



## Director's Message

Welcome to the 2014-2015 Annual Conference of the Center for Future Energy Systems! With the support of CFES researchers and partners, we have again put together a very strong program for you. This handout is your “guide book” for the event, so please take a moment to look through it and be familiar with the program. Following are a few highlights.

The conference starts with three oral presentation sessions each highlighting the latest development and industry collaboration in a core area of CFES research: a) energy storage and fuel cells; b) power electronics, photovoltaics and energy efficiency; and c) renewable energy systems and grid resiliency. Each session consists of seven presentations by CFES researchers as well as industry partners, and is divided into two parts: Part 1 in the morning and Part 2 after lunch. These sessions run in parallel in different conference rooms. Please pick the one that interests you the most and feel free to switch to a different one during the break between presentations.

We are excited to have Mr. Richard Kauffman, Chairman of Energy and Finance of the Office of Governor Andrew M. Cuomo as our keynote speaker this year. Mr. Kauffman will speak during the luncheon, to which all of you are invited.

Following the luncheon and Part 2 of the oral sessions, the poster and industry exhibition session will open in the foyer and ballroom area on the 1<sup>st</sup> floor. The posters are primarily presented by CFES researchers and graduate students, and cover a wide range of topics related to energy technology and application. Based on industry feedback, we expanded the industry showcase program initiated last year into an Industry Exhibition session that will run in parallel with the poster session. The exhibition tables are mixed with posters according to their technical areas.

This handout also includes a bio of our keynote speaker and each of the three oral session chairs, as well as a printout of the majority of the posters. Oral presentations will be posted on CFES webpage after the conference – please check back in a couple of weeks.

I would like to take this opportunity to thank NYSTAR for its continuous support of CFES. I would also like to thank our industry partners, especially those presenting today in the oral sessions and as exhibitors, for their partnership and collaboration with CFES. It would not have been possible to put together such an extensive program without the support and dedication of CFES researchers and staff, including our colleagues at Cornell University – thank you all!

I wish you a productive and enjoyable conference!



Jian Sun, Ph.D.  
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Professor, Department of Electrical, Computer and Systems Engineering  
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## CFES 2014-2015 Annual Conference

# Final Program

February 26, 2015  
Hilton Garden Inn, Troy, NY

Check In: 9:00am – 10:00am

Parallel Oral Sessions – Part 1 (10:00am – 11:40am)

### **A1: Energy Storage and Fuel Cells**

Room: Ferris Ballroom A

Session Chair: Andrew Naukam, Eastman Business Park

- a1. *Photo-Thermally Reduced Graphene Anodes for High-Performance Lithium-Ion Batteries*, Rahul Mukherjee and Nikhil Koratkar, RPI
- a2. *Operando X-Ray Scattering and Spectroscopic Analysis of Germanium Nanowire Anodes in Lithium-Ion Batteries*, Katharine Silberstein and Hector Abruña, Cornell
- a3. *Stabilizing Electrodeposition of Metals in Batteries*, Lynden Archer, Cornell
- a4. *Scalable Fabrication of Si Nanowire Anodes*, Ben Richards and Tobias Hanrath, Cornell

### **B1: Power Electronics, Photovoltaics and Energy Efficiency**

Room: Sage II Conference Room

Session Chair: Adam Todorski, DEMANSYS

- b1. *4H-SiC P-i-N Diodes on Lightly Doped Free-Standing Substrates*, Sauvik Chowdhury and T. Paul Chow, RPI
- b2. *Industrial Readiness of SiC Power Devices*, Ljubisa Stevanovic, GE Global Research Center
- b3. *The Role of Ferroelectric Polarization on Charge Separation and Recombination in Perovskite Solar Cells*, Yiping Wang and Jian Shi, RPI
- b4. *Electrochemical Rectification of Molecular Multilayered Films Towards Redox Mediators for Dye-sensitized Solar Cells*, Marissa Civic and Peter Dinolfo, RPI

### **C1: Renewable Energy Systems and Grid Resiliency**

Room: Osborn Amphitheatre

Session Chair: Hugo Raul Bashualdo, Siemens PTI

- c1. *A Fundamental Study of Applying Wind Turbines for Power System Frequency Control*, Felipe Wilches-Bernal and Joe Chow, RPI
- c2. *Comparison of Offshore Wind Farm Electrical System Architectures with HVDC Transmission*, Shahil Shah and Jian Sun, RPI



- c3. *Analysis and Mitigation of Subsynchronous Resonance Involving Type-III Wind Turbines*, Ignacio Vieto and Jian Sun, RPI
- c4. *Identification of Continuous “Unobservable” Data Attacks in Power Systems via Matrix Decomposition*, Pengzhi Gao (RPI), Meng Wang (RPI), Joe Chow (RPI), Scott G. Ghiocel (RPI), Bruce Fardanesh (NYPA), George Stefanopoulos (NYPA), and Michael P. Razanousky (NYSERDA)

## Luncheon with Keynote Speaker (11:50am – 1:30pm) – 1<sup>st</sup> Floor, Ferris Ballroom

11. Welcome and Introduction, Jian Sun, Director of CFES
12. Keynote Speaker, Richard Kauffman, Chairman of Energy & Finance, Office of Governor Andrew M. Cuomo

## Parallel Oral Sessions – Part 2 (1:45pm – 3:00pm)

### **A2: Energy Storage and Fuel Cells**

Room: Ferris Ballroom A

Session Chair: Andrew Naukam, Eastman Business Park

- a5. *Anion Exchange Membranes with Improved Chemical Stability*, Angela Mohanty and Chulsung Bae, RPI
- a6. *Anion Exchange Dynamics and Membrane Swelling of a Prospective Alkaline Anion Exchange Membrane Material for Fuel Cells*, Johary Rivera-Meléndez and Hector Abruña, Cornell
- a7. *Optimizing the Design of Utility-Scale Grid Storage*, Chris Thompson, Eaton Corp.

### **B2: Power Electronics, Photovoltaics and Energy Efficiency**

Room: Sage II Conference Room

Session Chair: Adam Todorski, DEMANSYS

- b5. *Furnace Optimization Using Vectorwall™ Static Mixers*, Arun Khuttan and Joel Plawsky, RPI
- b6. *Kick-Starting Oxetane Electron-Beam and Photopolymerizations*, Jim Crivello, RPI
- b7. *On-Site Net Zero Buildings*, Nick Novelli and Anna Dyson, RPI

### **C2: Renewable Energy Systems and Grid Resiliency**

Room: Osborn Amphitheatre

Session Chair: Hugo Raul Bashualdo, Siemens PTI

- c5. *DC Links as a Bridge to the Future of Self-Healing, Smart Grids*, Damian Sciano, Con Edison of New York, Inc.
- c6. *Advancements in the Real-Time Simulation of Large Distribution System with Power Electronic Subsystem*, Amine Yamane and Jean Belanger, Opal-RT Technologies
- c7. *A Non-Intrusive Measurement Based Approach for CVR Factor Estimation*, Chaitanya A. Baone and Santosh Veda, GE Global Research Center



## Poster Session & Reception (3:00pm – 6:30pm) 1<sup>st</sup> Floor, Foyer & Ferris Ballroom

Hors d'oeuvres, beer and wine will be served during the reception.

**Student Poster Awards:** Four posters will be selected for the Best Student Poster Awards. Each award will consist of a certificate and a cash prize of \$250. To qualify for this award, a poster must be prepared and presented by a student (excluding post-doc) who is identified as the lead author. Selection of the awards will be conducted by the attendees of the conference during the poster session. The results will be announced at 6:00 pm. The lead student author is underlined for each qualified poster listed below.

### Batteries and Materials for Energy Storage

- p1. *Photo-Thermally Reduced Graphene Anodes for High-Performance Lithium-Ion Batteries*, Rahul Mukherjee and Nikhil Koratkar, RPI
- p2. *Graphene-based sulfur cathodes for next-generation high-energy lithium-sulfur batteries*, Lu Li and Nikhil Koratkar, RPI
- p3. *Folding Insensitive, High Energy Density Lithium-Ion Battery with Carbon Nanotube Current Collectors*, Shravan Suresh and Nikhil Koratkar, RPI
- p4. *Stabilizing Electrodeposition of Metals in Batteries*, Lynden Archer, Cornell
- p5. *Salt-reinforced Nanoporous Ceramic/polymer Electrolyte for Lithium Metal Batteries*, Zhengyuan Tu, Yingying Lu, Deniz Gunceler, Tomás Arias and Lynden A. Archer, Cornell
- p6. *Carbon Dioxide Assist for Non-aqueous Metal-Oxygen Batteries*, Shaomao Xu and Lynden Archer, Cornell
- p7. *Nucleation and Growth of Lithium Peroxide in the Li-O<sub>2</sub> Cell*, Sampson Lau and Lynden Archer, Cornell
- p8. *Enhanced Lithium Sulfur Battery with Amine-functionalized Cathode*, Lin Ma and Lynden Archer, Cornell
- p9. *Hexacyanoferrate Films on Transition Metal Surfaces for Energy Storage Applications*, Jennifer Hampton, Bill K. Wheatle, Gabriel G. Rodríguez-Calero and Hector Abruña, Cornell
- p10. *New Imaging Tools for Nanoscale Characterization of Lithium-Sulfur Batteries*, Barnaby Levin, Megan E. Holtz, Kayla X. Nguyen, Michael J. Zachman, Jörg G. Werner, Ritu Sahore, Emmanuel P. Giannelis, Ulrich Wiesner, Lena F. Kourkoutis, David A. Muller, Cornell
- p11. *One-Pot Synthesis of Graded, Hierarchically Macro-and Mesoporous Carbon Materials*, Sarah Hesse, Jörg G. Werner and Ulrich Wiesner, Cornell
- p12. *Block Copolymer Derived Nanostructured Functional Materials for Energy Conversion and Storage Devices*, Peter Beaucauge, Joerg Werner, Spencer Robbins, Hiro Sai and Ulrich Wiesner, Cornell
- p13. *Increasing the Gravimetric Energy Density of Organic Based Secondary Battery Cathodes Using Small Radius Cations (Li<sup>+</sup> and Mg<sup>2+</sup>)*, Kenneth Hernández-Burgos, Gabriel G. Rodríguez-Calero and Hector Abruña, Cornell



- p14. *Operando X-Ray Scattering and Spectroscopic Analysis of Germanium Nanowire Anodes in Lithium-Ion Batteries*, Katharine Silberstein, Michael A. Lowe, Benjamin Richards, Jie Gao, Tobias Hanrath and Hector Abruña, Cornell
- p15. *Organic Electrolytes for Symmetric Redox Flow Batteries*, Rebecca Potash, James R. McKone and Hector Abruña, Cornell
- p16. *Scalable Fabrication of Si Nanowire Anodes*, Ben Richards and Tobias Hanrath, Cornell
- p17. *Conducting Polymers as Cathode Materials for Electrical Energy Storage Applications*, Luxi Shen, Masato Mizutani, Gabriel G. Rodríguez-Calero, Héctor D. Abruña and Geoffrey Coates, Cornell
- p18. *Lignocellulosic Composites and Fibers for Advanced Applications*, Trevor Simmons and Robert Linhardt, RPI
- p19. *High-speed High-sensitivity Carbon Nanotube-based Composite Bolometers*, Trevor Simmons (RPI) and Javier Gonzalez (CIACyT-UASLP)
- p20. *CFES Energy Materials and Device Laboratory*, Trevor Simmons and Jian Sun, RPI

### Fuel Cells

- p21. *Synthesis and Characterization of Novel Fluorene-Based Polymers for Anion Exchange Membranes*, Woo-Hyung Lee, Angela D. Mohanty & Chulsung Bae, RPI
- p22. *Poly(arylene ether sulfone) with Pendant Perfluorosulfonic Acid for Proton Exchange Membrane Fuel Cell Application*, Dong Won Shin, Ying Chang (RPI), Giuseppe F. Brunello (Georgia Tech), Jeffrey Fuller (Georgia Tech), Melanie L. Disabb-Miller (Pennsylvania State), Marilyn E. Hawley (Los Alamos National Laboratory), Yu Seung Kim (Los Alamos National Laboratory), Michael A. Hickner (Pennsylvania State), Seung Soon Jang (Tech), and Chulsung Bae (RPI)
- p23. *Anion Exchange Membranes with Improved Chemical Stability*, Angela Mohanty and Chulsung Bae, RPI
- p24. *Anion Exchange Dynamics and Membrane Swelling of a Prospective Alkaline Anion Exchange Membrane Material for Fuel Cells*, Johary Rivera-Meléndez, Kristina M. Hugar, Jimmy John, Geoffrey W. Coates, and Hector Abruña, Cornell
- p25. *Screening of Ternary Nitride Thin Films for Fuel Cell Catalyst Supports*, Abigail Van Wassen, James R. O'Dea, Anna E. Legard, John A. Marohn, R. Bruce van Dover and Hector Abruña, Cornell
- p26. *Synthesis of Ordered Nickel-Molybdenum Compounds for Hydrogen Evolution*, Peter Csernica, James R. McKone, Francis J. DiSalvo and Hector Abruña, Cornell
- p27. *Synthesis of Pseudo-ternary Metal Nitride Particles for Alternative Fuel Support Material*, Ryo Wakabayashi, Francis J. DiSalvo and Hector Abruña, Cornell

### Power Electronics and Photovoltaics

- p28. *Characteristics of MOS Capacitors with NO and POCl<sub>3</sub> Annealed Gate Oxides on (0001), (11-20) and (000-1) 4H-SiC*, Sauvik Chowdhury (RPI), K. Yamamoto (Denso Corporation), C. Hitchcock (RPI) and Paul Chow (RPI)





- p29. *4H-SiC P-i-N Diodes on Lightly Doped Free-Standing Substrates*, Sauvik Chowdhury, C. Hitchcock, R. Dahal, Ishwara Bhat and Paul Chow, RPI
- p30. *Performance Evaluation on Channel Length Downscaling of Various High Voltage AlGaIn/GaN Power HEMTs*, Zhibo Guo and Paul Chow, RPI
- p31. *Electrochemical Rectification of Molecular Multilayered Films Towards Redox Mediators for Dye-sensitized Solar Cells*, Marissa Civic and Peter Dinolfo, RPI
- p32. *Mechanisms of Solar-Driven Water Splitting for Renewable Energy Applications: Density Functional Theory Studies*, James Buchwald and Peter Dinolfo, RPI
- p33. *The Role of Ferroelectric Polarization on Charge Separation and Recombination in Perovskite Solar Cells*, Yiping Wang and Jian Shi, RPI
- p34. *Artificial Photosynthesis for Alternative Energy Production and CO<sub>2</sub> Sequestration*, Adam Bross, Mark Durniak, David Elsaesser, Stuart Smith, K. V. Lakshmi and Christian Wetzel, RPI
- p35. *The Structure and Function of Porphyrins in Energy Transduction: Electrochemical, Optical and Quantum Mechanical Studies of the Electronic Structure of Magnesium Porphyrins*, Greg Theophall, Yi-Yang Sun and K. V. Lakshmi, RPI
- p36. *High-Resolution Electronic Structure of the Primary Electron Acceptor A<sub>0</sub> of Photosystem I*, Stuart Smith (RPI), Sergey Milikisiyants (RPI), Sijie Hao (Pennsylvania State), John H. Golbeck (Pennsylvania State) and K.V. Lakshmi (RPI)
- p37. *Mechanism of Proton-Coupled Electron Transfer at the Redox-Active Tyrosine Residues of Photosystem II from an Electronic Structure Perspective*, Yi-Yang Sun (RPI), Zhaoyang Zheng (Dalian University), K. V. Lakshmi (RPI) and Shengbai Zhang (RPI)
- p38. *Phase Transformation Toughening of Glass Using Cristobalite Silica*, Siddhardth Sundararaman and Liping Huang, RPI

## Renewable Energy Systems and Grid Resiliency

- p39. *Comparison of Offshore Wind Farm Electrical System Architectures with HVDC Transmission*, Shalil Shah, Huan Guo, Hanchao Liu and Jian Sun, RPI
- p40. *Fault Behavior and Protection of a Series-DC Collection System for Offshore Wind Farms*, Shalil Shah, Huan Guo and Jian Sun, RPI
- p41. *Impedance Modeling of Type-III Wind Turbines*, Ignacio Vieto and Jian Sun, RPI
- p42. *Analysis and Mitigation of Subsynchronous Resonance in Doubly Fed Induction Generators*, Ignacio Vieto and Jian Sun, RPI
- p43. *Modeling and Control of Modular Multilevel Converters*, Hanchao Liu and Jian Sun, RPI
- p44. *System Control of Series-DC Collection Systems for Offshore Wind Farms*, Rohail Hassan and Jian Sun, RPI
- p45. *DC-DC Converters for Offshore Wind Farms with DC Collection*, Huan Guo, Shalil Shah and Jian Sun, RPI
- p46. *CFES Real-Time and Hardware-in-the-Loop Simulation Platforms and Applications*, Huan Guo and Jian Sun, RPI



- p47. *Identification of Continuous “Unobservable” Data Attacks in Power Systems via Matrix Decomposition*, Pengzhi Gao (RPI), Meng Wang (RPI), Joe Chow (RPI), Scott G. Ghiocel (RPI), Bruce Fardanesh (NYPA), George Stefopoulos (NYPA), and Michael P. Razanousky (NYSERDA)
- p48. *Malicious Cyber Attack on Power Systems Using a Markov Decision Process*, Yingshuai Hao, Meng Wang and Joe Chow, RPI
- p49. *A Fundamental Study of Applying Wind Turbines for Power System Frequency Control*, Felipe Wilches-Bernal and Joe Chow, RPI
- p50. *The Engineering, Economic, and Environmental Electricity Simulation Tool*, Biao Mao (RPI), Daniel L. Shawhan (Resources of the Future), Di Shi (Arizona State), Ray D. Zimmerman (Cornell), Jubo Yan (Cornell), John T. Taber (Cornell), Charles M. Marquet (Cornell), Yujia Zhu (Arizona State), Richard E. Schuler (Cornell), William D. Schulze (Cornell) and Daniel Tylavsky (Arizona State)
- p51. *Systems Equations for Wind Turbine Design*, Dave Runkel (GE) and Mark J. Embrechts (RPI)

### Energy Efficiency

- p52. *High Efficiency Light Emitting Sources Using Narrow Line-width Green Phosphor*, Anqing Liu, A. Khanna, Partha Dutta and Michael Shur, RPI
- p53. *Modeling and Design of Phosphor Based Luminescent Solar Concentrators*, Michael D. Hughes, Diana-Andra Borca-Tasciuc and Deborah A. Kaminski, RPI
- p54. *A Study of Iron Porphyrin (FeP) Molecular Conductance with STM Molecular Break Junctions*, Qi Zhou and Kim Lewis, RPI
- p55. *LED Campus Lighting*, Jennifer Brons, RPI
- p56. *Vibration Energy Harvesting on HVAC Ducts for Smart Building Applications*, John Oxaal, Mona Hella and Diana Borca-Tasciuc, RPI
- p57. *On-Site Net Zero Buildings*, Nick Novelli and Anna Dyson, RPI
- p58. *Performance Assessment of the Integrated Concentrating Solar Façade System as Deployed in the General Hospital Lobby of the Sheikh Khalifa Medical City, Abu Dhabi, UAE*, Nick Novelli, Brandon Andow, Jason Vollen, Anna Dyson, RPI
- p59. *Furnace Optimization Using Vectowall™ Static Mixers*, Arun Khuttan and Joel Plawsky, RPI

### Energy Scholars

- p60. *Overview of CFES Energy Scholars Program*, CFES Staff, RPI
- p61. *Mini-scale Cleanup of Natural Gas for Liquefaction*, Nancy Zhong (RPI), Joel Plawsky (RPI) and John Corey (Chart Industries)
- p62. *Glass/Ceramic Materials for Energy Storage Applications*, Eric Dominguez (RPI), Chulsung Bae (RPI) and Patrick Tepesch (Corning)
- p63. *Selective Catalytic Reduction(SCR) System Improvement*, Jinyuan Yu (RPI), Wayne Bequette (RPI) and Parag Kulkarni (GE Power & Water)
- p64. *Effects of Optimized Microgrids on Generation Sources*, Samuel Brown (RPI), Jian Sun (RPI) and Clayton Burns (National Grid)



## Industry Exhibition (3:00pm – 6:30pm) 1<sup>st</sup> Floor, Foyer & Ferris Ballroom

The following companies and organizations will exhibit their technologies and collaboration with CFES at the annual conference. The exhibition tables will be mixed with posters in the 1<sup>st</sup> floor foyer and ballroom according to the technology areas of the companies and products.

- 7AC
- ActaSys, Inc.
- Bettergy Corp.
- Blasch Precision Ceramics
- Conamix, Inc.
- CSS Nanotech, Inc.
- DemanSys Energy LLC
- DNV-GL
- Eaton Industries Co.
- EnerMat Technologies Inc.
- GE Global Research
- Lionano, Inc.
- Intertek
- MicroOrganic Technologies, Inc.
- National Grid
- New York Independent System Operator (NYISO)
- Opal-RT Technologies, Inc.
- Paper Battery Co.
- Siemens PTI
- ThermoAura, Inc.
- Troy Boiler Works, Inc.
- Vital Vio, Inc.
- Widetronix
  
- RPI Emerging Ventures EcoSystem (EVE)
- RPI Office of Technology Commercialization
- NYSERDA/Center for Economic Growth
- NY Battery and Energy Storage Technology (NY-BEST) Consortium





## Biography of Keynote Speaker

Richard L. Kauffman  
Chairman of Energy & Finance  
Office of Governor Andrew M. Cuomo



Richard Kauffman joined the administration of Governor Andrew M. Cuomo as New York State's first "energy czar" in February of 2013. In this capacity, Mr. Kauffman is responsible for developing and advancing the Governor's ambitious plan to create a cleaner, more resilient and affordable energy system.

Mr. Kauffman oversees and manages New York State's entire energy portfolio, including the New York State Department of Public Service, the New York Power Authority, the Long Island Power Authority, and the New York State Energy Research and Development Authority (NYSERDA). He was appointed chair of NYSERDA's board in June 2013. Mr. Kauffman leads New York State's comprehensive Reforming the Energy Vision (REV) initiative. REV includes groundbreaking regulatory reform to fundamentally restructure the energy and utility industry, an unprecedented ten-year commitment to support local renewable energy and efficiency markets through the creation of the Clean Energy Fund, and other bold initiatives such as NY Green Bank and the pioneering \$1 billion NY-Sun solar program.

Prior to joining the administration, Mr. Kauffman worked in energy and finance at some of the nation's highest levels, most recently serving as Senior Advisor to Secretary Steven Chu at the U.S. Department of Energy. In his private sector career, he was Chief Executive Officer of Good Energies, Inc., a leading investor in clean energy technologies, a partner of Goldman Sachs where he chaired the Global Financing Group, and vice chairman of Morgan Stanley's Institutional Securities Business and co-head of its Banking Department.

Mr. Kauffman has served as Chairman of the Board of Levi Strauss & Co., as well as on the boards of several organizations, including the Brookings Institution and the Wildlife Conservation Society. He is a member of the Council on Foreign Relations.

Mr. Kauffman earned a bachelor's degree from Stanford University, a master's degree in international relations from Yale University, and a master's in public and private management from the Yale School of Management.





## Biographies of Session Chairs

### Session A: Energy Storage and Fuel Cells – Andrew Naukam



**Andrew Naukam** is recently retired from industry with 32 years of experience primarily in two fields of interest: manufacturing engineering, batteries and energy systems. In the battery field, he initially focused on the research and development of non-rechargeable lithium manganese dioxide cell chemistry, configuration and production for military, automotive and medical applications. He oversaw the scale up and optimization of production of cells and batteries in factories in the UK, China and India and managed supply chain, quality assurance, testing and certification of batteries and charging systems.

Andy transitioned into applications for larger energy storage modules with lithium ion chemistries, and integration with solar generation, inverters and system control architecture and most recently worked in business development.

### Session B: Power Electronics, Photovoltaics and Energy Efficiency – Adam Todorski



**Adam Todorski** is the Chief Technology Officer and a co-founder of Demansys Energy, a smart grid technology company which operates energy storage assets and real time industrial demand response for the provision of reserves and regulation in eastern United States and Texas. Adam has worked in distributed generation and had an early demand response technology company. He has also managed business software development teams and one of the largest supercomputers in the world.

Adam has a BS in Computer Science from RPI.

### Session C: Renewable Energy Systems and Grid Resiliency – Hugo Raul Bashualdo



**Mr. Bashualdo** brings to the Siemens PTI team over 20 years of specialized engineering and managerial experience within the distribution system. His technical expertise includes distribution planning, distributed generation interconnection impact studies, power loss reduction strategies, reliability improvement, and the design, construction and maintenance of distribution systems.

He has led various areas within a distribution utility business, including: Technical Analysis; Design and Construction; Power Loss Control; Distribution Studies; and Planning, Tariff, Control, and IT. He improved the technical and economic performance of each area he managed. Mr. Bashualdo joined Siemens PTI in February 2012, and leads the consulting group in Distribution Planning and Microgrids.