Public Service Company of Colorado, (PSCo), a subsidiary of Xcel Energy; and an engineer at the North American Reliability Corporation.

Skeath has submitted work for multiple different NERC taskforces including the Power Plant Modeling and Verification Task Force, the Inverter Resource

Protection Task Force, and the Methods for Establishing Interconnection Reliability Operating Limits Task Force. He has also provides the annual NERC Case Quality Metrics and has recently published a report detailing the common oscillatory mode shapes in NERC's footprint.

Dr. Jyrki Penttonen has long history of supporting innovation in the power industry. He founded Viola Systems Ltd. (a Smart Grid company), with a focus on medium voltage grid automation projects. After selling Viola Systems to ABB, Dr. Penttonen participated in research programs in Aalto University Finland related to optimal compensation of earth fault currents and accurate detection of faults. As part of this research Dr. Penttonen completed his dissertation on magnetically controlled reactors on their use in earth fault compensation and the physics related to earth fault arc extinguishment. Dr. Penttonen has been published in the International Review of Electrical Engineering, "Optimal Tuning for Fast Arc Suppression Coil".

Dr. Penttonen is currently with a division of Ensto Ltd., which offers earth fault compensation and fault management systems. His duties at Ensto include commercialization of the aforementioned (Aalto University) research technology for global markets.His focus remains to help support utilities efforts to harden distribution grids for safer and more reliable operation.

James Pigeon has been involved in the evaluation, design, implementation, and operation of wholesale electricity markets at the New York Independent System Operator (NYISO) for over 18 years. His tenure at the NYISO includes work in Market Design and Information Technology. As Manager of Distributed Resources Integration he is currently responsible for integrating distributed energy resources (DER) into the NYISO wholesale electricity markets in support of New York State's strategic public policy objective called Reforming the Energy Vision (REV). His most recent work at the NYISO aligns with the company's DER Roadmap, which includes developing market concepts related to aggregation, measurement & verification, performance obligations and dispatchability of DERs.

He has been involved in a wide array of projects at the NYISO, including integrating renewable technologies into the marketplace, working with emerging storage and generation technologies, enhancing interregional trade, improving overall market efficiency as well as the design and implementation of NYISO market systems. Prior to joining the NYISO, he earned a Bachelor of Engineering degree in Computer Engineering from Clarkson University in Potsdam, New York.

Roderick Robinson – PG&E

Christopher E. Root has over 35 years of utility operations and engineering leadership experience. He is currently the Chief Operating Officer for Vermont Electric Power Company in Rutland, VT. He is responsible for the engineering, construction and operation of the transmission system in the state of Vermont, USA.

Previously, he was the Senior Vice President of Network Strategy at National Grid USA responsible for engineering and asset management of the electric and gas networks in the US. He was a Senior VP for 17 years in various roles in Transmission and Distribution Operations, Engineering and Construction for operations in MA, RI, NH and NY. He oversaw several operational mergers and was Emergency Director for over 70 significant events through the years.

Mr. Root has a BS in Electrical Engineering from Northeastern University and a MEng in Electric Power Engineering from Rensselear Polytechnic Institute. He attended the Program for Management Development at the Harvard Business School. Mr. Root is a registered Professional Engineer in the states of MA and RI.

Mr. Root has been the elected Treasurer, Secretary and Member at Large of the IEEE Power and Energy Society Governing Board. He has been member of the North American Transmission Forum Board of Directors and is on the Executive Committee of the US National CIGRE Committee. He is on the Editorial Board of the Power and Energy Magazine. He was awarded the 2009 Outstanding Engineering Award by the Boston Chapter of the Power and Energy Society. He has given many technical presentations throughout the world on various utility topics.

Jonathan Seager – PG&E

Jeff Shiles is the Principal Manager of Protection & Automation Engineering at Southern California Edison. His 28 year career has spanned a variety of technical leadership and managerial roles at SCE, including Transmission Planning, Distribution Engineering, T&D Business Planning, Asset Management & Operations Support, and T&D Engineering. Jeff has a broad perspective of the T&D organization at SCE with an emphasis on teamwork, collaboration, and integrating work activities across different functional areas.

Jeff earned his Bachelor of Science Degree in Electrical Engineering with emphasis in power systems from California Polytechnic State University, San Luis Obispo. He is a registered Professional Engineer in the State of California and a member of the IEEE Power & Energy Society.

Chase Sun is currently a principal engineer in the PG&E Grid Integration and Innovation Department, responsible for providing system-wide distributed generation support, and representing PG&E, on various IEEE-1547, UL-1741, California Rule 21, CEC/CPUC Smart Inverter working groups. He is also providing technical support for various microgrid and EV efforts in the PG&E territory.

He joined PG&E in 1977 and worked in different power system areas including, distribution, transmission, substations, and generation. He also worked in functional areas including engineering, planning, maintenance, construction, protection, project management, and asset management. He was the electrical engineer on various power generation projects, both large and small back in the 1980's. He developed a balance of plant cost estimate and associated conceptual design for a 1.2 MW modular PV central station power plant in 1982, while he was working in the alternative energy engineering group. He also designed the electrical system and control logic for a 125 kW R&D Turbo-Expander induction generator in the early 1990's. He coordinated the first complete set of PG&E generator interconnection requirements in 1984 and was on the team that developed the PG&E Interconnection Handbook in 1997.

He was a key contributor on the IEEE-929, and Rule 21 working groups when the certification concept and the Fast Track review/approval process for the small PV inverters were developed over 15 years ago. Subsequently, he was on the writing committee of IEEE-1547, IEEE-1547.4, IEEE-1547.6 and UL-1741 SA. While he was in distribution substation asset management, in the 1990's, he was responsible for the distribution protection standards/guidelines and developed the protection requirements for the new and replacement distribution substation transformers and breakers. He also developed relay setting templates, along with default settings, to facilitate the implementation of the new microprocessor-based protective relays. He received a B. S. in Electrical Engineering and Computer Science, Power Option, from UC Berkeley. He is a licensed Electrical Engineer in California, since 1981.

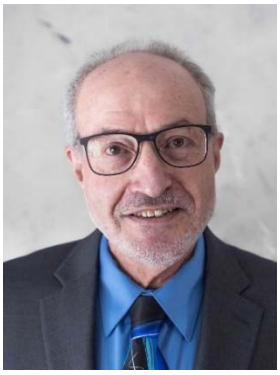
Joseph E. Svachula is Vice President, Strategic Planning for Exelon Utilities (EU) formulates and executes the strategic framework and long-term road map that enables the Exelon Utilities evolution to platform-based infrastructure businesses capable of supporting smart communities/cities across the EU footprint. He leads the strategic planning process that includes the refinement of strategic objectives, identification of key strategic milestones, measures of success at each stage and the investments needed in grid and customer technology to achieve the Exelon Utilities strategic objectives.

Exelon's six utilities, Atlantic City Electric, BGE, ComEd, Delmarva Power, PECO and Pepco, deliver electricity and natural gas to approximately 10 million customers in Delaware, the District of Columbia, Illinois, Maryland, New Jersey and Pennsylvania.

Chifong Thomas has more than 40 years of utility experience, more than 37 of which in electric transmission planning for the Pacific Gas and Electric Company (PG&E) system ranging from 60 kV to 500 kV.Prior to joining Smart Wires, she managedtransmission interconnection forsolar thermal power plants ranging from 200 MW to 1,000 MW for BrightSource Energy, Inc.

Chifonghas conducted and supervised transmission planning studies to develop transmission plans for PG&E.She has served as expert witness in various regulatory and judicial forums; she has developed methodologies,led and participated in developing processes and criteria for PG&E and WECC. She has also served on various WECC committees and task forces, NERC Standards Drafting Teams, Industry Advisory Committees of California Energy Commission (CEC),EPRI and NREL; and Technical Advisory Committee to the California Board of Registration for Professional Engineers and Land Surveyors. Chifong holds a BSEE degree from Washington State University and is a registered Electrical Engineer in the State of California. She is also a senior member of the Institute of Electrical and Electronics Engineers (IEEE).

Eric A. Udren has a distinguished 49-year career in design and application of protective relaying systems, substation control, wide-area monitoring and control systems, PMU applications, and communications systems. He held technical leader and manager positions at Westinghouse, ABB, Eaton Electrical, and KEMA. He programmed the world's first transmission line digital relay, installed in 1971 at PG&E Tesla Substation. He led development of the first integrated substation protection and control system based on a local-area network. He is co-inventor of the distribution falling conductor protection scheme currently being deployed southern California. He works today with major utilities to develop new substation protection, control, communications, and remedial action scheme designs based on Ethernet, IEC 61850 integration, and synchrophasor techniques. Since 2008 he has served as Executive Advisor with Quanta Technology, LLC of Raleigh, North Carolina; with his office in Pittsburgh, Pennsylvania.



Eric is Life Fellow of IEEE, and twice served as chair of the Relaying Communications Subcommittee of the IEEE Power System Relaying Committee. He is Technical Advisor to the US National Committee of IEC for TC 95 relay standards; and is member of IEC TC 57 WG 10 that develops IEC 61850. Eric serves as SME on the NERC System Protection and Control Subcommittee (SPCS) and the NERC Relay Maintenance Standard Drafting Team (PRC-005-6). He has written and presented over 90 technical papers and book chapters including the Westinghouse Applied Protective Relaying book and holds 12 patents. Eric appeared as PACworld Magazine Industry Guru in 2016. He has been elected in 2019 as

member of the National Academy of Engineering ‘for leadership in advancing protection technologies for electric power grids.

Marianna Vaiman is Executive Vice President of V&R Energy with over 25 years of experience in the electric utility industry. Her areas of expertise include power system stability, optimization, and control; analysis of cascading outages; state estimation; and use of synchrophasor measurements for enhanced situational awareness and control. She holds BS and MS in EE from Moscow University of Transportation Engineering, Moscow, Russia.

Marianna presently manages V&R Energy's Smart Grid portfolio. She is responsible for development and deployment of Physical and Operational Margins (POM) Suite, Region Of Stability Existence (ROSE), PMU ROSE, and D-PMU ROSE applications. She has authored over thirty papers devoted to the issues of power system stability and control.

Ms. Vaiman is active in NERC, WECC, NASPI and IEEE PES communities.

David Whitehead is chief operating officer at Schweitzer Engineering Laboratories. After joining SEL in 1994, Whitehead served in a variety of roles within the company, including hardware engineer, research engineer, and chief engineer of the Government Services Division, and vice president of Research & Development.

A passionate driver of product and talent development at SEL, Whitehead has had a hand in the steady stream of inventions and innovations to come out of the U.S. based-technology company. He has been awarded more than 60 patents around the world.

Whitehead is a leader in utility and industrial control system cybersecurity. He has presented at conferences, testified before FERC, chairs the IEEE Power and Energy Society Substations C6 group that addresses serial cryptographic protocols and has authored numerous papers on the topic.

Whitehead received his BSEE from Washington State University in 1989 and his MSEE from Rensselaer Polytechnic Institute in 1994. He is a registered Professional Engineer in Washington, New York, Michigan, and North Carolina

Niklas Winter is the Co-CEO of Swedish Neutral. Swedish Neutral develops, manufactures and markets systems for neutral treatment and earth fault protection that raises reliability and safety for power lines. Winter holds a master's degree in law from Stockholm University.

Jeff Wischkaemper received his B.S. and Ph.D. degrees from Texas A&M University in Electrical Engineering in 2003 and 2011 respectively. Dr. Wischkaemper is a Research Assistant Professor in the Power System Automation Laboratory and has worked on a variety of research projects including investigating arcing on low-voltage networks, characterizing transient response behavior for alternative distribution sensor technologies, and electrically characterizing vegetation contacts with conductors. Several of Dr. Wischkaemper's most recent projects have explored the role advanced sensing technologies can play in the mitigation of wildfire risk.

Steve Yang is an engineer at Bonneville Power Administration. His responsibilities include testing and monitoring of power system. He is involved in generator testing, performance monitoring and model validation. Mr. Yang led the end-use equipment testing program at BPA. He is a current chair of Power Plant Model Validation and Data Task Force (PPMVDTF) in WECC MVWG.

Pacific Gas and Electric Company, incorporated in California in 1905, is one of the largest combination natural gas and electric utilities in the United States. Based in San Francisco, the company is a wholly owned subsidiary of PG&E Corporation.

There are 21,000 employees who carry out Pacific Gas and Electric Company's primary business — the transmission and delivery of energy. The company provides natural gas and electric service to approximately 15 million people throughout a 70,000-square-mile service area in northern and central California.

PG&E customers include:

- **20,850 schools**
- **3,250 hospitals**
- **20,700 high-tech companies**
- **768 military facilities**

Pacific Gas and Electric Company and other utilities in the state are regulated by the California Public Utilities Commission. The CPUC was created by the state Legislature in 1911.

Fast Facts

- Service area stretches from Eureka in the north to Bakersfield in the south, and from the Pacific Ocean in the west to the Sierra Nevada in the east.
- 935 Transmission and Distribution Substations
- More than 139,000 circuit miles of electric lines (60, 70, 115, 230, and 525kV).
- More than 70% of 500kV lines are compensated
- More than 45,800 miles of natural gas pipelines
- 5 million electric customer accounts.
- 4 million gas customer accounts.
- Peak System Load – 30 GWH

Environmental Commitment

Pacific Gas and Electric Company has long been recognized as an environmental leader by providing safe, economical and reliable products and services in a responsible and environmentally sensitive manner. Doing more so that our impact on the environment is less drives us to adopt new technologies, improve our environmental management practices, build strong ties with local communities, reach out to stakeholders to address challenges and contribute to the development of public policies that raise the bar for our industry. The PacificForest and Watershed Lands Stewardship Council was created in 2004 to oversee the implementation of the Land Conservation Commitment, wherein PG&E will either donate or create conservation easements to preserve and enhance over 140,000 acres of PG&E's watershed lands and 655 acres in the Carizzo Plains. The PacificForest and Watershed Lands Stewardship Council will also oversee the implementation of the Environmental Opportunity for Urban Youth Program, which will provide inner city children with wilderness experiences and new urban parks and recreation facilities.